

# Chroma

## Test & Measurement 2017 Product Catalog



# Table of Contents

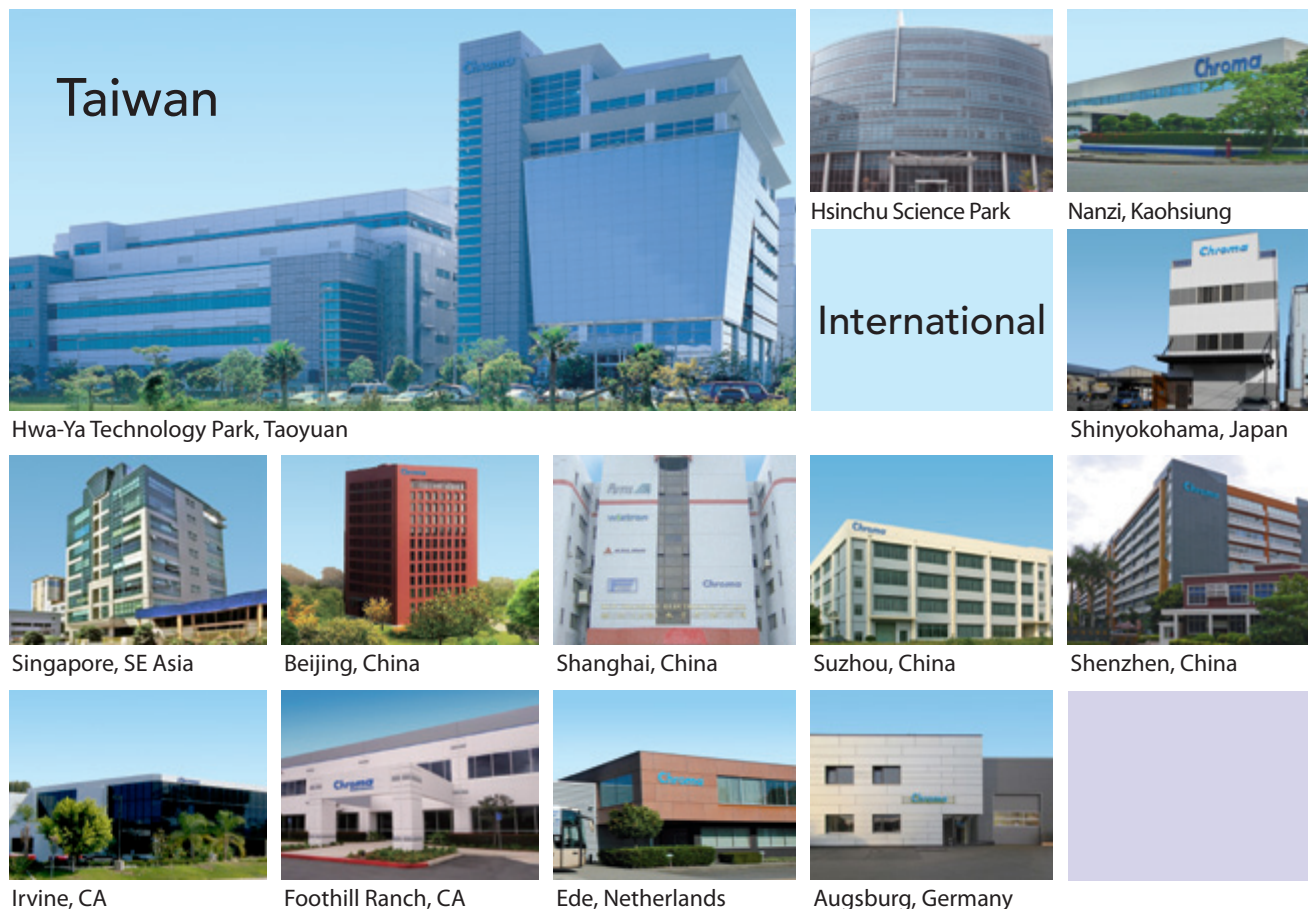
Introduction	1-1
Functional Index	2-1
Model Index	2-3
New Products	3-1
Video & Color Test Solution	4-1
Flat Panel Display (FPD) Test Solution	5-1
LED/Lighting Test Solution	6-1
Optical Devices Test Solution	7-1
Photovoltaic Test & Automation Solution	8-1
Automated Optical Inspection (AOI) Solution	9-1
Power Electronics & Electric Vehicle Test Solution	10-1
Battery Test & Automation Solution	11-1
Passive Component Test Solution	12-1
Electrical Safety Test Solution	13-1
Semiconductor/IC Test Solution	14-1
PXI Test & Measurement Solution	15-1
General Purpose Test Solution	16-1
Manufacturing Execution Systems (MES) Solution	17-1
Turnkey Test & Automation Solution	18-1
Customer Support & Service	19-1
Global Service Network	20-1



# Chroma Group

CHROMA GROUP			
CHROMA ATE INC.			
Newworld H.K.	Chroma Investment	MAS Automation/Taiwan	ADIVIC Technology
Chroma/Beijing	Chroma/USA	MAS Automation/Nanjing	EVT Technology
Chroma/Shanghai	Chroma/Netherlands	MAS Automation/Xiamen	Testar Electronics
Chroma/Suzhou	Chroma/Germany		Chroma New Material
Chroma/Chongqing	Chroma/Japan		DynaScan Technology
Chroma/Xiamen	Quantel/SE Asia (Company of Chroma)		ADLINK Technology
Chroma/Shenzhen			
Chroma/Dongguan			

## Global Operation Sites



## Video & Color Test Solution

Selection Guides		
Video Pattern Generator	22294-A	4-3
Video Pattern Generator	2234	4-5
Video Pattern Generator	★ 2235	4-7
Video Pattern Generator	★ 2238	4-9
Video Pattern Generator	23294	4-11
Video Pattern Generator	2333-B	4-13
Video Pattern Generator	2401/2402	4-15
Video Pattern Generator	★ 2403	4-17
HDMI Distributor	A222907	4-18
MHL Module	A222908	4-19
SDI Module	★ A222915	4-20
Pattern Analyzer	★ A222917	4-21
Display Color Analyzer	7123	4-22
Front Projector ATS	★ 7600A	4-24

## Flat Panel Display (FPD) Test Solution

OLED Lifetime Test System	58131	5-1
OLED Display Shorting Bar		
Pattern Generator	58166	5-2
LTPS Display Shorting Bar		
Pattern Generator	58167	5-3
LCD Shorting Bar Pattern Generator	58162 Series	5-4
LCD Shorting Bar Pattern Generator	58168	5-5
LCM Pattern Generator Card	27010 Series	5-6
LCM Tester	27011	5-8
LCM Tester	27012	5-9
LCM Tester	27013	5-10
FPD Tester	★ 27014	5-11
FPD Tester	★ 2918	5-13
LCM ATS	29133/29135	5-15
LCM ATS	2916	5-17
LCM ATS	2917	5-19
DC Power Supply for LCM Oven Burn-In	67300 Series	5-22

## LED/Lighting Test Solution

ESD Test System	58154 Series	6-1
LED Electrical Test Module	58221-200-2	6-2
LED Chip Level Tester	★ 58173-TC	6-3
LED Mapping Probe Tester	★ 58212-C	6-4
LED Burn-in Test System	58266	6-5
LED Light Bar Test System	58182	6-6
LED Light Bar Electrical Test System	58183	6-7
LED Luminaires Test System (For Lab.)	58158	6-8
LED Luminaires In-line Test System	★ 58158-SC	6-9

## Optical Devices Test Solution

TO-CAN/CoC Burn In System	★ 58603	7-1
TO-CAN/CoC Burn In System	★ 58604	7-3
Laser Diode Characterization System	58620	7-5
TOSA/BOSA Temperature Control System	★ 58690/58691	7-7
TO-CAN Package Inspection System	★ 7925	7-9

## Photovoltaic Test & Automation Solution

Solar Wafer Inspection System	3710-HS	8-1
Solar Cell Inspection Test/Sorting System	3730	8-2
Solar Cell Inspection Test/Sorting System	★ 3760	8-3
Solar Wafer/Cell Diffusion Loader/Unloader	3775	8-4
Automatic Optical Solar Wafer/Cell Inspection System	★ 7200 Series	8-5
c-Si Solar Cell Tester	58301	8-9

## Automated Optical Inspection(AOI) Solution

Automatic Optical Solar Wafer/Cell Inspection System	★ 7200 Series	8-5
Video Microscope	7310	9-1
Sub-nanometer 3D Optical Profiler	7503	9-3
TO-CAN Package Inspection System	★ 7925	7-7
Double sided Wafer Inspection System	★ 7936	9-5
Wafer Inspection System	★ 7940	9-7

## Power Electronics & Electric Vehicle Test Solution

Selection Guides		
Programmable DC Electronic Load	6310A Series	10-5
Programmable DC Electronic Load (LED Load Simulator)	63110A/63113A/63115A	10-10
High Power DC Electronic Load	★ 63200A Series	10-12
High Power DC Electronic Load	★ 63200E Series	10-21
High Speed DC Electronic Load	6330A Series	10-30
Programmable DC Electronic Load	★ 63600 Series	10-36
Programmable AC&DC Electronic Load	63800 Series	10-40
Programmable AC Source	★ 61500 Series	10-42
Programmable AC Source	★ 61600 Series	10-46
Programmable AC Source	61700 Series	10-50
Regenerative Grid Simulator	★ 61800 Series	10-52
Programmable AC Source	6400 Series	10-54
Programmable AC Source	6500 Series	10-56
Digital Power Meter	★ 66200 Series	10-58
Programmable DC Power Supply	62000P Series	10-62
Programmable DC Power Supply	62000H Series	10-66
Programmable DC Power Supply (Solar Array Simulator)	★ 62000H-S Series	10-70
Programmable DC Power Supply	★ 62000L Series	10-74
Modular DC Power Supply	62000B Series	10-76
Switching Power Supply ATS	★ 8000	10-78
Switching Power Supply ATS	8200	10-84
Adapter/Charger ATS	★ 8020	10-85
LED Power Driver ATS	8491	10-86

## Battery Test & Automation Solution

Battery Cell Test and Formation System	17000 Series	11-1
Battery Cell Charge&Discharge Test System	★ 17011	11-3
Regenerative Battery Pack Test System	★ 17020	11-5
Regenerative Battery Pack Test System	★ 17030	11-9
Regenerative Battery Pack Test System	★ 17040	11-13
Battery Pack ATS	★ 8700	11-17

## Passive Component Test Solution

<b>Selection Guides</b>		<b>12-1</b>
HF LCR Meter	★ 11050 Series	<b>12-3</b>
LCR Meter	11021/11021-L	<b>12-4</b>
LCR Meter	11022/11025	<b>12-5</b>
Precision LCR Meter	1062A/1075	<b>12-6</b>
Capacitance Meter	11020	<b>12-7</b>
Automatic Transformer Tester	★ 13350	<b>12-8</b>
Automatic Transformer Test System	3250/3252/ 3302	<b>12-10</b>
Telecom Transformer Test System	3312	<b>12-12</b>
Bias Current Source	1310/1320/ 1320S/1320-10A	<b>12-13</b>
Bias Current Test System	11300	<b>12-14</b>
Electrolytic Capacitor Analyzer	13100	<b>12-15</b>
Ripple Current Tester	11800/11801/11810	<b>12-17</b>
Capacitor Leakage Current/IR Meter	11200	<b>12-18</b>
Programmable HF AC Tester	11802/11803/11805/ 11890/11891	<b>12-19</b>
Milliohm Meter	16502	<b>12-21</b>
Component Test Scanner	13001	<b>12-22</b>
Magnetic Component Test System	1810	<b>12-23</b>
Capacitor Test System	★ 1820	<b>12-24</b>
Inductor Test & Packing Machine	★ 1870D Series	<b>12-25</b>
Inductor Layer Short Machine	★ 1871	<b>12-27</b>
Component ATS	8800	<b>12-29</b>
Electrical Double Layer Capacitor ATS	8801	<b>12-31</b>
EDLC Leakage Current Monitoring System	8802	<b>12-33</b>
Options of Passive Component Test Instruments		<b>12-35</b>

## Electrical Safety Test Solution

<b>Selection Guides</b>		<b>13-1</b>
Electrical Safety Analyzer	19032/19032-P	<b>13-3</b>
Wound Component EST Scanner	19035 Series	<b>13-5</b>
Wound Component EST Analyzer	★ 19036	<b>13-7</b>
Multi-channel Hipot Tester	19020 Series	<b>13-9</b>
AC/DC/IR/SCAN Hipot Tester	19052/19053/19054	<b>13-10</b>
Hipot Analyzer	★ 19055/19055-C	<b>13-11</b>
Hipot Analyzer	★ 19056/19057	<b>13-12</b>
AC/DC/IR Hipot Tester	19070 Series	<b>13-13</b>
Impulse Winding Tester	★ 19301A	<b>13-14</b>
Impulse Winding Tester	★ 19305 Series	<b>13-16</b>
Electrical Safety Test Scanner	19200	<b>13-17</b>
Ground Bond Tester	19572	<b>13-19</b>
Hipot Calibrator	9102	<b>13-20</b>
Electrical Equipment ATS	8900	<b>13-21</b>
Medical Electrical Safety ATS	8910	<b>13-22</b>
High Capacitance Electrolytic Capacitor ATS	1911	<b>13-23</b>
Options of Electrical Safety Test Instruments		<b>13-24</b>

## Semiconductor/IC Test Solution

<b>Selection Guides</b>		<b>14-1</b>
-------------------------	--	-------------

PXIe Digital IO Card	★ 33010	<b>14-3</b>
Programmable Pin Electronics Module	36010	<b>14-4</b>
Four-quadrant DUT Power Supply	36020	<b>14-5</b>
VLSI Test System	★ 3380D	<b>14-6</b>
VLSI Test System	3380P	<b>14-7</b>
VLSI Test System	3380	<b>14-8</b>
SoC/Analog Test System	3650-CX	<b>14-9</b>
SoC/Analog Test System	3650	<b>14-11</b>
SoC/Analog Test System	★ 3650-EX	<b>14-13</b>
SoC/Analog Test System	★ 3680	<b>14-15</b>
Full Range Active Thermal Control Handler	★ 3110-FT	<b>14-16</b>
Quad-site FT Test Handler	★ 3160/3160A/3160F	<b>14-17</b>
Tri-Temp Quad-site Test Handler	★ 3160C	<b>14-18</b>
Octal-site FT Test Handler	★ 3180	<b>14-19</b>
RF Solution Integrated Handler	★ 3240-Q	<b>14-20</b>
Hybrid Single Site Test Handler	3110	<b>14-21</b>
Mini Tabletop Single Site Test Handler	★ 3111	<b>14-22</b>
Automatic System Function Tester	3240	<b>14-23</b>
Automatic System Function Tester	3260	<b>14-24</b>
Die Test Handler	★ 3112	<b>14-25</b>
Miniature IC Handler	3270	<b>14-26</b>
Test-In-Tray Handler	3280	<b>14-27</b>

## PXI Test & Measurement Solution

PXI General-purpose Chassis & Backplane	52100 Series	<b>15-1</b>
High Precision Source Measure Unit	★ 52400e/52400 Series	<b>15-2</b>
Device Power Supply	52310e Series	<b>15-5</b>
Programmable DC Power Supply	52912/ 52914	<b>15-6</b>
Extension Card	52906	<b>15-7</b>

## General Purpose Test Solution

Thermal/Multi-function Data Logger	51101/51101C Series	<b>16-1</b>
TEC Controller	54100 Series	<b>16-4</b>
6½ Digital Multimeter	12061	<b>16-7</b>
Wi-Fi /Bluetooth /LTE Tester	ADIVIC MP5000 Series	<b>16-9</b>
RF ATE Test Equipment	★ ADIVIC MP5800	<b>16-10</b>
Multi-Channel GPS Simulator	ADIVIC MP6220	<b>16-11</b>
Single channel GPS/GLONASS Simulator	ADIVIC MP6230C	<b>16-12</b>
RF Recorder/Player	★ ADIVIC MP7 Series	<b>16-13</b>
Wireless Communication Test System	ADIVIC MP9000	<b>16-14</b>

## Intelligent Manufacturing Systems (IMS) Solution

Manufacturing Execution System	★ Sajat MES Series	<b>17-1</b>
Hemodialysis Management System	Chroma HDMS Series	<b>17-3</b>
Fast Easy Player	★ Chroma FEP Series	<b>17-4</b>

## Turnkey Test & Automation Solution

Assembly & Test Automation Solutions		<b>18-1</b>
Smart Conveyor	★ 5703	<b>18-2</b>



<b>1</b>			
1062A	Precision LCR Meter	12-6	
1075	LCR Meter	12-6	
11020	CLC/IR Meter	12-7	
11021	LCR Meter	12-4	
11021-L	LCR Meter	12-4	
11022	LCR Meter	12-5	
11025	LCR Meter	12-5	
11050	★ HF LCR Meter	12-3	
11050-30M	★ HF LCR Meter	12-3	
11050-5M	★ HF LCR Meter	12-3	
11200	CLC/IR Meter	12-18	
11300	Bias Current Test System	12-14	
11800	Ripple Current Tester	12-17	
11801	Ripple Current Tester	12-17	
11802	Programmable HF AC Tester	12-19	
11803	Programmable HF AC Tester	12-19	
11805	Programmable HF AC Tester	12-19	
11810	Ripple Current Tester	12-17	
11890	HF Hipot Tester	12-19	
11891	HF Load Life Tester	12-19	
12061	6½ Digital Multimeter	16-7	
13001	Component Test Scanner	12-22	
13100	Electrolytic Capacitor Analyzer	12-15	
1310	Bias Current Source	12-13	
1320	Bias Current Source	12-13	
1320-10A	Bias Current Source	12-13	
1320S	Bias Current Source (Slave)	12-13	
13350	★ Automatic Transformer Tester	12-8	
16502	Milliohm Meter	12-21	
17000	Battery Cell Formation System	11-1	
17011	★ Battery Cell Charge & Discharge Test System	11-3	
17020	★ Regenerative Battery Pack Test System	11-5	
17030	★ Regenerative Battery Pack Test System	11-9	
17040	★ Regenerative Battery Pack Test System	11-13	
17800	OCV/ACR Test Equipment	11-1	
17910	Barcode Binding Equipment	11-1	
17920	Rework Sorter	11-1	
17930	Grouping Equipment	11-1	
1810	Magnetic Component Test System	12-23	
1820	★ Capacitor Test System	12-24	
1870D	★ Inductor Test & Packing Machine	12-25	
1870D-12	★ Inductor Test & Packing Machine	12-25	
1871	★ Inductor Layer Short Machine	12-27	
19020	Multi-channel Hipot Tester	13-9	
19020-4	Multi-channel Hipot Tester	13-9	
19021	Multi-channel Hipot Tester	13-9	
19021-4	Multi-channel Hipot Tester	13-9	
19022	Multi-channel Hipot Tester	13-9	
19022-4	Multi-channel Hipot Tester	13-9	
19023-8-20	Multi-channel Hipot Tester	13-9	
19032	Electrical Safety Analyzer	13-3	
19032-P	Electrical Safety Analyzer	13-3	
19035	Wound Component EST Scanner	13-5	
19035-M	Wound Component EST Scanner	13-5	
19035-S	Wound Component EST Scanner	13-5	
19036	★ Wound Component EST Analyzer	13-7	
19052	AC/DC/IR Hipot Tester	13-10	
19053	AC/DC/SCAN Hipot Tester	13-10	
19054	AC/DC/SCAN Hipot Tester	13-10	
19055	★ Hipot Analyzer	13-11	
19055-C	★ Hipot Analyzer	13-11	
19056	★ Hipot Analyzer	13-12	
19057	★ Hipot Analyzer	13-12	
19057-20	★ Hipot Analyzer	13-12	
19071	AC Hipot Tester	13-13	
19073	AC/DC/IR Hipot Tester	13-13	
1911	High Capacitance Electrolytic Capacitor ATS	13-23	
19200	Electrical Safety Test Scanner	13-17	
19301A	★ Impulse Winding Tester	13-14	
19305	★ Impulse Winding Tester	13-16	
19305-10	★ Impulse Winding Tester	13-16	
19572	Ground Bond Tester	13-19	
<b>2</b>			
22294-A	Video Pattern Generator	4-3	
2234	Video Pattern Generator	4-5	
2235	★ Video Pattern Generator	4-7	
2238	★ Video Pattern Generator	4-9	
23294	Video Pattern Generator	4-11	
2333-B	Video Pattern Generator	4-13	
2401	Video Pattern Generator	4-15	
2402	Video Pattern Generator	4-15	
2403	★ Video Pattern Generator	4-17	
2701007	LCM Pattern Generator Card	5-6	
2701007 10 bit	LCM Pattern Generator Card	5-6	
2701009	★ LCM Pattern Generator Card	5-6	
2701020	LCM Pattern Generator Card	5-6	
27011	LCM Tester	5-8	
27012	LCM Tester	5-9	
27013	LCM Tester	5-10	
27014	★ FPD Tester	5-11	
29133	LCM ATS	5-15	
29135	LCM ATS	5-15	
2916	LCM ATS	5-17	
2917	★ LCM ATS	5-19	
2918	★ FPD Tester	5-13	
<b>3</b>			
3110	Hybrid Single Site Test Handler	14-21	
3110-FT	★ Full Range Active Thermal Control Handler	14-16	
3111	★ Mini Tabletop Single Site Test Handler	14-22	
3112	★ Die Test Handler	14-25	
3160	★ Quad-site FT Test Handler	14-17	
3160A	★ Quad-site FT Test Handler	14-17	
3160C	★ Tri-Temp Quad Sites Test Handler	14-18	

<b>3160F</b>	★ Quad-site FT Test Handler	<b>14-17</b>
<b>3180</b>	★ Octal-site FT Test Handler	<b>14-19</b>
<b>3240</b>	Automatic System Function Tester	<b>14-23</b>
<b>3240-Q</b>	★ RF Solution Integrated Handler	<b>14-20</b>
<b>3250</b>	Automatic Transformer Test System	<b>12-10</b>
<b>3252</b>	Automatic Component Analyzer	<b>12-10</b>
<b>3260</b>	Automatic System Function Tester	<b>14-24</b>
<b>3270</b>	Miniature IC Handler	<b>14-26</b>
<b>3280</b>	Test-In-Tray Handler	<b>14-27</b>
<b>33010</b>	★ PXIe Digital IO Card	<b>14-3</b>
<b>3302</b>	Automatic Component Analyzer	<b>12-10</b>
<b>3312</b>	Telecom Transformer Test System	<b>12-12</b>
<b>3380</b>	VLSI Test System	<b>14-8</b>
<b>3380-D</b>	★ VLSI Test System	<b>14-6</b>
<b>3380-P</b>	VLSI Test System	<b>14-7</b>
<b>3650</b>	SoC/Analog Test System	<b>14-11</b>
<b>3650-CX</b>	SoC/Analog Test System	<b>14-9</b>
<b>3650-EX</b>	★ SoC/Analog Test System	<b>14-13</b>
<b>3680</b>	★ SoC/Analog Test System	<b>14-15</b>
<b>36010</b>	Programmable Pin Electronics Module	<b>14-4</b>
<b>36020</b>	Four-quadrant DUT Power Supply	<b>14-5</b>
<b>3710-HS</b>	★ Solar Wafer Inspection System	<b>8-1</b>
<b>3730</b>	Solar Cell Inspection Test/Sorting System	<b>8-2</b>
<b>3760</b>	★ Solar Cell Inspection Test/Sorting System	<b>8-3</b>
<b>3775</b>	★ Solar Wafer/Cell Diffusion Loader/Unloader Equipment	<b>8-4</b>

## 5

<b>51101-8</b>	Thermal/Multi-function Data Logger	<b>16-1</b>
<b>51101C-8</b>	★ Thermal/Multi-function Data Logger	<b>16-1</b>
<b>51101-64</b>	Thermal/Multi-function Data Logger	<b>16-1</b>
<b>51101C-64</b>	★ Thermal/Multi-function Data Logger	<b>16-1</b>
<b>52101-1</b>	PXI 8-slot General-purpose Chassis	<b>15-1</b>
<b>52101-A</b>	PXI 8-slot Backplane	<b>15-1</b>
<b>52102-2</b>	PXI 14-slot General-purpose Chassis	<b>15-1</b>
<b>52102-A</b>	PXI 14-slot Backplane	<b>15-1</b>
<b>52105</b>	PXI 18-slot General-purpose Chassis	<b>15-1</b>
<b>52102-A</b>	PXI 18-slot Backplane	<b>15-1</b>
<b>52314e-6-1</b>	★ Device Power Supply	<b>15-5</b>
<b>52401-25-200m</b>	High Precision Source Measure Unit	<b>15-2</b>
<b>52405-5-2</b>	High Precision Source Measure Unit	<b>15-2</b>
<b>52405-10-2</b>	High Precision Source Measure Unit	<b>15-2</b>
<b>52405-25-1</b>	High Precision Source Measure Unit	<b>15-2</b>
<b>52405-25-2</b>	High Precision Source Measure Unit	<b>15-2</b>
<b>52401e-25-200m</b>	★ High Precision Source Measure Unit	<b>15-2</b>
<b>52405e-5-2</b>	★ High Precision Source Measure Unit	<b>15-2</b>
<b>52405e-10-2</b>	★ High Precision Source Measure Unit	<b>15-2</b>
<b>52405e-25-1</b>	★ High Precision Source Measure Unit	<b>15-2</b>
<b>52405e-25-2</b>	★ High Precision Source Measure Unit	<b>15-2</b>
<b>52906</b>	PXI Extension Card	<b>15-7</b>
<b>52912</b>	PXI Programmable DC Power Supply	<b>15-6</b>
<b>52914</b>	PXI Programmable DC Power Supply	<b>15-6</b>
<b>54115-27-12</b>	★ TEC Controller	<b>16-4</b>

<b>54130-24-13</b>	TEC Controller	<b>16-4</b>
<b>54180-40-20</b>	★ TEC Controller	<b>16-4</b>
<b>5703</b>	★ Smart Conveyor	<b>18-2</b>
<b>58131</b>	★ OLED Lifetime Test System	<b>5-1</b>
<b>58154</b>	ESD Test System	<b>6-1</b>
<b>58154-B</b>	ESD Test System	<b>6-1</b>
<b>58154-C</b>	ESD Test System	<b>6-1</b>
<b>58158</b>	LED Luminaires Test System (For Lab.)	<b>6-10</b>
<b>58158-SC</b>	★ LED Luminaires In-line Test System	<b>6-11</b>
<b>58162</b>	LCD Shorting Bar Pattern Generator	<b>5-4</b>
<b>58162-A(E)</b>	LCD Shorting Bar Pattern Generator	<b>5-4</b>
<b>58162-E(E)</b>	LCD Shorting Bar Pattern Generator	<b>5-4</b>
<b>58166</b>	OLED Display Shorting Bar Pattern Generator	<b>5-2</b>
<b>58167</b>	LTPS Display Shorting BarPattern Generator	<b>5-3</b>
<b>58168</b>	LCD Shorting Bar Pattern Generator	<b>5-5</b>
<b>58173-TC</b>	★ LED Chip Level Tester	<b>6-3</b>
<b>58182</b>	LED Light Bar Test System	<b>6-6</b>
<b>58183</b>	LED Light Bar Electrical Test System	<b>6-7</b>
<b>58212-C</b>	★ LED Mapping Probe Tester	<b>6-4</b>
<b>58221-200-2</b>	LED Electrical Test Module	<b>6-2</b>
<b>58266</b>	LED Burn-in Test System	<b>6-5</b>
<b>58301</b>	c-Si Solar Cell Tester	<b>8-9</b>
<b>58603</b>	★ TO CAN/CoC Burn-In System	<b>7-1</b>
<b>58604</b>	★ TO CAN/CoC Burn-In System	<b>7-3</b>
<b>58620</b>	Laser Diode Characterization System	<b>7-5</b>
<b>58690</b>	★ TOSA/BOSA Temperature Control System	<b>7-7</b>
<b>58691</b>	★ TOSA/BOSA Temperature Control System	<b>7-7</b>

## 6

<b>61501</b>	Programmable AC Source	<b>10-42</b>
<b>61502</b>	Programmable AC Source	<b>10-42</b>
<b>61503</b>	Programmable AC Source	<b>10-42</b>
<b>61504</b>	Programmable AC Source	<b>10-42</b>
<b>61505</b>	Programmable AC Source	<b>10-42</b>
<b>61509</b>	★ Programmable AC Source	<b>10-42</b>
<b>61511</b>	Programmable AC Source	<b>10-42</b>
<b>61512</b>	Programmable AC Source	<b>10-42</b>
<b>61601</b>	Programmable AC Source	<b>10-46</b>
<b>61602</b>	Programmable AC Source	<b>10-46</b>
<b>61603</b>	Programmable AC Source	<b>10-46</b>
<b>61604</b>	Programmable AC Source	<b>10-46</b>
<b>61605</b>	Programmable AC Source	<b>10-46</b>
<b>61609</b>	★ Programmable AC Source	<b>10-46</b>
<b>61611</b>	Programmable AC Source	<b>10-46</b>
<b>61612</b>	Programmable AC Source	<b>10-46</b>
<b>61701</b>	Programmable AC Source	<b>10-50</b>
<b>61702</b>	Programmable AC Source	<b>10-50</b>
<b>61703</b>	Programmable AC Source	<b>10-50</b>
<b>61704</b>	Programmable AC Source	<b>10-50</b>
<b>61705</b>	Programmable AC Source	<b>10-50</b>
<b>61830</b>	★ Regenerative Grid Simulator	<b>10-52</b>
<b>61845</b>	★ Regenerative Grid Simulator	<b>10-52</b>
<b>61860</b>	★ Regenerative Grid Simulator	<b>10-52</b>

<b>62015B-15-90</b>	Modular DC Power Supply	<b>10-76</b>	<b>63202A-1200-80</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62015B-150-10</b>	Modular DC Power Supply	<b>10-76</b>	<b>63203A-150-300</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62015B-30-50</b>	Modular DC Power Supply	<b>10-76</b>	<b>63203A-600-210</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62015B-60-25</b>	Modular DC Power Supply	<b>10-76</b>	<b>63203A-1200-120</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62015B-80-18</b>	Modular DC Power Supply	<b>10-76</b>	<b>63204A-150-400</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62050H-40</b>	Programmable DC Power Supply	<b>10-66</b>	<b>63204A-600-280</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62050H-450</b>	Programmable DC Power Supply	<b>10-66</b>	<b>63204A-1200-160</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62050H-600</b>	Programmable DC Power Supply	<b>10-66</b>	<b>63205A-150-500</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62075H-30</b>	Programmable DC Power Supply	<b>10-66</b>	<b>63205A-600-350</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62100H-100P</b> ★	Programmable DC Power Supply	<b>10-66</b>	<b>63205A-1200-200</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62100H-30</b>	Programmable DC Power Supply	<b>10-66</b>	<b>63206A-150-600</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62100H-40</b>	Programmable DC Power Supply	<b>10-66</b>	<b>63206A-600-420</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62100H-450</b>	Programmable DC Power Supply	<b>10-66</b>	<b>63206A-1200-240</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62100H-600</b>	Programmable DC Power Supply	<b>10-66</b>	<b>63208A-150-800</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62100H-1000</b> ★	Programmable DC Power Supply	<b>10-66</b>	<b>63208A-600-560</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62150H-100P</b> ★	Programmable DC Power Supply	<b>10-66</b>	<b>63208A-1200-320</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62150H-40</b>	Programmable DC Power Supply	<b>10-66</b>	<b>63210A-150-1000</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62150H-450</b>	Programmable DC Power Supply	<b>10-66</b>	<b>63210A-600-700</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62150H-600</b>	Programmable DC Power Supply	<b>10-66</b>	<b>63210A-1200-400</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62150H-1000</b> ★	Programmable DC Power Supply	<b>10-66</b>	<b>63212A-150-1200</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62020H-150S</b> ★	Programmable DC Power Supply	<b>10-70</b>	<b>63212A-600-840</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62050H-600S</b>	Programmable DC Power Supply	<b>10-70</b>	<b>63212A-1200-480</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62100H-600S</b>	Programmable DC Power Supply	<b>10-70</b>	<b>63215A-150-1500</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62150H-600S</b>	Programmable DC Power Supply	<b>10-70</b>	<b>63215A-600-1050</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62150H-1000S</b> ★	Programmable DC Power Supply	<b>10-70</b>	<b>63215A-1200-600</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62010L-36-7</b> ★	Programmable DC Power Supply	<b>10-74</b>	<b>63218A-150-1800</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62015L-60-6</b> ★	Programmable DC Power Supply	<b>10-74</b>	<b>63218A-600-1260</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62006P-100-25</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63218A-1200-720</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62006P-300-8</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63220A-150-2000</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62006P-30-80</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63220A-600-1400</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62012P-100-50</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63220A-1200-800</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62012P-40-120</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63224A-150-2000</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62012P-600-8</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63224A-600-1680</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62012P-80-60</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63224A-1200-960</b> ★ High Power DC Electronic Load	<b>10-12</b>
<b>62024P-100-50</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63202E-150-200</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>62024P-40-120</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63202E-600-140</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>62024P-600-8</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63202E-1200-80</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>62024P-80-60</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63203E-150-300</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>62050P-100-100</b>	Programmable DC Power Supply	<b>10-62</b>	<b>63203E-600-210</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63101A</b>	Programmable DC Electronic Load	<b>10-5</b>	<b>63203E-1200-120</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63102A</b>	Programmable DC Electronic Load	<b>10-5</b>	<b>63204E-150-400</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63103A</b>	Programmable DC Electronic Load	<b>10-5</b>	<b>63204E-600-280</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63105A</b>	Programmable DC Electronic Load	<b>10-5</b>	<b>63204E-1200-160</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63106A</b>	Programmable DC Electronic Load	<b>10-5</b>	<b>63205E-150-500</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63107A</b>	Programmable DC Electronic Load	<b>10-5</b>	<b>63205E-600-350</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63108A</b>	Programmable DC Electronic Load	<b>10-5</b>	<b>63205E-1200-200</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63110A</b>	Programmable DC Electronic Load	<b>10-10</b>	<b>63206E-150-600</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63112A</b>	Programmable DC Electronic Load	<b>10-5</b>	<b>63206E-600-420</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63113A</b>	Programmable DC Electronic Load	<b>10-10</b>	<b>63206E-1200-240</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63115A</b> ★	Programmable DC Electronic Load	<b>10-10</b>	<b>63208E-150-800</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63123A</b>	Programmable DC Electronic Load	<b>10-5</b>	<b>63208E-600-560</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63202A-150-200</b> ★	High Power DC Electronic Load	<b>10-12</b>	<b>63208E-1200-320</b> ★ High Power DC Electronic Load	<b>10-21</b>
<b>63202A-600-140</b> ★	High Power DC Electronic Load	<b>10-12</b>	<b>63210E-150-1000</b> ★ High Power DC Electronic Load	<b>10-21</b>



<b>63210E-600-700</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63210E-1200-400</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63212E-150-1200</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63212E-600-840</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63212E-1200-480</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63215E-150-1500</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63215E-600-1050</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63215E-1200-600</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63218E-150-1800</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63218E-600-1260</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63218E-1200-720</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63220E-150-2000</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63220E-600-1400</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63220E-1200-800</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63224E-150-2000</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63224E-600-1680</b>	★ High Power DC Electronic Load	<b>10-21</b>
<b>63224E-1200-960</b>	★ High Power DC Electronic Load	<b>10-21</b>
<hr/>		
<b>63301A</b>	High Speed DC Electronic Load	<b>10-30</b>
<b>63302A</b>	High Speed DC Electronic Load	<b>10-30</b>
<b>63303A</b>	High Speed DC Electronic Load	<b>10-30</b>
<b>63305A</b>	High Speed DC Electronic Load	<b>10-30</b>
<b>63306A</b>	High Speed DC Electronic Load	<b>10-30</b>
<b>63307A</b>	High Speed DC Electronic Load	<b>10-30</b>
<b>63308A</b>	High Speed DC Electronic Load	<b>10-30</b>
<b>63310A</b>	High Speed DC Electronic Load	<b>10-30</b>
<b>63312A</b>	High Speed DC Electronic Load	<b>10-30</b>
<b>63313A</b>	High Speed DC Electronic Load	<b>10-30</b>
<b>63315A</b>	★ High Speed DC Electronic Load	<b>10-30</b>
<b>63323A</b>	High Speed DC Electronic Load	<b>10-30</b>
<b>63610-80-20</b>	Programmable DC Electronic Load	<b>10-36</b>
<b>63630-600-15</b>	★ Programmable DC Electronic Load	<b>10-36</b>
<b>63630-80-60</b>	Programmable DC Electronic Load	<b>10-36</b>
<b>63640-80-80</b>	Programmable DC Electronic Load	<b>10-36</b>
<b>63640-150-60</b>	★ Programmable DC Electronic Load	<b>10-36</b>
<b>63802</b>	Programmable AC&DC Electronic Load	<b>10-40</b>
<b>63803</b>	Programmable AC&DC Electronic Load	<b>10-40</b>
<b>63804</b>	Programmable AC&DC Electronic Load	<b>10-40</b>
<b>6415</b>	Programmable AC Source	<b>10-54</b>
<b>6420</b>	Programmable AC Source	<b>10-54</b>
<b>6430</b>	Programmable AC Source	<b>10-54</b>
<b>6460</b>	Programmable AC Source	<b>10-54</b>
<b>6463</b>	Programmable AC Source	<b>10-54</b>
<b>6490</b>	Programmable AC Source	<b>10-54</b>
<b>6512</b>	Programmable AC Source	<b>10-56</b>
<b>6520</b>	Programmable AC Source	<b>10-56</b>
<b>6530</b>	Programmable AC Source	<b>10-56</b>
<b>6560</b>	Programmable AC Source	<b>10-56</b>
<b>6590</b>	Programmable AC Source	<b>10-56</b>
<b>66201</b>	Digital Power Meter	<b>10-58</b>
<b>66202</b>	Digital Power Meter	<b>10-58</b>
<b>66203</b>	★ Digital Power Meter	<b>10-58</b>
<b>66204</b>	★ Digital Power Meter	<b>10-58</b>

<b>66205</b>	★ Digital Power Meter	<b>10-58</b>
<b>67322</b>	Modular DC Power Supply(LCM Burn-in)	<b>5-22</b>
<b>67346</b>	Modular DC Power Supply(LCM Burn-in)	<b>5-22</b>
<b>67366</b>	Modular DC Power Supply(LCM Burn-in)	<b>5-22</b>

## 7

<b>7123</b>	Display Color Analyzer	<b>4-22</b>
<b>7201</b>	Solar wafer geometry & surface inspector	<b>8-5</b>
<b>7202</b>	Solar Wafer Quality Inspector	<b>8-5</b>
<b>7210</b>	Solar Cell Quality Inspector	<b>8-5</b>
<b>7212-HS</b>	★ Solar Cell Front-side Printing and Surface Defect Inspector	<b>8-5</b>
<b>7213-AD</b>	Solar Cell Backside Printing & Surface Inspector	<b>8-5</b>
<b>7214-D</b>	Anti-Reflection Coating Inspector	<b>8-5</b>
<b>7231</b>	Solar Wafer Sawmark Inspector	<b>8-5</b>
<b>7310</b>	Video Microscope	<b>9-1</b>
<b>7503</b>	★ Sub-nanometer 3D Optical Profiler	<b>9-3</b>
<b>7600A</b>	★ Front Projector ATS	<b>4-24</b>
<b>7925</b>	★ TO-CAN Package Inspection System	<b>7-7</b>
<b>7936</b>	★ Double sided Wafer Inspection System	<b>9-5</b>
<b>7940</b>	★ Wafer Inspection System	<b>9-7</b>

## 8

<b>8000</b>	★ Switching Power Supply ATS	<b>10-78</b>
<b>8020</b>	★ Adapter/Charger ATS	<b>10-85</b>
<b>8200</b>	Switching Power Supply ATS	<b>10-84</b>
<b>8491</b>	★ LED Power Driver ATS	<b>10-86</b>
<b>8700</b>	★ Battery Pack ATS	<b>11-17</b>
<b>8800</b>	Component ATS	<b>12-29</b>
<b>8801</b>	Electrical Double Layer Capacitor ATS	<b>12-31</b>
<b>8802</b>	EDLC Leakage Current Monitoring System	<b>12-33</b>
<b>8900</b>	Electrical Equipment ATS	<b>13-21</b>
<b>8910</b>	Medical Electrical Safety ATS	<b>13-22</b>

## 9

<b>9102</b>	Hipot Calibrator	<b>13-20</b>
-------------	------------------	--------------

## A ~ C

<b>A222907</b>	HDMI Distributor	<b>4-18</b>
<b>A222908</b>	MHL Module	<b>4-19</b>
<b>A222915</b>	★ SDI Module	<b>4-20</b>
<b>A222917</b>	★ Pattern Analyzer	<b>4-21</b>
<b>ADIVIC MP5000</b>	Wi-Fi/Bluetooth/LTE Tester	<b>16-9</b>
<b>ADIVIC MP5800</b>	★ RF ATE Test Equipment	<b>16-10</b>
<b>ADIVIC MP6220</b>	Multi-Channel GPS Simulator	<b>16-11</b>
<b>ADIVIC MP6230C</b>	Single channel GPS/GLONASS Simulator	<b>16-12</b>
<b>ADIVIC MP7 Series</b>	RF Recorder/Player	<b>16-12</b>
<b>ADIVIC MP9000</b>	Wireless Communication Test System	<b>16-13</b>
<b>Chroma FEP Series</b>	★ Fast Easy Player	<b>17-4</b>
<b>Chroma HDMS Series</b>	Hemodialysis Management System	<b>17-3</b>
<b>Sajet MES Series</b>	★ Manufacturing Execution System	<b>17-1</b>

## Video Pattern Generator

### Model 2238



- Support 8K Super Hi-Vision (7680x4320/8192x4320)
- Independent graphics core for 8K Super Hi-Vision pattern with less than 200 ms switch time
- Up to 4 signal modules per unit
- Multi-out function
- 7 inch 1024x 600 high-resolution touch panel, GUI interface
- BMP file format support
- USB 3.0 data access
- Gigabit Ethernet high-speed network interface
- HDMI 2.0a signal module (option)
  - 8K x 4K 60 Hz (4 HDMI port)
  - 4K x 2K 60 Hz (1 HDMI port)
  - Pixel rate up to 600MHz (6Gbps TMDS rate)
- RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 or 4:2:0
- HDCP 2.2 / 1.4
- Wide color gamut
- HDR (High Dynamic Range) Testing (HDR infoframe & metadata / EOTF)
- SCDC (status & control data channel) Reader
- DisplayPort 1.3 signal module (option)
  - 8K x 4K 60 Hz (2 DP port)
  - 8K x 4K 30 Hz (1 DP port)
  - 1.62 / 2.7 / 5.4 / 8.1 Gbps per lane
  - HDCP 2.2 / 1.3
  - DPCD (Display Port Configuration Data) Reader
  - MST (Multi-Stream Transport) testing

 See Page 4-9

## FPD Tester

### Model 2918



- Support 8K SHV (Super Hi-Vision 7680x4320 / 8192x4320)
- Support full 8K scrolling function
- Independent signal and power module design
- Dual-core graphics processing architecture
  - Increase graphics and data transmission performance
  - 8K Super Hi-Vision images switch in less than 200ms
- Support 6/8/10/12 bits color depth (12 bit only in LUT mode)
- Support user edited test patterns
  - BMP pattern format
  - Maxi. 300 of 8Kx4K bmp patterns
- Support VDIM and PWM dimming function
- Support cross coordinates defect positioning function
- Support auto flicker adjustment (with A712306)
- Support gigabit Ethernet control interface
- Support USB port for data update

 See Page 5-13

## LED Chip Level Tester

### Model 58173-TC



- High test speed: complete whole test within 25ms (selected test items)
- Super stable of temperature variation
- Support high voltage and high power LED test requirement
- Support multi-die test (option)
- Support ESD test (option)

 See Page 6-3

## LED Mapping Probe Tester

### Model 58212-C



- High Speed and Accuracy
- Lateral, Vertical, and Flip Chip
- Wide Power Test Range (up to 200V/2A)
- Up to 8 inch Wafers
- Chroma® Huge Photo Detector
- Unique Edge Sensor
- Patented Probe Head
- Robust Z-Axis Stage
- Wafer Mapping Algorithm
- External Light Shielding Enclosure
- Analysis Tools and Statistical Reports

#### HARDWARES

- Automatic LED Wafer/Chip Prober
- Electrical Test Module
- Optical Test Module
- Optional ESD Test Module

 See Page 6-4

## LED Lighting Test System (For Laboratory)

Model 58158



- Simulate the real AC test condition and environment
- Integrate AC, DC, and optical features test to one platform
- Support DC test for AC LED
- Support dual-optical test module in one platform (Integrating sphere or average intensity) (optional)
- Support AC /DC LIV Analysis
- Offer standard light source for calibration

 See Page 6-8

## TO-CAN/CoC Burn In System

Model 58604



- Applicable for burn-in, reliability and life testing
- ACC and APC control modes
- Individual channel driving and measurement
- Driving current 500 mA per channel and up
- Precise temperature control up to 125 °C
- Individual module operation

 See Page 7-3

## TOSA/BOSA Temperature Control System

Model 58690/58691



- Wide temperature range (-40°C~ 85°C)
- Excellent temperature uniformity to make sure all DUTs are under the same temperature condition
- Within  $\pm 0.5^{\circ}\text{C}$  temperature stability
- Fast heating and cooling to shorten testing time
- Temperature control up to 72 DUTs at the same time to increase testing output
- In mass production, TOSA/BOSA provides:
  - Electrical test connector
  - Optical fiber connector

\* Dependent on DUT form factor

 See Page 7-7

## TO-CAN Package Inspection System

Model 7925



- Able to inspect lens scratches, cracks, particles and metal cap defects of TO-CAN package
- Auto focus function for various height adaption of tray or package
- Defect criteria editor for versatile pass/fail settings
- Higher reliability and repeatability than visual inspection
- More than UPH 3600 throughput
- Auto-cassette function to reduce operator loading/unloading time
- Customized inspection report and defect images for analysis

 See Page 7-9



## Solar Cell Inspection Test/Sorting System

**Model 3730-E**



- Good for 6 inches mono/multi crystalline silicon cells
- High throughput and low breakage rate  $\leq 0.1\%$
- Integrated with automatic optical inspectors by customers' request
- Color classification and sorting bins can be defined by customers' request
- Efficiency can be defined by customers' request
- Sorting bin can be extended by module

 See Page 8-3

## Automatic Optical Solar Wafer/Cell Inspection Modules

**Model 7200 Series**



- Adjustable criteria for different process application or model
- Flexible algorithms programming editor for mono-crystalline and multi-crystalline silicon solar cells
- Multiple interface to communicate with manufacturing equipment or information system
- Various defects inspection capability from multilayer LED lighting design
- Flexible design that can be easily integrated to your in-line printing system and sorting system

 See Page 8-5

## Wafer Inspection System

**Model 7940**



- Simultaneous double side color inspection
- 6" wafer / 8" inspection area
- Automatic wafer alignment
- Wafer shape / edge identification
- Unique defect detection algorithm
- Versatile defect criteria definitions
- Complete defect classification
- Defect detection rate  $> 99\%$
- Wafer mapping
  - Yield
  - Up/down stream operation

 See Page 9-7

## Digital Power Meter

**Model 66200 Series**



- Embedded high speed DSP, 16 bits Analog/Digital converters
- 5mA minimum current range(66203/66204/66205)and 0.1mW power resolution
- Capable of extending current measurement range up to 30A (66205)
- Meets ENERGY STAR / IEC 62301 / ErP ecodeign / SPEC POWER measurement requirement
- Meets IEC 61000-4-7 standard requirement for harmonics measurement (66205)
- Support different wiring configuration power measurement (1P2W/1P3W/3P3W/3P4W) (66203/66204)
- Support external shunt and CT for higher current measurement application (66204)
- SMART Range function provides seamless power measurement capability (66205)

 See Page 10-58

## Ultra High Power Density 6kW@4U



### High Power DC Electronic Load

### Model 63200A/63200E Series

- Rated power : 2kW, 3kW, 4kW, 5kW, 6kW, 8kW, 10kW, 12kW, 15kW, 18kW, 20kW, 24kW
- Voltage range: 150V, 600V, 1200V
- Current range: 2,000A max. per unit
- CC, CR, CV & CP operation modes
- CR+CC, CR+CV, CC+CV complex modes (63200A Series)
- Up to 10 units master/slave parallel control
- Dynamic synchronous control in static and dynamic loads
- User defined waveform (UDW) (63200A Series)
- CZ mode for turn on capacitive load simulation

 See Page 10-12  
 See Page 10-21

### Programmable AC Source

### Model 61509/61609



- Power Rating : 6kVA
- Voltage Range: 0~350VLN
- Frequency: DC, 15Hz~2kHz, (5kHz optional)
- 5U form factor/High power density
- Single phase/three phase output selectable
- Constant Current (continuous current limit) function
- Enhancement for DC functionality
- Synchronizing multiple units for multiple output phase applications
- Parallel output capability
- Remote interface: GPIB, RS-232, USB and Etherne

 See Page 10-42  
 See Page 10-46

### Regenerative Grid Simulator

### Model 61800 Series



- Power rating - 61830 : 30kVA ; 61845: 45kVA ; 61860: 60kVA
- Voltage range : 0-300V, 400V (option)
- Frequency: DC, 30Hz-100Hz
- Full regenerative capability based on 100% of output current rating
- Specifically designed for PV inverter, Smart Grid and EV related test applications
- Single phase or three-phase output selectable
- Voltage dips, short interruption and voltage variation simulation
- Harmonics, inter-harmonics waveform synthesizer
- Comprehensive measurement capability, including current harmonics
- Analog programmable interfaces
- Provide parallel feature for meeting high power test applications (Three phase only)

 See Page 10-52

## Solar Array Simulator



### Solar Array Simulator

### Model 62150H-S Series

- Voltage range : 0 ~150V / 600V / 1000V / 1800V
- 3U/15kW high power density module with easy master/slave parallel operation up to 1.5MW
- 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 (4096 points)
- Low leakage current (< 3mA)
- Build-in dynamic MPPT test profile of EN50530, Sandia, CGC/GF004, CGC/GF035, NB/T 32004
- Auto I-V program: 100 I-V curves & Dwell time 1-15,000s

 See Page 10-70



## EVSE ATS

**Model 8000**

- Customized system for EV Supply Equipment (EVSE) testing
- Meets SAE-J1772, CNS15511, GB/T18487, GB/T27930, GB/T20234, NB/T 33008.1, NB/T 33008.2 standards
- Simulates various AC grid situation and EV charging mode
- Integrated connecting panel
- Exclusive test items

 See Page 10-78



## Battery Pack ATS

**Model 8700**

- Specifically designed for battery production line, or battery development testing
- The application range of this system includes battery modules for electric vehicles, motor vehicles, and power storage systems
- Increases QA efficiency by up to 80%
- Inspection of BMS functions, connector withstand voltage, consistency, and performance of battery module
- Charge/discharge power range : 5kW~500kW  
Charge/discharge voltage range : 0V~1200V  
Charge/discharge current range : 0A~2600A
- Standard test items include insulation resistance, electrical tests, software/communication, and battery performance testing
- Able to create test fixture to connect the customized battery module with the automated switch control
- The control system is an easy to use open software platform that supports shop floor control integration with Manufacturing Execution System (MES)

 See Page 11-17



## Regenerative Charge & Discharge Test System

**Model 17011**

- High precision output and measurement up to 0.02%F.S.
- High sampling rate up to 10ms
- Channel parallel output function with maximum 1200A output
- Operating modes: CC/CC-CV/CP/CR
- Dynamic working condition simulation (current/power)
- Built-in DCIR, HPPC, EDLC capacitance & DCIR, LIC capacitance & DCR test functions
- Flexible sampling recording (t, V, I, Q, W)
- Energy recycling during discharge (AC/DC bi-directional regenerative series)
- Integrating ACIR test fixture, temperature/data logger and humidity chamber

 See Page 11-3



## Regenerative Battery Pack Test System

**Model 17020/17040**

- Regenerative battery energy discharge
  - Energy saving, environment protection, and low heat output
- Channels paralleled for higher currents
- Charge / discharge mode (Constant current, Constant voltage, Constant power)
- Driving cycle simulation (Power/Current)
- High precision measurement accuracy
- Data recovery protection (after power failure)
- Independent protection of multi-channel
- Total harmonic distortion: less than 5% of rated power
- Customized rating power/voltage/current
  - Voltage range : 0~500V ; Current range : 0~2600A ; Power range : 600W~50kW (Model 17020)
  - Voltage range : 30~1000V ; Current range : 0~750A ; Power range : 60~300kW (Model 17040)
- System Integration
  - Chamber Control
  - Multi-channels voltage/temperature measurement (Max 256CH)
  - BMS Communication

 See Page 11-5

 See Page 11-13



## HF LCR Meter

## Model 11050 Series



- Test Parameter: L/C/R/Z/Y/DCR/Q/D/  $\theta$
- Test Frequency :  
75kHz ~ 30MHz (11050-30M), 1kHz ~ 10MHz (11050), 60Hz ~ 5MHz (11050-5M)
- Test Level: 10mV ~ 5V
- Basic Accuracy: 0.1%
- 7ms fast speed measurement
- 3 kinds of output impedance modes
- Test signal monitoring function
- Compare & bin-sorting function
- Open/short zeroing & load correction function
- Detached measurement & display unit design
- Standard Handler, RS-232C, USB storage & external bias current control interface
- Optional GPIB or LAN interface

 [See Page 12-3](#)

## Impulsing Winding Tester

## Model 19301A



- Apply high/low inductance test (0.1uH~100uH)
- 10V~1000V impulse voltage test, with 0.06V test resolution
- 20mS high speed test (P1.0 for ACQ)
- Inductance contact check function
- Inductance differential voltage compensation function
- High impulse test sampling rate (200MHz), 10bits
- Breakdown Voltage Analysis (BDV)
- Low voltage range to increase the sensibility of waveform analysis (25V/50V/100V/200V/400V/800V/1000V)
- Traditional Chinese/Simplified Chinese/English user interface
- USB port for storing waveform & screen capture
- Graphical color display
- Standard LAN, USB and RS232 interface

 [See Page 13-14](#)

## Inductor Test & Packing Machine

## Model 1870D Series



- Test and packing speeds from 80ppm to 1,800ppm
- Provides 4 test stations based on test requirements for users to select desired test items
- Complete list of test items: Polarity, Layer Short Circuit, IR, DCR, Ls & Rs (Q value), Bias current
- Patented high-speed polarity reversing design ensures that products on the conveyor all have the same polarity
- Each test station has an independent NG (No Good) product collection box for later quality analysis
- Circular load plate design eliminates dropped inductors
- Equipment is fast, stable and safe
- Exclusive data collection software designed for test and packing machines for monitoring product quality in real time

 [See Page 12-25](#)

## Inductor Layer Short Machine

## Model 1871



- Test speeds from 600ppm to 1,500ppm
- Provides 2 or 5 test stations for ATS selections based on testing requirements
- Equipped with inductance measurement contact check and voltage difference compensation functions
- Patented testing probe with "Four wire system" design to test voltage's authenticity and stability
- Tested NG inductors are collected to a separate box by failed item for bad process model and cause analysis
- Circular load plate design to eliminate dropped inductors
- Exclusive data collection software designed for layer short automatic test system for monitoring product quality in real time

 [See Page 12-26](#)

## VLSI Test System

## Model 3380D



- 100 MHz clock rate
- 50/100 MHz data rate
- 256 I/O digital I/O pins
- Up to 256 sites Parallel testing
- 32/64/128M Pattern Memory
- Various VI source
- Flexible HW-architecture (Interchangeable I/O, VI, ADDA,)
- Real parallel Trim/Match function
- Time & Frequency Measurement Unit (TFMU)
- AD/DA test (16/24bits option)
- SCAN test option (max 1G M/chain)
- ALPG test option for embedded memory
- STDF tools support
- Test program/pattern converter (J750, D10, S50, E320, SC312, V7, TRI-6020)

- User friendly Windows 7 environment
- CRAFT C/C++ programming language
- SW (Software) Same as 3360 & 3360P
- D-M Probe-card compatible with 3360P DM Probe-card
- C-M DUT-card compatible with 3360D/3360P C-M DUT-card(FT/CP)
- Direct mount fixture can be compatible with 3360P probe-Card
- Cable mount fixture can be compatible with 3360D & 3360P

 See Page 14-5

## SoC/Analog Test System

## Model 3680



- 25 interchangeable slots for digital, analog and mixed-signal applications
- 250 Mbps up to 1Gbps data rate
- Up to 512 sites parallel test
- Up to 2048 digital I/O pins
- 256 MW vector memory (512 MW option)
- Up to 32 CH PMU for high precision measurement
- Per-pin timing/ PPMU/ frequency measurement
- Scan features to 16G depth/scan chains
- Switching timing accuracy  $\pm 150$ ps
- Up to 128 CH High density DPS32
- High density HDADDA2 mixed-signal option\*
- High density HDVI analog option\*
- Efficient high power HCDPS analog option\*
- High performance HDAVO option\*

- Microsoft Windows 10 OS
- C#.NET and GUI programming interface
- CRISPro, full suite of intuitive software tools
- Test program and pattern converters for other platforms
- Accept DIB and probe card of other testers directly
- Support STDF data output and customized data format
- Air-cooled, small footprint tester-in-a-test-head design

\* Call for availability

 See Page 14-15

## Full Range Active Thermal Control Handler

## Model 3110-FT



- Temperature Test from -40~125°C
- Final Test
- 3x3 mm~45x45 mm Package
- Contact Force Control 1~10 kg (Optional)
- Up to 4 Output Trays
- Remote Control Operation
- Yield Monitor
- Intelligent Auto Retest & Auto Retry
- Real-time Tray Status

 See Page 14-16

## Tri-Temp Quad Sites Test Handler

## Model 3160C



- Advance thermal technology (Nitro TEC)
- Faster index time 0.6 sec
- Active thermal control and full range temperature
- Chamber less design
- Support multiple sites (Single, Dual or Quad test sites)
- Simple, quick kit changeover

 See Page 14-17

## Device Power Supply

## Model 52310e Series



- 4 Isolated channels of  $\pm 6V$ , 1 A (max)
- 20-bit measurement resolution
- Low output noise
- Maximum sampling rate of 600 KS/s
- Deterministic output by hardware sequencer
- Programmable output resistance
- 8 selectable control bandwidths
- Master/Slave operation
- Drivers with LabVIEW/ LabWindows & C/C# API
- PXI Express Peripheral Module (X1 PCI Express Link)

 See Page 15-6

## PXIe Digital IO Card

## Model 33010



- Standard PXIe-Hybrid [3U] compatible bus type
- 100MHz maximum clock rate
- 32 channels per board
- Extendable up to 256 channels in one chassis
- Any pin to any site
- Per board sequencer architecture (multiple time domains supported)
- Per-pin timing with per-pin, per-cycle bidirectional control
- Per-pin time & frequency measurement
- Per-pin DC level & PMU
- 16 timing sets with on-the-fly timing changes
- 64M sequencer command memory per pin & 64M vector memory per pin
- SCAN pattern function support

 See Page 14-3

## Manufacturing Execution System

## Model Sajat MES Series

### Smart Factory



- Complete Production Process Trace - Traceability
- Full Production Information Monitoring - WIP Control
- Equipment /PLC Automatic Connectivity
  - Computer Integrated Manufacturing: CIM
  - Equipment Automation Program: EAP
- Professional Quality Control System
  - Statistical Process Control: SPC
  - Corrective Action Report: CAR
  - Out of Control Action Plan: OCAP
- Manufacturing Equipment Management
  - Equipment Management System: EMS
  - Overall Equipment Effectiveness: OEE
- Real-time Report
  - Yield Rate Report
  - WIP Report
- Mobile App Real-Time Queries and Notifications, supported types :
  - Smartwatch
  - Smartphone
  - Tablet Computer

 See Page 17-1

## Turnkey Test & Automation Solutions

### ASSEMBLY & TEST AUTOMATION

- Flat Panel Display Burn-in & Testing
- LED Lighting Automatic Assembly & Testing
- Photovoltaic Automatic Testing & Sorting
- Battery Cell Formation System
- Battery Pack Automatic Assembly
- Passive Component Testing & Packing
- CIS Automatic Testing & Sorting
- 3C/IoT Devices Automatic Assembly & Testing
- Smart Conveyor

 See Page 18-1

### Automation Integration

Test & Measurement  
Technology



Intelligent  
Manufacturing  
System



Loading → Assembly → AOI → Safety Test → Power Electronics Test → TEC Test & Control → Aging → Final Test → Sorting → Unloading

Manufacturing Execution System → Computer Integrated Manufacturing → Equipment Management System → Statistics Process Control System

<b>Selection Guides</b>	<b>4-1</b>
<b>Video Pattern Generator (VPG)</b>	<b>4-3</b>
<b>HDMI Distributor</b>	<b>4-18</b>
<b>MHL Module</b>	<b>4-19</b>
<b>SDI Module</b>	<b>4-20</b>
<b>Pattern Analyzer</b>	<b>4-21</b>
<b>Display Color Analyzer</b>	<b>4-22</b>
<b>Front Projector ATS</b>	<b>4-24</b>



## VIDEO PATTERN GENERATOR



**HDMI  
Distributor**

**MHL  
Module**

**SDI  
Module**

**Pattern  
Analyzer**

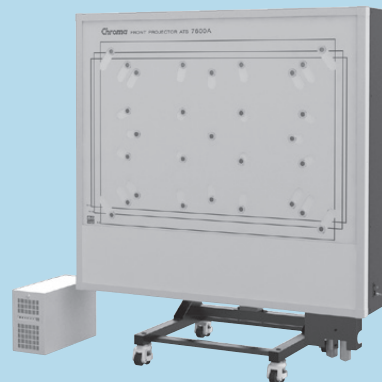


**Video Pattern Generator**

## COLOR ANALYZER / SPECTROCOLORIMETER / Display ATS



**Display Color Analyzer**



**Front Projector ATS**

# Selection Guides

Video Pattern Generator Selection Guide-1

TYPE	Model	Analog	Digital					PAGE
			DVI (TMDS)	HDMI	DisplayPort	Standard	Interface	
Programmable	22294-A	300MHz	330MHz	** 300MHz	--	HDMI 1.4	HDMI x 4	4-3
	2234	250MHz	330MHz	* 165MHz	270MHz	HDMI 1.3 DP 1.1	HDMI x 3 DP x 2	4-5
	2235	300MHz	330MHz	** 300MHz	600MHz	HDMI 1.4 DP 1.2	HDMI x 2 DP x 2	4-7
	2238	300MHz	330MHz	*** 600MHz	1.03GHz	HDMI 2.0a DP 1.3	HDMI x 4 (option) DP x 2 (option) Analog x 1 (option) DVI x 1 (option)	4-9
Non-Programmable	23294	250MHz	330MHz	* 165MHz	--	HDMI 1.4	HDMI x 3	4-11
	2333-B	250MHz	330MHz	* 165MHz	270MHz	HDMI 1.3 DP 1.1	HDMI x 3 DP x 2	4-13
Economy	2401	165MHz	--	--	--	--	--	4-15
	2402	165MHz	165MHz	165MHz	--	HDMI 1.3	HDMI x 1	4-15
	2403	--	--	*** 600MHz	600MHz	HDMI 2.0 DP 1.2	HDMI x 4 (option) DP x 2 (option)	4-17

\* TMDS Rate 225MHz  
 \*\* TMDS Rate 300MHz  
 \*\*\* TMDS Rate 600MHz

Video Pattern Generator Selection Guide-2

TYPE	Model	DTV		TV			OTHERS			PAGE
		SDTV	HDTV	NTSC	PAL	SECAM	HDCP	AUDIO	I/O	
Programmable	22294-A	V	V	V	V	V	V	V	USB	4-3
	2234	V	V	V	V	V	V	V	USB	4-5
	2235	V	V	V	V	V	V	V	USB	4-7
	2238	* V	* V	* V	* V	* V	V	V	USB	4-9
Non-Programmable	23294	V	V	V	V	V	V	V	USB	4-11
	2333-B	V	V	V	V	V	V	V	USB	4-13
Economy	2401	V	V	V	V	V		V	USB	4-15
	2402	--	--	--	--	--	V	V	USB	4-15
	2403	--	--	--	--	--	V	V	USB	4-17

\* Analog Module

## Signal Module Selection Guide -1

### By Output Signals

Signal Module	Output Signal				PAGE
	HDMI 1.3 Distributor	MHL 2.0	3G/HD/SD SDI	Main board PCBA	
A222907	V	--	--	--	4-18
A222908	--	V	--	--	4-19
A222915	--	--	V	--	4-20
A222917	--	--	--	V	4-21

## Signal Module Selection Guide -2

### By Video Pattern Generators

Signal Module	VPG	22294-A	2234	2235	2238	23294	2333-B	2401	2402	2403
A222907 HDMI 1.3 Distributor		V	V	V		V	V		V	
A222908 MHL 2.0 Module		V	V	V	V					V
A222915 3G/HD/SD SDI Module		V	V	V						V
A222917 Pattern Analyzer (LVDS)				V	V					
A223800 12G-SDI Signal Module					V					
A223801 Display Port 1.3 Signal Module					V					
A223802 HDMI 2.0a Signal Module					V					
A223803 Analog Signal Module					V					
A223806 DVI Signal Module					V					
A240001 Remote Controller		V	V	V	V	V	V	V	V	V
A240301 HDMI 2.0 Signal Module										V
A240302 Display Port 1.2a Signal Module										V
PAGE		4-3	4-5	4-7	4-9	4-11	4-13	4-15	4-15	4-17



**Analog** 300 MHz  
**DVI (TMDS)** 330 MHz  
**HDMI V1.4a** 300 MHz  
**(TMDS Rate)** 300 MHz)  
**Multi-port** HDMIx4  
**3D Output**

### KEY FEATURES

- Fully Comparable with HDMI 1.4 Standard
  - 3D Format Output
  - Audio Return Channel
  - Ethernet Channel
  - 4Kx2K / 1080P 120Hz
  - sYCC601 / Adobe RGB / Adobe sYCC601
  - CEC / Deep Color / Lip-Sync / xvYCC
- Multi ports output test application
  - HDMI port output x 4
  - SCART port x 2 (output x1/input x1)
- 330MHz digital (DVI) frequency
- Support Dual HDCP in DVI test application
- HDCP supports Auto / Manual Mode
- Ethernet Browser on Screen
- HDCP ON / OFF IN DVI & HDMI Interface
- S-Video / CVBS / SCART / RGB / Y.Pb.Pr / Y.Cb.Cr / Y.R-Y,B-Y / D-terminal
- NTSC / PAL / SECAM signals
- EDID Read/ Write/Compare/Analysis
- Optical / coaxial audio input (SPDIF)
- Support pattern dynamic scrolling
- Built-in China high definition standard HD patterns
- HDMI/DVI Hot-Plug function
- Support Gamma calibration
- ESD protection circuit
- Front USB & control interface
- PIP & OSD function

Chroma 22294-A Programmable Video Pattern Generator is a multi-functional test device with high speed signal transmission features. It has high resolution test quality and multiple outputs support that can meet the test requirements for the multimedia display industries such as LCD Monitor / LCD TV / PDP / Projector of today and in the future.

Chroma 22294-A supports the up-to-date high resolution multimedia digital/video interface, HDMI V1.4, with the features described below.

The VPG has 3D signal standard format output, Audio Return function that is able to test the external audio source and the Ethernet function that is able to do two-way data transmission. In addition, higher bandwidth and Color Deep are equipped to support 24, 30, 36 bit (RGB or YCbCr) and the new generation color standard xvYCC, sYCC601, Adobe RGB as well as Adobe YCC601 for the implementation of 4Kx2K real natural colors and high resolution image screens with larger color range.

**CEC(Consumer Electronics Control) Function:** Chroma 22294-A is able to set the CEC test parameters automatically or manually and support TX (transmission) / RX (reception) / MONITOR (monitoring) & FEATURE (user property) test modes.

**Lip Sync :** Since the technology of digital signal process improves progressively, potential factors may exist to cause delay when processing the video for a high definition presentation. The HDMI 1.3 allows CE devices to compensate the time difference automatically by synchronizing both of the video and audio to enhance viewer's experience.

This video pattern generator is able to provide analog/digital/TV control signals concurrently: For the analog signal RGB output, the pixel rate is up to 300MHz that meets the RS-343A signal standard, and it supports Y, Pb, Pr/Y, Cb, Cr/Y, R-Y, B-Y.

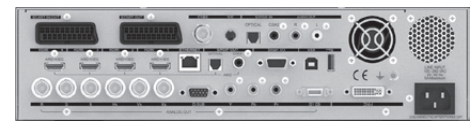
The digital signal output is TMDS with pixel rate up to 330MHz and the test screen resolution supports beyond WQUXGA. Furthermore, to cope with the higher frequency signal tests, Chroma 22294-A also supports DVI Dual HDCP test for dual channel DVI test application.

As to the specification of TV output, the image and chrominance signals of Chroma 22294-A meet the NTSC, PAL and SECAM standards. The output

signals include CVBS compound signals, BNC and Y/ C (Luminance/Chrominance) separated signals as well as S-Video/SCART output connectors. Tests for special TV functions such as Closed Caption, V-chip and Teletext are also supported.

For the application of multiple tests, Chroma 22294-A supports a variety of audio/video and pattern file formats for play with the resolution up to 1080p. Meanwhile, to fulfill the test application for multi-ports output, multi-port HDMI have been built in to reduce a great deal of test time and finish the tests in the fastest way possible.

For operation, Chroma 22294-A has adopted full color graphic interface and built in super capacity memory for storage with the diversified special test patterns like xvYCC, HDCP&E-EDID, 8/10/12bit deep color, CEC, Lipsync and Chinese high definition test patterns embedded for use. Tests can be performed easily and rapidly to save the time and control the cost. Besides using the panel or remote controller for editing, users can edit various timing parameters and test patterns via the VPG Master application. Its easy operating interface and complete test functions are applicable for all video and related industries in R&D, production test and quality assurance.

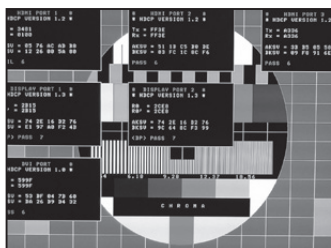


Model 22294-A Rear View

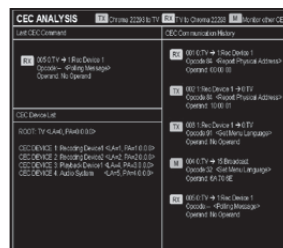
### ORDERING INFORMATION

- 22294-A :** Video Pattern Generator Analog 300MHz/DVI 330MHz/HDMI 300MHz (TMDS Rate 300MHz)/TV/HDTV
- A240001:** Remote Controller

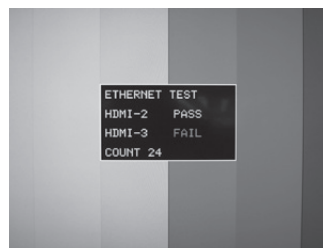
### Special Pattern



Multi-HDCP Pattern



CEC Analysis



HEC & ARC Test Pattern



3D Operation Interface



## SPECIFICATIONS

ANALOG OUTPUT	
Display Size	4096 x 2160
Pixel Rate Range	0.5~300MHz
Video Level	R,G,B (75 ohms) 0~1.0V programmable
Sync on Green/Level	0~0.5V On/Off programmable
White Level	0~1.2V programmable
Black Level	7.5 IRE / 0 IRE selectable
HORIZONTAL TIMING	
Total Pixels	32~8192 pixels / 1 pixels resolution
VERTICAL TIMING	
Total Pixels	4~4096 lines (non-interlace) 4~2048 lines (interlace) / 1 line programmable
COMPOSITE SYNC	
	H+V, H EXOR V, Equalization & Serration Pulse
SEPARATE SYNC	
	BNC : Hs,Vs,Xs ; D-SUB : Hs(Xs), Vs
VIDEO FORMAT	
<b>Video Output</b>	R, G, B / RS-343A Y, R-Y, B-Y Y, Cb, Cr / ITU 601 Y, Pb, Pr / ITU 709, RP177, SMPTE 240M DDC II B (D-SUB)

DVI (TMDS) OUTPUT	
Pixel Rate Range	25 < 1 link ≤ 165MHz/165 < 2 link ≤ 330MHz
EDID	Read / Write / Compare / Edit / Analysis
HDCP	HDCP V.1.0 (with Dual Mode)
Compliant	DVI 1.0 specification
Video Signal Type	RGB
Sampling Mode	4:4:4

HDMI VIDEO OUTPUT	
Version	HDMI V1.4b (3D Format / ARC / HEC / CEC / Lip Sync)
Pixel Rate Range	25~300MHz
Support HDMI Timing	85 Timing (CEA-861E)
Pixel Repetition	4
Video Signal Type	RGB or YCbCr
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2
Bits per Component	8 / 10 / 12 @RGB & YCbCr
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709 / xvYCC (IEC61966-2-4) / sYcc601 / Adobe RGB / Adobe sYcc601
HDCP	HDCP V1.2
EDID	Read / Write / Compare / Edit / Analysis

HDMI AUDIO OUTPUT	
Sample Rate	32, 44.1, 48, 88.2, 96, 176.4, 192KHz
Number of Channel	8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)
Bits per Sample	16 / 24 bit
Waveform	Sine wave
Amplitude	-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS
Frequency Range	10Hz to 20KHz
Frequency Resolution	1Hz / Step
External Audio Input	Optical and Coaxial (S/PDIF)
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

TV OUTPUT									
Output Mode	NTSC			PAL				SECAM	
Subcarrier Frequency	443 4.43	M,J 3.58	BDGHI 4.43	M 3.57	60 4.43	N 4.43	Nc 3.58	4.41/ 4.25	MHz
Closed Caption (NTSC)	C1, C2, C3, C4 / T1, T2, T3, T4								
V-CHIP (NTSC)	MPAA Rating : G, PG, PG-13, R, NC-17, X								
	FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA								
	Canada English Rating : C, C8+, G, PG, 14+, 18+								
	Canada French Rating : G, 8ans+, 13ans+, 16ans+, 18ans+								
Teletext (PAL)	Teletext System B Level 1, 1.5								

SDTV / HDTV FORMAT					
Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
720 x 483	59.94P	60/1.001			SMPTE 293
			59.94I	59.94/2	ITU 601 SMPTE 170M
720 x 576	50P	50			ITU 1382
			50I	25	ITU 601
1920 x 1080	60P	60	60I	30	SMPTE 274
	59.94P	60/1.001	59.94I	30/1.001	SMPTE 274
	50P	50	50I	25	SMPTE 274
	30P	30			SMPTE 274
	29.97P	30/1.001			SMPTE 274
	25P	25			SMPTE 274
	24P	24			SMPTE 274
	23.98P	24/1.001			SMPTE 274
1920 x 1035			60I	30	SMPTE 240
			59.94I	30/1.001	SMPTE 240
1280 x 720	60P	60			SMPTE 296
	59.94P	60/1.001			SMPTE 296
	50P	50			SMPTE 296

3D VIDEO FORMAT OUTPUT	
3D Scanning Mode	Frame packing
	Field alternative
	Line alternative
	Side-by-Side (Full)
	L + depth
	L + depth + graphics + graphics-depth
	Top & Bottom
	Side-by-Side (Half)

DATA STORAGE DEVICE	
Default	2000 timings + 2000 patterns
Internal Memory	3000 timings + 3000 patterns + 1000 programs
External Memory	USB Host interface

OTHERS	
AC Input	1Ø 100~240V ± 10% V <sub>LN</sub> , 47~63Hz
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %

DIMENSION & WEIGHT	
22294-A	88 x 350 x 350 mm / 3.46 x 13.78 x 13.78 inch (HxWxD) 5.6 kg / 12.33 lbs



**Analog** 250 MHz  
**DVI (TMDS)** 330 MHz  
**HDMI V1.3C** 165 MHz  
**(TMDS Rate 225 MHz)**  
**DisplayPort V1.1a** 270 MHz  
**Multi-port (HDMIx3, DPx2)**  
**Multimedia Audio/Video**

### KEY FEATURES

- Support multimedia audio / video play formats
- Support up to 1080p high definition resolution
- Multi ports independent output test application
  - HDMI port output x 3
  - DisplayPort output x 2
  - SCART port x 2 (output x 1 / input x 1)
- DisplayPort V1.1a pixel rate 270MHz
- DisplayPort supports HDCP V1.3
- Support automatically & manually setting for DisplayPort function
  - 2 Link rate (1.62 / 2.7Gbps) selectable
  - 1, 2, 4 Video lane selectable
  - 0 / 3.5 / 6 / 9.5dB pre-emphasis selectable
  - 400 / 600 / 800 / 1200mV swing level selectable
- Support HDMI V1.3C (with 24, 30, 36bit color depth / xvYCC / CEC / Lip Sync)
- Support dual HDCP in DVI test application
- HDCP supports auto / manual mode
- HDMI and DisplayPort multiplexer function or switching for independent output
- HDCP ON/OFF in DVI, HDMI & DisplayPort interface
- Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y output
- S-Video / CVBS / SCART / RGB / Color Component / D-terminal
- NTSC / PAL / SECAM signals
- EDID read / write / compare
- Optical / coaxial audio input (SPDIF)
- Scrolling pattern support
- Built-in China HD standard test patterns
- HDMI / DVI hot plug function

In order to perform motion pictures on the displays nowadays, the 2234 Video Pattern Generator has integrated the Multi-Media playback technology to provide versatile motion pictures for display quality evaluation test. It has high resolution test quality and multiple outputs support that can meet the requirements for multimedia video tests such as LCD Monitor / LCD TV / PDP / Projector of today and in the future.

This Video Pattern Generator provides both analog and digital signals, also supports multiple ports for independent output test and multimedia audio/video formats for play application. For the digital signal, the pixel rate of TMDS output is up to 330MHz and the test screen resolution is able to support beyond WQUXGA. Moreover, to cope with the higher frequency signal test for DVI Dual HDCP tests, it also supports dual link DVI test application.



Chroma 2234 has built in the up to date high resolution multimedia digital video transmission interface, HDMI V1.3, to provide high speed bandwidth and color depth. It supports 24, 30, 36 bits (RGB or YCbCr) and new color standard xvYCC along with sYCC, Adobe RGB, and Adobe YCC(CEA-861E) to implement the real natural colors and high resolution images.

DisplayPort is the state-of-the-art video output interface defined by VESA. The signal transmission is mainly composed of main channel, AUX CH and hot plug (HPD) 3 types of signals. The main channel is formed by 4 lanes (1, 2, 4 Lane) and each lane can support 2.7Gbps or 1.62Gbps transmission rate. Up to 10.8Gbps can be transmitted by 4 lanes. Chroma 2234 supports the DisplayPort standard formats with the following key features:

DPCD (DisplayPort Configuration Data) is the main function of DisplayPort that acted as a communication bridge between source and sink. Chroma 2234 is able to adjust the parameters such as Lane, Main link rate and etc. automatically or manually after connection. As the signal attenuation may occur during long distance transmission for DisplayPort, the Pre-emphasis and Swing voltage can also be adjusted.

In addition Chroma 2234 supports SSC (Spread Spectrum Clock, the technology to eliminate EMI) test that can significantly reduce the EMI problems occurred among displays and components, and simplify the product design.

For the application of multiple tests, Chroma 2234 supports a variety of audio/video and pattern file formats for play with the resolution up to 1080p. Meanwhile, to fulfill the test application for multi ports output, 3 HDMI and 2 DisplayPorts of which the output settings can be executed separately have been built in to reduce a great deal of test time and finish the tests in the fastest way possible.

For operation, Chroma 2234 has adopted full color graphic interface and built in memory for storage with the diversified special test patterns like xvYCC, HDCP&E-EDID, 8/10/12bit deep color, CEC, Lipsync and China high definition test patterns embedded for use. Tests can be performed easily and rapidly to save the time and control the cost.

A remote controller (optional) can be used to replace the direct panel editing for flexible practice in a large test area. It is suitable for mass application in the production line. In addition, various timing parameters and test patterns can be edited via the VPG Master application on PC site. The easy operating interface and complete test functions of Chroma 2234 are applicable for all video and related industries in R&D, production test and quality assurance.



Model 2234 Rear View

### ORDERING INFORMATION

- 2234** : Video Pattern Generator  
Analog 250MHz/DVI 330MHz/HDMI 165MHz  
(TMDS Rate 225MHz)/DisplayPort 270MHz
- A240001** : Remote Controller

### Multimedia Operation interface



SPECIFICATIONS				
<b>ANALOG OUTPUT</b>				
Display Size	4096 x 2160			
Pixel Rate Range	0.5~250MHz			
Video Level	R,G,B (75 ohms) 0~1.0V programmable			
Sync on Green / Level	0~0.5V On/Off programmable			
White Level	0~1.2V programmable			
Black Level	7.5 IRE / 0 IRE selectable			
<b>HORIZONTAL TIMING</b>				
Total Pixels	32~8192 pixels / 1 pixels resolution			
<b>VERTICAL TIMING</b>				
Total Pixels	4~4096 lines (non-interlace) 4~2048 lines (interlace) / 1 line programmable			
<b>COMPOSITE SYNC</b>				
H+V, H EXOR V, Equalization & Serration Pulse				
<b>SEPARATE SYNC</b>				
BNC: Hs, Vs, Xs D-SUB: Hs (Xs), Vs				
<b>VIDEO FORMAT</b>				
Video Output	R,G,B/RS-343A			
	Y, R-Y, B-Y			
	Y, Cb, Cr / ITU 601			
	Y, Pb, Pr / ITU 709, RP 177, SMPTE 240M			
	DDC II B (D-SUB)			
<b>DVI (TMDS) OUTPUT</b>				
Pixel Rate Range	25 < 1 link ≤ 165MHz/165 < 2 link ≤ 330MHz			
E-EDID	Read / Write / Compare / Edit			
HDCP Support	HDCP V1.0 (with Dual Mode)			
Compliant	DVI 1.0 specification			
Video Signal Type	RGB			
Sampling Mode	4:4:4			
<b>HDMI VIDEO OUTPUT</b>				
Version	HDMI V1.3C(with 24,30,36 bit deep color/xvYCC/CEC/Lip Sync)			
Pixel Rate Range	25 ~ 165 MHz ( TMDS CLK : 225MHz)			
Support HDMI Timing	77 Timing(CEA-861D)			
Pixel Repetition	4			
Video Signal Type	RGB or YCbCr			
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2			
Bits per Component	8 / 10 / 12 @RGB & YCbCr			
Color Space	RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-2-4) /sYCC 601/Adobe RGB/Adobe YCC 601			
HDCP Support	HDCP V.1.2			
EDID	Read / Write / Compare / Edit			
<b>HDMI AUDIO OUTPUT</b>				
Sample Rate	32,44.1,48,88.2, 96,176.4, 192KHz			
Number of Channel	8 Channel (FL/FR/RL/RR/FC/LFE/RRC)			
Bits per Sample	16 / 24 bit			
Waveform	Sine wave			
Amplitude	-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS			
Frequency Range	10Hz to 20KHz			
Frequency Resolution	10Hz / Step			
External Audio Input	Optical and Coaxial ( S/PDIF )			
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time			
<b>DISPALY PORT OUTPUT</b>				
Pixel Rate Range	25~270MHz			
Video Signal Type	RGB/YCbCr			
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2			
Color Depth Transmission	6/8/10/12 bits per component			
HDCP Support	HDCP V1.3			
Main Link Data Rate	2.7Gbps or 1.62Gbps per lane			
Lane Count	1/2/4 Lanes			
Pre-emphasis	0dB/3.5dB/6dB/9.5dB selectable			
Swing level	400mV/600mV/800mV/1200mV selectable			
Audio	2 Channel (L-PCM)-Internal 8 Channel (AC3/DTS)-External			
Bit Per Sample	24bit			
Sample Rate	32, 44.1, 48, 88.2, 96, 176.4, 192KHz			
<b>TV OUTPUT</b>				
Output Mode	NTSC	PAL	SECAM	
Subcarrier Frequency	443 M, J 4.43 3.58	BDGHI M 4.43 3.57	60 N Nc 4.43 3.58	4.41/4.25 MHz
Subcarrier Stability	± 50			Hz
Video Output	Composite (BNC), S-Video			
	Burst On/Off (NTSC, PAL)			
	Contrast programmable			
	Brightness programmable			
	Saturation programmable			
Hue programmable				
Closed Caption Support (NTSC)	C1, C2, C3, C4/ T1, T2, T3, T4			
V-CHIP (NTSC)	MPAA Rating : G, PG, PG-13, R, NC-17, X			
	FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA			
	Canada English Rating : C, C8+, G, PG, 14+, 18+			
Canada French Rating : G, 8 ans+, 13 ans+, 16 ans+, 18 ans+				
Teletext (PAL)	Teletext System B Level 1 , 1.5			
<b>MULTIMEDIA PLAY</b>				
Video Format	MPEG-1(.mpg, .dat) ; MPEG-2(.vob) MPEG-4(.avi, .mp4) ; Support Up to 40Mbps(1080p)			
Audio Format	MPEG-1 Layer-3(.mp3) ; LPCM(.wav) ; AAC(.aac)			
Picture Format	BitMap(.bmp) ; JPEG(.jpg)			
Interface	USB 2.0			
File system	Internal: EXT-3, External: EXT-3 / FAT-32			
Storage method	Internal: 16GB Flash Memory, External: Media USB Port			
<b>DATA STORAGE DEVICE</b>				
Default	2000 timings + 2000 patterns			
Internal Memory	3000 timings + 3000 patterns + 1000 programs			
External Memory	USB Host interface			
<b>OTHERS</b>				
AC Input	1Ø 100~240V ± 10% V <sub>LN</sub> , 47~63Hz			
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C			
Humidity	20~90 %			
<b>DIMENSION</b>				
2234 (H x W x D)	88 x 350 x 350 mm / 3.46 x 13.78 x 13.78 inch			
<b>WEIGHT</b>				
2234	5.6 kg / 12.33 lbs			

Video & Color  
Flat Panel Display  
Lighting LED/  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semicconductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



## KEY FEATURES

- Comply with DisplayPort 1.2a standard
  - 4K x 2K 60/50Hz
  - Pixel rate support up to 600MHz
  - Auto / Manual training mode
  - 1.62 / 2.7 / 5.4Gbps per lane
  - 1 / 2 / 4 Link
  - 0 / 3.5 / 6 / 9.5 dB pre-emphasis
  - 400 / 600 / 800 / 1200mV Swing level
  - MST( Multi Stream Transport )
  - DPCD Analyze
- HDMI support up to 300MHz
  - 4K x 2K 24/30Hz
  - 1080p 120Hz
  - 3D format with 1080p 60Hz (Frame packing / Side-by-Side Full)
- 2 HDMI ports + 2 DisplayPort output
- Analog support up to 300MHz
- Support HDCP function
- S-Video/CVBS/SCART/RGB/Component/ D-terminal NTSC/PAL/SECAM standard
- Dual link DVI support up to 330MHz
- EDID Read/Write/Compare/Analyze
- Support Pattern Scrolling Function
- ESD Protection Circuit
- Front Panel USB Port & Control Interface
- Graphic Operating & Editing Interface

Chroma 2235 is a programmable video pattern generator that equipped with various standard analog/digital signal output functions. The built-in high speed graphic engine is able to provide standard test signals and patterns for display devices with various resolutions to meet the requirements of multimedia display industries today and in the future for R&D and test applications.

The Video Pattern Generator supports the up-to-date high resolution multimedia digital audio and video transmission interface HDMI and DisplayPort specification with the following features:

## Support 4Kx2K ultra high resolution

For digital interface, the DisplayPort supports 600MHz, the HDMI supports 300MHz and DVI supports up to 330MHz (Dual link). For analog interface, the signal supports up to 300MHz. The high bandwidth signal output capability supports the testing for the newest generation of 4K ultra high resolution displays.

## DP 1.2a standard format signal output

Supports DisplayPort 1.2a standard HBR2(High Bit Rate 2, 5.4Gbps) bandwidth transmission up to 4K x 2K 60Hz resolution. Supports MST( Multi Stream Transport ) function, with one DisplayPort output testing 4 Full HD(1080P) monitors at once. The 3D function is fully supported with abundant 3D test patterns, and provided for the user to download customized 3D patterns (splitting left/ right images in Bitmap file format).

## Fully support HDMI defined functions

The 2235 is equipped with HEAC (Ethernet / Audio Return Channel) / Lipsync / HDCP / CEC / EDID functions and supports 24 / 30 / 36 bit color depth (RGB or YCbCr) and newest generation of color standard xvYCC / sYCC601/ Adobe RGB / Adobe YCC601.

## Multi-signal port for simultaneous output

The 2235 has 2 HDMI / DisplayPort output ports that can provide multi-signal output simultaneously to meet the test applications for multi-port displays nowadays.

The RGB (BNC / D-Sub) and component (YPbPr / D-Terminal) signals provided by 2235 are able to output all kinds of standard signal formats to test the displays with traditional analog interface. The digital DVI output signal supports dual channels HDCP which is most applicable for high resolution display testing.

For TV signals, the 2235 is able to output the signals that comply with NTSC, PAL and SECAM specifications, also to support CVBS and Y/C

separation signal formats for BNC / S-Video / SCART output ports. Special TV function tests such as Closed Caption, V-chip and Teletext are also supported.

Chroma 2235 has full color graphic interface and super large capacity of storage memory with lots of special test patterns built-in such as xvYCC, HDCP, E-EDID Deep color, CEC, Lipsync and high-definition test images defined by China to give the user an easy way to judge the test result and save the time for production improvement as well as to achieve cost effective control. In addition to the panel editing of standalone device, remote control can be applied also the application software VPG Master can be utilized to edit various test programs and parameters. Its easy-to-use interface and complete test functions are most suitable for the applications of R&D, production tests and quality assurance in all video and associate industries.



Model 2235 Rear View

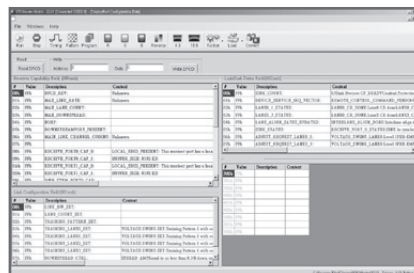
## ORDERING INFORMATION

- 2235** : Video Pattern Generator  
Analog 300MHz/DVI 330MHz/HDMI 300MHz (TMDS Rate 300MHz)/DisplayPort 600MHz
- A240001** : Remote Controller

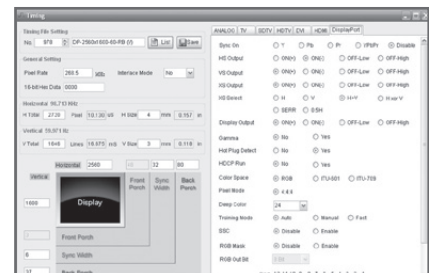
## Multi-Stream Transport (MST)



## Soft Panel



DPCD Screen



DisplayPort Timing Screen



## SPECIFICATIONS

Analog Output	
Display Size	4096 x 2160
Pixel Rate Range	0.5~300MHz
Video Level	R,G,B (75 ohms) 0~1.0V programmable
Sync on Green/Level	0~0.5V On/Off programmable
White Level	0~1.2V programmable
Black Level	7.5 IRE / 0 IRE selectable
Horizontal Timing	
Total Pixel	32~8192 pixels / 1 pixels resolution
Vertical Timing	
Total Line	4~4096 lines (non-interlace) / 1 line programmable 4~2048 lines (interlace) / 1 line programmable
Composite Sync	
	Hs+ Vs, Hs EXOR Vs, Equalization & Serration Pulse
Separate Sync	
	BNC : Hs,Vs,Xs ; D-SUB : Hs(Xs), Vs

DVI (TMDS) Output	
Pixel Rate Range	25 < 1 link ≤ 165MHz/165 < 2 link ≤ 330MHz
EDID	Read / Write / Compare / Edit / Analysis
HDCP	Support HDCP V.1.0 (with Dual Mode)
Compliant	DVI 1.0
Video Signal Type	RGB
Sampling Mode	4:4:4

HDMI Video Output	
Version	HDMI 1.4b (3D / ARC / HEC / CEC / Lip Sync)
Pixel Rate Range	25 ~ 300 MHz (TMDS rate 300 MHz)
Support HDMI Timing	85 Timing(CEA-861E)
Pixel Repetition	4
Video Signal Type	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2
Color depth	24 / 30 / 36 bits per pixel
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709 / xvYcc / sYcc601 / Adobe RGB / Adobe sYcc601
HDCP	HDCP V.1.2
EDID	Read / Write / Compare / Edit / Analysis

HDMI Audio Output	
Sample Rate	32, 44.1, 48, 88.2, 96, 176.4, 192KHz
Number of Channel	8 Channel (FL/FR/LR/RR/FC/LFE/RLC/RR)
Bits per Sample	16 / 24 bit
Waveform	Sine wave
Amplitude	-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS
Frequency Range	10Hz to 20KHz
Frequency Resolution	1Hz / Step
External Audio Input	Optical and Coaxial ( S/PDIF )
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

DISPLAYPORT Output	
Version	DISPLAYPORT 1.2a (3D)
Pixel Rate Range	25~600 MHz (4K x 2K 60Hz)
Main Link Data Rate	1.62 / 2.7 / 5.4 Gbps per lane
Lane Count	1/2/4 Lanes
Pre-emphasis	0dB/3.5dB/6dB/9.5dB selectable
Swing Level	400mV/600mV/800mV/1200mV selectable

Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2
Color Depth	6/8/10/12 bits per component
HDCP	HDCP V1.3
Audio	2 Channel internal (L-PCM)
Bit Per Sample	24bit
Sample Rate	32, 44.1, 48, 88.2, 96, 176.4, 192KHz
Frequency Range	10Hz to 20KHz
MST	FHD (1920 x 1080P60) x 4 max. (Simple/Split mode)

TV Output										
Output Mode	NTSC			PAL				SECAM		
Subcarrier Frequency	443	M,J	BDGHI	M	60	N	Nc	4.41/	MHz	
	4.43	3.58	4.43	3.57	4.43	4.43	3.58	4.25		
	± 50								Hz	
Video Output	Composite (BNC), S-Video Burst On/Off (NTSC, PAL) Contrast / Brightness / Saturation / Hue programmable									
Closed Caption Support (NTSC)	C1, C2, C3, C4 / T1, T2, T3, T4									
V-CHIP (NTSC)	MPAA/FCC/Canada English / Canada French Rating									
Teletext (PAL)	Teletext System B Level 1, 1.5									

SDTV / HDTV Format					
Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate(Hz)		Standard
1920X1080	60P	60	60I	30	SMPTE 274
	59.94P	60/1.001	59.94I	30/1.001	SMPTE 274
	50P	50	50I	25	SMPTE 274
	30P	30			SMPTE 274
	29.97P	30/1.001			SMPTE 274
	25P	25			SMPTE 274
	24P	24			SMPTE 274
23.98P	24/1.001			SMPTE 274	
1920X1035			60I	30	SMPTE 240
			59.94I	30/1.001	SMPTE 240
1280X720	60P	60			SMPTE 296
	59.94P	60/1.001			SMPTE 296
	50P	50			SMPTE 296

Data Storage Device	
Default	2000 timings + 2000 patterns
Internal Memory	3000 timings + 3000 patterns + 1000 programs
External Memory	USB Host interface

Others	
AC Input	1Ø 100~240V ± 10% V <sub>LN</sub> , 47~63Hz
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %

Dimension & Weight	
2235 (HxWxD)	88x350x350 mm / 3.46x13.78x13.78 inch 5.6 kg / 12.33 lbs



## KEY FEATURES

- Support 8K Super Hi-Vision (7680x4320/8192x4320)
- Independent graphics core for 8K Super Hi-Vision pattern with less than 200 ms switch time
- Up to 4 signal modules per unit
- Multi-out function
- 7 inch 1024x 600 high-resolution touch panel, GUI interface
- BMP file format support
- USB 3.0 data access
- Gigabit Ethernet high-speed network interface
- HDMI 2.0a signal module (option)
  - 8K x 4K 60 Hz (4 HDMI port)
  - 4K x 2K 60 Hz (1 DP port)
  - Pixel rate up to 600MHz (6Gbps TMDS rate)
  - RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 or 4:2:0
  - HDCP 2.2 / 1.4
  - Wide color gamut
  - HDR (High Dynamic Range) Testing (HDR infotrame & metadata / EOTF)
  - SCDC (status & control data channel) Reader
- DisplayPort 1.3 signal module (option)
  - 8K x 4K 60 Hz (2 DP port)
  - 8K x 4K 30 Hz (1 DP port)
  - 1.62 / 2.7 / 5.4 / 8.1 Gbps per lane
  - HDCP 2.2 / 1.3
  - DPCD (Display Port Configuration Data) Reader
  - MST (Multi-Stream Transport) testing



7 inches touch panel



The Chroma 2238 Video Pattern Generator is equipped with various video standards including analog and digital signal output functions. A modular design with built-in high-speed independent graphics core provides standard test signals and patterns for the required resolutions. This unit can be used in a variety of display test requirement for today's multimedia industry. It supports the latest high-definition multimedia interface, HDMI as well as DisplayPort standard with key features listed below.

### 8K Super Hi-Vision

Full 8K (7680x4320/ 8192x4320) resolution is provided for testing @30/60Hz (HDMI, Display Port interface).

### Modular Signal Interface Design

This VPG supports up to 4 signal modules for various test requirement. The multi-out function can provide 4 different types of timing and pattern from each of the 4 modules simultaneously. Each module has a built-in high-speed independent graphics core that significantly increase video speed for drawing and data transmission applications. 8K SHV image switch occurs in less than 200ms.

### HDMI 2.0a Testing Function (HDMI module)

This VPG supports HDMI 2.0a highest 6Gbps TMDS signal output (TMDS rate), 24/30/36 bit for color depth (RGB/YCbCr) and YCbCr 4:2:0 signal sampling output formats. It provides high resolution test functions with color standard ITU-R BT2020 and HDCP 2.2 & 1.4/ARC/CEC/EDID/SCDC (Status & Control Data Channel)/HDR (High Dynamic Range).

### DisplayPort 1.3 Testing Function (DP module)

The 2238 VPG supports the highest HBR3 (High

Bit Rate 3, 8.1Gbps bandwidth) output as defined by DisplayPort 1.3 with audio transmission and 3D/EDID/MST/ DPCD (Display Port Configuration Data).

### Touch panel and convenient graphical user interface

Equipped with a 7 inch 1024x600 touch panel and a friendly graphical user interface, this VPG unit has an Instant Pattern View function that allows users to view and edit patterns directly on the device screen. The Program function allows a combination of timing/pattern/audio as required for testing to increase production efficiency. Its VPG Master software allows users to edit distinctive programs and parameters. Complete test functions and an easy-to-operate interface make it suitable for a variety of R&D and production test as well as quality verification in all video related industries.

### Network management via Ethernet

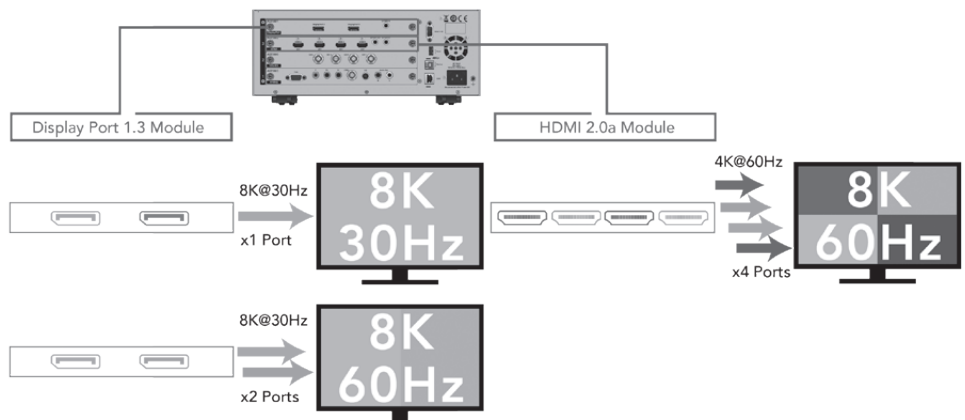
The 2238 VPG also has a built-in Ethernet high-speed network communication interface that provides remote setting functions, along with uploading and downloading of data such as BMP File/Timing /Pattern/Program /Setting/FW Update. For test security and revision control, the unit is password protected. Its unique serial no. and IP address allows system managers to remotely monitor production throughput, efficiency and yield.



Model 2238 Rear View

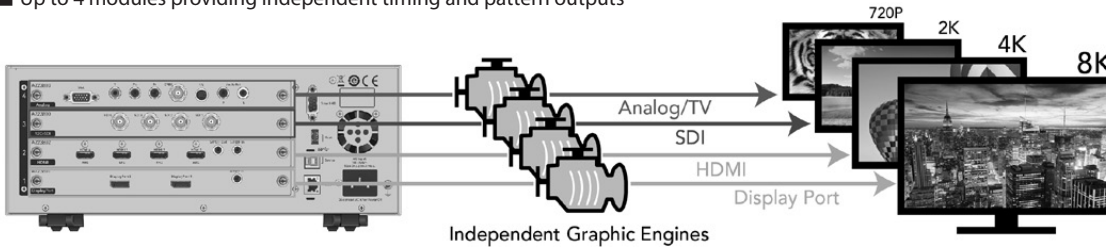
### 8K Super Hi-Vision Application

- Featured in modular design, the 2238 Video Pattern Generator is capable of providing 8K Super Hi-Vision (7680 x 4320 / 8192 x 4320) resolution for testing. Full 8K at 30/60 Hz resolution is supported by one single module (via a HDMI Display Port), and up to 4 modules can be installed and configured as required for all testing application to 8K.



## Multi-Out Function

- Independent graphics modular design
- Up to 4 modules providing independent timing and pattern outputs



## SPECIFICATIONS

### MODEL 2238 MAIN FRAME

SYSTEM	
Display	1024 x 600
Signal Slot	4 signal slot
Data Storage	5000 timings + 5000 patterns + 2000 programs
AC input Voltage Range	100 ~ 240V, 50~60Hz, 1.5 A Max.
Fan Noise	< 65dB (with fan control circuit)
Operating Temperature	+5°C ~ +40°C
Storage temperature	-20°C ~ 60°C
Humidity	20% ~ 90%
Dimensions	132 x 350 x 350 mm (HxWxD)

### A223800 12G-SDI SIGNAL MODULE

VIDEO OUTPUT	
Signal Compliant	SD/HD/3G/6G/12G - SDI Specification
Video Signal Type	RGB / YCbCr
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 or 4:2:0
Color Depth	8 / 10 / 12 / 16 bits per component
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709
AUDIO OUTPUT	
Channel	8 Channel (L-PCM)
Sample Rate	48KHz

### A223801 DISPLAYPORT SIGNAL MODULE

VIDEO OUTPUT	
Signal Compliant	Display Port v1.3 Specification
Resolution	8Kx4K@30Hz (1Port) 8Kx4K@60Hz (2 Port)
Main Link Data Rate	1.62 / 2.7 / 5.4 / 8.1 (HRB3) Gbps per lane
Pixel Rate Range	25 MHz~2.4GHz
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 or 4:2:0
Color Depth	6 / 8 / 10 / 12 / 16 bits per component
HDCP	v1.3 / v2.2
MST	4K (3840x2160) x 4 stream max
AUDIO OUTPUT	
Channel	2 Channel (L-PCM)-Internal 8 Channel (AC3/DTS)-External 8 Channel HBR-audio
Sample Rate	32, 44.1, 48, 88.2, 96, 176.4, 192KHz, +/- 1000ppm

### A223802 HDMI SIGNAL MODULE

VIDEO OUTPUT	
Signal Compliant	HDMI v2.0a Specification
Resolution	4Kx2K@60Hz (1Port) 8Kx4K@60Hz (4 Port)
Pixel Rate Range	25 ~ 600 MHz (TMDS CLK : Max. 300MHz)
Video Signal Type	RGB / YCbCr
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 or 4:2:0
Color Depth	24 / 30 / 36 / 48* @ RGB & YCbCr (*Max. 150MHz)
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709 / SYCC / xvYcc (IEC61966-24) / Adobe RGB / Adobe YCC / ITU-R BT.2020
HDCP	v1.4 / v2.2
AUDIO OUTPUT	
Channel	8 Channel (FL / FR / RL / RR / FC / LFE / RLC / RRC)
Sample Rate	32, 44.1, 48, 88.2, 96, 176.4, 192KHz +/- 1000ppm

### A223803 ANALOG SIGNAL MODULE

ANALOG	
Pixel Rate Range	0.5 MHz ~ 300 MHz
Video Signal	R, G, B (75 ohms)
Video Level	0~1.0V, 1 mV/step
TV OUTPUT	
Output Mode	NTSC
Subcarrier	443 M, J BDGHI M 60 N Nc 4.41/4.43 3.58 4.43 3.57 4.43 4.43 3.58 4.25
Frequency	4.43 3.58 4.43 3.57 4.43 4.43 3.58 4.25
Subcarrier Stability	± 50
Video Output	Composite (BNC), S-Video Burst On/Off (NTSC, PAL) Contrast / Brightness / Saturation / Hue Programmable
Closed Caption Support (NTSC)	C1, C2, C3, C4 / T1, T2, T3, T4
V-CHIP (NTSC)	MPPAA/FCC/Canada English / Canada French Rating
Teletext (PAL)	Teletext System B Level 1, 1.5
AUDIO OUTPUT	
Channel	2 Channel ( R, L)
Sample Rate	32, 44.1, 48, 88.2, 96, 176.4, 192KHz
Frequency	10 Hz ~20 KHz, 1 Hz/ step

### A223806 DVI SIGNAL MODULE

VIDEO OUTPUT	
Signal Compliant	DVI 1.0 specification
Video Signal Type	RGB
Pixel Rate Range	25 MHz < 1 link ≤ 165MHz ; 165 < 2 link ≤ 330MHz
Sampling Mode	4:4:4
EDID	Version 1.3 (Read/Write/Compare/Edit/Analysis)
HDCP	Version 1.0 (with Dual-link mode)

## ORDERING INFORMATION

- \* **2238** : Video Pattern Generator
- \* **A223800** : 12G-SDI signal module
- \* **A223801** : Display Port V1.3 signal module
- \* **A223802** : HDMI V2.0a signal module
- \* **A223803** : Analog signal module
- \* **A223806** : DVI signal module
- \* Call for availability



**Analog** 250 MHz  
**DVI (TMDS)** 330 MHz  
**HDMI V1.4a** 165 MHz  
**(TMDS Rate 225 MHz)**  
**3D Output**

#### KEY FEATURES

- Multipoint independent output test application
  - 3 HDMI port output
  - 2 SCART port (Input/Output x1/Outputx1)
- Analog frequency 250MHz
- Digital (DVI) frequency 330MHz (dual channel)
- DVI Dual HDCP test application support
- HDMI 1.4 standard
  - 3D standard format output
  - ARC audio return function
  - HEC network test function
  - Color vector sYCC601 / Adobe RGB / Adobe YCC601
  - CEC / Deep Color / Lip-Sync / xvYCC
- 4Kx2K graphic display capability
- CEC analysis & multi-directional monitor
- Real 30bit deep color output
- DVI & HDMI with HDCP output
- Support HDCP V1.0 (DVI) / V1.2(HDMI)
- Y, Pb, Pr / Y, Cb, Cr / Y,R-Y, B-Y Output
- S-Video / CVBS / SCART / RGB / color component / D terminal
- NTSC / PAL / SECAM TV signals
- Support Close Caption / V-Chip / Teletext
- EDID read / write / compare
- HDMI supports fiber/coaxial audio input (S/PDIF)
- ARC supports fiber/coaxial audio output (S/PDIF)
- Built-in low distortion audio output (2ch / 8ch)
- Easy to use audio shortcuts
- Support graphic dynamic movement (Scrolling) function
- Built in China high definition standard test patterns / 3D test images
- HDMI / DVI plug and play function
- ESD protective circuit
- Front USB control interface
- User Key (maximum 32 combinations of serial actions)

Chroma 23294 Video Pattern Generator provides various international standard signals with built-in 3 HDMI and 2 SCART ports that can satisfy the output tests for multiple ports to shorten the test time and improve productivity.

Chroma 23294 adopts a brand new structure design with a high performance CPU to carry high speed / high density FPGA as the graphic engine. It has highly efficient system control and supports the up-to-date high definition multimedia digital video interface HDMI V1.4 standard to supply the following features:



3D signal standard format output: It is a fast operating interface designed specially for 3D only that can adjust and switch to various 3D output easily.

The ARC (Audio Return Channel) function is able to test the external audio source and the Ethernet (HDMI Ethernet Channel) function is able to provide dual data transmission test, higher speed bandwidth & Color Deep. It supports 24, 30 byte (RGB or YCbCr) and the color standards of new generation such as xvYCC, sYCC601, Adobe RGB and Adobe YCC601 to realize the true natural color and high definition image with broader color range.

CEC (Consumer Electronics Control) Function: The CEC test parameters can be set via the proprietary software VPG MASTER which also supports the test modes of TX (send)/RX (receive)/MONITOR (monitor) & FEATURE (user's).

Chroma 23294 has analog/digital/TV control signals as well.

For the analog RGB output, its pixel frequency is up to 250MHz that complies with the RS-343A signal standard and support Y,Pb,Pr / Y,Cb,Cr / Y, R-Y & B-Y. As to the digital signal, it is TMDS pixel frequency up to 330MHz with dual channel DVI output that can support DVI Dual HDCP tests to satisfy the application for testing higher bandwidth display.

In TV output specification, the image and chromaticity signals of 23294 comply with NTSC, PAL and SECAM regulations. The output signals include CVBS composite signals, Y/C (Luminance/Chrominance) image/chromaticity separate signals and S-Video/SCART output connector. It can also support special TV test functions such as Closed Caption, V-chip and Teletext.

To supply multiple test applications, Chroma is able to play the picture file format up to 4Kx2K resolution. Moreover, 3 HDMI and 2 SCART ports are built in to satisfy the test for multipoint independent output and reduce the test time substantially.

Chroma 23294 has many special test patterns such as xvYCC, HDCP&E-EDID, 8/10 bit deep color, CEC, Lipsync and China high definition patterns for easy test assessment to save the time and increase productivity efficiently. In addition, the equipped application VPG Master with easy-to-use interface and complete test functions that is capable of editing various kinds of test procedures and parameters makes Chroma 23294 suitable for the R&D, production test and quality assurance of all video and related industries.



Model 23294 Rear View

#### ORDERING INFORMATION

**23294** : Video Pattern Generator  
 Analog 250MHz/DVI 330MHz/HDMI 165MHz  
 (TMDS Rate 225MHz)/TV/HDTV  
**A240001**: Remote Controller



## SPECIFICATIONS

ANALOG OUTPUT	
Display Size	4096 x 2160
Pixel Rate Range	0.5~250MHz
Video Level	R,G,B (75 ohms) 0~1.0V programmable
Sync on Green / Level	0~0.5V On/Off programmable
White Level	0~1.2V programmable
Black Level	7.5 IRE / 0 IRE selectable

HORIZONTAL TIMING	
Total Pixels	32~8192 pixels / 1 pixels resolution

VERTICAL TIMING	
Total Pixels	4~4096 lines (non-interlace) 4~2048 lines (interlace) / 1 line programmable

COMPOSITE SYNC	
	H+V, H EXOR V, Equalization & Serration Pulse

SEPARATE SYNC	
	D-SUB: Hs (Xs), Vs

VIDEO FORMAT	
Video Output	R, G, B / RS-343A / RS-170 / VESA (VSIS)
	Y, R-Y, B-Y
	Y, Cb, Cr / ITU 601
	Y, Pb, Pr / ITU 709, RP 177, SMPTE 240M
	DDC II B (D-SUB)

DVI (TMDS) OUTPUT	
Pixel Rate Range	25 < 1 link ≤ 165MHz/165 < 2 link ≤ 330MHz
E-EDID	Read / Write / Compare / Edit
HDCP Support	HDCP V1.0 (with Dual Mode)
Compliant	DVI 1.0 specification
Video Signal Type	RGB
Sampling Mode	4:4:4

HDMI VIDEO OUTPUT	
Version	HDMI V1.4a (3D Format / ARC / HEC / CEC / Lip Sync)
Pixel Rate Range	25 ~ 165 MHz (TMDS rate 225MHz)
Support HDMI Timing	85 Timing(CEA-861E)
Pixel Repetition	4
Video Signal Type	RGB or YCbCr
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2
Bits per Component	8 / 10 / 12 @RGB & YCbCr
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709 / xvYCC (IEC61966-2-4) / sYcc601 / Adobe RGB / Adobe sYcc601
HDCP Support	HDCP V.1.2
EDID	Read / Write / Compare / Edit

HDMI AUDIO OUTPUT	
Sample Rate	32,44.1,48,88.2, 96,176.4, 192KHz
Number of Channel	8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)
Bits per Sample	16 / 24 bit
Waveform	Sine wave
Amplitude	-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS
Frequency Range	10Hz to 20KHz
Frequency Resolution	10Hz / Step
External Audio Input	Optical and Coaxial ( S/PDIF )
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

TV OUTPUT	
Output Mode	NTSC PAL SECAM
Subcarrier Frequency	443 M,J BDGHI M 60 N Nc 4.43 3.58 4.43 3.57 4.43 3.58 4.41/4.25 MHz
Subcarrier Stability	± 50 Hz
Video Output	Composite (RCA), S-Video
	Burst On/Off (NTSC, PAL)
	Contrast programmable
	Brightness programmable
	Saturation programmable
Closed Caption Support (NTSC)	Hue programmable
	C1, C2, C3, C4/ T1, T2, T3, T4
V-CHIP (NTSC)	MPAA Rating : G, PG, PG-13, R, NC-17, X
	FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA
	Canada English Rating : C, C8+, G, PG, 14+, 18+
	Canada French Rating : G, 8 ans+, 13 ans+, 16 ans+, 18 ans+
Teletext (PAL)	Teletext System B Level 1, 1.5

HDTV FORMAT					
Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
1920 x 1080	60P	60	60I	30	SMPTE 274
	59.94P	60/1.001	59.94I	30/1.001	SMPTE 274
	50P	50	50I	25	SMPTE 274
	30P	30			SMPTE 274
	29.97P	30/1.001			SMPTE 274
	25P	25			SMPTE 274
	24P	24			SMPTE 274
1920 x 1035	23.98P	24/1.001			SMPTE 274
			60I	30	SMPTE 240
1280 x 720			59.94I	30/1.001	SMPTE 240
	60P	60			SMPTE 296
	59.94P	60/1.001			SMPTE 296
	50P	50			SMPTE 296

3D VIDEO FORMAT OUTPUT	
3D Scanning Mode	Frame packing
	Field alternative
	Line alternative
	Side-by-Side (Full)
	L + depth
	L + depth + graphics + graphics-depth
	Top & Bottom
	Side-by-Side (Half)

DATA STORAGE DEVICE	
Default	2000 timings + 2000 patterns
Internal Memory	3000 timings + 3000 patterns + 1000 programs
External Memory	USB Host interface

OTHERS	
AC Input	1∅ 100~240V ± 10% V <sub>LN</sub> 47~63Hz
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %

DIMENSION	
23293-B (H x W x D)	88 x 350 x 350 mm / 3.46 x 13.78 x 13.78 inch

WEIGHT	
23294	4.5 kg / 9.9 lbs



Analog	250 MHz
DVI (TMDS)	330 MHz
HDMI V1.3C	165 MHz
(TMDS Rate 225 MHz)	
DisplayPort V1.1a	270 MHz

#### KEY FEATURES

- Multi-port output tests
  - 3 HDMI output ports
  - 2 DisplayPort output ports
  - 2 SCART ports (output x1/ input x1)
- DisplayPort V1.1a pixel rate 270MHz
  - 2 Link Rate (1.62/2.7Gbps)
  - 1,2,4 Video Lane
- HDMI V1.3C
  - True 30 bits color depth output
  - Support xvYCC & sYCC, Adobe RGB, Adobe YCC color space
  - Support CEC Function
  - Built-in Lip Sync test pattern
  - Digital audio output
  - 3 HDMI outputs to provide individual HDCP Enable/Disable
- DVI pixel rate 330MHz (dual channel)
- DVI Dual HDCP test application support
- DVI, HDMI & DisplayPort with HDCP output
- Support HDCP V1.0 (DVI) / V1.2 (HDMI) / V1.3 (DisplayPort)
- Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y output
- S-Video / CVBS / SCART / RGB / color component / D-terminal output
- NTSC/PAL/SECAM TV signal
- Support Closed caption / V-Chip / Teletext
- Built-in low low-distortion audio output (2ch/8ch)
- Easy-to-use audio hot key
- EDID read/write/compare
- USB (Host & Device)
- User key (up to 32 continuous actions can be combined)

Chroma 2333-B is a high value-added test equipment that can meet the diversified demands for multi-media displays. It has high resolution test quality and multiple output types that can support comprehensive tests for large-scale application in the field of R&D, quality assurance and mass production.

Chroma 2333-B combines Analog / DVI / HDMI / DisplayPort / SDTV / HDTV signals that can satisfy the needs for testing various signals from multi-media displays.

For digital signal: The TMDS output with pixel rate 25~330MHz that supports the dual channel HDCP test is able to fit in the high bandwidth test requirements under 120Hz screen refresh rate.



For HDMI output: The 2333-B provides higher speed bandwidth and color depth. It supports 24,30 bits (RGB or YCbCr) and the new generation color standards xvYCC, sYCC, Adobe RGB and Adobe YCC to attain truly natural color and high resolution image screen. It also supports complete CEC and Lip Sync tests.

DisplayPort is the new video output interface promoted by Video Electronics Standards Association; VESA. It is an open and extendable interface standard for display devices. Its maximum transmission bandwidth is up to 10.8Gb/s. With the official certification of VESA, Chroma 2333-B is able to provide the consistency and integrity signals in highest standard.

DisplayPort is composed of main channel, auxiliary channel and hot swap (HPD) 3 types of signals. The main channel is made by 4 lanes (1, 2, 4 Lane) and each lane supports 2.7Gbps or 1.62Gbps transmission rate. The parameters can be adjusted automatically via DPCD connection and complete the test procedure in sequential.

For TV output, the image and chromaticity signals are complying with the NTSC, PAL and SECAM standards. Also, the tests for special TV functions such Closed Caption, V-chip and Teletext are supported. To fulfill the application of multi-port output test, Chroma 2333-B has built-in 3 HDMI, 2 DisplayPort and 2 SCART ports that can finish testing the displays with multi-port in the fastest speed and reduce the test time in a great deal.

Various test patterns and timing parameters are built-in Chroma 2333-B for operation. Shortcuts are provide for Timing/Pattern/Program/Audio to simplify the settings. The test program edited by the user on PC can be downloaded to Chroma 2333-B directly for storage and recall next time.

Moreover, for the function keys used frequently a special User Key is designed to combine these functions. Up to 32 keys can be memorized for continuous actions and executed by a single key. Besides the panel operation, remote control can be enabled with a remote controller for users to operate the device more easily.



Model 2333-B Rear View

#### ORDERING INFORMATION

**2333-B** : Video Pattern Generator  
Analog 250MHz/DVI 330MHz/HDMI 165MHz  
(TMDS Rate 225MHz)/DisplayPort 270MHz  
**A240001**: Remote Controller

SPECIFICATIONS	
<b>ANALOG OUTPUT</b>	
Display Size	4096 x 2160
Pixel Rate Range	0.5~250MHz
Video Level	R,G,B (75 ohms) 0~1.0V programmable
Sync on Green / Level	0~0.5V On/Off programmable
White Level	0~1.2V programmable
Black Level	7.5 IRE / 0 IRE selectable
<b>HORIZONTAL TIMING</b>	
Total Pixels	32~8192 pixels / 1 pixels resolution
<b>VERTICAL TIMING</b>	
Total Pixels	4~4096 lines (non-interlace) 4~2048 lines (interlace) / 1 line programmable
<b>COMPOSITE SYNC</b>	
H+V, H EXOR V, Equalization & Serration Pulse	
<b>SEPARATE SYNC</b>	
D-SUB: Hs (Xs), Vs	
<b>VIDEO FORMAT</b>	
Video Output	R, G, B / RS-343A / RS-170 / VESA (VSIS) Y, R-Y, B-Y Y, Cb, Cr / ITU 601 Y, Pb, Pr / ITU 709, RP 177, SMPTE 240M DDC II B (D-SUB)
<b>DVI (TMDS) OUTPUT</b>	
Pixel Rate Range	25 < 1 link ≤ 165MHz / 165 < 2 link ≤ 330MHz
E-EDID	Read / Write / Compare / Edit
HDCP Support	HDCP V1.0 (with Dual Mode)
Compliant	DVI 1.0 specification
Video Signal Type	RGB
Sampling Mode	4:4:4
<b>HDMI VIDEO OUTPUT</b>	
Version	HDMI V1.3C(with 24,30 bit deep color/xvYCC/CEC/Lip Sync)
Pixel Rate Range	25 ~ 165 MHz ( TMDS CLK : 225MHz)
Support HDMI Timing	77 Timing(CEA-861D)
Pixel Repetition	4
Video Signal Type	RGB or YCbCr
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2
Bits per Component	8 / 10 @RGB & YCbCr
Color Space	RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-2-4) /sYCC 601/Adobe RGB/Adobe YCC 601
HDCP Support	HDCP V.1.2
EDID	Read / Write / Compare / Edit
<b>HDMI AUDIO OUTPUT</b>	
Sample Rate	32,44.1,48,88.2, 96,176.4, 192KHz
Number of Channel	8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)
Bits per Sample	16 / 24 bit
Waveform	Sine wave
Amplitude	-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS
Frequency Range	10Hz to 20KHz
Frequency Resolution	10Hz / Step
External Audio Input	Optical and Coaxial ( S/PDIF )
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time
<b>DISPLAYPORT OUTPUT</b>	
Version	DisplayPort 1.1a
Pixel Rate Range	25~270MHz
Video Signal Type	RGB/YCbCr
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2
Color Depth Transmission	6/8/10 bits per component
HDCP	HDCP V1.3
DPCD	Read / Write
Main Link Data Rate	2.7Gbps or 1.62Gbps per lane
Lane Count	1/2/4 Lanes
Audio	2 Channel (L-PCM)-Internal
Bit Per Sample	24bit
Sample Rate	32, 44.1, 48, 88.2, 96, 176.4, 192KHz
<b>TV OUTPUT</b>	
Output Mode	NTSC PAL SECAM
Subcarrier Frequency	443 M, J 4.43 3.58 4.43 3.57 60 4.43 N 4.43 Nc 3.58 4.41/4.25 MHz
Subcarrier Stability	± 50 Hz
Video Output	S-Video, RCA Burst On/Off (NTSC, PAL) Contrast programmable Brightness programmable Saturation programmable Hue programmable
Closed Caption Support (NTSC)	C1, C2, C3, C4/ T1, T2, T3, T4
V-CHIP (NTSC)	MPAA Rating : G, PG, PG-13, R, NC-17, X FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA Canada English Rating : C, C8+, G, PG, 14+, 18+ Canada French Rating : G, 8 ans+, 13 ans+, 16 ans+, 18 ans+
Teletext (PAL)	Teletext System B Level 1, 1.5
<b>AUDIO (ANALOG) OUTPUT</b>	
Number of Channel	2 Channel (R / L)
Sample Rate	32, 44.1, 48, 88.2, 96, 176.4, 192KHz
Level Resolution	10mV / Step
Level Range	0V to 2V (at 600 Ohms Load)
Frequency Range	10Hz to 20KHz / 10Hz Step
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time
<b>DATA STORAGE DEVICE</b>	
Default	2000 timings + 2000 patterns
Internal Memory	3000 timings + 3000 patterns + 1000 programs
External Memory	USB Host interface
<b>OTHERS</b>	
AC Input	1Ø 100~240V ± 10% V <sub>LN</sub> , 47~63Hz
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %
<b>DIMENSION</b>	
2333-B (H x W x D)	88 x 350 x 350 mm / 3.46 x 13.78 x 13.78 inch
<b>WEIGHT</b>	
2333-B	4.5 kg / 9.9 lbs

Video & Color  
Flat Panel Display  
Lighting  
LED/  
Optical Devices  
Photovoltaic Test & Automation  
Optical Inspection  
Automated  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semi-conductor/IC  
Measurement  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



**Analog** 165MHz  
**DVI(TMDS)** 165MHz (2402)  
**HDMI V1.3b** 165MHz (2402)  
**(TMDS Rate** 225MHz)

### KEY FEATURES

- Analog pixel rate 165MHz
- Analog output with DDC
- 2K x 2K Graphic size
- NTSC / PAL / SECAM signal (Model 2401)
- Closed Caption function ( NTSC ) (Model 2401)
- V-Chip function ( NTSC ) (Model 2401)
- Teletext function ( PAL ) (Model 2401)
- S-Video / CVBS / SCART / RGB Color Component / D-Terminal (Model 2401)
- Bi-level SDTV format (Model 2401)
- Tri-level HDTV Format (Model 2401)
- DVI pixel rate 165MHz (Model 2402)
- HDMI V1.3b (with xvYCC) (Model 2402)
- DVI & HDMI with HDCP output (Model 2402)
- Y, Pb, Pr/Y, Cb, Cr/Y, R-Y, B-Y output (Model 2401)
- PC remote control
- User Define Key
- Built-in variety of video timings & patterns
- Scrolling Pattern
- USB interface
- High Capacity Memory
- ESD protection circuit
- Economy

Along with the rapid development of LCD TV industry, all manufacturers are facing the competition of producing high value added and low cost products; and seeking for a total test solution to meet their needs has become the first priority.

Chroma 2401/2402 Video Pattern Generator with the features described below is specially designed to fit in the requirements and application of production line for LCD-TV manufacturers.

**(1). Lightweight Design :** The size of Chroma 2401/2402 VPG is close to A4 that is portable and handy for various kinds of spaces or locations.

**(2). Exclusive Signals :** The mapped international standard signal sources are provided for diverse Video signals requirements such as the requisite TV and monitor that are applied in the configuration of production line planning and test workstation.



**(3). Convenient & Rapid Function :** The test programs created in advance increase the production efficiency; in addition for the frequently used function keys, users can edit the User KEY to work with compound functions in specific test to save the test time.

**(4). USB Interface :** The convenient USB interface can use USB Disk on PC to edit test programs, patterns and even to upload or download the upgrade programs to 2401/2402 to reduce engineer's workload in setup and management.

**(5). Large Capacity :** It has built in large capacity of storage memory that allows users to swap and save for different UUT without backup or download.(1000 TIMINGS and PATTERNS, 500 PROGRAMS)

**(6). Abundant Test Patterns :** It includes standard static, dynamic and pattern screens to check the characteristics response, white balance and residual of UUT. Also it can use PC to create the test patterns required.

**(7). Extended Control :** The default extended function on the front/rear panel is able to add remote control device or output control device for on-line link automatically.



Model 2401 Rear View

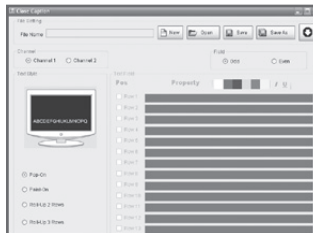


Model 2402 Rear View

### ORDERING INFORMATION

- 2401:** Video Pattern Generator Analog 165MHz/TV/HDTV
- 2402:** Video Pattern Generator Analog 165MHz/DVI 250MHz/HDMI 165MHz (TMDS Rate 225MHz)
- A240001:** Remote Controller

### Software - Model 2401

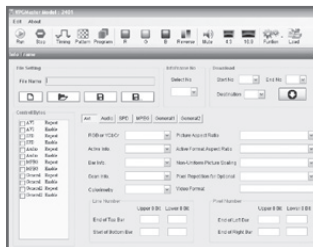


Closed Caption Screen

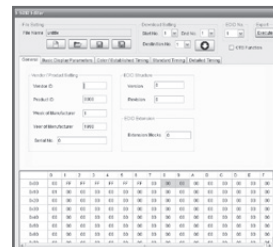


User Key Screen

### Software - Model 2402



InfoFrame Screen



E-EDID Screen



## SPECIFICATIONS

### ANALOG OUTPUT

Display Size	2048 x 2048
Pixel Rate Range	0.5~165MHz
Video Level	R,G,B (75 ohms) 0~1.0V programmable
Sync on Green / Level	0~0.5V On/Off programmable
White Level	0~1.2V programmable
Black Level	7.5 IRE / 0 IRE selectable

### HORIZONTAL TIMING

Total Pixels	64~8192 pixels / 2 pixels resolution
--------------	--------------------------------------

### VERTICAL TIMING

Total Pixels	4~4096 lines (non-interlace) / 1 line programmable 4~2048 lines (interlace) / 1 line programmable
--------------	---

### COMPOSITE SYNC

	H+V, H EXOR V, Equalization & Serration Pulse
--	---

### SEPARATE SYNC

	Hs(Xs), Vs
--	------------

### VIDEO FORMAT

Video Output	R, G, B / RS-343A
	Y, R-Y, B-Y
	Y, Cb, Cr / ITU 601
	Y, Pb, Pr / ITU 709, RP 177, SMPTE 240M
	DDC II B

### HDMI VIDEO OUTPUT (Model 2402 only)

Version	HDMI V1.3b (with xvYCC)
Pixel Rate Range	25 ~ 165 MHz (TMDS CLK : 225MHz)
Support HDMI Timing	77 Timing(CEA-861D)
Pixel Repetition	4
Video Signal Type	RGB or YCbCr
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2
Bits per Component	8 bits (1024 color)
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709 / xvYCC
HDCP Support	HDCP V.1.2
EDID	Read / Write / Compare / Edit

### HDMI AUDIO OUTPUT

Sample Rate	32,44.1,48,88.2, 96,176.4, 192KHz
Number of Channel	8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)
Bits per Sample	16
Waveform	Sine wave
Amplitude	-90.3 to 0.0 dBFS
Frequency Range	10Hz to 20KHz
Frequency Resolution	10Hz / Step
External Audio Input	Optical and Coaxial ( S/PDIF )
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

### DVI (TMDS) OUTPUT (Model 2402 only)

Pixel Rate Range	25 < 1 link ≤ 165MHz (256 color)
E-EDID	Read / Write / Compare / Edit
HDCP Support	HDCP V1.0
Compliant	DVI 1.0 specification
Video Signal Type	RGB
Sampling Mode	4:4:4

### TV OUTPUT (Model 2401 only)

Output Mode	NTSC	PAL						SECAM	
Subcarrier Frequency	443 4.43	M, J 3.58	BDGHI 4.43	M 3.57	60 4.43	N 4.43	Nc 3.58	4.41/4.25	MHz
Subcarrier Stability	± 50								Hz
Video Output	Composite (RCA), S-Video								
	Burst On/Off (NTSC, PAL)								
	Contrast programmable								
	Brightness programmable								
	Saturation programmable								
Closed Caption Support (NTSC)	Hue programmable								
	C1, C2, C3, C4/T1, T2, T3, T4								
	MPAA Rating : G, PG, PG-13, R, NC-17, X FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA Canada English Rating : C, C8+, G, PG, 14+, 18+ Canada French Rating : G, 8 ans+, 13 ans+, 16 ans+, 18 ans+								
V-CHIP (NTSC)	Teletext (PAL)								
Teletext (PAL)	Teletext System B Level 1, 1.5								

### SDTV / HDTV FORMAT (Model 2401 only)

Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
	59.94P	60/1.001	59.94I	59.94/2	
720 x 483					SMPTE 293 ITU 601 SMPTE 170M
			59.94I	59.94/2	
720 x 576	50P	50	50I	25	ITU 1382 ITU 601
1920 x 1080	60P	60	60I	30	SMPTE 274
	59.94P	60/1.001	59.94I	30/1.001	SMPTE 274
	50P	50	50I	25	SMPTE 274
	30P	30			SMPTE 274
	29.97P	30/1.001			SMPTE 274
	25P	25			SMPTE 274
	24P	24			SMPTE 274
	23.98P	24/1.001			SMPTE 274
1920 x 1035			60I	30	SMPTE 240
			59.94I	30/1.001	SMPTE 240
1280 x 720	60P	60			SMPTE 296
	59.94P	60/1.001			SMPTE 296
	50P	50			SMPTE 296

### AUDIO (ANALOG) OUTPUT

Frequency Range	50Hz~20KHz
Waveform	Sine wave
Number of Channel	2 Channel (R / L)
Level Range	0V to 2V (at 600 Ohms Load)
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

### DATA STORAGE DEVICE

Default	1000 timings + 1000 patterns
Internal Memory	1000 timings + 1000 patterns + 500 programs
External Memory	USB Host interface

### OTHERS

AC Input	1Ø 100~240V ± 10% V <sub>LN</sub> , 47~63Hz
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %

### DIMENSION

2401 (H x W x D)	88 x 320 x 240 mm / 3.46 x 12.6 x 9.45 inch
2402 (H x W x D)	88 x 320 x 240 mm / 3.46 x 12.6 x 9.45 inch

### WEIGHT

2401	3.2 kg / 7.05 lbs
2402	3.1 kg / 6.83 lbs



## KEY FEATURES

- Modular design
- HDMI 2.0 Signal module (Option)
  - Comply with HDMI 2.0 standard
  - 4K x 2K 60/50Hz
  - Pixel rate support up to 600MHz (6Gbps TMDS rate)
  - RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 or 4:2:0
  - HDCP 1.4 / 2.2
  - CEA-861-F timing
  - 24 / 30 / 36 color depth
  - ARC (Audio Return Channel)
  - sYCC601 / Adobe RGB / Adobe YCC601 / xvYCC / ITU-R BT.2020
  - HDR (High Dynamic Range) Test Function (HDR Infoframe & Metadata / EOTF / Wide Color Gamut)
  - SCDC (Status & Control Data Channel) Read Function
- DisplayPort Signal module (Option)
  - Comply with DisplayPort 1.2a standard
  - 4K x 2K 60/50Hz
  - Pixel rate support up to 600MHz
  - 1.62 / 2.7 / 5.4Gbps per lane
  - 1 / 2 / 4 Link
  - 2 Channel (L-PCM)
  - DPCD (Display Port Configuration Data) Read Function
- EDID Read / Write / Compare / Analyze
- Scrolling function
- Built in China high-definition / 3D / 4K test pattern
- User Define Key(32 Key max)
- One-touch function keys
- Front panel USB and control interface
- Graphical software user interface
- ESD protection circuit
- BMP file format support

Chroma 2403 programmable video pattern generator is the perfect instrument for digital video signal interface testing. It provides users with a high performance-low cost test solution. The built-in high speed graphic engine is able to provide standard test signals and patterns for display devices with various resolutions to meet the requirements of multimedia display industries today and in the future for R&D and test applications.

The Video Pattern Generator supports the up-to-date high resolution multimedia digital audio and video transmission interface HDMI and DisplayPort specification with the following features:

### Supports 4K x 2K 60Hz

2403 is built-in with a high speed graphic engine. The output signal can reach up to 600MHz. It supports UHD(Ultra High Definition) 4K x 2K@60Hz ultra high resolution displays testing.

### Modulized Signal Interface Design

The modulized design output interface has 2 signal module terminals for users to choose from based on their testing needs. The modules support multi-signal terminal synchronized output capability which meet the multi-input terminals displays testing.



### HDMI 2.0 Testing Function (HDMI module)

Supports HDMI 2.0 standard 6Gbps TMDS signal output (TMDS rate) and HDCP1.4 / 2.2 Supports 24 / 30 / 36 bits color depth (RGB / YCbCr) and HDMI 2.0 standard YCbCr 4:2:0 sampling format output and at the same time provides high resolution color standard ITU-R BT2020 and HDCP 2.2 / ARC (Audio Return Channel)/CEC/EDID/SCDC (Status & Control Data Channel)/HDR (High Dynamic Range) testing functions.

### DisplayPort 1.2a Testing Function (DP module)

Supports DisplayPort 1.2 standard HBR2(High Bit Rate 2, 5.4Gbps) bandwidth transmission up to 4K x 2K 60Hz. Also supports audio transmission and 3D/EDID/DPCD(Display Port Configuration Data) testing functions.

### Hot Key Function

Default or user-defined testing program can help to increase manufacturing efficiency. Chroma 2403 is built-in with abundant timing and pattern,

including standard static, motion and scrolling pattern. It supports the testing of the displays' performance. The modulized signal interface design can be flexibly choose from based on testing application. The VPG Master supports programmable timing, pattern and program. Its user-friendly interface is suitable for R&D, production and QA verification.

### ORDERING INFORMATION

- 2403:** Video Pattern Generator
- A240001 :** Remote Controller
- A240301 :** HDMI signal module
- A240302 :** DisplayPort signal module



Model 2403 Rear View

2403 Main Frame	
Display Size	4096 x 2160
Horizontal Timing	
Total pixel	32~8192 pixels / 1 pixels resolution
Vertical Timing	
Total line	4~4096 lines (non-interlace) / 1 line programmable 4~2048 lines (interlace) / 1 line programmable
Data storage device	
Default	1000 timings + 1000 patterns (Depend on signal module)
Internal Memory	1000 timings + 1000 patterns + 500 programs
External Memory	USB Host interface
Other	
AC Input	100-240V, 50~60Hz, 1A Maximum
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %
2403 (HxWxD)	320x240mm / 3.46x12.6x9.45inch
Weight	3.1kg / 6.83 lbs



**A240301 :** HDMI signal module

HDMI Signal Module A240301	
Version	HDMI 2.0 x 4ch (3D / ARC / CEC / HDR / SCDC)
Pixel Rate Range	25 ~ 600 MHz (TMDS rate 600 MHz)
Support HDMI Timing	125 Timing (CEA-861F)
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 or 4:2:0
Color depth	24 / 30 / 36 bits per pixel
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709 / xvYcc / sYcc601 / Adobe RGB / Adobe sYcc601 / ITU-R BT.2020
EDID	Read / Write / Compare / Edit / Analysis
HDCP	HDCP 2.2 / 1.4 (Automatic selection)
Audio	8 Channel (16 / 24 bit)



**A240302 :** DisplayPort signal module

DisplayPort Signal Module A240302	
Version	DISPLAYPORT 1.2a x 2ch (3D / DPCD)
Pixel Rate Range	25 ~ 600 MHz
Main Link Data Rate	1.62 / 2.7 / 5.4Gbps per lane
Lane Count	1 / 2 / 4 Lanes
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2
Color depth	6 / 8 / 10 / 12 bits per component
HDCP	HDCP 1.3
Audio	2 Channel (16 / 24 bit)
MST	FHD (1920 x 1080P @ 60) x 4 max. (Simple/Split mode)

All specifications are subject to change without notice.



## KEY FEATURES

- One HDMI Source to connect up to 4 displays
- Support Full-HD 1080P resolution
- Compliant with HDMI V1.3
- Compliant HDCP V1.2
- HDCP Key sets allows each output independently
- Control by Smart I/O interface
- DDCIIB Plug & Play Function
- Distributor / Multiplexer Mode selection
- ESD protection
- Low cost

Chroma A222907 HDMI Distributor has HDMI signal output interface that can work with the Video Pattern Generator of Chroma to perform extended tests for HDMI signals.

This distributor has 1-In/4-Out HDMI ports that comply with the HDMI 1.3 standards to support the tests for the newest HDMI 1.3 functions.

In addition, Chroma A222907 is equipped with Distributor and Multiplexer modes that each output port can set the HDCP/EDID to be enabled or disabled concurrently or separately to facilitate the user's tests greatly.

Supporting most of CEC features which are used to communicate with HDMI network. Chroma A222907 can also output 4 CEC commands simultaneously to reduce user's test time. Depends on the showing response message from A222907 on the screen, users can verify the CEC function immediately.

In order to comply with the multi-port input design of digital FPD industry, this distributor adopts external connection with handy compact size to ease the use in variety of production lines and R&D labs.

Chroma A222907 has dynamic message function which can display HDCP key data and EDID content of TV and help users to check the data correctness.

This distributor is applicable for the Signal Generators with Smart I/O manufactured by Chroma to extend and expand the HDMI signals for various applications such as the long distance transmission of serial production line or parallel usage in demonstration room and etc. In the meantime, its special output design can be used to protect the back-end of a signal generator.

## HDMI Distributor Application 1 for single unit

One A222907 has 4 outputs to test all of the HDMI ports (maximum 4) on the display directly.

## HDMI Distributor Application 2 for single unit

One A222907 can output signals to 4 displays to test the EDID & HDCP functions and interpret the data separately or concurrently.

## HDMI Distributor Application 3 for multiple units

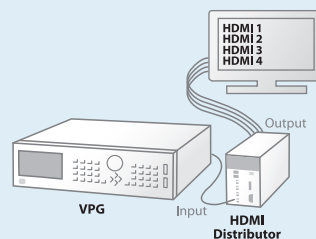
Multiple A222907 can be connected in series to test even more displays for the series-parallel application of multiple devices.

## HDMI Distributor Application 4 for CEC feature

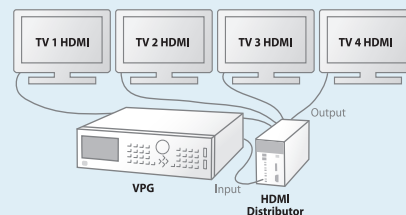
One A222907 can output features to 4 different displays to test CEC function of TV independently.

## HDMI DISTRIBUTOR APPLICATIONS

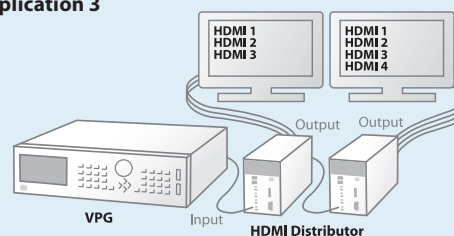
### Application 1



### Application 2



### Application 3



## SPECIFICATIONS

Output		
Signal Format		TMDS signal Link
Video Signal	Pixel Rate	25 to 165 MHz (TMDS CLK : 225MHz )
	Color Space	RGB, ITU-601, ITU-709, xvYcc
Audio Signal	Sampling Frequency	32 to 192 KHz
	Number of Channels	8 Channel
ESD / Surge protect ( IEC 61000-4-2 Level 4 Regulation)		Contact 8KV / Air 15 KV
HDMI / HDCP		
HDMI Version		Version 1.3a
HDCP Version		Version 1.2
DDC		DDC2B compliant
E-EDID		Version1.3
Connector		
Input Signal Source from Chroma VPG Series		Equipped with Smart I/O port in 22xx / 23xx Series
HDMI		HDMI 19 Pin x5
Smart I/O		3 In 3 Out x1
CEC		
Support Feature	One touch play	
	System standby	
	OSD Display	
	Set OSD Name	
	Give power status	
Audio control		
Front Control Mode		
Remote Mode		Control by VPG or Manual
Manual Mode		Output ON / OFF, or selection
Other		
User Interface		Smart I/O
DC Input		9V/2A (With Chroma adapter only)
Temperature	Operation	+5~+40 deg.C
	Storage	-20~+60 deg.C
Humidity		20~90%
DIMENSION & WEIGHT		
A222907 (H x W x D)		88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch 750g / 1.65lbs



## KEY FEATURES

- Compliant with MHL 2.0 standard
- MHL pixel rate support up to 150MHz
  - 1080p 60Hz
  - 3D format
- Cbus (RCP) test function
- Vbus test function
  - Active load 500/900mA
  - Voltage & current measurement
- EDID / HDCP linking test
- Test result on screen display
- 8 channel audio
- 2 MHL ports output
- 2 HDMI ports output
- ESD protection
- High cost-performance value
- Compliant with chroma 22/23/24 series

Chroma A222908 MHL module is a test equipment that supports the Mobile High-definition Link (MHL™) signal, which is able to work with the Chroma Video Pattern Generator for extending MHL signal output, in order to provide the solutions for display industry.

The A222908 supports the specification of MHL v2.0 which can expand 1 set of HDMI signal to 2 sets of MHL signal and HDMI signal. Its main features are as the following.

### Standard MHL Signal Output

It provides two sets of standard MHL signal output that supports up to 1080P 60Hz (PackedPixel mode) and 8-channel audio signal transmission.

### 3D standard Format Signal Output

Supporting MHL defined 3D format (Frame packing / Top-and-Bottom / Left-Right) that works with the 3D Video Pattern Generator of Chroma to output 3D test pattern for 3D display application.

### Multiple Signal Port Output function concurrently

The A222908 is equipped with signal output function of 2 sets of MHL and 2 sets of HDMI simultaneously that comply with multiple input port display test application nowadays.

### HDCP/EDID Test Function

Working with the Video Pattern Generator of Chroma that can display HDCP and EDID test results on the test pattern for getting quick testing function.

### Cbus Test Function

MHL specification provides Remote Control Protocol (RCP) to support RCP display for users control smart phone via the remote controller to select the film to be viewed and perform control functions of play, fast forward or rewind. Chroma A222908 works with the Video Pattern Generator of Chroma to provide RCP detection function and fast judge remote control function of MHL display.

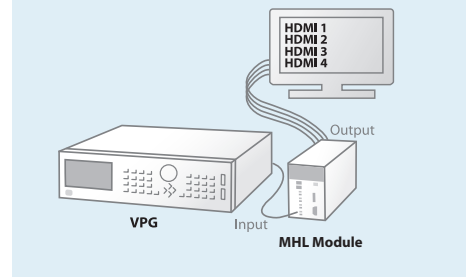
### Vbus Measurement Function

Working with the Video Pattern Generator of Chroma that can provide MHL Vbus voltage measurement function. Fast judge Vbus function by reading the measured voltage and current value on the test pattern.

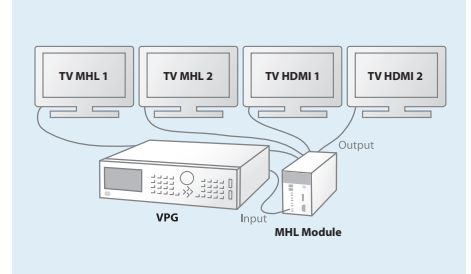
In the aspect of operation, the A222908 provides users simple and rapid setting management, easy operation interface and complete test function via Chroma control editing software (VPGMaster, need work with the Video Pattern Generator of Chroma). It is applicable for research and development, production test and quality verification application of all MHL related video industry.

## MHL MODULE APPLICATIONS

### Application 1



### Application 2



## SPECIFICATIONS

MHL Video Output	
Version	MHL v2.0
Pixel rate	25 ~ 150MHz
Color space	RGB / YCbCr
HDMI Video Output	
Version	HDMI v1.4
Pixel rate	25 ~ 165MHz
Color space	RGB / YCbCr
MHL / HDMI Audio Output	
Sample Rate	32, 44.1, 48, 88.2, 96, 176.4, 192KHz
Number of Channel	8 Channel
MHL Function	
Vbus test	Voltage / Current
Message Display	Cbus (RCP) / Device Capability / HDCP / EDID
Connector	
MHL	Micro USB 5 pin x 2
HDMI	HDMI TYPE A 19 Pin x3 ( Input x 1 / Output x 2)
SMART I/O	Smart I/O x 1
Others	
DC Input	12V / 2.5A (With Chroma adapter only)
Temperature(Operation/Storage)	+5~+40 deg.C / -20~+60 deg.C
Humidity	20 ~ 90%
Dimension & Weight	
A222908 (HxWxD)	88x45x200mm / 3.46x1.77x7.87 inch
	750g / 1.65lbs





### KEY FEATURES

- Convert HDMI signal to SDI signal output
- Support 48K Audio output
- SDI Output x 2
- SYNC Output x 1
- Comply with SDI Standard (SMPTE)
  - SD-SDI : SMPTE-259M
  - HD-SDI : SMPTE-274M / 296M
  - 3G-SDI : SMPTE-425M (Level A/B)
- SD/HD/3G format auto identification
- Control by Smart I/O interface
- ESD protection
- Low cost

Chroma A2229015 SDI Module is specially designed to meet the test demands of diversified low cost SDI signals for today's display industry. It has extended specifications and functions when integrated with the main VPG test device that creates the SDI signal products for applications in broad domain.



It is an HDMI to SDI Adapter that can be controlled by Smart I/O. With the combination of Chroma VPG with A222915, the external module can be connected to Chroma VPG easily for various SDI tests.

Chroma A222915 has equipped with the latest 3G-SDI standard resolution which is the mainstream specification of all 1080P transmission. It can double the HDTV transmission rate in the advanced video environment, also enhance the overall broadcasting quality in the transmission network.

The industries of Chroma A222915 applied extensively include the distributed amplifier, video router and the serial connection interface of switch, camera and other devices. The SDI can use a 75Ω coaxial cable to transmit the uncompressed digital video signal within long distance range in a TV studio or a place with related equipment to achieve the high quality HD playback.

For peripheral industry, the display related customer can involve the SDI test requests directly to the application of LED TV wall, projector, outdoor large-scale display and broadcasting hardware.

In the meantime, its simple design is applicable for all SDI multimedia tests in practical use including R&D, manufacturing test and quality assurance, especially the mass production for rapid verification and assessment.

Moreover, Chroma A222915 uses HDMI as the signal input source and 2 sets of SDI can output at the same time. SD-SDI/ HD-SDI/3G-SDI supports 2CH / 8CH - 48kHz Audio output that can work with VPG to test various standard static and dynamic images.

To cope with the design of multi-port inputs for the FPD in this digital age, the SDI module is developed to connect externally and in compact size to be used flexibly in any site of production line and laboratories.

### SPECIFICATIONS

PIXEL RANGE				
Input : HDMI Signal		HDMI Ver1.0 ~ 1.3 (2.25Gbps)		
Output : SDI Signal		SD/HD/3G SDI SMPTE 259M/274M/296M/425M (Up to 2.97Gbps)		
Connector				
Input Signal Source from Chroma VPG Series		Equipped with Smart I/O port in 22xx / 23xx Series		
HDMI		Input : HDMI 19 Pin x1		
SDI		Output : BNC x2		
SYNC		Output : BNC x1		
ESD / Surge protect ( IEC 61000-4-2 Level 4 Regulation)		Contact 8KV / Air 15 KV		
TIMING LIST				
Output format	Bit rate	Standard	Video format	
SD-SDI	270Mbps	SMPTE-259M	NTSC	720x480/59.94i
			PAL	720x576/50i
HD-SDI	1.485Gbps	SMPTE-274M	1920x1080p	30/29.97/25/24/23.98
			1920x1080i	60/59.94/50
3G-SDI	2.97Gbps	SMPTE-296M	720p	60/59.94/50
			SMPTE-425M (Level A)	1920x1080p
		SMPTE-425M (Level B)		1920x1080i
			1920x1080psf	30/29.97/25/24/23.98
Other				
User Interface		Smart I/O		
DC Input		9V/2A (With Chroma adapter only)		
Temperature	Operation	+5~+40 deg.C		
	Storage	-20~+60 deg.C		
Humidity		20~90%		
DIMENSION & WEIGHT				
A222915 (H x W x D)		88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch 750g / 1.65lbs		



## KEY FEATURES

- TV / Monitor PCBA test system
- VESA / JEIDA data mapping
- LVDS 2 channel input / output
- LVDS 6 / 8 / 10 bits
- LVDS pixel rate
  - 1 Link up to 135MHz
  - 2 Link up to 270MHz
  - 4 Link up to 540MHz (A222917 x 2)
- Timing / pattern / audio compare
- LVDS Vdd measurement
- DC voltage measurement
- PWM frequency / duty cycle measurement
- Bidirectional digital control
- Speaker / headphone audio input
- Optical / Coaxial audio input (SPDIF)
- EDID / HDCP test (with VPG)
- IR transceiver control (Option)
- ESD protection
- Modular design
- High Cost-performance value

Chroma A222917 is a multi-functional PCBA main board signal test device for display. It has ultra high speed LVDS (Low-voltage differential signaling) as image signal analysis core to provide high efficiency and stability test quality. It can form a PCBA automatic test system when integrated with the newest generation of Chroma 22XX Series Video Pattern Generator (\*1) that can meet the requirements for testing the PCBA main boards automatically in present and future multi-media display industries.

The A222917 Pattern Analyzer supports various audio and video automatic testing functions for PCBA production line. The features include:

High speed LVDS video pattern standard format signal analysis interface that supports VESA and JEIDA standard with 6 / 8 / 10 color depth testing selection. The LVDS signal frequency supports up to 270MHz in Dual link mode and is able to output simultaneously during analysis so that the user can connect the panel to do screen inspection.

### LVDS timing analysis

Timing analysis can be done via various detail parameters including pixel rate, horizontal and vertical timing, which can be used easily to judge if the LVDS transmission channel is correct.

### Image comparison

It replaces the traditional artificial screen inspection with high speed image comparison core to do a series of comparison on each frame. The user can set the frame numbers and

maximum 32 comparing blocks in each frame for comparison. It can also mark the error coordinates and inspection values for follow-up fixing latter.

### Audio signal test

It has digital/analog audio signal amplitude and frequency test capability for the production line to test the audio signal interface function rapidly.

### Digital control interface

It has 16 channels of bidirectional digital control interface and is able to set 3.3V or 5V interface voltage for automatic testing control or warning.

### Voltage measurement module

Equipped with LVDS Vdd voltage and 8 DC voltage measurement modules, A222917 is able to measure the voltage for PCBA test points.

To achieve automated test application for PCBA production line, the A222917 Pattern Analyzer replaces the traditional screen inspection with automatic signal inspection device by

programming the complex PCBA test procedures via software. Only one button is required for the actual production line inspection to complete related tests automatically. It saves the test time greatly and improve the test accuracy.

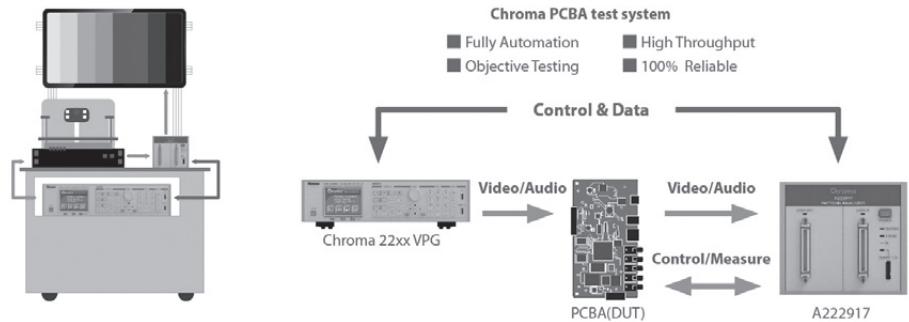
The A222917 has graphical test program editing software that gives the user an easy and fast way to manage and edit the test programs with the actual test items performed in production line. The easy-to-use operating interface and complete test functions are most applicable for all video and related industries when doing research and development, production test and quality assurance.

(\*1) Support Model 22293-B/22294-A/2233-B/2234/2235

## ORDERING INFORMATION

**A222917** : Pattern Analyzer

## CONFIGURATION



## SPECIFICATIONS

LVDS In/Out	
Signal format	VESA / JEIDA
Color depth	6 / 8 / 10 bits
Link mode	1 link up to 135 MHz / 2 link up to 270MHz
Audio input	
Channel	2 Ch(LINE/COAX/OPTICAL) / 3 Ch(SPEAKER)
Amplitude	0 ~ 4 Vp-p(LINE) / 0 ~ 40 Vp-p(SPEAKER)
Frequency	20 Hz ~20 KHz
Digital I/O	
Voltage range	3.3V / 5V Selectable (Bidirectional )
DC voltage measurement	
Voltage range	0 ~ 20V
Connector	
LVDS	MDR 50 pin x 2
S/PDIF Input	Optical x1 / Coaxial x 1
Line in	Headphone Jack x 1
Speaker in	8 pin 2.5mm header x 1
Other	
DC Input	9V/2A (With Chroma adapter only)
Temperature (Operation/Storage)	+5~+40 deg.C / -20~+60 deg.C
Humidity	20 ~ 90%
Dimension & Weight	
A222917	88X100X200 mm / 3.46X3.94X7.87 inch (H x W x D) 1 kg / 2.2 lbs



## KEY FEATURES

- Luminance and chromaticity measurement of Color Display
- 0.005 cd/m<sup>2</sup> low luminance measurement (A712301)
- Wide range of luminance display:
  - 0.0001 to 25,000 cd/m<sup>2</sup> (A712301)
  - 0.01 to 200,000 cd/m<sup>2</sup> (A712302)
  - 0.01 to 6000 cd/m<sup>2</sup> (A712200)
- High accuracy measurement
- Maximum 9 display modes: xyY, TΔuvY, u'v'Y, RGB, XYZ, Contrast, Program
- Able to control Video Pattern Generator and UUT (Unit Under Test)
- Built-in contrast measurement function to calculate the contrast ratio directly
- Equipped with programmable test items that can complete the planned tests with one single button
- Support USB flash disk that can copy the test procedures to other station for use
- Judgment function embedded to judge the test result automatically with one single button
- Calibration period setting and reminding function
- Memory for storing 100 channels of standard color data and calibration data
- Built-in flat display calibration data LCD-D65 & LED-D65\* to be applied for chromaticity measurement instantly
- Optional display white balance alignment system can be used to integrate all optical test stations to one single station

\* It uses the typical fluorescent excited white light LED display

Chroma 7123 Display Color Analyzer adopts the design of contact and non-contact type measurements based on the probe selected to measure the luminance and chromaticity of display panels. Developed with the most advanced digital signal processor and the technology of optoelectronic transfer as well as precision optical parts and circuit design, the 7123 Display Color Analyzer is capable of performing high speed, accurate and stable color tests.

The configuration of Chroma 7123 complies with the color matching function sensor of CIE 1931 and CIE1976 UCS that can measure the luminance and chromaticity of display panel accurately. Users can switch to various types of chromaticity coordinates freely including xyY, TΔuvY, u' v' Y, RGB, XYZ, Contrast and Program 9 modes in total. The A712301 that is designed to test the LCD characteristics with LED backlight is able to meet the low luminance test requirements of 0.005cd/m<sup>2</sup>. In addition, the A712302, designed for small size display in particular can solve the problem of color analyzer measurement area larger than the display area with its 5mm measurement area.

To satisfy the needs for automation, the 7123 is equipped with the function to control the video pattern generator and the UUT without using a personal computer to cut down the acquisition and management cost. The 7123 also has the functions of contrast measurement, result judgment and programmable test items that can fulfill the auto test requirements to enhance the production efficiency.

The Optical Measurement Software incorporated by Chroma 7123 is able to do chromaticity, luminance, and Gamma measurements on PC, and then show the measured data on CIE 1931 and CIE1976 UCS chromaticity coordinate chart directly. Besides the function of drawing Gamma curve, the measured data can also be stored on PC and exported to EXCEL® for process. The example programs enclosed in optical measurement software allow users to develop the test programs that suit their needs.

Chroma 7123 Display Color Analyzer has 100 channels of built-in memory for storing the value of standard colors and calibrated data. In addition, Chroma 7123 also provides many friendly user interfaces for operation such as the way test data shows, the position set for push buttons, the positioning projector, USB and RS-232 interfaces for data transmission, calibration period setting as well as reminding function and etc. to satisfy the requirements for actual measures. Using the USB flash disk, the test procedures can be copied to other stations for use and reduce the time for repeated editing considerably.

As the technology and products of flat displays have become the mainstream in the market today, every manufacturer is seeking for high value-added and low cost measurement solutions to raise its competitiveness; Chroma 7123 Display Color Analyzer is the excellent tool to assist in achieving that purpose.

## Software Development Kit (SDK)

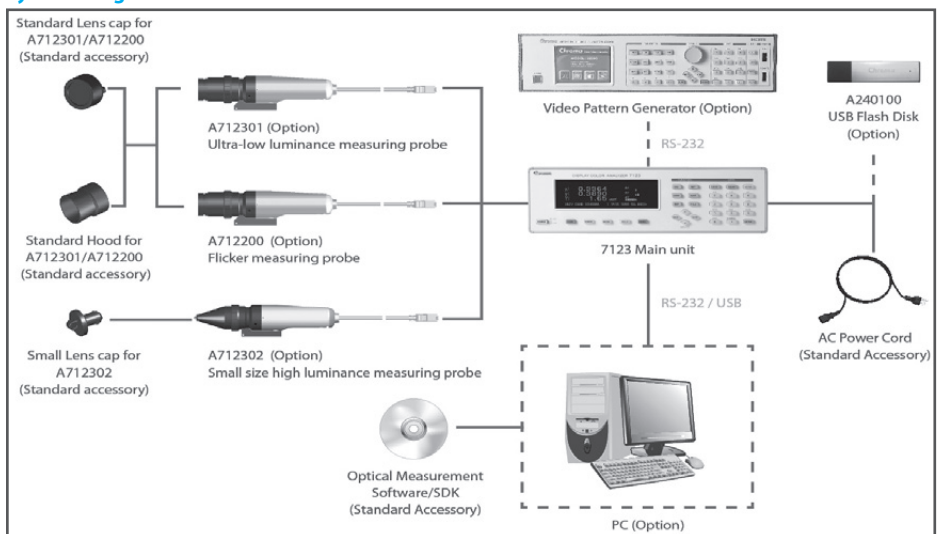
- Example Program:
  - Color Measurement
  - Multiple Control
  - Gamma Measurement
  - Color Calibration
- API Development Library

## System Requirements

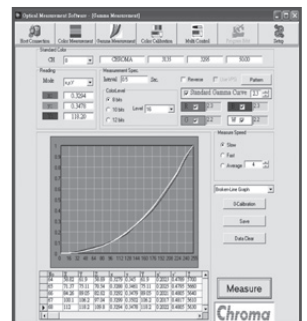
Operating System: Windows® XP/7

Windows® & EXCEL® are the registered trademarks of Microsoft in United States and other countries.

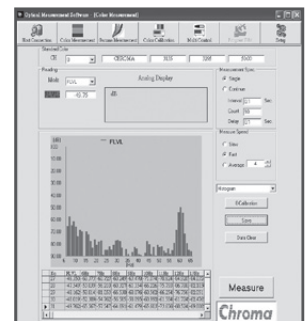
## System Diagram



Color Measurement



Gamma Measurement



Flicker Measurement

Video & Color  
Flat Panel Display  
LED/Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation

SPECIFICATIONS			
Model	7123		
Probe Model	A712301 (Ultra-Low luminance measuring probe)	A712302 (Small size high Luminance measuring probe)	A712200 (Flicker measuring probe)
Measurement Area	Ø27 mm / Ø1.06 inch	Ø5 mm / Ø0.20 inch	Ø27 mm / Ø1.06 inch
Measurement Distance	30 ± 10mm	0~10mm	30 ± 10mm
Acceptance Angle	± 2.5°	± 5°	± 2.5°
Display Range	Luminance	0.0001 to 25,000 cd/m <sup>2</sup>	0.01 to 200,000 cd/m <sup>2</sup>
	Chromaticity	4 or 3 digits display	
Luminance unit	cd/m <sup>2</sup> or fL, selectable via button on the front panel		
Display Mode	Digital	xyY; TΔuvY; u' v' Y; RGB; XYZ; Contrast; Program	xyY; TΔuvY; u' v' Y; RGB; XYZ; FMA; FLVL; Contrast; Program
	Analog	Δx Δy ΔY; ΔR ΔG ΔB; ΔR G/R B/R; R/G ΔG B/G	ΔxΔyΔY; ΔRΔGΔB; ΔR G/R B/R; R/G ΔG B/G; FMA
Luminance <sup>*1</sup>	Meas. Range	0.0050 to 6,000cd/m <sup>2</sup> (0.001 to 1751fL)	0.30 to 6,000 cd/m <sup>2</sup> (0.09 to 1751 fL)
	Accuracy	0.0050 to 0.0199 cd/m <sup>2</sup> : ± 0.0005cd/m <sup>2</sup> 0.020 to 0.099 cd/m <sup>2</sup> : ± 4% ± 2 digits 0.100 to 6,000 cd/m <sup>2</sup> : ± 2% ± 1 digit	0.30 to 6,000 cd/m <sup>2</sup> : ± 2% ± 1 digit
	Repeatability	0.0050 to 0.0199 cd/m <sup>2</sup> : ± 0.0003cd/m <sup>2</sup> 0.020 to 0.099 cd/m <sup>2</sup> : 1% + 2 digits(2σ) 0.100 to 0.999 cd/m <sup>2</sup> : 0.2% + 1 digit(2σ) 1.00 to 6,000 cd/m <sup>2</sup> : 0.1% + 1 digit(2σ)	0.30 to 2.99cd/m <sup>2</sup> : 0.2% + 1 digit(2σ) 3.00 to 6,000 cd/m <sup>2</sup> : 0.1% + 1 digit(2σ)
Chromaticity <sup>*1</sup>	Accuracy	0.100 to 2.99 cd/m <sup>2</sup> : ± 0.008 3.00 to 4.99 cd/m <sup>2</sup> : ± 0.005 5.00 to 9.99 cd/m <sup>2</sup> : ± 0.003 10.00 to 6,000 cd/m <sup>2</sup> : ± 0.002	0.30 to 14.99 cd/m <sup>2</sup> : ± 0.008 15.00 to 119.9 cd/m <sup>2</sup> : ± 0.005 120.0 to 6,000 cd/m <sup>2</sup> : ± 0.003
	Repeatability	0.100 to 0.199 cd/m <sup>2</sup> : 0.015(2σ) 0.200 to 0.499 cd/m <sup>2</sup> : 0.008(2σ) 0.500 to 1.99 cd/m <sup>2</sup> : 0.003(2σ) 2.00 to 6,000 cd/m <sup>2</sup> : 0.001(2σ)	0.30 to 0.59 cd/m <sup>2</sup> : 0.015(2σ) 0.60 to 1.49 cd/m <sup>2</sup> : 0.008(2σ) 1.50 to 7.99 cd/m <sup>2</sup> : 0.003(2σ) 8.00 to 6,000 cd/m <sup>2</sup> : 0.001(2σ)
Flicker -Contrast Method(FMA)	Range	---	5 cd/m <sup>2</sup> or higher
	Display Range	---	0.0 to 100%
	Accuracy	---	± 1% (Flicker frequency: 30 Hz AC/DC 10 % sine wave) ± 2% (Flicker frequency: 60 Hz AC/DC 10 % sine wave)
Flicker -JEITA/VESA Method (FLVL)	Range	---	5 cd/m <sup>2</sup> or higher
	Display Range	---	6-240Hz
	Accuracy	---	± 0.5dB (Flicker frequency: 30 Hz AC/DC 10 % sine wave)
Measurement Speed	xyY	Y:0.0050 to 0.0199 cd/m <sup>2</sup> : 1 time/sec (Low luminance Mode) Y:0.020 to 1.99 cd/m <sup>2</sup> : 4 times/sec. (Auto mode); 2.00 cd/m <sup>2</sup> and above: 15 times/sec.	0.3 to 7.99 cd/m <sup>2</sup> : 1 time/sec. 8.00 cd/m <sup>2</sup> and above: 15 times/sec.
	FMA	---	6 times/sec. (UNIV); 20 times/sec.(NTSC); 16 times/sec. (PAL)
	FLVL	---	0.5 time/sec.
Dimension	Ø 46 x 234.9(D) mm / Ø 1.81 x 9.25(D) inch	Ø 46 x 221.9(D) mm / Ø 1.81 x 8.74 (D) inch	Ø 46 x 234.9(D) mm / Ø 1.81 x 9.25(D) inch
Weight	0.5 kg / 1.1 lbs	0.5 kg / 1.1 lbs	0.5 kg / 1.1 lbs
Cord Length	2.5m / 98.43 inch		
Optical System	LED positioning function		
Main unit			
Memory Channel	100 Channels		
Sync Mode	NTSC, PAL, EXT, UNIV, INT		
Object Under Measurement	10~240 Hz		
Interface	USB(2.0), USB flash disk port, RS-232C (Baud rate max. 115200)		
Input Voltage Range	1Ø 110~240V ± 10% V <sub>LN</sub> , 47~63Hz, 50VA		
Operating Temperature/ Humidity Range	10°C to 30°C (50°F to 86°F); less than 75% relative humidity (with no condensation)		
Storage Temperature / Humidity Range	0°C to 40°C (32°F to 104°F); less than 75% relative humidity (with no condensation)		
Dimension (H x W x D)	115x320x260 mm / 4.5x12.6x10.2 inch		
Weight	2.7 Kg / 5.95lbs		
Other Functions	Customized light source calibration, memory channel ID storage, variable analog display range, display pause, remote control, comparison, video pattern generator and UUT control, programmable test item, test result judgment, calibration period setting and reminding function, USB flash disk supported. <sup>*2</sup>		
Certification	CE		

**Note \*1:** Standard illuminant A is used for test according to Chroma's test condition. **Note \*2:** Only the USB flash disks certified by Chroma are supported.

**\*Reference standards:** IEC 61747-6, EIAJ ED-2522, ASTM E455-03, VESA Standard

## ORDERING INFORMATION

- 7123** : Display Color Analyzer Main Unit
- A712200** : Flicker measuring probe (with 2.5m signal cable)
- A712102** : Tripod (including a level gauge)
- A712200** : Flicker measuring probe (with 2.5m signal cable)
- A712301** : Ultra-Low luminance measuring probe (with 2.5m signal cable)
- A712302** : Small size high luminance measuring probe (with 2.5m signal cable)





## KEY FEATURES

- 0.001 Lux ultra low illumination display range
- Comply with ANSI-1997, JBMIA, IEC & SJ/T projector testing standards
- 29 sets chroma meter & Illuminance meter measuring at the same time, high test throughput
- Integrated with Video Pattern Generator and one click to complete all measurements
- Accurate chroma meter with tuned color filters (closely approximates CIE 1931 color matching functions), and cosine correctors
- User-defined calibration function facilitates the system maintenance
- Testing criteria storage for various models requirements
- "Pre-Test" function to edit testing items setting for non-ANSI standard tests
- Automatic white balance adjustment
- Auto maximum brightness selection and DC-index compliance with chromaticity specification
- Complete test items: ANSI Lumens, Light Uniformity, Color Uniformity, Contrast Ratio and Correlated Color Temperature
- High accuracy measurement:  
Y :  $\pm 2\% \pm 1$  digit  
x, y :  $\pm 0.002$
- Precise repeatability measurement:  
Y :  $\pm 0.5\% \pm 1$  digit  
x, y :  $\pm 0.0005$
- NIST traceable calibration
- Data output saved automatically for statistical analysis and able to upload to MES
- User authority control for system management
- Support Windows 7 (32 bit)

Chroma 7600A is an automatic test system developed in compliance with with ANSI /NAPM IT 7.228-1997 which is defined by American National Standard Institute, JBMIA-ISO21118 (2005.8) which is defined by Japan Business Machine & Information Industry Association, IEC61947-1 (2002) which is defined by International Electrotechnical Commission and SJ/T 11340-2006 (2007.1.1) which is defined by Ministry of Industry and Information Technology of the People's Republic of China to test the front projectors. The chroma meter used in the system is designed with advanced microprocessor and precision optical components along with filters closely approximate to CIE 1931 Color Matching

Function and Cosine Correction. It can offer accurate and high-speed illuminant and chromatic measurements performance and quality judgments for LCD, DLP and LCOS projectors.

The software of Chroma 7600A is a Window™ based control program with comprehensive graphic user interface that can enhance testing efficiency of the projector manufacturers and lower down the test and labor cost. With the integration of video pattern generator of Chroma, the user can complete all the ANSI-1997 testing items, acceptance criteria and file saving with just one click.

To accommodate the diversified needs users may have, Chroma 7600A provides various test results including ANSI Lumens, Light Uniformity, Color Uniformity, Contrast Ratio and Correlated Color Temperature for one's choice. In addition, a flexible formula editing wizard is offered for the user to edit the desired calculation formula. The

"Pre-Test" function in the software allows the user viewing the measured values in real time to integrate into the convergence, grayscale tests and VR adjustments etc. before performing ANSI tests. And with the user-defined calibration function Chroma 7600A provides, it is very convenient for the system maintenance which can reduce the calibration cost in the future effectively.

When the performance of luminance-chrominance has become the key factor for the value of front projector, the chromaticity measurements must comply with more standards and test benchmarks. As the demand of compact, high brightness and resolution display devices is increasing quickly now, the front projector will play a leading role in the near future. Every front projector make is looking for the most cost-effective test solution to keep up with this trend. Such a versatile and easy-to-use instrument like Chroma 7600A must satisfy your intent to win competitive advantages.

## SPECIFICATIONS

Model	7600A		
Photo Sensor	13 chroma meters (13 points) or 13 chroma meters plus 16 Illuminance meters (29 points) closely approximates CIE 1931 Color Matching Function, and cosine correctors		
Illuminance Range	0.05 to 30,000 Lux		
Display Range	0.001 to 30,000 Lux		
OS	Windows® 7		
Software User Interface	Based on ANSI test standard : Illuminance & Chromaticity test (13 points) readings : Y, x, y/CCT/Y, u', v'/ $\Delta u'v'$ /ANSI Lumens/Uniformity/Max/Min/ Avg. Contrast Ratio analysis (16 points) readings : Y/Contrast Ratio/Max/Min/ Avg. User-defined testing parameters, calculating formula, white balance adjustment, auto maximum brightness selection and DC-index compliance with chromaticity specification		
	Data storage		
Measuring Area	100 in. (13 points & 29 points)	60 in. (13 points & 29 points)	25 in. (13 points) *1
Body Modular	Fixed : 4:3, 16:9,16:10 3 in 1 : 4:3/16:9/16:10	Fixed : 4:3, 16:9,16:10 3 in 1 : 4:3/16:9/16:10	Fixed : 4:3, 16:9,16:10 3 in 1 : 4:3/16:9/16:10
Chroma Meter Measuring Area	Ø22mm		
Repeatability (2σ) *2	Y : $\pm 0.5\% \pm 1$ digit ; x, y : $\pm 0.0005$		
Accuracy *2	Y : $\pm 2\% \pm 1$ digit ; x, y : $\pm 0.002$		
Data Communication	USB		
Power	1Ø 110~240V $\pm 10\%$ V <sub>LN</sub> , 47~63Hz, 50VA		
Power Consumption	55VA max. (110V AC 60Hz)		
Operating Temp./Humidity Range	5°C to 40°C (41°F to 104°F); < 75% R.H. (without condensation)		
Storage Temp./ Humidity Range	0°C to 50°C (32°F to 122°F); < 75% R.H. (without condensation)		
Certification	CE		

**Note \*1 :** 25 in. supports 13 chroma meters only

**Note \*2 :** Measurement condition is under 500 Lux illuminant A

## ORDERING INFORMATION

**7600A :** Front Projector ATS

**Project Board :** 100 inch, 60 inch ,25 inch ; project ratio : Fixed - 4:3 / 16:9 / 16:10, 3 in 1 - 4:3/16:9/16:10

**Body Modular :** Fixed - 4:3,16:9,16:10 ; 3 in 1 - 4:3/16:9/16:10

**71507 :** Chroma meter (13 points)

**71508 :** Illuminance meter (16 points)

**A760020 :** RS232 to UART bridge

**A766006 :** USB to I<sup>2</sup>C bridge

**LCD Display**

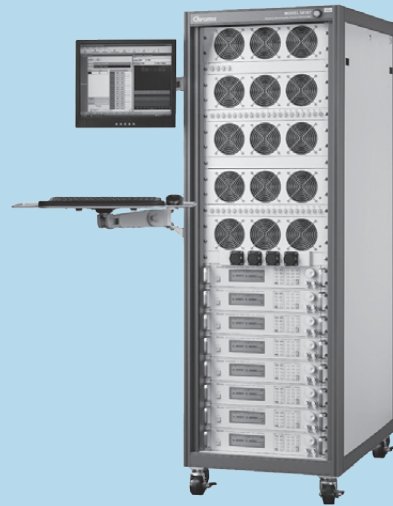
**Chroma Series Video Pattern Generators**

# Flat Panel Display (FPD) Test Solution

<b>OLED Lifetime Test System</b>	<b>5-1</b>
<b>OLED Display Shorting Bar Pattern Generator</b>	<b>5-2</b>
<b>LTPS Display Shorting Bar Pattern Generator</b>	<b>5-3</b>
<b>LCD Shorting Bar Pattern Generator</b>	<b>5-4</b>
<b>LCM Pattern Generator Card</b>	<b>5-6</b>
<b>LCM Tester</b>	<b>5-8</b>
<b>FPD Tester</b>	<b>5-11</b>
<b>LCM ATS</b>	<b>5-15</b>
<b>DC Power Supply for LCM Burn-in Applications</b>	<b>5-22</b>



**OLED Lifetime Test System**



**OLED Display  
Shorting Bar Pattern Generator**



**LTPS Display  
Shorting Bar Pattern Generator**



**LCD Shorting Bar Pattern Generator**

## In-line Application Signal Generator & DC Power Signal Conversion Board



## Off-line Application LCM Pattern Generator Card



## Off-line Application DC Power Supply

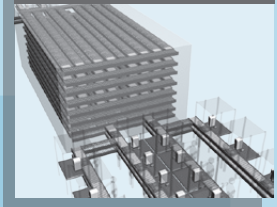
### IN LINE APPLICATION

LCM Production Line

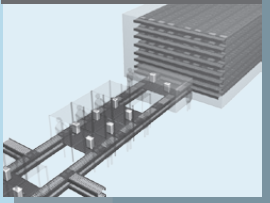
MES/CIM System

In-line Direction

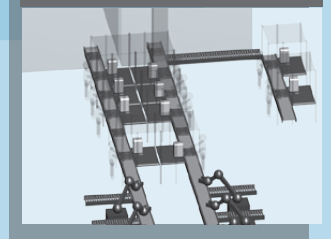
### AGING OVEN



### FINAL TEST/QC



### ASSEMBLY TEST



## FPD Tester



## LCM Tester

## LCM ATS





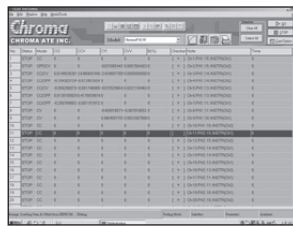
### Hardware

- 18-slot PXI Chassis
- ADLINK PXI-3920 above, 1GHz Embedded
- 52951 Two-Quadrant Source-Measure Card
- Optional 19" Rack of 20U
- Optional 19" LCD monitor, mouse & keyboard

### Software

The test system provides a Windows™ interface for easy configuration of all electrical & optical tests. Each test comprises:

- Multiple stimulus configuration
- Real time test data presentation in tabular and graphical forms
- Up to 34 UUTs
- Brightness calibration
- Automatic test termination when brightness test limit is reached



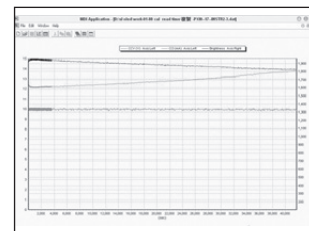
### Customized Test Fixture

- 19" Rack Mount configuration
- Up to 34 test fixtures in drawers
- Flexible fixture design allows for different OLED panel sizes
- OLED panel sizes



### Calibration

Independent calibration data for each channel



Graphical Data Presentation

	A	B	C	D	E	F	G
1	13.5612226	0.98000002	1845.52574	100			
2	13.5150004	0.97514352	1864.36784	100.0002619			
3	13.0204207	0.91185447	1876.21205	101.6504046			
4	12.9945052	0.91000004	1882.24708	102.2400451			
5	12.8518686	0.91052513	1888.39462	103.3091473			
6	12.8080394	0.90642121	1895.22626	103.6621195			
7	12.7519762	0.90642121	1899.18498	103.9217222			
8	12.6834819	0.90303015	1900.17371	103.9946056			
9	12.6172256	0.90075719	1900.66579	103.8719188			
10	12.5460288	0.90059786	1905.79684	103.1327451			
11	12.4717987	0.940239175	1905.49009	103.2212604			
12	12.4256462	0.908026452	1914.60679	103.2927228			
13	12.4030687	0.906228718	1913.17405	103.6407355			
14	12.4104853	0.910337713	1915.51914	103.7077586			
15	12.5400017	0.920718015	1916.79787	103.820503			
16	12.5184816	0.906738716	1918.50262	103.8293889			
17	12.5364217	0.920734632	1915.91202	103.1446671			

### SPECIFICATIONS

HARDWARE	
<b>Model</b>	<b>58131</b>
<b>Facilities</b>	
Power source voltage	110/220VAC(50/60Hz)
Electric power consumption	Maximum 1,000Watt
Storage temperature	0 ~ 75°C
Operation environmental temperature	0 ~ 35°C
Operation humidity	35 ~ 90% RH (No condensation)
Atmosphere	No corrosive gas environment
Grounding	Grounding with 3-pin-plug
Size of System	W 600 x D 1000 x H 1140 (mm)
Weight	Approximately 150kg
<b>Constant Current Mode</b>	
Current Range	0~10mA(0.64W)
Step Current	5uA
Accuracy	± (0.5% Programmed Value + 30uA)
Current Resolution	12Bit
Maximum Voltage	18V
<b>Constant Voltage Mode</b>	
Voltage Range	± 18V
Step Voltage	10mV
Accuracy	± (0.5% Programmed Value + 30mV)
Voltage Resolution	12Bit
<b>Switching Mode</b>	
Output	CC/CV switching waveform
Cycle time	60HZ~120HZ(16.66msec~8.33msec)
Duty Cycle	1/256~256/256
<b>Current Measurement</b>	
Range	0~10mA
Accuracy	+/(0.5% Programmed Value + 40uA)
Resolution	12Bit
<b>Voltage Measurement</b>	
Range	+/-18V
Accuracy	+/(0.5% Programmed Value + 40mV)
Resolution	12Bit
<b>Brightness Measurements</b>	
Detector Type	Si Photodiode
Wavelength range	320~1100nm
Maximum Brightness	8,000 Nit
Output value	Relative Brightness

### SOFTWARE

#### Operating Systems supported

Microsoft Windows XP or 7

#### Test Application

The application supports the following measurements:

1. Brightness
2. Constant Voltage mode Voltage and Current
3. Constant Current mode Voltage and Current

The application support the following features:

- Program restart can reload last configuration and status
- Multiple stimulus configuration
- Stimulus parameter setting (Frequency, Duty, Voltage, Current)
- Up to 34 UUTs, each UUT may pause and restart testing
- Automatic test termination when brightness test limit is reached
- Real time graphical presentation of current, voltage, relative brightness and test time
- Independent calibration data for each channel

### ORDERING INFORMATION

**Model 58131** : PXI OLED Lifetime Test System

### KEY FEATURES

- Individual PMU for each UUT
  - Precision sourcing of current/voltage per UUT
  - Precision measurement unit per UUT
  - Single UUT failure is self contained, will not interrupt or corrupt other UUT testing
- Test Function
  - Electrical Characteristics
  - Brightness
  - Programmable driving waveform (Bipolar current/voltage)
- Automatic testing and data logging
  - Standard Test System
  - PXI Chassis with Controller
  - Modular OLED test cards (one for every two OLED panels)
  - Maximum 34 UUTs/system
- Optional Components
  - TEC heater
  - Spectrometer unit for in depth optical characterization
  - Turnkey test solution
  - Flexible test fixtures (Accept different OLED panel sizes)
  - Half rack with sliding drawers (4 fixtures per drawer)

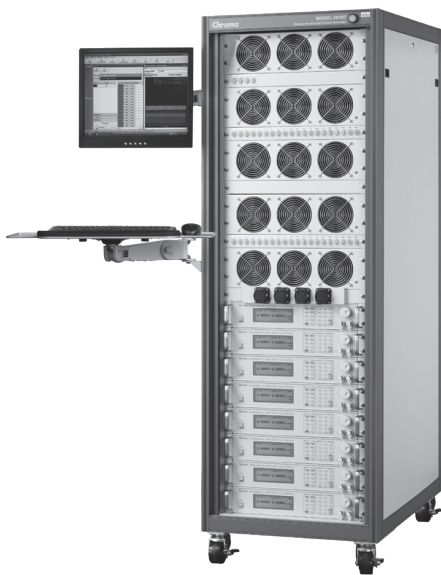
The 58131 Lifetime Test System is designed specifically for the OLED industry. Model 58131 provides twoquadrant constant current (CC) and constant voltage (CV) stimulus to each OLED panel and acquires electrical and optical characteristics automatically. Two independent and isolated precision source-and-measure units (PMU) are incorporated in one modular card, which is capable of testing two OLED panels. Additional instrument cards are added to expand test capacity.

58131 comes with a simple to use windowing graphical interface. Configuration of stimulus voltage, current, duty cycle, calibration, and test intervals can be changed easily. Adjustable measurement frequency at different time intervals allows rapid sampling at initial stages and lengthened measurement period later on. Report generation, including graphical data presentation is available to facilitate data analysis. 58131 software is comprehensive enough for R&D in depth characterization, yet simple enough for production on-going reliability test operation.

58131 OLED Lifetime Test System offers good test capacity in a very small footprint, isolated PMU for each panel, and comprehensive software with a friendly user interface. Without a doubt, it is the best OLED test solution in the market.



# OLED Display Shorting Bar Pattern Generator Model 58166



## KEY FEATURES

- Provide the test signal for different sizes of OLED display
- Powerful PC-based platform
- Flexible waveform editor
- Auto FTP download
- Engineer analysis function
- Lock function during testing
- 0-255 steps waveform output
- Auto discharge

58166 is a Shorting Bar Pattern Generator especially designed for OLED Cell inspection. The unique PC-Based architecture can upgrade the inspection Flow settings automatically from Server through FTP network without doing it on the client side respectively that increases the production efficiency significantly. The built-in RS-232 and USB interfaces can work with any AOI and Gamma optical measurement systems. 58166 can solve the problems that traditional equipments had in complex upgrade procedures, unfriendly user interface, difficult system integration and etc.

58166 works with 0.1  $\mu$ S high-resolution time unit to edit the output waveforms of Source and Gate. The strong driving capacity and High Slew Rate design along with the step waveform output for maximum 255 steps can output the inspected waveform accurately

that also eliminate panel from any block effect. In addition, the unique engineer analysis mode can provide engineers the best test environment for waveform analysis.

Utilizing the flexible adjustment function to change the parameters of voltage and time in real time can acquire the most applicable test conditions for the production line during mass production. Auto discharge function is especially designed to prevent the residual charge and potential ESD from damaging the panel. 58166 helps improving production yield rate, optimizing inspection process and also reduces measurement cost.

58166 is the most compatible Shorting Bar Pattern Generator for OLED testing in the market today.

## SPECIFICATIONS

### Specifications of Inspection Signal

Type of signal	Signal name	Number of signal	Voltage range
Data signal	Data1~Data24	12*2	+40V ~ -40V
Power signal	VDD(V1)	1*1	0~ + 40V
	VSS(V2)	1*1	- 40 ~ 0V

### Data signal (Vsign & WS) generator (Total 24CH)

Vsign (Data 1~12)	Output	+ 40V ~ - 40V / 0.1A
	Voltage accuracy	$\pm 2\% \pm 0.1V$
	Time base	0.1 $\mu$ s
	Quantity of Ch	12
WS (Data 13~24)	Output	+ 40V ~ - 40V / 0.1A
	Voltage accuracy	$\pm 2\% \pm 0.1V$
	Time base	0.1 $\mu$ s
	Quantity of Ch	12
Load Regulation		2%

### Power signal generator (Total 20CH+2CH)

VDD(V1)	DC Output	+ 40V ~ 0V / 30A
	Voltage accuracy	$\pm 1\% \pm 0.1V$
	Load Regulation	5%
VSS (V2)	DC Output	0V ~ - 40V / 50A
	Voltage accuracy	$\pm 1\% \pm 0.1V$
	Load Regulation	5%

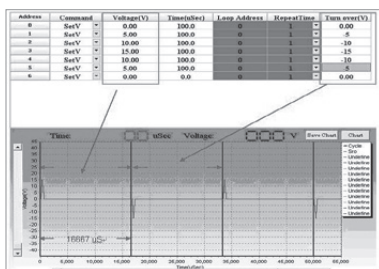
### General Specification

AC Power source voltage	220V/50Hz 1 $\phi$ 5500VA
Storage temperature	0 ~ 75 $^{\circ}$ C
Operation temperature	5 ~ 35 $^{\circ}$ C
Operation humidity	35 ~ 90% RH (No condensation)
Dimension (H x W x D)	1827 x 600 x 900 mm
Weight	Approximately 350kg

**Note\*1:** VDD(V1) and VSS(V2) are DC, waveform editor is not applicable

## ORDERING INFORMATION

**Model 58166 :** OLED Display Shorting Bar Pattern Generator





## KEY FEATURES

- High Slew Rate of max. 2500V/μs
- Provide the test signal for E-paper and LTPS panels
- Powerful PC-based platform
- Auto FTP download
- Engineer analysis function
- Lock function during testing
- 512 steps waveform output
- Auto discharge
- 36 channels output

In the evolution of panel design, larger display and higher resolution will be the main-stream of future technology for panel manufacturers. LTPS TFT process is one of many technologies that could fulfill the abovementioned requirements. It had become a more and more important milestone for panel manufacturers who want to maintain their competitiveness.

58167 is a Shorting Bar Pattern Generator especially designed for OLED Cell inspection. The unique PC-Based architecture can upgrade the inspection Flow settings automatically from Server through FTP network without doing it on the client side respectively that increases the production efficiency significantly. The built-in RS-232 and USB interfaces can work with any AOI and Gamma optical measurement systems. 58167 can solve the problems that traditional equipments had in complex upgrade procedures, unfriendly user interface, difficult system integration and etc.

58167 is the most compatible Shorting Bar Pattern Generator for LTPS technology testing in the market today.

## SPECIFICATIONS

SPECIFICATIONS	
<b>Model</b>	<b>58167</b>
Power source voltage	110/220VAC(50/60Hz)
Storage temperature	0 ~ 75°C
Operation humidity temperature	5 ~ 35°C
Operation humidity	35 ~ 90% RH (No condensation)
Dimension of Main unit (HxWxD)	130 x 442x 505 mm
Weight	Approximately 14 kg
<b>Data1~Data12</b>	
Output	+ 20V ~ - 20V / 400mA
Voltage Accuracy	± 2% ± 0.1V
Time base	0.1 μs
Number of output	12
Line Regulation	2%(full load, 1.8m cable)
<b>Data13~Data36</b>	
Output	+ 40V ~ - 40V / 120mA
Voltage Accuracy	± 2% ± 0.1V
Time base	0.1 μs
Number of output	24
Line Regulation	2% (full load, 1.8m cable)

## ORDERING INFORMATION

**58167** : LTPS Shorting Bar Pattern Generator



### KEY FEATURES

- Strong Driving Capacity
- 0-255 step waves output
- Auto discharge
- 12 Source Output
- 8 Gate Output  
(expandable up to 16 channels)
- 4 COM Output
- Powerful PC-based platform
- Auto FTP download
- Friendly Flow editing
- Easy to integrate with AOI & Optical measure system
- Real-time voltage & time parameter adjustment
- Engineer Analysis Function

58162 is a high capability Shorting Bar Pattern Generator especially designed for LCD Cell inspection. The exclusive PC-Based architecture can download the inspection Flow settings automatically from Server through FTP network for update without doing it on the client respectively that increases the production efficiency significantly. The built-in RS-232 and USB interfaces can integrate with any AOI and Gamma optical measurement systems. 58162 can solve the problems of complex upgrade for traditional equipment, unfriendly user interface, difficult system integration and etc.

58162 works with 0.5 μs high-resolution time unit to edit the output waveforms of Source and Gate. The strong driving capacity and High Slew Rate design along with the step waves output for maximum 512 steps can output the inspected waveform accurately to eliminate panel from any block. In addition the unique engineer analysis mode can provide engineers the best test environment for waveform analysis. Utilizing the flexible adjustment function to change the parameters of voltage and time in real time can acquire the most applicable test conditions for the production line during mass production. Auto discharge function is especially designed to prevent the residual charge and ESD from damaging the panel. 58162 not only increases the panel defect inspection ability, reduce the inspection process but also improve the production yield rate and lower down the measurement cost.

58162 is expandable with Gate extension board up to 24 channels that can satisfy the a-Si/LTPS multiple panel design in the future. It is the most compatible Shorting Bar Pattern Generator in the market today.

SPECIFICATIONS											
Model	58162		58162-A		58162-AE		58162-E		58162-EE		
Power source voltage	110/220VAC(50/60Hz)										
Electric power consumption	Main unit : Maximum 500Watt										
Insulation resistance	Min. 10MΩ at DC500V Mega (Between AC power source terminal and housing case)										
Dielectric strength	1 minute of AC 1000V (Between AC power source terminal and housing case)										
Storage temperature	0 ~ 75°C										
Working environmental temperature	5 ~ 35°C										
Working humidity	35 - 90% RH (No condensation)										
Atmosphere	No corrosive gas environment										
Grounding	Grounding with 3-Pin-Plug										
Dimension of Main unit(HxWxD)	130 x 442 x 504 (mm)										
Weight	Approximately 14kg										
Type of signal	Number of signal	Voltage range	Number of signal	Voltage range	Number of signal	Voltage range	Number of signal	Voltage range	Number of signal	Voltage range	
Source (Data)	6*2	-20 ~ +20V	6	-20 ~ +20V	6	-20 ~ +20V	12	-40 ~ +40V	12*2	-40 ~ +40V	
Common	1*2 1*2	-20 ~ +20V	1 1	-20 ~ +20V	1 1	-20 ~ +20V					
Gate	4*2	-40 ~ +40V	4	-40 ~ +40V	4 12	-40 ~ +40V -40 ~ +40V					
Specifications of Inspection Signal											
General											
Time base	0.5 μs										
Frame period	8,000us ~1,000,000us										
Source and Common total output power	75 Watt				--			--			
Gate total output power	75 Watt										
Source signal generator											
Output	-20 ~ +20V / 400mA						--		--		
Voltage accuracy	±2% ±0.1V						--		--		
Number of output	12			6			--		--		
Load Regulation	1.5%(full load, 2m cable)						--		--		
Gate signal generator											
Output	-40V ~ +40V/ 500mA										
Voltage accuracy	±0.2V										
Number of output	8		4		16		12		24		
Load Regulation	2% (full load, 2m cable)										
DC Voltage generator											
Output	-20V ~ +20V / 400mA						--		--		
Voltage accuracy	±2% ±0.1V						--		--		
Number of output	4			2			--		--		
Load Regulation	1.5%(full load, 2m cable)						--		--		
Industrial Computer											
Operating System	Windows XP Embedded										
CPU	1.6 GHz										
Hard Disk	80 Gbyte										
RAM	1 Gbyte										

Patent Name : Multi-Channel Signal Generator for Optical Display Device with Protective Circuit  
Patent No. : 96208025

### ORDERING INFORMATION

- 58162** : LCD Shorting Bar Pattern Generator 12S-8G-4C
- 58162-A** : LCD Shorting Bar Pattern Generator 6S-4G-2C
- 58162-AE** : LCD Shorting Bar Pattern Generator 6S-16G-2C
- 58162-E** : LCD Shorting Bar Pattern Generator 12G
- 58162-EE** : LCD Shorting Bar Pattern Generator 24G
- A581600** : Conversion board box



Conversion board box

Video & Color  
Flat Panel Display  
LED/Lighting  
Optical Devices  
Photovoltaic test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



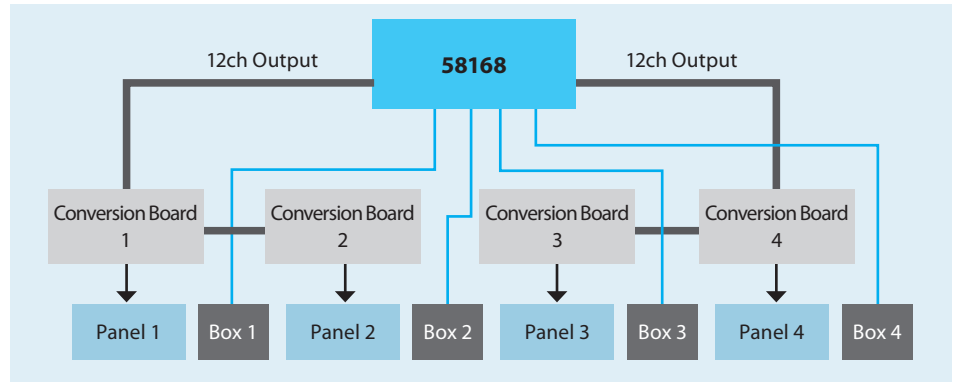
### KEY FEATURES

- 24CH Output(12CH or 24CH, optional)
- 0~1024 step waves output
- Prober integration with RS-232
- Loading Recipes via SD Card
- 4 Colonization by 4 OP BOX
- Low cost

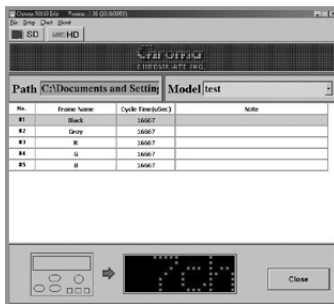
58168 is a high C/P ratio Shorting Bar Pattern Generator especially designed for small size LCD cell inspection. The exclusive modularized architecture provides the unique implement of inspections by "1 instrument, 4 Colonization", which provide 4 users 4 OP boxes to operate the only one 58168 instrument simultaneously but each one of them feel like that they own a whole instrument without interfered by others. 58168 is truly suitable in low cost application display field.

58168 works with  $0.5 \mu s$  high-resolution time unit to edit the output waveforms of Data channels. All channels of each model are edited in PC's software and saved to SD card, which is capable of more than 500 models. Fast duplication of SD which is easy in PC provide the engineer with efficiency with the lack of network. In addition no PC is required while 58168 operates ensures low power consumption.

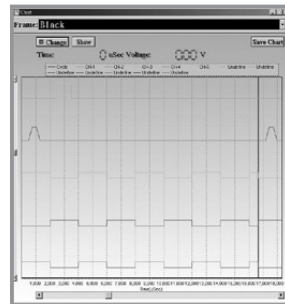
### 4 Colonization by 4 OP BOX



SPECIFICATIONS			
<b>Model</b>	<b>58168</b>		
Power source voltage	110/220VAC(50/60Hz)		
Electric power consumption	Main unit: Maximum 200Watt		
Storage temperature	0 ~ 75°C		
Operation humidity temperature	5 ~ 35°C		
Operation humidity	35 ~ 90% RH (No condensation)		
Dimension of Main unit (HxWxD)	190 x 320 x 370 mm		
Weight	Approximately 9.5kg		
<b>Type of signal</b>	<b>Signal name</b>	<b>Number of signal</b>	<b>Voltage range</b>
Data	Data1, Data2, Data3	6*4	-40V~+40V
	Data4, Data5, Data6		
<b>Specifications of Inspection Signal</b>			
<b>General</b>			
Time base	0.5 $\mu s$		
Frame period	8000us ~ 1000000us		
Total data output power	75 Watt		
<b>Source signal generator</b>			
Item	Content		
Output	-40V ~ +40V / 120mA		
Voltage accuracy	$\pm 2\% \pm 0.1V$		
Time base	0.5 us		
Number of output	24		
Load Regulation	2% (full load, 1.8m cable)		



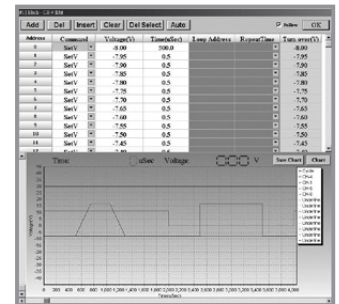
Channel Editing Screen



Waveform of all channels Screen

No.	Channel	Min(V)	Max(V)
#1	CH-1	0.00	11.00
#2	CH-2	0.00	11.00
#3	CH-3	0.00	11.00
#4	CH-4	-0.00	17.00
#5	CH-5	-0.00	17.00
#6	CH-6	30.00	30.00
#7	CH-7	5.00	5.00

Channel Information Screen



Channel Editing Screen

### ORDERING INFORMATION

- 58168** : LCD Shorting Bar Pattern Generator with 4 Colonization
- A581600** : Conversion board box



Conversion board box





## KEY FEATURES

- LVDS / MIPI(Optional) / eDP(Optional) output
- Display size up to UHD 4096x2160@60Hz max
- Data Clock: Single 1 Lin 150MHz / 2 Link 300MHz / 4Link 600MHz / 8Link 1.2GHz max
- Data Bits: 6/8/10bit programmable max
- Vdd output 2V~24V/3A programmable max
- Vbl output 2V~36V/6A programmable max
- Vbl/Vdim Dimming adjustable 0~8V max
- Power OCP protection
- Up / down load function
- Timing / Pattern Auto / Manual Run
- Low cost
- Customer design for user define

\* All specifications of 27010 series are customer design, please contact Chroma sales representative for detailed information.

To comply with the current digital standard signal, LCD and digital display for test application, the Pattern Generator Card is a low cost and high value-added product that can provide LCD manufacturers for In-line or Batch oven of aging test.

This 27010 series LCM Pattern Generator Card can be output with LVDS signal. For the multimedia applications, the 27010 series can be support MIPI/eDP(optional). By supporting the display screen up to 4096x2160@60Hz, it is capable of performing LCD pixel inspection during production, OLB test, burn-in test, combination test, final test and life test widely.

The PG Card uses Programmable Logic Device which is the pattern generator for LCD MODULE test. It supports VGA~ UHD, 1 Link / 2 Link / 4 Link / 8 Link and 30 sets Timings, 64 sets Patterns and 30 sets Programs max for testing.

The signal transmission using the method of replacement output to panel depends on the interface the LCD Module installed for the signal (LVDS, MIPI, eDP) used. As to power rating, its VDD support 2V~24V, 3A max output power is applicable to signal and LCD Module. Furthermore the required pattern, Color and other test functions can be set manually via the system control.

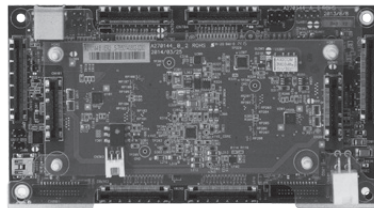
The PG card is equipped with a unique window-based editing software. Its convenient operating environment allows users to set timings, create patterns, and edit programs as well as control the power on/off timings of the PG Card via PC. The created files can be uploaded or downloaded from data buffer to PG Card easily



for modification. This useful and practical design enables the software and testing parameter of PG Card be updated efficiently and optimizes its functions. Under this series could be customer design by user define.

## Signal Conversion Board A270144

- Extension of the 2701007 PG Card for eDP/MIPI tests
- Signal Conversion Board modular design
- Compatible eDP V1.3 Standard
  - Resolution: 2560 x 1600 @ 60 Hz max
  - Lane rate : 1.62 / 2.7 Gbps selectable
  - Lane count : 1 / 2 / 4 Lane selectable
  - Color depth : 8 / 10 bits
- Compatible MIPI DSI V1.02.00 spec
  - Lane rate : 1 Gbps selectable
  - Lane count : 1 / 2 / 3 / 4 / 4+4 Lane selectable
  - Pixel format : RGB-565 / RGB-666 / RGB-888
- Output resolution up to
  - eDP up to 2560x1600 @ 60Hz (Max)
  - MIPI up to 2560x1600@60Hz Max (4+4 Lane)
- Able to provide 2 sets of eDP / MIPI standard signal source simultaneously
- Easy-to-use graphical interface
- Production line process control and data editing



The Chroma A270144 Signal Conversion Board is a device designed to convert signals to various types of video signals for output that can meet the testing demands of multimedia display industries for the products like Notebook, PAD and Mobile Phone.

The Signal Conversion Board supports the latest eDP and MIPI standard and featured as follows:

Display Port is a digital video interface standard promoted by Video Electronics

## 27010 Series Pattern Generator Cards



Standards Association (VESA). It is one of the new generation specifications in video display interface technology that can transmit image and voice data when connected to PC with display (screen) or PC with home theatre system or DVD player and Notebook, etc. to replace the traditional LVDS interfaces.

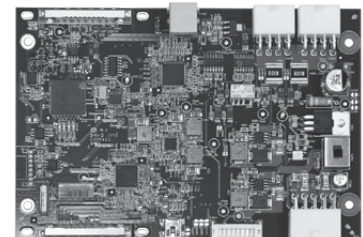
The latest specification, eDP (embedded Display Port), developed by VESA for mobile devices is also becoming the major internal interface specification of portable PCs such as notebook and tablet PC.

MIPI (Mobile Industry Processor Interface) designed for handheld electronic products have the following main standards.

DCS (Display command set) specifies the control command set ; DSI (Display Serial Interface) specifies the transmission interface between CPU and display module (ex. MIPI signal source output) All of the above can easily by Chroma software.

## eDP Bist module A270148

- Compatible eDP V1.3 Standard
  - Version: Support DPCD V1.1
  - DP AUX Channel : 1MHz
  - BIST mode : DPCD Read / Write control
- Vdd output 3V~12V/3A programmable max
- Vbl output 10V~24V/6A programmable max
- Able to provide 2 sets of eDP BIST signal source simultaneously
- Easy-to-use graphical interface
- Production line process control and data editing



A270148 eDP Bist module can provides the DPCD control signal and power for panel into BIST mode, integrate with Chroma Aging system can provide a complete eDP panel aging test solution.

- Video & Color
- Flat Panel Display
- LED/ Lighting
- Optical Devices
- Photovoltaic test & Automation
- Optical Inspection
- Automated
- Power Electronics
- Battery Test & Automation
- Passive Component
- Electrical Safety
- Semiconductor/ IC
- PXI Test & Measurement
- General Purpose
- Intelligent Manufacturing System
- Turnkey Test & Automation

SPECIFICATIONS				
Model	2701007	2701007 10 bit	2701009	2701020
<b>LVDS Interface</b>				
Resolution	up to 1920 x1080/60Hz	up to 2560 x1600/60Hz	up to 4096x2160/120Hz	up to 2560 x1600/60Hz
Pixel Rate	1 Link	90MHz	135MHz	135MHz
	2 Link	180MHz (90MHz x 2)	270MHz (135MHz x 2)	270MHz (135MHz x 2)
	4 Link	-	-	330MHz
	8 Link	-	-	1.2 GHz (150MHz x 8)
Color Depth	6/8 bits	6/8/10 bits	6/8/10 bits	6/8/10 bits (10bit for gray scale)
Output Mode	2 Channel x 2	2 Channel x 2	8 channel x 1 / 4 channel x 2 / 2 channel x 4 / 1 channel x 4	2 Channel x 2 4 Channel x 1
I/O	Box Head 34pin	Box Head 40pin	JAE 51 pin	Box Head 50pin
<b>Power Requirement</b>				
Input (Vdd)	15V/3A	15V/3A	16V/8A	16V/10A
Output (DC)	Vdd : 3.3,5,12V/2.5A Vbl : 12,24V/6A max Vif : 3.3,5V	Vdd : 3.3~12V/3A Vbl : 12~24V/6A Vif : 3.3/5V/1A	Vdd : 2 ~24 V/6A Vbl : 2~36V/12A	Vdd : 3.3~13V/4A max Vbl : 10~25V/26A Vif : 5V
Communication Interface	RS-485	RS-485	Ethernet	RS-485
Vdim	0~7V/0.1 step	0~7V/0.1 step	0 ~ 8V/0.1 step	0~7V/0.1 step
Inverter Voltage	On : 5V ; Off : 0V	On : 5V ; Off : 0V	On : 3.3V ; Off : 0V	On : 5V ; Off : 0V
<b>Power Sequence Resolution</b>				
Turn-on (Vdd/Signal/Vbl)	1ms	1ms	1ms	1ms
Turn-off (Vdd/Signal/Vbl)	1ms	1ms	1ms	1ms
<b>Operation</b>				
Pattern Control	64 sets auto/manual (30 sets by editing)	64 sets auto/manual (30 sets by editing)	200 sets by editing	64 sets auto/manual (30 sets by editing)
Timing Control	30 sets by editing	30 sets by editing	200 sets by editing	30 sets by editing
Program Control	30 sets by editing	30 sets by editing	100 sets by editing	30 sets by editing
<b>Environment</b>				
Operation Temperature	0~60°C	0~60°C	0~60°C	0~60°C
Storage Temperature	-20~80°C	-20~80°C	-20~80°C	-20~80°C
Humidity	0~80%	0~80%	0~80%	0~80%
<b>Dimension</b>				
HxWxD	180x140x30 mm	180x140x30 mm	216x66x228 mm	210x230x60mm
Weight	845g	845g	2000g	1870g

Model	A270144
<b>Main Board</b>	
Input Video	LVDS 2 Link 25 ~ 135 MHz / 1 Link 50 ~ 270 MHz / 2 Link
Vdd(Vcc)	By pass from PG Card
Input Power	DC +16V
Communication	RS-485
<b>eDP Signal Module</b>	
Compliant	eDP V1.3
Resolution	2560 x 1600 @ 60 Hz max
Lane rate	1.62 / 2.7 Gbps
Lane Count	1 / 2 / 4 Lane
Color depth	8 / 10 bits
Function	HPD / EDID
<b>MIPI Signal Module *</b>	
Compliant	MIPI DSI V1.02.00
Resolution	2560 x 1600 @ 60 Hz max
Lane rate	1 Gbps
Lane Count	1/2/3/4/4+4 Lane
Pixel format	RGB-565 / RGB-666 / RGB-888
<b>Environment</b>	
Operation Temperature	20 ~ 60°C
Storage Temperature	-20 ~ 70°C
Humidity	70%
Dimension (H x W x D)	16x153x82 mm
Weight	85g

Model	A270148
<b>Main Board</b>	
Input Power	LDC + 16V
Vdd(Vcc)	RS-485
<b>eDP Signal Module</b>	
Compliant	eDP V1.3
DP AUX Channel	1 MHz
BIST Mode	DPCD Read / Write control
Lane Count	1 / 2 / 4 Lane
Color depth	8 / 10 bits
Function	HPD / EDID
<b>Environment</b>	
Operation Temperature	20 ~ 60°C
Storage Temperature	0 ~ 70°C
Humidity	70%
Dimension (H x W x D)	17x163x105 mm
Weight	300g

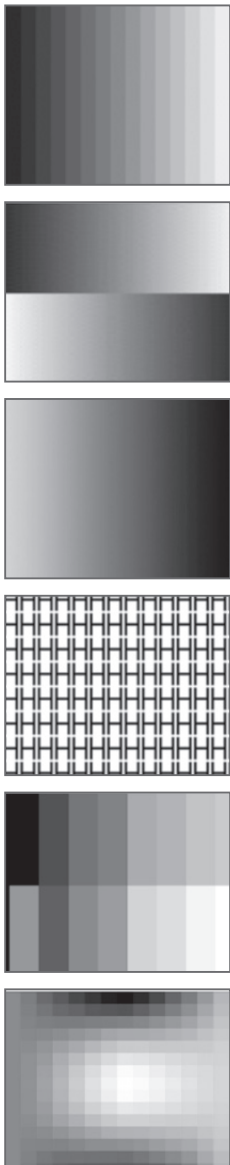
## ORDERING INFORMATION

- 2701007** : Pattern Generator Card, 2CH Signal 90MHz/Dual 180Hz
- 2701007 10 bit** : Pattern Generator Card, 2CH Signal 135MHz/Dual 270MHz
- 2701009** : Pattern Generator Card 8 CH
- 2701020** : Pattern Generator Card, 4CH 330MHz/10bit
- A270100** : Data Bank
- A2701005** : Remote Keypad
- A270114** : Hub
- A270121** : External Control Box
- A270144** : Signal Conversion Board
- A270148** : eDP Bist Module



### KEY FEATURES

- LVDS / TTL (Optional) / TMDS (Optional) output
- Pixel rate up to 162 MHz (LVDS x 2 Link)
- Display size up to UXGA (1600 x 1200)
- 16 timings selecting and editing
- 64 patterns library (32 sets by editing)
- 16 programs (total 3553 sequence)
- 12V / 5V output for backlight
- 12V / 5V / 3.3V output for Vdd
- Power on sequence for signal / Vdd
- Timing / Pattern editing via PC
- Up / down load function
- Timing / Pattern Auto / Manual Run
- Low cost



### LVDS Power

To meet the high accuracy and low price requirements for LCM test device, Chroma 27011 that integrates the signal and power source provide a complete test solution for LCD Module. Its LVDS / TTL signal source fully complies with the digital signal standard, meanwhile with the 12V/5V/3.3V DC source output it is able to supply power to VDD/Backlight for LCM test without obtaining external power source. Equipped with the interface of single key to switch the timing/pattern/program rapidly for test in auto or manual mode, the 27011 is able to provide a direct and convenient test environment for LCM by its complete hardware configuration and easy operation.

To fulfill the standard test signal requirements of various panels, this device supports LVDS signal with optional TTL signal available for use. It has 16 timings, 64 patterns, auto image rotation display system and multiple test functions settings. In addition an editor software is available for editing timing / pattern / program at PC site to create a product specific test program. The design of signal and power source integration for 27011 allows it to be utilized extensively in R&D/Quality Assurance/Quality Inspection/After Sales Services/Sales fields for LCM related tests.

The Programmable Logic Device is used in 27011 as the image generator to test the LCD Module. It supports VGA, SVGA, XGA, SXGA, UXGA and

1 Link / 2 Link digital signal output, also it has quartz oscillator built in to supply stable test signals as the standard signal source to the Device Under Test. This test device provides LVDS signal primarily, however, users can purchase the optional TTL signal conversion board for use to cope with the LCM features.

Besides the power source input of AC 90~250V, it has the 12V / 5V / 3.3V DC power switch required by the LCM Vdd in the market and the 12V / 5V power for Backlight Inverter. Moreover, it has Signal/Vdd power on sequence to fit in the LCM Turn On test sequence.

As regards operation, 27011 can switch the Timing / Pattern and Program by the Mode key on the front panel directly to show the status on a 7-segment display. Users can select the required Timing and switch it to Pattern mode by pressing the Mode key, or switch it to program; and then conduct the test automatically or manually. It can execute tests easily and quickly with the convenient operation method and multiple function keys.

### ORDERING INFORMATION

- 27011** : LCM Tester
- A270100** : Data Bank
- A270111** : LVDS to TTL Signal Adapter
- A270112** : TTL to TMDS Signal Adapter

SPECIFICATIONS			
<b>Model</b>	<b>27011</b>		
<b>Output</b>	LVDS		
<b>Option</b>	TTL (A270111) / TMDS (A270112)		
<b>Pixel Range</b>			
<b>Pixel Rate</b>	1 Link	2 Link	
<b>25.175MHz</b>	VGA (25.175MHz)	-	
<b>40MHz</b>	SVGA (40MHz)	-	
<b>32.5MHz</b>	XGA (65MHz)	XGA (65MHz)	
<b>54MHz</b>	-	SXGA (108MHz)	
<b>81MHz</b>	-	UXGA (162MHz)	
<b>Signal Interface</b>			
<b>Signal</b>	LVDS (6 or 8 bit)		
<b>Connector</b>	Box Header 26 Pin Right Angle		
<b>Power Requirement</b>			
<b>Input (AC)</b>	1Ø 110~240V ±10% V <sub>LH</sub> , 47~63Hz		
<b>Output (DC)</b>	5V/2.5A max. and 12V/4A max. (for Backlight) 12V/5V/3.3V (for Vdd)		
<b>Power Sequence Resolution</b>	Main Board PWR	Vdd	Signal
<b>Turn-on</b>	1ms	1ms	1ms
<b>Turn-off</b>	-	1ms	1ms
<b>Operation</b>			
<b>Pattern Control</b>	64 sets auto / manual (32 sets by editing)		
<b>Timing Control</b>	16 sets auto / manual		
<b>Program Control</b>	16 programs (Total 3553 sequence max.)		
<b>Environment</b>			
<b>Operation Temperature</b>	0 ~ 60°C		
<b>Storage Temperature</b>	-20 ~ +80°C		
<b>Humidity</b>	0 ~ 80 %		
<b>Dimension (H x W x D)</b>	84.4 x 103.5 x 232.2 mm / 3.32 x 4.07 x 9.14 inch		
<b>Weight</b>	1.4 kg / 3.08 lbs		



A270111



A270100





### KEY FEATURES

- Support LCD TV Module Testing
- LVDS signals output
- TTL (Optional) signals output
- Pixel rate up to 162 MHz (LVDSX2 Link)
- Display size up to 1920X1080 @ 60Hz
- 16 timings for selection
- 64 patterns library
- 16 programs (total 3553 sequence)
- 24V / 12V / 5V output for Vbl
- 12V / 5V / 3.3V output for Vdd
- Power on sequence for signal / Vdd
- Timing / Pattern editing & download
- Timing / Pattern Auto / Manual Run
- Low cost

To meet the high accuracy and low price requirements for LCM TV test device, Chroma 27012 that integrates the signal and power source provide a complete test solution for LCD Module. Its LVDS / TTL(Optional) signal source fully complies with the digital signal standard, meanwhile with the 24V/12V/5V/3.3V DC source output it is able to supply power to VDD/ Backlight for LCM test without obtaining external power source. Equipped with the interface of single key to switch the Timing/Pattern/Program rapidly for test in auto or manual mode, the 27012 is able to provide a direct and convenient test environment for LCM TV by its complete hardware configuration and easy operation.

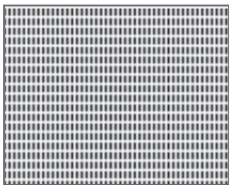
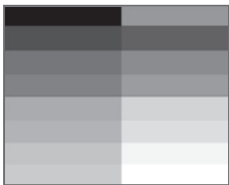
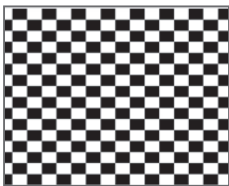
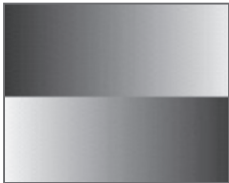
To fulfill the standard test signal requirements of various panels, this device supports LVDS signal with optional TTL signal available for use. It has 16 timings, 64 patterns, auto image rotation display system and multiple test functions settings. In addition an editor software is available for editing Timing/Pattern/Program at PC site to create a product specific test program. The design of signal and power source integration for 27012 allows it to be utilized extensively in R&D/Quality Assurance/Quality Inspection/After Sales Services/Sales fields for LCM related tests.

The Programmable Logic Device is used in 27012 as the image generator to test the LCD TV Module. It supports VGA~UXGA and 1 Link/2 Link digital

signal output, also it has quartz oscillator built in to supply stable test signals as the standard signal source to the Device Under Test. This test device provides LVDS signal primarily, however, users can purchase the optional TTL signal conversion board for use to cope with the LCM TV features.

Besides the power source input of AC 100V~240V, it has the 12V/5V/3.3V DC power switch required by the LCM Vdd in the market and the 24V/12V/5V power for Backlight Inverter. Moreover, it has Signal/Vdd power on sequence to fit in the LCM TV Turn On test sequence.

As regards operation, 27012 can switch the Timing/Pattern and Program by the Mode key on the front panel directly to show the status on a 7-segment display. Users can select the required Timing and switch it to Pattern mode by pressing the Mode key, or switch it to program for test program editing; and then conduct the test automatically or manually. It can execute tests easily and quickly with the convenient operation method and multiple function keys.



### ORDERING INFORMATION

- 27012** : LCM Tester
- A270100** : Data Bank
- A270103** : Editor Software
- A270111** : LVDS to TTL Signal Adapter

SPECIFICATIONS			
<b>Model</b>	<b>27012</b>		
<b>Output</b>	LVDS		
<b>Option</b>	TTL (A270111) / TMD5 (A270112) / Data Bank (A270100)		
<b>Pixel Range</b>			
<b>Pixel Rate</b>	1 Link up to 81 MHz	2 Link up to 162 MHz	
<b>25.175MHz</b>	VGA (25.175MHz)	-	
<b>40MHz</b>	SVGA (40MHz)	-	
<b>32.5MHz</b>	XGA (65MHz)	XGA (65MHz)	
<b>54MHz</b>	-	SXGA (108MHz)	
<b>81MHz</b>	-	UXGA (162MHz)	
<b>Signal Interface</b>			
<b>Signal</b>	LVDS (6 or 8 bit)		
<b>Connector</b>	Box Header 34 Pin (Compatible with 27011)		
<b>Power Requirement</b>			
<b>Input (AC)</b>	1Ø 110~240V ± 10% V <sub>LH</sub> , 47~63Hz		
<b>Output (DC)</b>	5V / 1.5A ; 12V / 7A ; 24V / 6.5A max. (for Vbl) ; 12V / 5V / 3.3V / 3.5A (for Vdd)		
<b>Power Sequence Resolution</b>	Vdd	Signal	Vbl
<b>Turn-on</b>	1ms	1ms	1ms
<b>Turn-off</b>	1ms	1ms	1ms
<b>Operation</b>			
<b>Pattern Control</b>	64 sets auto / manual (32 sets by editing)		
<b>Timing Control</b>	16 sets auto / manual		
<b>Program Control</b>	16 programs (Total 3553 sequence max.)		
<b>Environment</b>			
<b>Operation Temperature</b>	0 ~ 40°C		
<b>Storage Temperature</b>	-20 ~ +70°C		
<b>Humidity</b>	0 ~ 70 %		
<b>Dimension (H x W x D)</b>	69.6 x 310.5 x 273 mm / 2.74 x 12.22 x 10.75 inch		
<b>Weight</b>	3.3 kg / 7.27 lbs		



A270111



A270100





### KEY FEATURES

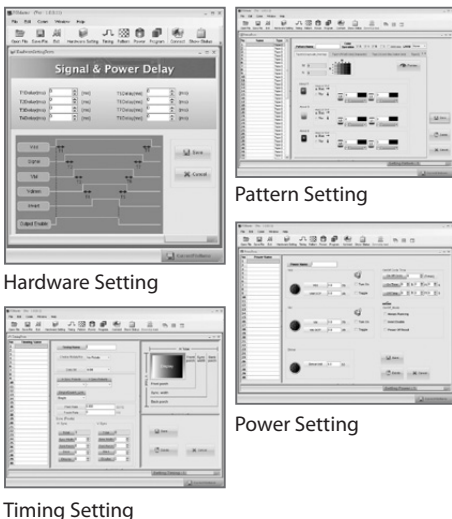
- LVDS Signals support
  - 1 / 2 / 4 Channel output
  - Color depth 6 / 8 / 10bits
  - 2 output port
  - Pixel rate up to 330MHz (1 Link 135MHz / 2 Link 270MHz / 4 Link 330MHz)
- The Resolution up to 2560x1600
- 30 sets Timing / Power / Program selection
- 64 sets Pattern
- Vdd output 3.3~13V / 3.5A programmable
- Vbl by pass outside DC source
- DC Power protection OCP
- EDID Read / Write / Compare
- 10 sets EDID data store
- Auto / Manual Pattern switch
- Auto Pattern switch delay time setting
- Power on sequence for signal / Vdd / Vbl (External)
- RGB Signal reverse Hot Key
- Control by RS-232

Chroma 27013 is a portable tester that supports high resolution and large scale LCM with the signals, power supply and test patterns required for LCD Module test.

Users can edit various timing parameters and patterns on PC via software applications. Auto execution or one-key manual control on the device can switch the Timing / Pattern / Program mode rapidly. The easy and convenient operation along with compound key usage made the 27013 LCM Tester most applicable for R&D/ Quality Assurance/ Quality Verification/ Services/ Sales areas for LCM related tests.

27013 LCM Tester contains the following features: **(1) Comply with Full HD 120Hz Test:** The 27013 LCM Tester supports LVDS signal with pixel rate

### PG Master Software



Timing Setting



330MHz (1 Link 135MHz/2 Link 270MHz/4 Link 330MHz ) that can test the screen resolution up to 2560x1600 pixels to meet the test requirements for standard test signal of various panels today and Full HD 120Hz (Double frame rate.)

**(2) Providing, Measuring & Determining Output Power:** The system provides 3.3~13V / 3.5A VDD output power for users to set auto test by LCM's electrical features. Each output channel is able to simulate the timing relationship of power on/off and over voltage protection function. Protection occurs when the power parameter exceeds the predefined range.

**(3) Complete Test Patterns:** The large capacity of memory provides 30 Timings/64 Patterns with many built-in standard test patterns. The 27013 not only can generate the patterns of 10Bit grayscale, pure color, stripes, text and cross.

**(4) Separate RGB Signal Control:** The panel of 27013 LCM Tester has several rapid one-key operation modes which include: R, G, B & Inversion signal separation and resume – it can separate or resume one of the RGB signals in the display screen; while the Inversion reverses the pattern display on the screen.

Timing / Pattern / Program / Power mode – users can create the test program specially for UUT by the PC software application and conduct one-key operation from the panel directly.

The VDD rapid key is able to switch the built-in 3 fixed voltage settings 3.3V/5V/12V directly to meet the power output conditions for most LCM tests rapidly.

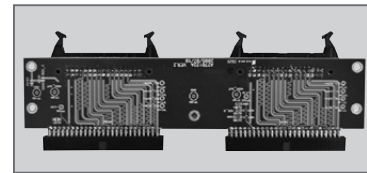
**(5) RS-232 Interface for Data Upload/Download:** 27013 LCM Tester with PG MASTER software can edit the test programs and upload/download edited data through the RS-232 interface data control box. Users can update test programs on different testers via the data control box directly without controlling by PC to save the time effectively.

Chroma 27013 carried complete test functions with highly accurate signals and power source. It adopts 20x4 LCD screen in compact size with friendly user interface, and its small-scale design can be used flexibly on various tests to satisfy the work unit that needs to move often. The powerful function and fast test speed make it the best tool for production test.

### ORDERING INFORMATION

**27013 :** LCM Tester

**A270122 :** Conversion Board 50pin to 34pin



A270122

### SPECIFICATIONS

<b>Model</b>	<b>27013</b>		
Output	LVDS		
Option	DataBank		
<b>LVDS interface</b>			
Resolution	Up to 2560x1600 / 60Hz, 1920X1080 / 120Hz		
Pixel Rate	1 link up to 135MHz / 2 link up to 270MHz / 4 link up to 330MHz		
Color Deep	6/8/10bits Programmable (10bit for gray scale)		
Output mode	2 Channel x2 / 4 Channel x1		
Connector	Box Header 50Pin		
<b>Power Requirement</b>			
Input (AC)	1Ø 110~240V ± 10% V <sub>LH</sub> , 47~63Hz		
Output (DC)	Vdd : 3.3V~13V, 3.5A programmable Vbl : Internal 12V / 24V 4A Max External 25V / 26A Max		
Vdim	0V~7V Step 0.1V		
Inverter Voltage	On: 5V, Off: 0V		
<b>Power Sequence Resolution</b>			
	Vdd	Signal	Vbl
Turn-on	1ms	1ms	1ms
Turen-off	1ms	1ms	1ms
<b>Operation</b>			
Pattern Control	64 sets auto/manual (30 sets by editing)		
Timing Control	30 sets by editing		
Program Control	30 sets by editing		
<b>EDID Application</b>			
EDID 1	Read / Write / Compare		
EDID 2	Read / Write / Compare		
EEDID	Read / Write / Compare		
EDID store	10 sets EDID Data store		
<b>Environment</b>			
Operation Temperature	0~40°C		
Storage Temperature	-20~70°C		
Humidity	0~80%		
Dimension (H x W x D)	69 x 309.3 x 271.5 mm / 2.74 x 12.18 x 10.69 inch		
Weight	2.9 kg / 6.39 lbs		

Video & Color  
Flat Panel Display  
Lighting LED/  
Devices Optical  
& Automation Photovoltaic test  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semicconductor/IC  
Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



Chroma 27014 FPD Tester is a complete test solution that meets the requirements for LCM tests and production line and control by friendly remote keypad integrate the video generator, multi-channel precision power supply and process control unit for LCM signals, patterns and electricity tests.

Users can use software to edit the test program according to the LCM task features to create a comprehensive and effortless test mode for production improvement. Chroma 27014 FPD Tester has the following test functions:

### KEY FEATURES

- Modular interface design for various panel test application
  - One LVDS module (option) + One MIPI / eDP / V-by-One signal module (option)
- Highly accurate programmable power
  - VDD 2 ~ 20V / 10A max, 36W max (24W max available on September)
  - VBL 2 ~ 25V / 20A max, 100W Max (100W max available on September)
  - Real-time voltage / current measurement
  - Programmable power protection function
  - On / off timing programmable
- Editable timing, pattern and power source for test program combination
- User friendly edit software available
- Cross coordinate defect positioning function
- Bitmap file display function
- Scrolling pattern display function
- eDP 1.4 Signal module (Option)
  - Support up to UHD (5K x 3K@60Hz)
  - 6 / 8 / 10 bit color depth
  - 1.62 / 2.16 / 2.43 / 2.7 / 3.24 / 4.32 / 5.4Gbps per lane
  - 1 / 2 / 4 / 8 Link
  - 0 / 3.5 / 6 / 9.5 dB pre-emphasis
  - 200 / 250 / 300 / 350 / 400 / 450 / 600 / 800 / 1000mV Swing level
  - PSR1 test function
  - PSR2 test function (option)



Remote Control Box

### Test Program Editing

It sets the parameters of Turn On / Turn Off, Timing, Pattern and O.C.P. / O.V.P. / U.C.P. / U.V.P. following the LCM specification to offer a complete and accurate test.

### Screen Quality Test

It has built in standard patterns for use, or users can create the required geometric patterns by assembling the Icons randomly or input the natural picture with BMP extension. With the pattern preview function, it is very convenient to edit it.

### Timing Setting and Pattern Editing

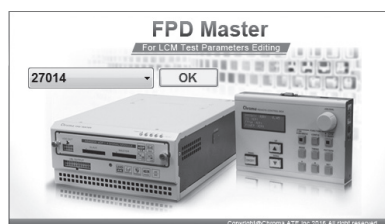
Besides the default VESA timings and patterns available for use, users can define their own test timings and patterns for application.

### Output Voltage/Current Measurement and Classification

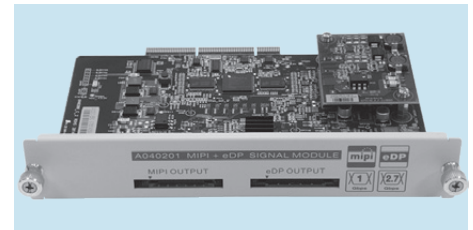
The system has build-in programmable DC power source to provide necessary power for LCM control chip, driver chip and backlight module. Each output has the actual readings of voltage and current. Its unique design can move the measurement point to load, avoid the transmission voltage drop and ensure the measurement accuracy for LCM operating status analysis. In the meantime, each output channel is able to program the timing relationship of power on and off as well as the over voltage and current protection. The protection will occur and the LED will be applied to remind operators for action when the voltage or current exceeds the setting.

### Graphic User Interface - FPD Master Software

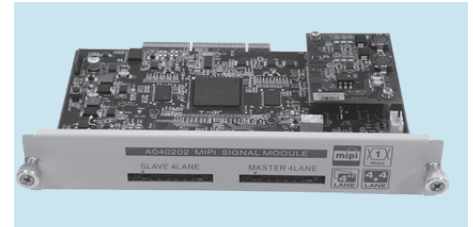
- Easy for Timing/Pattern /Power/Program Editing
- BMP Picture Playback
- EDID Read / Write
- Cross Coordinate Defect Positioning Function
- In-Line Process Control and Data Collection
- Operator Authority Control
- GO/NO GO Fast Measurement
- MES Network Management Function (option)



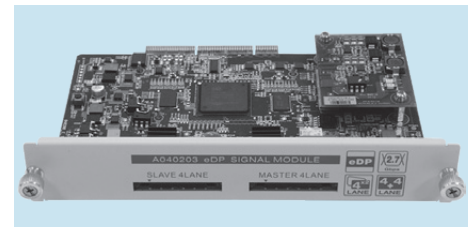
FPD Master Start-up



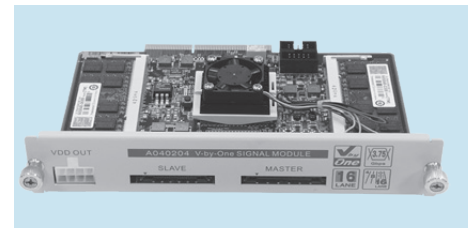
eDP+MIPI Signal Module



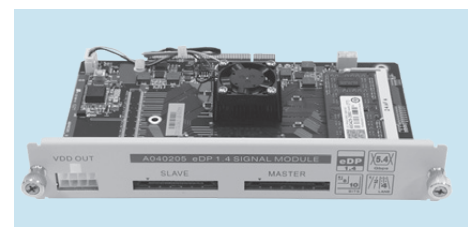
MIPI Signal Module



eDP Signal Module



V-by-One Signal Module



eDP 1.4 Signal Module

### ORDERING INFORMATION

- 27014** : FPD Tester
- A040201** : eDP+MIPI Signal Module
- A040202** : MIPI Signal Module
- A040203** : eDP Signal Module
- A040204** : V-by-One Signal Module
- A040205** : eDP 1.4 Signal module
- A040206** : Remote Control Box
- A040207** : LVDS Output Module

## SPECIFICATIONS

Model	27014
Main Frame	
Configuration	Embedded MCU with FPGA graphic engine
Signal interface	Slot front : option for eDP / MIPI / V-by-One Slot upper : option for LVDS 4 ch
I <sup>2</sup> C x 1 (VBL output connector)	Floating / 0V / 3.3V / 5 V programmable
Inverter On/Off Control (VBL output connector)	0V / 3.3V / 5V programmable
Analog Vdim control (VBL output connector)	0~8 V (20mA), 0.1Vstep programmable
Digital Vdim control (PWM) (VBL output connector)	3.3V / 5V Frequency 100~15K Hz / 1 Hz step Duty cycle 0~100% +/-1%

<b>Data Store</b>	
Timing	50
Pattern	Logic : 300 BMP : 8G Memory (999 BMP files max)
Program	50
Power	50
<b>Communication I/O</b>	
Remote / PC	D-Sub 15 pin
<b>Application Functions</b>	
Cursor	Display x, y coordinates and RGB values
Motion Pattern	Moving direction and speed programmable

<b>Others</b>	
AC Input	1Ø 100~240V ± 10% V <sub>LN</sub> , 47~63Hz
Operating temperature	+10~40 °C
Storage temperature	0~80 °C
Humidity	20~90%
Dimensions	210(W) x 300(D) x 100(H) mm
Weight	5 kg / 11 lbs

<b>MIPI + eDP Signal Module - A040201</b>	
<b>MIPI</b>	
Compliant	MIPI DSI v1.02.00 spec
Resolution	1920 x 1200@60Hz max
Lane Count	1 / 2 / 3 / 4 Lane
Pixel Format	RGB-565 / RGB-666 / RGB-888
<b>eDP</b>	
Compliant	eDP v1.3 spec
Resolution	2560 x 1600@60Hz max
Lane Count	1 / 2 / 4 Lane
Color Depth	6 / 8 / 10 bits
Lane Rate	1.62 / 2.7 Gbps

<b>MIPI Signal Module - A040202</b>	
Compliant	MIPI DSI v1.02.00 spec
Resolution	1920 x 1200@60Hz max(4 lane) 2560 x 1600@60Hz max(8 lane)
Lane Count	1 / 2 / 3 / 4 / 8 Lane
Pixel Format	RGB-565 / RGB-666 / RGB-888

<b>eDP Signal Module - A040203</b>	
Compliant	eDP v1.3 spec
Resolution	2560 x 1600@60Hz max (4 lane) 3840 x 2160@60Hz max (8 lane)
Lane Count	1 / 2 / 4 / 8 Lane
Color Depth	6 / 8 / 10 bits
Lane Rate	1.62 / 2.7 Gbps

<b>V-by-One Signal module - A040204</b>	
Resolution	5120 x 2880@60Hz max
Lane Count	16 / 8 / 4 lane
Color Depth	8 / 10 bits
Data Mapping	Non / 2 / 4 / 8 division

<b>VDD Output</b>	
Voltage range	2 ~ 20V / 10A max, 36W max
Resolution	0.1 V / step
Accuracy	1% F.S.
Voltage ripple and noise	Under 100mV@20MHz
Rising time	1ms < Tr < 30ms
Falling time	< 30ms @ full load
Protection	OCP / OVP / UCP / UVP / OPP
Measurement range	OVP / UVP : 0~ 22V OCP / UCP : 0~ 11A OPP : 40W Protection delay range : 0~1000 ms programmable
Measurement accuracy	Voltage: ± 1% F.S. ; Current: ± 2% F.S.
Maximum remote sense	Maximum remote sense line drop compensation is 1V ( If the voltage is compensated to maximum voltage, the voltage is no longer compensated)

<b>VBL Output</b>	
Voltage range	2 ~ 25V / 20A max, 100W Max
Resolution	0.1 V/ step
Accuracy	1% F.S.
Voltage ripple and noise	Under 100mV@20MHz
Rising time	1ms < Tr < 30ms
Falling time	< 50ms@full load
Protection	OCP / OVP / UCP / UVP / OPP
Measurement range	OVP / UVP : 0~ 27V OCP / UCP : 0~ 22A OPP : 110W Protection delay range : 0~1000 ms programmable
Measurement accuracy	Voltage: ± 1% F.S. Current: ± 2% F.S.
Maximum remote sense	Maximum remote sense line drop compensation is 1V (If the voltage is compensated to maximum voltage, the voltage is no longer compensated)

<b>eDP 1.4 Signal Module - A040205</b>	
Compliant	eDP v1.4 spec
Resolution	4096 x 2160 @ 60Hz max (4 lane) 5120 x 2880 @ 60Hz max (8 lane)
Lane Count	1 / 2 / 4 / 8 Lane
Color Depth	6 / 8 / 10 bits
Lane Rate	1.62Gbps / 2.16Gbps / 2.43Gbps / 2.7Gbps / 3.24Gbps / 4.32Gbps / 5.4Gbps Lane
Pre-emphasis	0 / 3.5 / 6 / 9.5 dB selectable
Swing Level	200mV / 250mV / 300mV / 350mV / 400mV / 450mV / 600mV / 800mV / 1000mV selectable

<b>Remote Control Box - A040206</b>	
Display	20 words x 4 lines Matrix LCD Display
Control Button	Jog dial x 1 Panel ON/OFF x1 (with LED light) Increment key x1 Decrement key x1 Function key x 9
Connection type	D-sub 15 Pin
USB port	USB 2.0 Host port

<b>LVDS Output Module - A040207</b>	
Resolution	4096 x 2160 @ 60Hz max
LVDS Mode	VESA / JEIDA
Color Depth	6 / 8 / 10 bits
Link Mode	4 channels 1 Link : 10-150 MHz 2 Link : 20- 300 MHz 4 Link : 40- 600 MHz

Video & Color  
Flat Panel Display  
LED/ Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/ IC  
PXI Test & Measurement  
General Purpose  
Manufacturing System  
Turnkey Test & Automation





### KEY FEATURES

- Support 8K SHV  
(Super Hi-Vision 7680x4320 / 8192x4320)
- Support full 8K scrolling function
- Independent signal and power module design
- Dual-core graphics processing architecture
  - Increase graphics and data transmission performance
  - 8K Super Hi-Vision images switch in less than 200ms
- Support 6/8/10/12 bits color depth (12 bit only in LUT mode)
- Support user edited test patterns
  - BMP pattern format
  - Maxi. 300 of 8Kx4K bmp patterns
- Support VDIM and PWM dimming function
- Support cross coordinates defect positioning function
- Support auto flicker adjustment (with A712306)
- Support gigabit Ethernet control interface
- Support USB port for data update

The Chroma 2918 is a high-performance and high stability FPD tester that can be used in LCM ATS. It is in modular design and capable of combining different signals and power modules to set the testing criteria as required. The tester is highly adaptable and extendable with various test functions listed as follows :

### Support 8K Super Hi-Vision

It provides 8 K SHV for ultrahigh resolution testing (7680x4320/8192x4320) by supporting 8K@60/120 Hz resolution spec (32/64 lane V-By-One).

### High Speed Signal Module Design

The modular designed interface supports LVDS and V-by-One which are the mainstreams of LCM interfaces for inspection. The tester uses dual-core graphics processing architecture to significantly increase the drawing and data transmission speed. The data rate of V-by-One interface is up to 3.75GHz per lane, and the 8K SHV images switch is less than 200ms. It is a high-speed, high-specification, and flexible new generation of signal equipment.

### Programmable power module

The tester has built in VDD and VBL programmable power modules to supply voltage for TCON (Timing Controller) and backlight module based on the UUT spec. The parameters include current measurement, turn on/turn off, scan timing, power auto compensation , slew rate, voltage/current upper and lower limits, and OCP/OVP/UCP/UVF protection are provided to user to conduct an accurate and complete test.

### Timing parameter, pattern and test program editing

The FPD tester supports standard JEIDA/VESA timing formats that can be used directly or created as need. In addition, the user can create geometric patterns required for diversified tests by combining any of the icons or importing the natural pictures with BMP file extension. Maximum 300 of 8Kx4K (BMP) patterns can be saved.

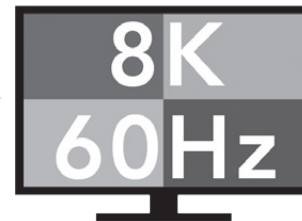
### Network Management Control (Option)

For production test, the Chroma 2918 can apply to production line when integrated with PC and the optional customized GO/NOGO software that can preset the authority of operators and unify the system management mode to reduce human error. The friendly, easy-to-use graphical user interface uses cross coordinates to check and record the defect position during testing. The data of LCM defect types and classifications can be created to generate test reports for analysis. It can finish testing rapidly to greatly reduce the total testing hours. For complete test application and management of production line, it can also be configured with client' s system to maintain and manage the test programs, upload/download the data, compile statistics, and write in EDID network online function. This allows the system administrator remote monitoring the factory production status firsthand at its onset for capacity, efficiency, and yield rate review.

### Support 8K Super Hi-Vision



16 lane V-by-One x 2



16 lane V-by-One x 4



\* Based on module A291802

### True 8K Motion Pattern

- True 8K scrolling function for 8K motion picture inspection
- Adjustable scrolling direction (up/down/left/right), motion speed to test dynamic response of panel

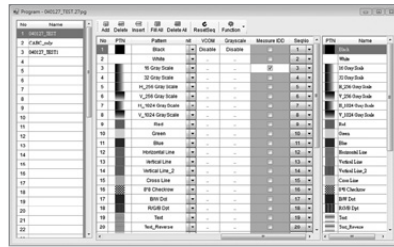
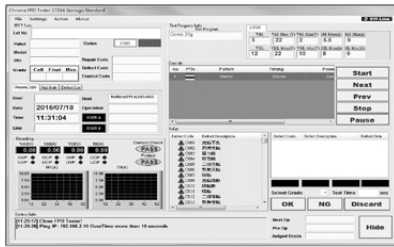


Remote Control Box



## Graphic User Interface - FPD Master Software

- Graphical user interface for test program editing
- Unique GO/NO GO software (option) for quick inspection
- Support VCOM/Grayscale/EDID inspection



## SPECIFICATIONS

Main Frame	
<b>Signal</b>	
Signal interface	4 slot module
Resolution	Support up to 8K@120 resolution (1 Slot for 4K@120)
Pattern switch time	8K Logic pattern: < 200ms 8K BMP pattern: <2s (non-preload), < 100ms (Pre-load)
<b>Functions</b>	
Special Functions	EDID /Cursor / Scroll / BMP support
<b>Communication</b>	
LAN	RJ-45
Remote	D-Sub 15
<b>Others</b>	
System ready time (Output video)	< 10s
Fan noise	< 65dB
Operation Temperature	5°C ~ 40°C
Store Temperature	0°C ~ 80°C
Humidity	20% ~ 90% RH
Dimensions (HxWxD)	190mm(H) x 386mm(W) x 292mm(D) (include power module 67393-120-480)
Weight	11KG (include power module 67393-120-480)

A291800 : 4CH LVDS Signal Module	
Resolution	4096 x 2160 @ 60Hz max
LVDS Signal Channel	4 Channel Output 1 Link : 10-150 MHz 2 Link : 20- 300 MHz 4 Link : 40- 600 MHz
Color depth	6 / 8 / 10 bits Programmable
I <sup>2</sup> C	Level : Floating / 0V / 3.3V / 5 V Max frequency: 400KHz
Aging Mode Control x 1	Floating / 0V / 3.3 V programmable
Inversion Control x 1	Floating / 0V / 3.3 V programmable
GPIO x 8	0V / 3.3V @4mA max , programmable
Spare Power (VIF)	1.0V~ 5.0 V / 0.5A max
ESD Protection	Contact 8KV / Air15KV (Refer to IEC 61000-4-2 Level 4)

A291802 :16 lane V-by-One Signal Module	
Compliant	V-by-One HS v1.4 standard
Resolution	4096x2160 @ 120Hz max. (with 1 module)
Color depth	6 / 8 / 10 / 12 bits Programmable
Lane count	4 / 8 / 16 Lane (with 1 module)
Data rate	3.75 GHz / Lane
Packer type	4 / 5 Bytes
I <sup>2</sup> C	Level : Floating / 0V / 2.5V / 3.3 V (I <sup>2</sup> C and GPIO level must be the same) Max frequency: 400KHz
GPIO x 8	Floating/0V/2.5V/3.3 V@4mA max, programmable (I <sup>2</sup> C and GPIO level must be the same)
ESD Protection	Contact 8KV / Air15KV (Refer to IEC 61000-4-2 Level 4)

67393-120-480 : FPD Tester Power Module	
<b>AC Input</b>	
Voltage	1Ø 100~240V ± 10% V <sub>LN</sub> ,47~63Hz
<b>VDD Output</b>	
VDD	VDD=2~25V / IDD=22A Max, P=264W Max IDD-1=11A Max, PIDD-1=132W Max IDD-2=11A Max, P IDD-2=132W Max
Resolution	0.1 V/step
Accuracy	1% F.S.
Protection	OVP 2V ~ 27.5V UVP 0V~25V OCP (VDD) : 0.5A ~ 22.5 A UCP (VDD) : 0A ~ 21.5 A
<b>VBL Output</b>	
VBL	VBL 3~30V / 20A, 480W Max
Resolution	0.1 V/step
Accuracy	1% F.S.
Protection	OVP 3 V~32.5V UVP 0V~30 V OCP: 0.5A ~ 20.5 A UCP: 0A ~ 19.5 A

## ORDERING INFORMATION

- 2918 : FPD Tester  
67393-120-480 : FPD Tester Power Module  
7123 : Display color analyzer main unit

- A040206 : Remote Control Box  
\* A291800 : 4CH LVDS Signal Module  
\* A291802 : 16 Lane V-by-One Signal Module  
A712306 : Flicker measuring probe (for LCM ATS)  
**Network Management Function of Software**

\* Call for availability

Video & Color  
Flat Panel Display  
LED/Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



## KEY FEATURES

- For full HD measurement
- True Color computer base LCM Testing
- LVDS/TTL(OPT)/TMDS signals support (29130 LVDS 8 bit only)
- Display Up to WUXGA @ 60Hz
- Precise programmable DC source
- Extension Power control (option)
- Power protection OVP/OCP/UVP/UCP
- Voltage/Current measurement
- GO/NOGO fast measurement
- Easy for Timing/Pattern/Program editing
- Unlimited Timing/Pattern/Program storage
- EDID read/write/compare
- LCM failure code editing & record
- Cross Mark for cell checking
- JPG/BMP/AVI/MPEG file support
- Keypad operation
- Special I/O
- Network management function (option)
- Production line process control and data collection

The Chroma 29133/29135 LCM Automatic Test System (ATS) which is structured in computer based system with powerful on-line network function and easy-to-use interface is designed to fulfill the key requirements of LCM tests and the production line management theory from factory. By integrating the video generator, multi-channel precision power supply and process control unit, the LCM ATS is capable of providing complete test solutions for LCM signals, patterns and electricity.

The test programs performed by LCM ATS tasks can be edited by the embedded test editor. The mouse and remote keypads used by the test program editor give the production line a most complete and convenient test mode to expedite the productivity. The test functions Chroma 29133/29135 LCM ATS have are:



## Test Program Editor

It contains the parameters settings of power Turn On/ Turn Off, scanning timing, pattern, over and under voltage/current protection (OCP/OVP/UCP/ UVP), and real-time voltage Ramp Up/Ramp Down based on the LCM electricity specifications for accurate and comprehensive tests.

## Screen Quality Test

Besides the built-in standard patterns, users can define the geometry patterns that composed of various ICONS; moreover, the natural picture file with BMP/JPG filename extension can be imported. In addition the animation function is available for the LCD Response time test. All patterns can be scaled automatically according to the LCM resolution to facilitate the pattern editing preview function.

## Timing Setting and Pattern Editing

It provides VESA timings and patterns; furthermore, the user-defined test timings and patterns can be created as per request. The LVDS / TMDS / TTL (OPTION) signals required by LCM are offered as well.

## Output voltage, current measurement and judgment

The system has 3 programmable DC power outputs 15V/4A, 16V/1A, 25V/3A to provide the power source required by LCM control chip, driver chip and backlight module through the RS-232 interface.

## Test Methods

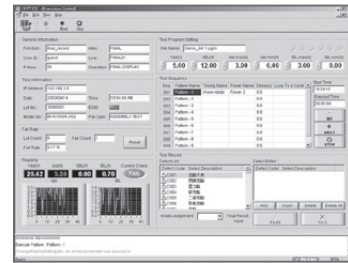
Mouse and keypad are used to control the cross mark for cell checking and log during test, also the LCM defect types can be built by the test patterns that minimize the test time intensely. Thus the test can be done rapidly no matter it is applied in R&D or production line.

## Network Management Control (Option)

The system administrator is able to perform the test program maintenance and management, hardware configuration, data upload/download, computing and EDID read/write/compare network on-line function via the network interface for production status control at the first time as well as analysis of production, efficiency and yield rate.

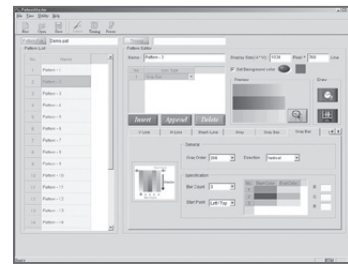
The Chroma 29133/29135 LCM ATS utilizes the computer based system to integrate the signal source /power source for LCM patterns and electricity specification tests, also equips with easy-to-use system program for Timing/Pattern/ Power/Program editing, mouse or keypad for LCM defect log, system self test for electricity judgment and rapid selection for defect types greatly reduce the test time in production line.

## LCM Master II Software



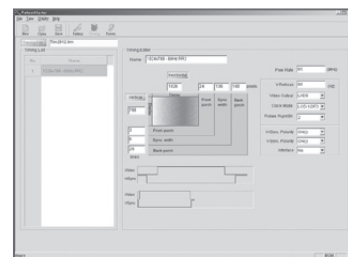
## Main Test Screen

- Model and Test Program Mapping Setting
- System layout and on-line status for factory production line
- Visualization management in factory to show real time information
- Real time production line fail rate display, warning appears when the failure rate is too high
- VDD/VBL voltage/current setting, real time reading for 2D display, and high speed auto voltage/current maximum/minimum judgment and warning
- Display all of the information required including, model, test date and time, detected date, production area, fail status, and etc.



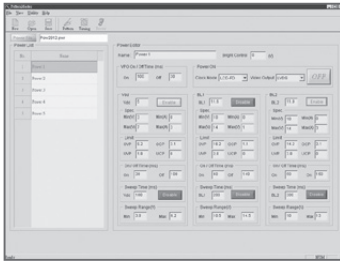
## Pattern Edit Screen

- More than 23 types of ICON for patterns creation
- Various ICON composition for logic computing
- Support BMP / JPG file format
- Various resolution auto scaling
- Support animation
- Real time preview function



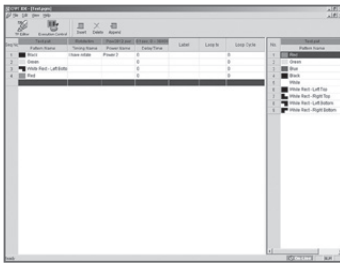
## Timing Edit Screen

- H / V Display, Sync, Back-Porch, Front-Porch, setting
- H / V Sync Polarity  $\pm$  setting
- LVDS / TMDS / TTL output setting
- Pixel rate setting
- 1 / 2 Clock Mode, 6 / 8 / 10 bit link setting
- Bit Rotate setting



### Power Edit Screen

- 3 channel DC source setting
- OVP / OCP / UVP / UCP setting
- Vdd / Signal / Vbl On / Off sequence setting
- Vdd / Vbl / Idd / Ibl spec judgment
- Power Sweep setting



### Test Program Edit Screen

- Provide TIMING / PATTERN / POWER for LCM test programs creation
- Provide Loop function
- Provide Pre-test function

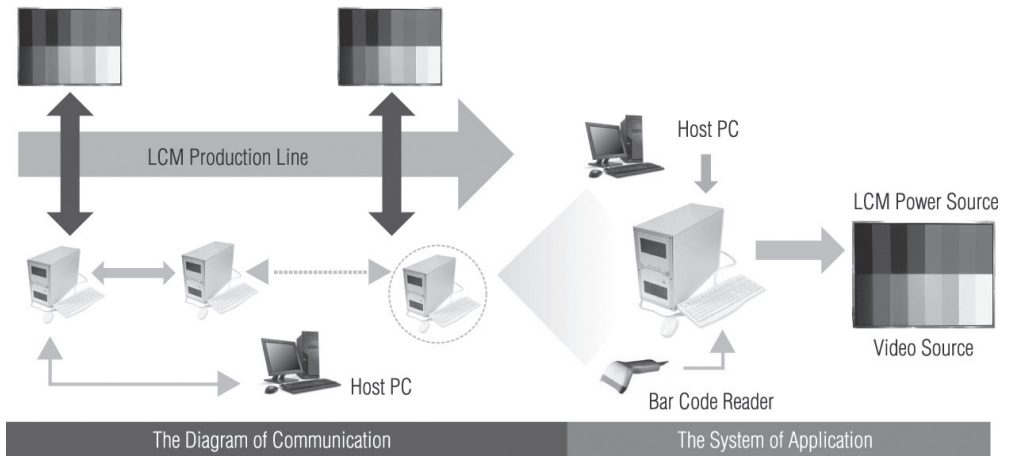
### ORDERING INFORMATION

- 29133** : LCM Automatic Test System
- 29135** : LCM Automatic Test System
- A270111** : LVDS to TTL Signal Adapter
- A270143** : Signal Conversion Board
- A712306** : Flicker Measuring Probe (for LCM ATS)
- Network management function of software**



A270111

### The application of LCM ATS



SPECIFICATIONS			
Model	29133		29135
<b>LVDS Interface</b>			
Resolution	640x480; 800x600; 1024x768; 1152x864; 1280x768; 1280x960; 1280x1024; 1400x1050; 1600x900; 1600x1024; 1600x1200; 1920x1080; 1920x1200; 1280x800; 1366x768; 1280x854		
Pixel Rate	1 link 135/2 link 162MHz		1 link 135/2 link 270MHz
Signal	6 / 8 / 10 bit (10 bit for Gray Scale)		
H,V Sync Polarity	+ or -		
Video signal output can turn ON OFF by software			
<b>DVI Interface</b>			
Resolution	640x480; 800x600; 1024x768; 1152x864; 1280x768; 1280x960; 1280x1024; 1400x1050; 1600x900; 1600x1024; 1600x1200; 1920x1080; 1920x1200; 1280x800; 1366x768; 1280x854		
Pixel Rate	Up to 162MHz		
Interlace	Interlace or Non-Interlace		
H,V Sync Polarity	+ or -		
Video signal output can turn ON OFF by software			
<b>Internal Power Source</b>			
<b>Channel</b>	<b>Channel 1</b>	<b>Channel 2</b>	<b>Channel 3</b>
Output Voltage	2 ~ 15V	3 ~ 16V	3 ~ 25V
Output Current	0 ~ 4A	0 ~ 1A	0 ~ 3A
<b>Programmable Resolution</b>			
Output Voltage	5mV	5mV	12.5mV
Current Protect	1mA	1mA	1mA
<b>Meter Ratings</b>			
Read back Voltage	0 ~ 20V	0 ~ 20V	0 ~ 30V
Read back Current	0 ~ 5A	0 ~ 2A	0 ~ 4A
<b>Meter Resolution</b>			
Read back Voltage	2mV	2mV	4mV
Read back Current	0.3mA	0.2mA	0.4mA
<b>On / Off Sequence Resolution</b>			
Turn-On/Off	1ms	1ms	1ms
<b>V-dim function</b>			
Vdim	PWM function		
	Freq: 100~500Hz / 1Hz step;		
	Duty: 0%~100%;		
	Level: 5V / 3.3V programmable		
Analog function 0~8V / 0.1V step			
<b>Others</b>			
AC Input Voltage	1Ø 110~240V ± 10% V <sub>LH</sub>		
AC Input Frequency	47~63 Hz		
Operation Temperature	10~30°C		
Operation Humidity	Max. 70%		



### KEY FEATURES

- LCM signal and power source test systems
- LVDS 4 channel output
- LVDS pixel rate Signal :  
135MHz  
Dual 270MHz  
4 Link 540MHz
- The resolution up to 1920x1080/240Hz
- LVDS data Even/Odd switch support
- MPEG/AVI/GIF Playback
- Easy transfer pattern file to BMP file
- Output voltage and current measurement
- Output 8 channel DC Power
- Power protection OVP/OCP/UVP/UCP
- EDID read/write/Compare
- External control interface I<sup>2</sup>C/SMBUS/PWM individually
- Network function base on fast Ethernet (option)
- GO/NOGO fast measurement
- Operator authority control
- High efficient GUI for easy operation
- Production line process control and data collection

Chroma 2916 is a high performance, highly stable LCM Automatic Test System with modular design that can work with different signals and power modules flexibly to compose the test conditions required. It integrates the signals and power source with powerful network function and friendly interface that make it suitable for the production tests of various sizes LCMs including the standard signal source required, pattern inspection and voltage/current measurements. Chroma 2916 is an integrated LCM ATS equipment that is most applicable for production test, quality inspection or automatic system integration.

This equipment mainly supports LVDS signals with optional TMDS signal converters available for purchase to meet the standard test signals requirement for various panels and digital displays of today.

2916 LCM ATS has the following test functions:

#### LVDS Signal Output

It supports Signal, Dual, Quad Link output test with pixel rate up to 600MHz. The test screen resolution supports up to 1920x1080 @240Hz (refresh rate) that complies with the test specification of Full HD high multiple frequency transmission technology nowadays.

#### Editing Timing, Pattern & Test Sequence

Chroma 2916 supports standard JEIDA/VESA Timing Format. Users can select the timing parameters directly or build them as need.

Through the combination of Icon, the geometry patterns required for diversified tests can be built, also the natural patterns with the extension of BMP/JPG can be inputted. In the meantime it supports MPEG/AVI/GIF play format for animation and provides LCD Response time test. All patterns can be scaled based on the LCM resolution and previewed by pattern editor.

Besides the LVDS signals required for LCM test, the LCM electricity specification can be followed to provide parameter settings of Turn On/Turn Off, Scan Timing, Pattern, supply voltage/current high/low limit protection (OCP/OVP/UCP/UVP) and voltage Ramp Up/Ramp Down for the most complete and accurate LCM test.

#### Multiple High-Precision DC Power Supply

This system has many modularized external power supplies that are applicable for various kinds of panel sizes. It supports 8 sets of direct power output to provide the power required by LCM control chip, driver chip and backlight module via USB standard interface. Each output contains the actual readings of voltage and current. Its unique design can move the measurement point to load to prevent the transmission voltage drop also ensure the measurement accuracy reaches mV level for complete analysis of LCM working status. Meanwhile each output channel is able to simulate the timing relationship of power on/off, the Ramp-up/down waveform output and over voltage/current protection function. When

the status exceeds the setting, in addition to the protection, LED and beeps are activated to remind users to fix it.

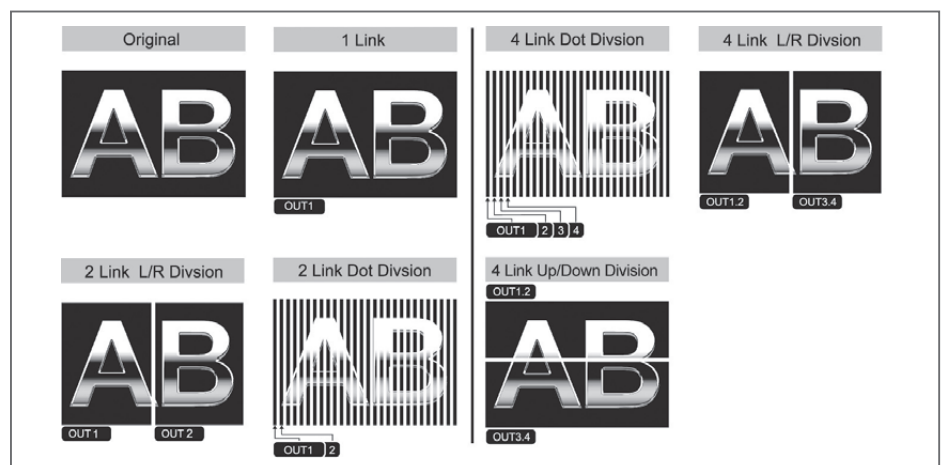
#### Environment & Network Control (Optional)

For production test, Chroma 2916 allows the administrator to preset the operator's access permission and unify the system management mode to reduce the human operation error. The user friendly graphic interface is very easy to use. Mouse and keypad can be utilized to control the cross coordinate defect positioning check and log during test. Moreover, the information including the LCM defect types and levels as well as all kinds of test report analysis are able to build and generate via the interface. Thus tests can be done in the fastest way to cut down the test time significantly no matter it is applied to R&D or production line.

To fulfill complete test application and management on the production line, network interface is used to maintain and manage the test programs, configure the hardware, upload/download data, compile statistics and write in EDID so that the system administrator can control the production status effectively from remote distance for productivity, efficiency as well as yield rate review. The system also has other external control interfaces such as I<sup>2</sup>C/SMBUS/PWM to extend the functions and enhance the system flexibility.

2916 LCM ATS is structured based on PC under the OS of Windows XP to give users an easy and familiar operating environment. With powerful software support and user-friendly operation interface to edit Timing/Pattern/Power/Program, the system is able to judge the electrical specification automatically and select the defect type rapidly to save the test time. In addition the test result can be exported to network easily for data gathering and analysis via network management function to provide an excellent solution for production management.

#### 4 Link Data Mapping





**SPECIFICATIONS**

<b>Model</b>	<b>2916</b>
<b>LVDS Interface</b>	
Resolution	640x480; 800x600; 1024x768; 1152x864; 1280x768; 1280x960; 1280x1024; 1400x1050; 1600x900; 1600x1024; 1600x1200; 1920x1080; 1920x1200; 1280x800; 1366x768; 1280x854; 2560x1600
Pixel Rate	1 Link up to 135 MHz 2 Link up to 270 MHz (135 MHz x 2) 4 Link up to 540 MHz (135 MHz x 4)
Signal	6/8/10 Bit and support bit rotate (10 Bit for Gray Scale)
H,V Sync Polarity	+ or -
Connector	10 Bit Four Link by MDR36 x 2
Video signal output can turn ON OFF by software	

<b>General Specifications</b>	
AC Input Voltage	1Ø 110~240V ± 10% V <sub>LH</sub>
AC Input Frequency	47~63Hz
Operation Temperature	10~40°C
Operation Humidity	Max. 70%

<b>Dimension &amp; Weight</b>	
<b>2916 Main System</b>	
Dimension (HxWxD)	156.4x320x430 mm / 6.16x12.6x16.9 inch
Weight	8 kg / 17.62 lbs
<b>A291600 Signal Module</b>	
Dimension (HxWxD)	50x320x230 mm / 1.96x12.59x9.06 inch
Weight	1.7 kg / 3.8 lbs
<b>A291512 Power module</b>	
Dimension (HxWxD)	206.4x100x430 mm / 8.12x3.937x16.92 inch
Weight	4.6 kg / 10.1 lbs
<b>2916LCM ATS (2916+A291600+A291512)</b>	
Dimension (HxWxD)	206.4x420x430 mm / 8.13x16.54x16.93 inch
Weight	14.3 kg / 31.5 lbs

<b>Power Source</b>			
Channel	DC1	DC2	DC3~DC8
Output Voltage	2-25V	5-25V	0-5V
Output Current	0-4A	0-26.5A	0-1A
<b>Programmable Resolution</b>			
Output Voltage	20mV	20mV	-
Current Protect	5mA	20mA	-
<b>Meter Ratings</b>			
Read back Voltage	0-30	0-30V	-
Read back Current	0-5A	0-30A	-
<b>Meter Resolution</b>			
Voltage	20mV	20mV	-
Current	5mA	20mA	-
<b>On / Off Sequence Resolution</b>			
Turn-On/Off	1ms	1ms	1ms
<b>I<sup>2</sup>C BUS Function</b>			
SDA	3.3 / 5V / device select		
SCL	50~100KHz		
<b>DIM Function</b>			
Analog	Analog function 0~8 / 0.1V step		
<b>V-PWM Function</b>			
Vpwm	3.3 / 5V / FV Selectable		
Fout	100~15KHz		
Dout	0~100% 1% Step		
<b>SMBUS Function</b>			
SDA	3.3 / 5V / device select		
SCL	10~100KHz		

**ORDERING INFORMATION**

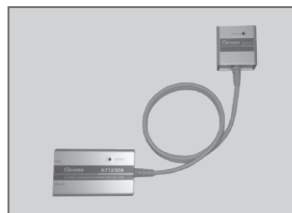
- 2916** : LCM Automatic Test System
- A270143** : Signal Conversion Board
- A291600** : Signal Module LVDS 135/270/540 MHz
- A291512** : Power Module 780W
- A712306** : Flicker Measuring Probe (for LCM ATS)
- Network Management Function of Software**



A291600



A291512



A712306

Video & Color  
Flat Panel Display  
Lighting LED/  
Optical Devices  
Photovoltaic test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



### KEY FEATURES

- LCM signal and power source test systems
- Easy for Timing / Pattern / Program editing
- Suitable for Full HD measurement
- The Resolution up to 1920x1080@240Hz, 3840x2160@60Hz
- LVDS 8 channel output
- MPEG/AVI Playback
- High accurate programmable DC source
- Output voltage and current measurement
- Power protection OVP/OCP/UVP/UCP
- EDID read/write
- Cross coordinate defect positioning function
- Network management function (OPT)
- In-line process control and data collection
- Operator authority control
- GO/NOGO fast measurement
- High efficient GUI for easy operation

The technology development of liquid display has been moving toward the features of large scale, high quality, high contrast and fast dynamic response recently that made the Full HD (1920X1080) high resolution specification become a new mainstream in the market. In order to meet the test requirements of today's industries, Chroma 2917 LCM ATS is structured in modularized with integrated signals and power source. The powerful on-line network function and easy-to-use interface are equipped to fulfill the test requirements such as all kinds of standard signal sources, test patterns and voltage/current measurements for various sizes of LCM.

This ATS provides LVDS signals and users can set the settings through mouse and Remote Keypad in accordance with the LCM features to give the production line a most complete and convenient test mode to expedite the productivity. The test functions Chroma 2917 LCM ATS have are:

### Modulized Design

To cope with the test requirements of various sizes panels, the design concept of modulization is applied to fit in the specifications of different signals and power modules for application.

### Test Program Editor

It contains the parameters settings of power Turn On/ Turn Off, scanning timing, pattern, over and under voltage/current protection (OCP/OVP/UCP/UVP), and real-time voltage Ramp Up/Ramp Down based on the LCM electricity specifications for accurate and comprehensive tests.

### Screen Quality Test

Besides the built-in standard patterns, users can define the geometry patterns that composed of various ICONS; moreover, the natural picture file with BMP/JPG filename extension can be imported. In addition the animation function is available for the LCD Response time test. All

patterns can be scaled automatically according to the LCM resolution to facilitate the pattern editing preview function.

### Timing Setting and Pattern Editing

The ATS allows users to define the test timings and patterns for application as need and provides LVDS signals for comprehensive LCM tests by setting the signal/power supply activation time. Other signals like TMDS / TTL / ANALOG (option) can also be applied for testing.

### Output voltage, current measurement and judgment

This system has multiple modularized external power supplies that can be used for different sizes of panels / LED backlight constant current sources (option) and to provide the power source required by LCM control chip, driver chip and backlight module through the USB interface. Also Provide the optional of multi-channel metering system for readback applications.

### Test Methods

Mouse and keypad are used to control the cross mark for cell checking and log during test, also the LCM defect types can be built by the test patterns that minimize the test time intensely. Thus the test can be done rapidly no matter it is applied in R&D or production line.

### Network Management Control

The system administrator is able to perform the test program maintenance and management, hardware configuration, data upload/download, computing and EDID read/write network on-line function via the network interface for production status control at the first time as well as analysis of production, efficiency and yield rate.

Chroma 2917 LCM ATS integrates the signal source/power source for LCM patterns and electricity specification tests. The user-friendly interface along with simple system programs can be used to edit the Timing / Pattern / Power / Program while the mouse or keypad can be used to log the LCM defects. Moreover, the PC based platform can fully utilize the network function for data collection and analysis that makes it most applicable for production line management.

### High Performance Hardware Devices

Chroma 2917 LCM ATS is structured in modularized with integrated signals and power source. The powerful on-line network function and easy-to-use interface are equipped to fulfill the test requirements such as all kinds of standard signal sources, test patterns and voltage/current measurements for various sizes of LCM.

### Main Unit

- Support 2 port LAN
- Integrated all test signals with LVDS
- Provide LVDS Signal Output
- Support 2 / 4 / 8 ch Data Output



### Power Module Series A291710

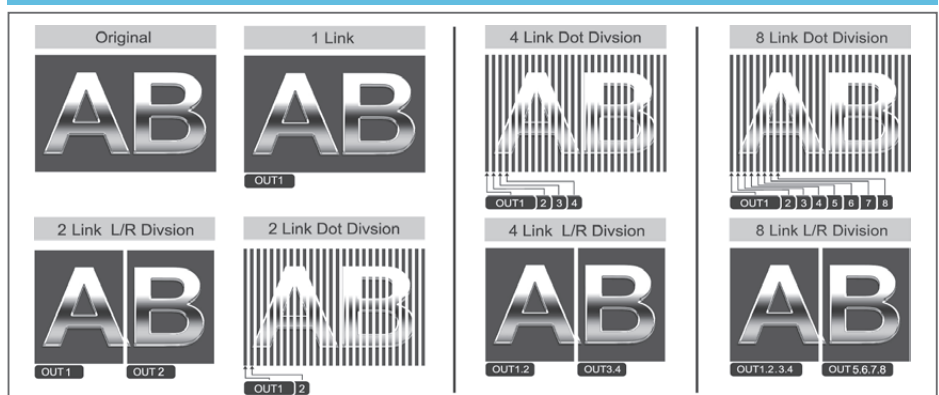
- 4~8 channel Power Source (Depend on Model)
- OCP/UCP/OVP/UVP Protection
- SM Bus, I<sup>2</sup>C external data read and write functions



### Signal Conversion Board A270143(option)

- Extension of the 29135 LCM ATS for eDP/MIPI tests
- Signal Conversion Board modular design
- Compatible eDP V1.3 Standard
  - Auto / Manual Training
  - Lane rate selectable: 1.62 / 2.7 Gbps
  - Lane count selectable: 1 / 2 / 4 Lane
  - Color depth: 8 / 10 bits
- Compatible MIPI DSI V1.02.00 spec
  - Auto / Manual Training
  - Lane rate selectable: 1 Gbps
  - Lane count selectable: 1 / 2 / 3 / 4 Lane
- Output resolution up to
  - eDP up to 2560x1600 @ 60Hz (Max)
  - MIPI up to 1920x1080 @ 60Hz (Max)
- Able to provide 2 sets of eDP / MIPI standard signal source simultaneously
- Test images support BMP format output

### 4/8 Link Data Mapping



- Easy-to-use graphical interface
- Production line process control and data editing



### LVDS to eDP Signal Conversion Module A270147 (option)

The Chroma A270147 is a signal conversion module that converts the LVDS to eDP signal, the eDP output support up to 5.4Gbps/lane and comply with eDP1.4 standard, extension of the 2917 LCM ATS for eDP testing.

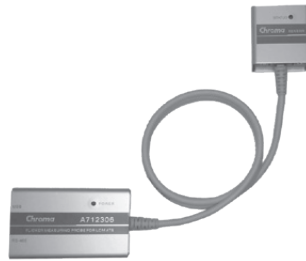
- Signal Conversion Board modular design
- LVDS input: 8 links up to 1.2Gbps
- Compatible eDP V1.4 Standard
  - Resolution: 4096 x 2160@60Hz max
  - Lane rate : 1.62Gbps / 2.16Gbps / 2.43Gbps / 2.7Gbps / 3.24Gbps / 4.32Gbps / 5.4Gbps Lane selectable
  - Lane count : 1 / 2 / 4 Lane selectable
  - Color depth : 6 / 8 / 10 bits
  - Function : HPD / EDID
- Able to provide 2 sets of eDP standard signal source simultaneously



### Flicker Measuring Probe A712306 (option)

The Chroma A712306 Flicker Measuring Probe for LCM ATS is specifically designed for adjusting the flicker on LCM automatically following the FMA(Flicker Modulation Amplitude) standards defined by VESA (Video Electronics Standards Association) and JEITA(Japan Electronics Information Technology Industries Association) for flicker measurement. It can work with the Chroma 291X Series LMC automatic test system to complete auto flicker adjustment.

- Able to integrate with LCM ATS for LCM auto flicker adjustment
- Capable of integrating Chroma 29XX Series LCM Auto Test System
- Support FMA and FLVL flicker measurement mode
- Have a patented adjustment algorithm, making adjustment speed faster
- Capable of editing adjustment script when using with LCM Master



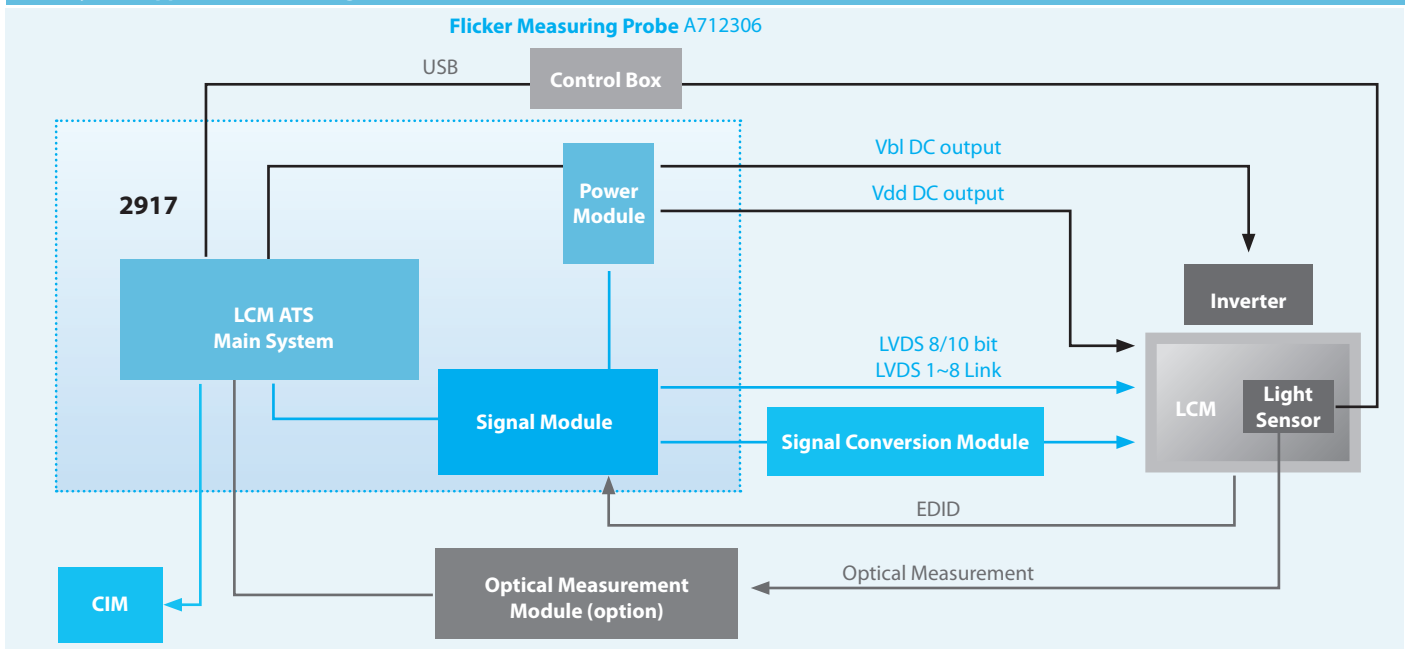
### V by one SG & Power Module A040105 (option)

The Chroma A040105 is a signal conversion module that converts the LVDS to V by One signal with additional sets of IO signals for panel control. V-By One signal is defined as the next generation of LCM video signal transmission interface to provide high bandwidth and long distance signal transmission.

- Extension of the 2917 LCM ATS for V by one testing
- Signal/power source integrated design
- Support 3840 x 2160 resolution
- Support 8 channel LVDS input and outputting 16 Lanes V by one
- Support 16 Lanes Channel Data mapping function (follow up V by One V1.3)



## 2917 System Application Block Diagram



## ORDERING INFORMATION

- 2917** : LCM Automatic Test System
- A040105** : V by one SG & Power module
- A270143** : Signal conversion board
- A270147** : eDP signal conversion module
- A270148** : eDP bist module

- A291710** : Power module 650W
- A712306** : Flicker measuring probe (for LCM ATS)
- 7123** : Display color analyzer main unit
- Network Management Function of Software**

SPECIFICATIONS

Model	2917
<b>LVDS Interface</b>	
Resolution	640x480; 800x600; 1024x768; 1152x864; 1280x768; 1280x960; 1280x1024; 1400x1050; 1600x900; 1600x1024; 1600x1200; 1920x1080; 1920x1200; 1280x800; 1366x768; 1280x854; 2560x1600; 3840x2160
Pixel Rate	1 Link up to 135 MHz 2 Link up to 270 MHz (135 MHz x 2) 4 Link up to 540 MHz (135 MHz x 4) 8 Link up to 1.08GHz (135 Mhz x 8)
Signal	6/8/10 Bit and support bit rotate (10 Bit for Gray Scale)
Data Swap	+ or -
H,V Sync Polarity	+ or -

General Specifications	
AC Input Voltage	1Ø 110~240V ± 10% V <sub>LH</sub>
AC Input Frequency	47~63Hz
Operation Temperature	10~40°C
Operation Humidity	Max. 70%

Dimension & Weight	
2917 Main System	
Dimension (HxWxD)	20.64 x 32 x 43 mm / 8.12 x 12.6 x 16.92 inch
Weight	12.6 kg / 27lbs lbs
A291710 DC Power Source	
Dimension (HxWxD)	206.4 x 100 x 430 / 8.12 x 3.94 x 16.92 inch
Weight	4.6 kg/10.1 lbs
2917 LCM ATS (2917 Main System and A291710 DC Power Source)	
Dimension (HxWxD)	206.4 x 420 x 430 mm / 8.12 x 16.54 x 16.92 inch
Weight	17.2 kg / 37.1 lbs

Power Source			
Channel	DC1	DC2	DC3~DC4
Output Voltage	2-20V	5-50V	0-5V
Output Current	10A	22A	0-1A
Power Consumption	132W	500W	15W

Programmable Resolution			
Output Voltage	20mV	20mV	-
Current Protect	20mA	20mA	-

Meter Ratings			
Read back Voltage	0-22V	0-55V	-
Read back Current	0-11A	0-24.2A	-

Meter Resolution			
Voltage	100mV	100mV	-
Current	100mA	100mA	-

On / Off Sequence Resolution			
Turn-On/Off	1ms	1ms	1ms

I <sup>2</sup> C BUS Function	
SDA	3.3 / 5V / device select
SCL	50~100KHz

DIM Function	
Analog	Analog function 0~12/0.1V step

V-PWM Function	
Vpwm	3.3 / 5V / FV Selectable
Fout	100~15KHz
Dout	0~100% 1% Step

SMBUS Function	
SDA	3.3 / 5V / device select

Model	A270143
<b>Main Board</b>	
Input Video	LVDS 2 Link 25 ~ 135 MHz / 1 Link ; 50 ~ 270 MHz / 2 Link
Vdd(Vcc)	By pass from Tester
Input Power	DC +12V
Communication	USB
<b>eDP Signal Module</b>	
Compliant	eDP V1.3
Resolution	2560 x 1600 @ 60 Hz max
Lane rate	1.62 / 2.7 Gbps
Lane Count	1 / 2 / 4 Lane
Color depth	8 /10 bits
Function	HPD / EDID
<b>MIPI Signal Module</b>	
Compliant	MIPI DSI V1.02.00
Resolution	1920 x 1200 @ 60 Hz max
Lane rate	1 Gbps
Lane Count	1/2/3/4/4+4 Lane
Pixel format	RGB-565 / RGB-666 / RGB-888

Environment	
Operation Temperature	20 ~ 40°C
Storage Temperature	-20 ~ 70°C
Humidity	70%
Dimension (H x W x D)	43 x 190 x 164 mm
Weight	1 Kg / 2.2 lbs

Model	A270147
<b>Main Board</b>	
Input Video	LVDS 2 / 4 / 8 Link, 15 ~ 150 MHz / 1 Link, 30 ~ 300 MHz / 2 Link, 60 ~ 600 MHz / 4 Link, 20MHz ~ 1.2GHz / 8 Link
Vdd(Vcc)	By pass from Tester
Input Power	DC +12V
Communication	LAN
<b>eDP Signal Module</b>	
Compliant	eDP V1.4
Resolution	4096 x 2160@60Hz max
Lane rate	1.62Gbps / 2.16Gbps / 2.43Gbps / 2.7Gbps / 3.24Gbps / 4.32Gbps / 5.4Gbps Lane
Lane Count	1 / 2 / 4 Lane
Color depth	6 / 8 /10 bits
Function	HPD / EDID

Environment	
Operation Temperature	5~ 40°C
Storage Temperature	-20 ~ 60°C
Humidity	70%
Dimension (H x W x D)	34 x 147 x 211 mm
Weight	1 Kg / 2.2 lbs

Model	A712306	
Measurement Area	Ø10mm	
Measurement Distance	0 mm (contact measurement)	
Measurement Range	10 lux ~1000lux	
Measurement Mode	FMA, FLVL	
Flicker -Contrast Measurement method (FMA)	Display Range	0.0 to 100%
	Accuracy	±2% (Flicker frequency : 30 Hz AC/DC 10 % sine wave) ±3% (Flicker frequency : 60 Hz AC/DC 10 % sine wave)
Flicker -JEITA Measurement method	Repeatability	1% (2σ) (Flicker frequency : 20 to 65 Hz AC/DC 10 % sine wave)
	Accuracy	±1dB (Flicker frequency : 30 Hz AC/DC 10 % sine wave)
Measurement time	Repeatability	0.5dB (Flicker frequency : 30 Hz AC/DC 10 % sine wave)
	FMA	0.5 sec / time
Communication Interface	JEITA	2 sec / time
	Supported Software	USB
Input Voltage	LCM Master	
Operating Temp./Humidity	DC 5V, 500 mA	
	0°C to 40°C (32° F to 104° F) ; less than 90% relative humidity (non-condensing)	
Storage Temp./Humidity	0°C to 40°C (32° F to 104° F) ; less then 90% relative humidity (non-condensing)	





## ORDERING INFORMATION

- 67300** : Six Position 67300 Mainframe with 1 output BUS bar, 220V 1Ø
- 67300** : Six Position 67300 Mainframe with 2 output BUS bar, 220V 1Ø
- 67300** : Six Position 67300 Mainframe with 3 output BUS bar, 220V 1Ø
- 67300** : Six Position 67300 Mainframe with 6 output BUS bar, 220V 1Ø
- A673002** : Six Position 67300 Mainframe with 2 output BUS bar, 220V/380V 3Ø
- A673003** : Six Position 67300 Mainframe with 3 output BUS bar, 220V/380V 3Ø
- A673004** : Six Position 67300 Mainframe with 6 output BUS bar, 220V/380V 3Ø
- A673005** : Three Position 67300 Mainframe with 2 output BUS bar, 220V/380V 3Ø
- 67322** : DC Power Supply Module 5V/100A/600W
- 67346** : DC Power Supply Module 12V/90A/1484W
- 67366** : DC Power Supply Module 30V/50A/1500W

## KEY FEATURES

- Three models: 67322 5V/100A  
67346 12V/90A  
67366 24V/50A
- N+1 Redundancy Power System Ideal for Burn-in Applications
- High Power Density (464mW / cm<sup>3</sup>)
- Hot-swappable
- Cost-effective
- Remote Sense, 1V Line Loss Compensation
- Remote ON/OFF Signal
- Remote RS-485 Interface Control
- Graphic Softpanel Control and Monitor (option)

Chroma's new 67300 Series of modular DC power supplies offer many unique features for Burn-in applications. The features include a N+1 redundancy power system, high power density, hot-swappable for maintenance, remote ON/OFF input signal as well as the ability to create a custom burn-in chamber system.

The 67300 Series contain 3 different modules ranging from 600W to 1500W, up to 100A and 30V. The 67300 mainframe allows encasing up to six modules for parallel or stand-alone operation that made it easy to expand up to thirty units of mainframe for high power applications via RS-485 control.

The Modular DC Power Supplies of 67300 Series are cost effective with high power density (464mW/cm<sup>3</sup>). They are most suitable for burn-in applications such as the typical LCD panel, D2D converter, power inverter, notebook, battery charger, and etc.

Modern power factor correction circuitry is incorporated in 67300 Series to increase the input power factor above 0.98 to meet the IEC regulation. It not only reduces the input current requirement but also raises the efficiency over 80%. In addition, an optional graphic Softpanel connected via RS-485 is offered to control and monitor the power system which is a user friendly tool applicable for factory automation.



Module

## SPECIFICATIONS

Model	67322	67346	67366
<b>Electrical Specifications</b>			
<b>Output Ratings</b>			
Output Voltage Range	2.5 ~ 6V	2 ~ 16V	2 ~ 30V
Default Voltage Setting	5V	15V	24V
Output Current	100A	90A	50A
Output Power	600W	1440W	1500W
Line Regulation	0.10%		
Load Regulation	5%		
Meter Accuracy	1% F.S.		
Noise (0-20MHz) : V (P-P)	100mV	100 mV	100 mV
Output Ripple (rms) : V	30 mV	30 mV	30 mV
Efficiency	> 80% @ Full Load		
Transient response time -Time	< 5 ms		
25% step change-Leve	Time for the output voltage to recover within 1% of its rated for a load changed of 25%		
<b>Protection Function</b>			
OVP	Automatically shuts down when over setting voltage plus 0.2V (67322) / plus 0.5V( 67346 / 67366)		
OCP	0A - Full Scale setting current limit, CC mode		
OTP	Automatically shuts down		
<b>I/O Signal</b>			
Remote ON/OFF	Closed is enable, vice versa		
<b>Remote Interface</b>			
RS-485	Standard (Adjustable via DIP switch of each power supply)		
<b>General Specifications</b>			
Remote Sensing	1V line loss compensation		
Parallel Operation	Current Sharing (± 5%)		
Operating Temperature	-5°C to 50°C		
Humidity Range	0 ~ 90% RH. Non-condensing		
AC Input Voltage	220~230V ± 10% V <sub>LN</sub> , 47~63Hz		
Input Power Factor	> 0.98@ full load		
Weight	3.7 kg / 8.15 lbs		
Dimension (H x W x D)	132.5 x 67.5 x 376 mm / 5.22 x 2.66 x 14.8 inch		
<b>Front Panel Overview</b>			
Control Function	V&I display change button, main switch		
Indications LED	Normal, Warming, V, I, 7-segment LED		

Video & Color  
Flat Panel Display  
Lighting  
LED/  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation

# LED/Lighting Test Solution

<b>ESD Test System</b>	<b>6-1</b>
<b>LED Electrical Test Module</b>	<b>6-2</b>
<b>LED Chip Level Tester</b>	<b>6-3</b>
<b>LED Mapping Probe Tester</b>	<b>6-4</b>
<b>LED Burn-in Tester</b>	<b>6-5</b>
<b>LED Light Bar Test System</b>	<b>6-6</b>
<b>LED Light Bar Electrical Test System</b>	<b>6-7</b>
<b>LED Luminaires Test System (For Laboratory)</b>	<b>6-8</b>
<b>LED Luminaires In-line Test System (For Production)</b>	<b>6-9</b>



**ESD Test System**



**LED Electrical Test Module**



**LED Chip Level Tester**



**LED Mapping Probe Tester**



**LED Burn-in Tester**



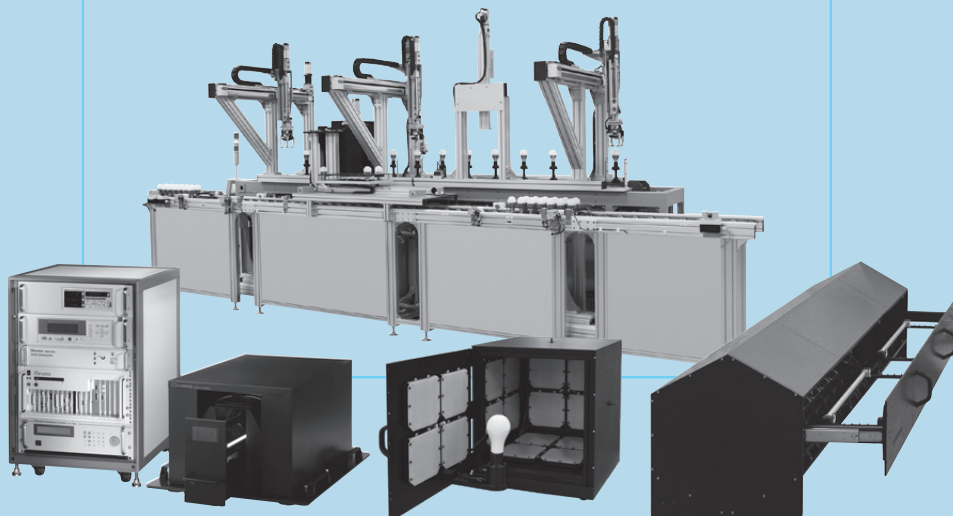
**LED Light Bar  
Electrical Test System**



**LED Light Bar Test System**



**LED Lighting Test System  
(For Laboratory)**



**LED Luminaires In-line Test System  
(For Production)**



Chroma 58154 series ESD (Electrostatic Discharge) Test Systems are PCI controlled module to simulate electrostatic discharge pulse during electronic device testing. The 58154 series offer both ANSI/ESDA/JEDEC JS-001-2014-Human Body Model and ANSI/ESD STM 5.2-2012-Machine Model. The user friendly software offers programmable and flexible features, such as sampling test on a wafer, ESD model, ESD pulse polarity, ESD pulse interval in a sequence, and automatic testing function.

The 58154 series includes a control module and a pulse output external box. High voltage power supply unit (PSU) and pulse shaping circuits provide the ESD standards compliant pulse waveform.

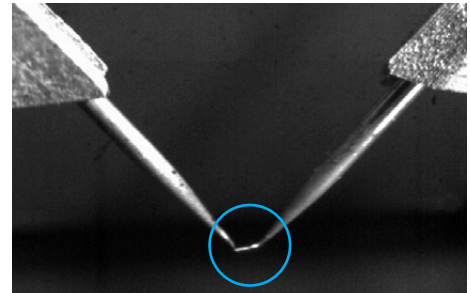
The 58154 series offer a flexible and total ESD test solution to customers. Furthermore, the ESD pulse is generally applied to the device under test before measuring device electric parameters and the 58154 series can be perfectly integrated with Chroma 58212-C to provide a total solution in production line.

### ORDERING INFORMATION

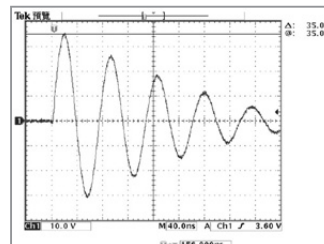
- 58154** : ESD Test System (4kV/400V)
- 58154-B** : ESD Test System (6kV/800V)
- 58154-C** : ESD Test System (8kV/800V)

### KEY FEATURES

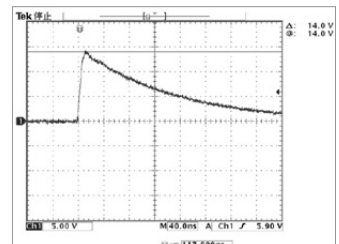
- Two models ESD pulse generation : human body model and machine model
- Programmable auto test : pulse delay, cycle and polarity are programmable
- Resolution (58154) : 5V per-step for machine model, 20V per-step for human body model
- Resolution (58154-B) : 10V per-step for machine model, 30V per-step for human body model
- Resolution (58154-C) : 10V per-step for machine model, 30V per-step for human body model
- Diversity control interface : PCI DIO card
- Up to 8000V (58154-C)



ESD Test on LED chip



Machine Model waveform



Human Body Model waveform

SPECIFICATIONS			
Model	58154	58154-B	58154-C
Parameter	Value		
ESD Mode	Machine Model / Human body model		
Pulse Voltage	Machine model: 50V to 400V ± 5V Human body model: 250V to 4KV ± 20V	Machine model: 100V to 800V ± 10V Human body model: 250V to 6KV ± 30V	Machine model: 100V to 800V ± 10V Human body model: 250V to 8KV ± 30V
ESD Specification *1 *2	Machine model reference on STM5.2-2012 ; Human body model reference on ANSI/ESDA/JEDEC JS-001-2014		
Pulse Interval	20 ms *3 to 1 s (User definable)		
Pulse Repetition	Single or multiple		
Pulse Polarity	Positive or negative (software control)		
AC Input	100 to 240V, 47 to 63 Hz		
Dimensions	434.6mm(W) x 97.7mm(H) x 306.8mm(D)		434.6mm(W) x 97.7mm(H) x 450mm(D)
Weight	10 kg	12 kg	

Pattern No. : I311648, I398655, ZL 2009 2 0148342.2

Pattern Name : Discharge and remote feedback integrated testing system

**Note\*1** : The test condition is under Chroma's probe tips

**Note\*2** : The accuracy of Chroma 58154 may vary in customer's setup conditions. To fix this problem, ESD tester needs to be tuned the value of the impedance to minimized waveform distortion, or customers provide their setup information in advance and Chroma tunes ESD testers before shipment to fit customer's test method.

**Note\*3** : The test condition is for Model 58154 and the operation is at fix pulse mode.





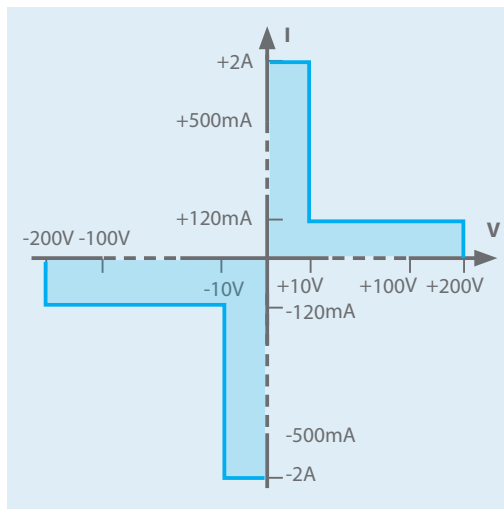
### KEY FEATURES

- Focuses on LED test application
- Cover High Voltage (HV) and High Power (HP) LED test requirement
- Build-in hardware sequencer
- Build-in program memory and data memory
- Support LED SCR characteristic detect function

### TEST ITEMS

- Forward voltage (Vf)
- Reverse breakdown voltage (Vrb) Leakage (Ir)
- LIV
- I-V characterization

Chroma 58221-200-2 is a module specially designed to test the electrical features of LED in full range. It has all functions required for testing the LED electrical features. The 58221-200-2 supplies high accuracy current source up to  $\pm 200V/\pm 120mA$  for High voltage (HV) and up to  $\pm 10V/\pm 2A$  for High Power (HP). Besides the standalone operation the 58221-200-2 is featured in, the USB interface and other integrated design can also be applied for synchronous measurement.



### ORDERING INFORMATION

**58221-200-2** : LED Electrical Test Module

SPECIFICATIONS				
Model	58221-200-2			
<b>Current Source Accuracy</b>				
Range	Programming Resolution	Source Accuracy 23°C ± 5°C ± (Reading + Range)	Default Measurement Resolution	Measurement Accuracy 23°C ± 5°C ± (Reading + Range)
± 20 μA	1nA	0.05% + 0.04%	1nA	0.05% + 0.04%
± 500 μA	50nA	0.05% + 0.04%	50nA	0.05% + 0.04%
± 20mA	1 μA	0.05% + 0.04%	1 μA	0.05% + 0.04%
± 500mA	50 μA	0.08% + 0.04%	50 μA	0.08% + 0.04%
± 2A	100 μA	0.05% + 0.1% (≥0.1A range) 0.1% + 0.3% (<0.1A range)	100 μA	0.05% + 0.1% (≥0.1A range) 0.08% + 0.1% (<0.1A range)
<b>Voltage Source Accuracy</b>				
Range	Programming Resolution	Source Accuracy 23°C ± 5°C ± (Reading + Range)	Default Measurement Resolution	Measurement Accuracy 23°C ± 5°C ± (Reading + Range)
± 10V	1mV	0.03% + 0.02%	1mV	0.03% + 0.02%
± 100V	10mV	0.03% + 0.02%	10mV	0.03% + 0.02%
± 200V	10mV	0.03% + 0.02%	10mV	0.03% + 0.02%
<b>General Specification</b>				
Interface	USB/Stand alone			
Trigger	Available			
RAM (16 bits)	16M			
Operatoin Environment	0°C~50°C (32°F~122°F) ; Humidity : < 70% R.H. Non-condensing			
Max. Power Consumption (VA)	120VA			
Dimensions (WxHxD)	432x110x432 mm			
Weight (kg)	10			

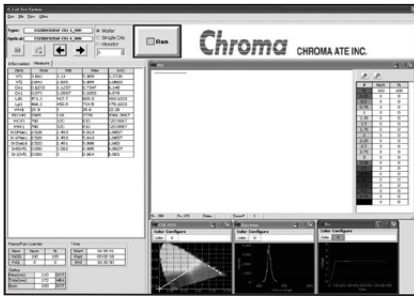


The LED Test System Model 58173-TC focuses on LED wafer/chip characteristics analysis and provides optimized test performance. Its test items include a variety of voltage/current output measurement, optical power measurement, and spectrum analysis. On measurement, several electrical and optical characteristics analysis can be achieved at a time within 25 ms, and its electrical measurement supports high-voltage LED and high-brightness LED applications.

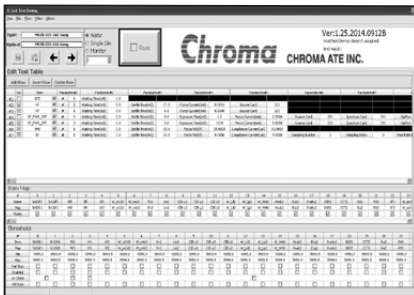
On system integration, the 58173-TC can easily integrate various Probers and Handlers for wafer probing and chip sorting. In addition, optional switch module allows test system to perform multi-channel and multi-chip measurements.

## KEY FEATURES

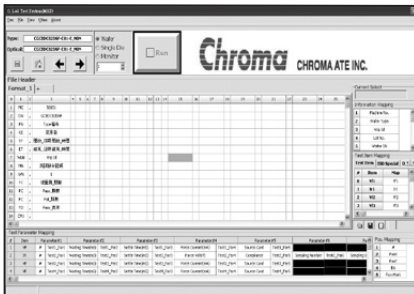
- High test speed: complete whole test within 25ms (selected test items)
- Super stable of temperature variation
- Support high voltage and high power LED test requirement
- Support multi-die test (option)
- Support ESD test (option)



Real-Time Production Information



Flexible Editable Test Parameters



Powerful Report File Editing

## SPECIFICATIONS

Model		58173-TC	
<b>Parameters</b>			
Electrical Test Items	Forward Voltage(Vf), Reverse Leakage Current (Ir), Reverse Breakdown Voltage (Vrb), SCR		
Optical Test Items	Luminous Intensity (mcd), Lumen (lm), Radiant power (mw), Dominant Wavelength (Wd), Peak Wavelength (Wp), FWHM, CIE Chromaticity, CCT, CRI		
<b>Electrical Parameter Measurements</b>			
Power Range	≤ 20W, as the figure shows on next page		
Voltage	Source Range	± 10V / ± 100V / ± 200V	
	Source Accuracy	0.05% + 0.03%F.S. / 0.05% + 0.03%F.S. / 0.05% + 0.03%F.S. *1	
	Measurement Range	± 10V / ± 100V / ± 200V	
Current	Measurement Accuracy	0.03% + 0.02%F.S. / 0.03% + 0.02%F.S. / 0.03% + 0.02%F.S. *1	
	Source Range	± 20uA / ± 500uA / ± 20mA / ± 500mA / ± 2A	
	Source Accuracy	0.08% + 0.06%F.S. / 0.08% + 0.05%F.S. / 0.08% + 0.05%F.S. / 0.3% + 0.1%F.S. / 0.3% + 0.3%F.S. *1	
	Measurement Range	± 20uA / ± 500uA / ± 20mA / ± 500mA / ± 2A	
Measurement Accuracy	0.06% + 0.04%F.S. / 0.06% + 0.03%F.S. / 0.06% + 0.03%F.S. / 0.25% + 0.1%F.S. / 0.25% + 0.3%F.S. *1		
	<b>Optical Measurements</b>		
	Spectrometer	Wavelength Rang	350 ~ 780 nm
	Detector Pixels	2048 pixels	
Wp	Repeatability *2	± 0.5 nm	
Wd (380~780nm)	Repeatability *2	± 0.2 nm	
Radiant Flux (mW)	Repeatability *2	± 1%	
Operation Environment	Temperature	20° ~ 30°C	
	Humidity	40% ~ 70%	
<b>Facility Requirements</b>			
Power Requirement	800 VA		
Dimensions (W x D x H)	Electrical Test Module : 486 mm x 462 mm x 110 mm Optical Test Module : 486 mm x 475 mm x 110 mm		
Weight	15 kg		

**Note \*1** : Test condition is under point of sensing

**Note \*2** : The tested device is blue LED chip

## ORDERING INFORMATION

- 58173-TC** : LED Chip Level Tester
- Optical Fiber** : UV-VIS / 0.25m~2m / ψ100~600nm
- Optical Attenuation Module**
- Solar Cell Photo Detector (optional)**
- Integrating Sphere (2"~4") (optional)**
- Industrial Personal Computer**
- Four channels Switching Box**



The Chroma 58212-C features an automated LED wafer/chip probe tester, delivering fast and accurate LED measurements with test times less than 125ms \*1.

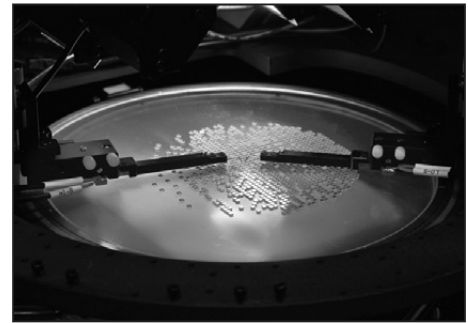
The system can be modified to support different LED structures including Lateral, Vertical, and Flip Chip designs. Integrated scanners provide autonomous wafer mapping to guarantee precision testing. The patented probe head prevents device scratches and ensures solid contact with every LED.

Chroma's unique design acquires and analyzes optical data such as the dominant wave length, peak wavelength, and CCT. Additionally, it provides essential electrical data such as forward voltage, leakage current, and reverse breakdown voltage, all in one test step.

The 58212-C includes a user-friendly graphical interface and advanced logic algorithms to

significantly increase production efficiency. Comprehensive statistical reports and analysis tools allow for easy control and mass production management.

**Note \*1 :** Test condition: under 300um sample pitch, 5 electrical test parameters and 1 optical parameter. Due to differences in LED characteristics, the measurement results may vary.



## KEY FEATURES

- High Speed and Accuracy
- Lateral, Vertical, and Flip Chip
- Wide Power Test Range (up to 200V/2A)
- Up to 8 inch Wafers
- Chroma® Huge Photo Detector
- Unique Edge Sensor
- Patented Probe Head
- Robust Z-Axis Stage
- Wafer Mapping Algorithm
- External Light Shielding Enclosure
- Analysis Tools and Statistical Reports

## HARDWARES

- Automatic LED Wafer/Chip Prober
- Electrical Test Module
- Optical Test Module
- Optional ESD Test Module

## TEST ITEMS

- Electrical Parameters:
  - Forward Voltage Measurement (Vf)
  - Reverse Breakdown Voltage Measurement(Vrb)
  - Reverse Leakage Current (I<sub>r</sub>)
  - SCR Detection
- Optical Parameters:
  - Optical Power (mw, lm, mcd)
  - Dominant Wavelength (Wd)
  - Peak Wavelength (Wp)
  - Full Width at Half Maximum (FWHM)
  - CIExy - CCT - CRI

## SPECIFICATIONS

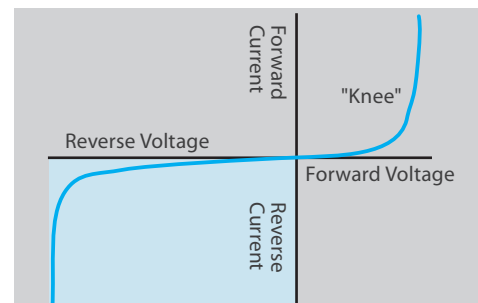
Model		58212-C
<b>Application</b>		
Test Area	ψ 8 inch wafer	
Supported Device (Chuck is device selected)	Chip on wafer : 2", 4", 6", 8" Chip on tape : 2", 4", 6"	
Chuck Type	Lateral type, Vertical type, and Flip Chip type (Select one of them)	
Die Size	7 ~ 120 mil	
Pad Size	≥ 70 μm	
<b>Electrical Parameter Measurements</b>		
Power Range	≤ 20W	
Voltage	Source Range	± 10V / ± 100V / ± 200V
	Source Accuracy	0.05% + 0.03%F.S. / 0.05% + 0.03%F.S. / 0.05% + 0.03%F.S. *2
	Measure Range	± 10V / ± 100V / ± 200V
	Measure Accuracy	0.03% + 0.02%F.S. / 0.03% + 0.02%F.S. / 0.03% + 0.02%F.S. *2
Current	Source Range	± 20uA / ± 500uA / ± 20mA / ± 500mA / ± 2A
	Source Accuracy	0.08% + 0.06%F.S. / 0.08% + 0.05%F.S. / 0.08% + 0.05%F.S. / 0.3% + 0.1%F.S. / 0.3% + 0.3%F.S *2
	Measure Range	± 20uA / ± 500uA / ± 20mA / ± 500mA / ± 2A
	Measure Accuracy	0.06% + 0.04%F.S. / 0.06% + 0.03%F.S. / 0.06% + 0.03%F.S. / 0.25% + 0.1%F.S. / 0.25% + 0.3%F.S. *1
<b>Optical Measurements</b>		
Spectrometer	Wavelength Rang	350 ~ 780 nm
	Wp Repeatability	± 0.5 nm
	Wd Repeatability (380~780nm)	± 0.3 nm
Optical Power	Repeatability	± 1%
Operation	Temperature	20° ~ 30°C
Environment	Humidity	40% ~ 70%
<b>Facility Requirements</b>		
Machine Dimension	980 mmx1160mmx1500 mm (does not include monitor and signal)	
Power Requirement	Single phase, 220VAC ± 10%, 50/60Hz, 20A	
Input Air	-0.2 Mpa / ψ 6 mm	
Weight	750 kg	

**Note \*1 :** Test condition is under point of sensing

**Note \*2 :** The tested device is blue LED chip

## ORDERING INFORMATION

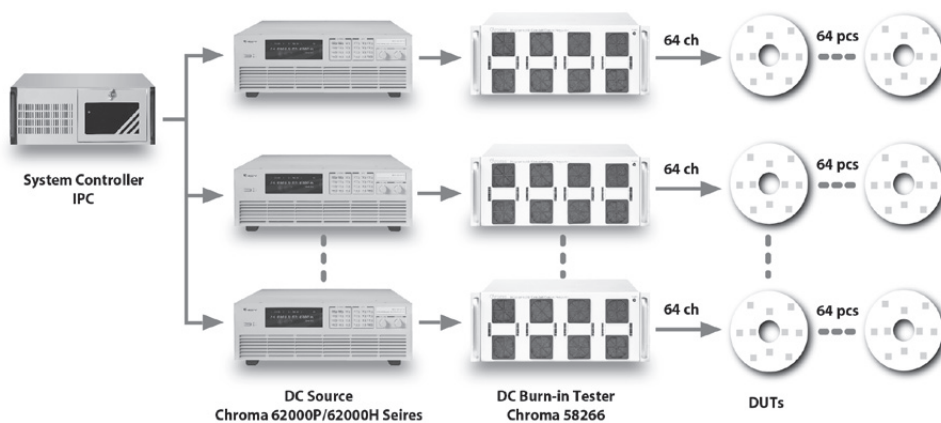
**58212-C :** LED Mapping Probe Tester



LED I-V curve



All specifications are subject to change without notice.



## KEY FEATURES

- Flexible channels output: 32/64/128 channels
- Each channel can offer up to 500mA /400V
- Each channel can parallel connection for high current requirement. Ex: 2-ch: 1A, 4-ch: 2A
- High accuracy of current output and voltage measurement

## SYSTEM ARCHITECTURE

- DUT: single LED, LED array, LED light bar or LED module
- Support channels: 64 ch
- Force Current: Max. 500mA per-channel
- Support parallel connection: Ex: 2-ch: 1A
- Voltage measurement: Max. 400V

Chroma 58266 is a LED Burn-in Tester that each channel can offer a constant current up to 500mA but also has 0~400V voltage measurement function. For product application, various programmable power supplies can be applied for multi-channel constant current output and voltage measurement. The user can integrate several power supplies based on the demands of channels and current for multi-channel test.

## CONFIGURATION

Programmable DC Power Supply	LED Burn-in Tester	Force I range	Measure V Range
Model 62012P-40-12 40V/120A/1200W	Model 58266	500mA	30V
		400mA	35V
Model 62012P-100-50 100V/50A/1200W	Model 58266	500mA	32V
		170mA	95V
Model 62024P-80-60 80V/60A/2400W	Model 58266	500mA	70V
		440mA	75V
Model 62024P-100-50 100V/50A/2400W	Model 58266	500mA	70V
		350mA	95V
Model 62024P-600-8 600V/8A/2400W	Model 58266	110mA	300V
		80mA	400V
Model 62050P-100-100 100V/100A/5000W	Model 58266	500mA	95V
Model 62050H-450 450V/34A/15KW (380V/3 Φ 4W)	Model 58266	500mA	400V

## SPECIFICATIONS

Model	58266			
Voltage Accuracy (23°C ± 5°C)				
Range	0~4V	0~40V	0~400V	
Default Measurement Resolution	1mV	10mV	100mV	
Measure Accuracy ± (%rdg. + offset)	0.2%+5mV	0.2%+50mV	0.3%+500mV	
Current Accuracy (23°C ± 5°C)				
Range	10 μA	1mA	100mA	500mA
Programming Resolution	5nA	500nA	50 μA	200 μA
Source Accuracy ± (%rdg. + offset)	0.1%+20nA	0.1%+300nA	0.1%+200 μA	0.2%+1mA
Temperature Coefficient	10~18°C & 28~50°C ±(0.5 × accuracy specification)/°C			
Max. Voltage Difference of all Channel	10V @ 500mA 50V @ 100mA 100V @ 50mA			
Operation Environment	Temperature : 10~50°C Humidity : 10~70%RH			
Storage Environment	Temperature : -20~70°C Humidity : 5~95%RH			

## ORDERING INFORMATION

**58266** : LED Burn-in Tester



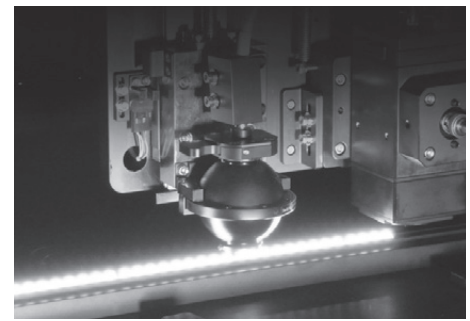


### KEY FEATURES

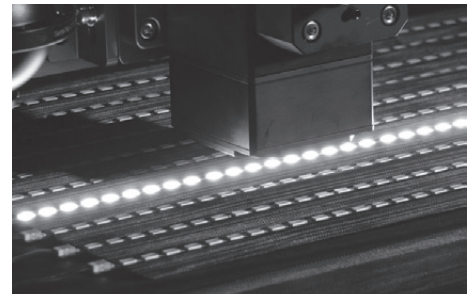
- Measure the top-view/side-view light bar uniformity composed of white light
- Equipped with image recognition function to capture the LED location accurately
- Excellent optical performance
- ESD damaged sorting function
- FPC/PCB light bar adaptability

Chroma 58182 LED Light Bar Test System is a fully automatic test system able to measure the top-view/side-view light bar uniformity composed of white light. With image recognition function, it can accurately capture the location of LED and identify the center of LED under the measurement. With automatic mechanical and optical measurement function, the 58182 can perform extremely accurate optical and electrical measurement.

The 58182 integrates image recognition function, automatic mechanical and optical measurement. It can not only improve the yield rate by sifting out the defect products, but also reduce the product verification time and development cost. In addition, the 58182 has a flexible measurement platform to adapt different type of top-view / side-view LED light bar measurement, and friendly user interface to reduce user's learning time. Consequently, the 58182 is the best choice for testing top-view/side-view light bar.



CIE127 Partial Flux Measurement Module



CIE127 Condition B measurement Module

### ORDERING INFORMATION

**58182** : Top-view LED Light Bar Test System

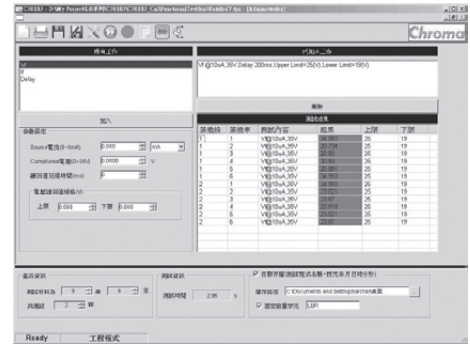
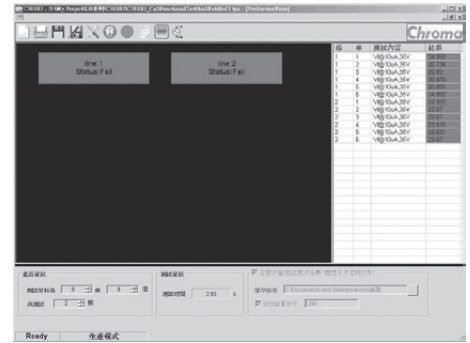
SPECIFICATIONS				
Model		58182		
Optical Module		CIE 127 condition B optical tube or Partial flux measurement module		
Average Intensive (mcd)	Range	100~10000mcd		
	Accuracy	± 5%		
	Repeatability	± 2%		
CIE x, y	Accuracy	± 0.004		
	Repeatability	± 0.002		
Spectrometer	Wavelength Range	380~780nm		
	Optical resolution	2nm		
	A/D	16 bits		
Light Bar length		600mm		
Offer Channels		20 X 12 Ch		
Power Supply	Voltage	0~200V	0~60V	0~300V
	Current	10uA~5mA	1mA~2A	40mA~2A
	Voltage accuracy	0.3%+0.1%F.S	0.01%+10mV	0.05%+0.05%F.S
	Current accuracy	0.3%+0.1%F.S	0.01%+1mA	0.03%+40mA
Data output	Format	Excel (*.csv)		
	Output items	mcd, CIEx, CIEy		
XY moving range		600x250mm		
Dimension		1300 (D) × 2360 (W) × 1815 (H)mm		



Chroma 58183 is a PC base test system for LED light bar electrical test. In hardware design, Chroma 58183 not only offers an accurately current (10uA~5mA) to test LED electrical features but also can integrate an extra high power supply for high current test. Otherwise, Chroma 58183 offers multi-channels test function. It is widely used in many application. In LED light bar manufactory, 58183 can test more 10 pieces Light bar at the one time. In LED backlight manufactory, 58183 can test 4 pieces LED backlight via a 4 channels control box. To sum up, 58183 is a very strong and powerful tool for LED light bar and LED backlight manufactories.

### KEY FEATURES

- Integrating customer's extened power supply
- PC base design
- Support multi- channels test
- Using general DUT adapter to offer test application widely
- Software support authority management



### ORDERING INFORMATION

**58183 : LED Light Bar Electrical Test System**

SPECIFICATIONS	
<b>Model</b>	<b>58183</b>
<b>Voltage</b>	
Output Range	10V / 100V / 200V
Source Accuracy *1	0.05% + 0.03% F.S
Measure Accuracy *1	0.03% + 0.02% F.S
<b>Current</b>	
Output Range	20uA/500uA/20mA/500mA
Source Accuracy *1	0.1% + 0.1% F.S
Measure Accuracy *1	0.1% + 0.1% F.S
Applicative Type	Top/side-view LED light bar
Dimensions	IPC : 451 x 426.5 x 177 Relay Box : 276 x 430 x102 Chroma 58221 : 432 x 432 x 110 (D x W x H mm)
Weights	Total 27 Kg (IPC 12Kg, Relay Box 5Kg, Chroma 58221-200-2 10Kg)
<b>Relay Box (Not in live wire)</b>	
	Ch1~24
	Ch25~32
Switch voltage	200VDC
Carry current	300mA
Life expectancy of mechanical	10 <sup>^</sup> 6
<b>Power IN</b>	
IPC, Chroma 58221-200-2	90-240VAC
Relay Box	110 / 220V,50~60Hz, 2A
<b>Others</b>	
General purpose relay	32 Channels
Operation environment	Temperature:10~40°C Humidity:10%~70%



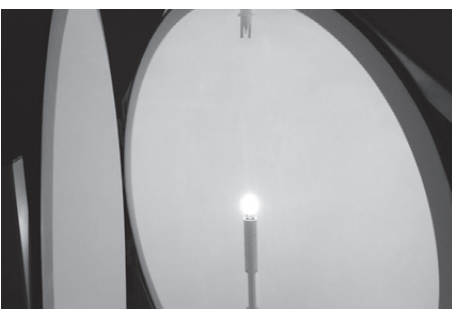
## For Laboratory

### KEY FEATURES

- Simulate the real AC test condition and environment
- Integrate AC, DC, and optical features test to one platform
- Support DC test for AC LED
- Support dual-optical test module in one platform (Integrating sphere or average intensity) (optional)
- Support AC /DC LIV Analysis
- Offer standard light source for calibration

Chroma 58158 LED Lighting Test System, compliances the AC LED Device National Standard, has integrated Chroma's Power Electronics Test Equipment - Programmable AC Power Source and Digital Power Meter to offer users a real AC environment for measuring AC LED.

Furthermore, the 58158 also integrates Chroma DC Power Supplies with the flexible optical test platform which equips with integrating sphere, photo detector, and etc.. Users can measure optical and electrical parameters of AC/DC LED through a friendly software interface.



For Laboratory Test

SPECIFICATIONS (50 cm Integrating Sphere)		
<b>Model</b>	<b>58158</b>	
<b>Measurement Items</b>		
Optical Measurement Items	Lumens (lm), CIE(x,y), CIE(u',v'), CCT, CRI	
Electrical Measurement Items	Frequency, Real power P, power factor PF, THD (Option), Vf (Option)	
<b>Optical Measurement</b>		
Photo Detector	Wavelength Range	380~780nm
	Lumens Range *1	<5,000 lm (>5K lm optional)
Spectrometer	Detector Type	2048 Pixels Linear CCD array (optional)
	Optical Fiber Connector	SMA 905
Lumen accuracy	± 5%	
CIExy accuracy	± 0.004	
Lumen Repeatability *2	± 0.5%	
CIExy Repeatability *2	± 0.005	
<b>Electrical AC Source</b>		
Output Rating-AC	500VA	
Voltage	Range/Phase	150V/300V/Auto
	Accuracy	0.2%+0.2%F.S.
	Resolution	0.1V
	Line Regulation	0.10%
	Load Regulation	0.20%
Max.Current / Phase	RMS	4A/2A (150V/300V)
	peak	24A/12A (150V/300V)
<b>Electrical AC Meter</b>		
Power	Range (W)	1.5W~1KW (Model 66201) ; 1.5W~10KW (Model 66202)
	Power Factor Accuracy *3	0.006+(0.003/PF)KHz
Harmonic	Range	2~50 order
<b>DC Measurement (Optional)</b>		
DC Power Supply	Output Voltage	0~64V (> 64V optional)
	Output Current	0~3A (> 3A Optional)
	Ripple and Noise	1400 uVrms & 14 mVp-p / < 1mA
	Line Regulation	0.01% +4mV / 0.01% + 300 μ A
	Load Regulation	< 6mV / 0.01% + 300 μ A
	Program Accuracy	0.02% + 10mV / 0.01%+1mA
	Read back Accuracy	0.02% + 10mV / 0.01%+1mA
<b>Others</b>		
Dimension (H x W x D)	1081 x 532 x 700 mm	
Weight	100k g	
Power Consumption	300 W	
Operating	100~240V VAC 50/60HZ	
<b>Software Support DC Source</b>		
Chroma 6200P-300-8, Chroma 11200 (650V), Chroma 11200 (800V), Keithley 24XX Series		

**Notes \*1:** 20 inch Integrating Sphere

**Notes \*2:** The unit under test is 10W halogen lamp

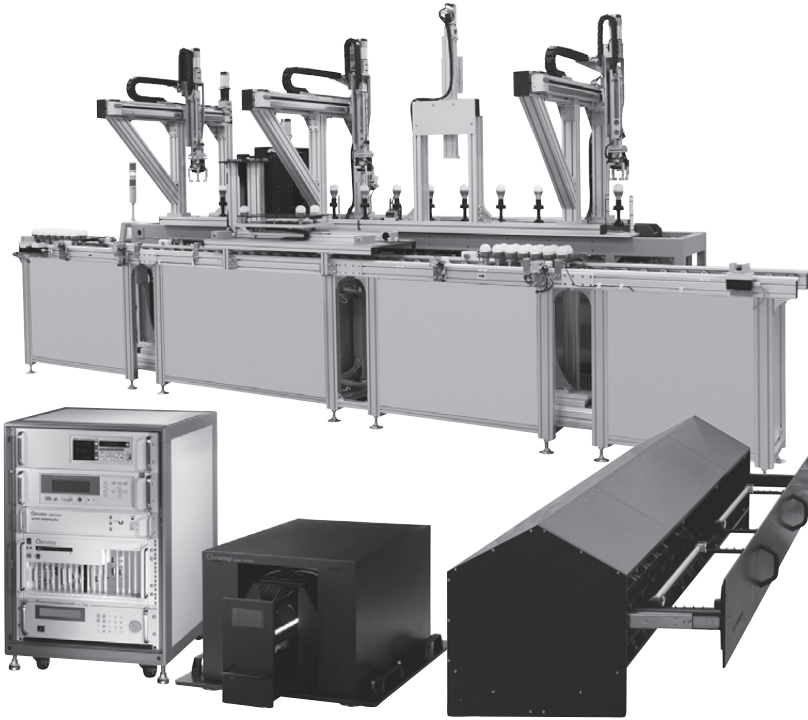
**Notes \*3:** The PF spec. applies only when the signals are higher then 50% of the selected voltage and current ranges

### ORDERING INFORMATION

**58158 :** LED Luminaires Test System (for laboratory Test)

Integrating sphere	50cm	1m	2m
Luminaire	small lamp, bulb, MR-16	middle lamp, 2 feet T8/T5 tube	large lamp, 4 feet T8/T5 tube, street light
Application	laboratory	laboratory	laboratory

**Note :** Customization for 3m integrating sphere



Test Instruments

Solar Cell Modules

The design concept of Chroma LED high speed measurement module is to combine several large size detectors and add up the luminous flux obtained by each detector to calculate the total flux of LED light. This design not only overcomes the shortcoming of previous inconvenient measurement for total flux by conventional integrating sphere, it also implements the inline test on production line. Chroma is able to provide the customer a fully automatic production line that covers both quality and productivity.

### TEST ITEMS

- Optical Power characteristics :  
Lm, lm/w, LED operating frequency (Flicker)
- Color characteristics :  
CIExy, Duv, CIEu'v', CCT, CRI
- Power characteristics :  
AC mode : Power factor (PF), Irms, Vrms, THD  
DC mode : Forward voltage

### ORDERING INFORMATION

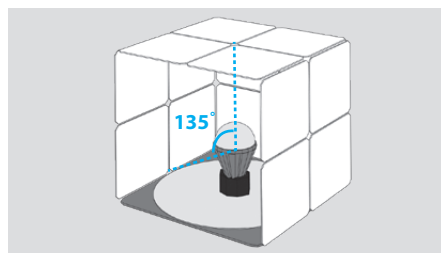
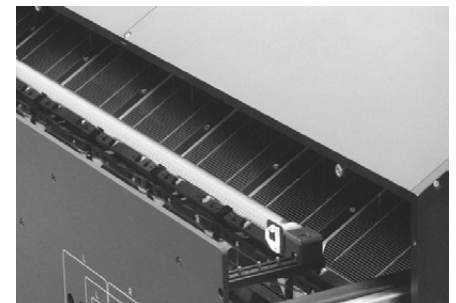
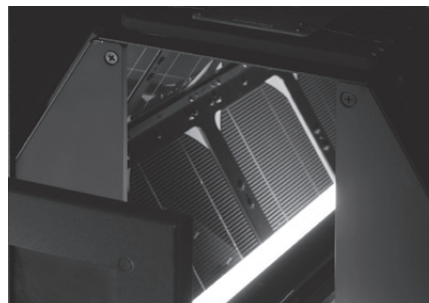
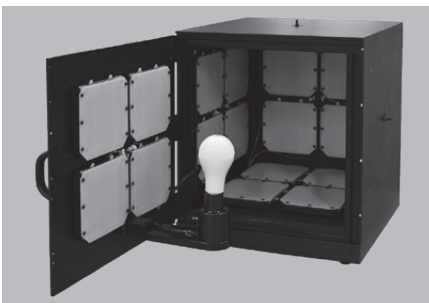
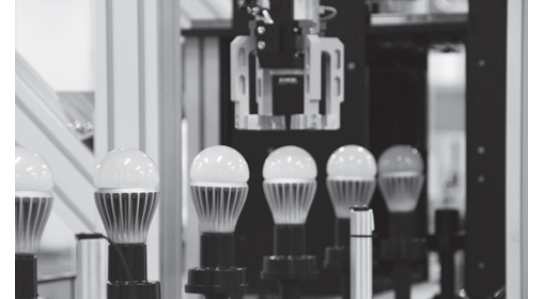
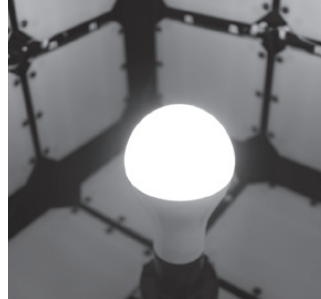
**58158-SC** : LED Luminaires In-line Test System \*

\*Call for customized availability

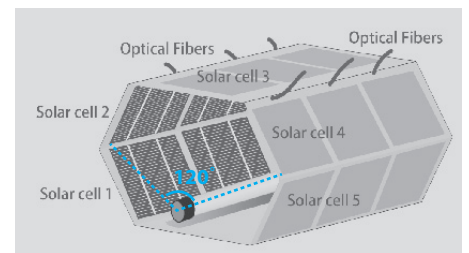
## For Production

### KEY FEATURES

- Mass production application: LED lamp, LED bulb, LED bar, LED streetlight, and other luminaries
- Less error comparing to integrating sphere measurement
- High speed test and flicker measurement
- Provide standard light source for calibration which is international standard traceable
- Thermal control fixture adaptable (option)



Solar Cell Module for Omnidirectional lamp



Solar Cell Module for JEL 801 LED Tube

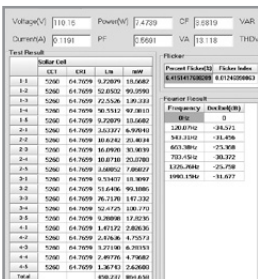


SPECIFICATIONS		
<b>Model</b>	<b>58158-SC</b>	
<b>Measurement Items</b>		
Optical Measurement Items	Lumens (lm), CIE(x,y), CIE(u',v'), CCT, CRI	
Electrical Measurement Items	Frequency, Real power P, power factor PF, THD (Option), Vf (Option)	
<b>Optical Measurement</b>		
Photo Detector	Wavelength Range	380~780nm
	Lumens Range	<5,000 lm (>5K lm optional)
Spectrometer	Detector Type	2048 Pixels Linear CCD array
	Optical Fiber Connector	SMA 905
Lumen measurement Repeatability		± 0.5%
CIExy Repeatability *1		± 0.0005
CCT Repeatability		± 5K
CRI Repeatability		± 1
<b>Electrical AC Source</b>		
Output Rating-AC		500VA
Voltage	Range/Phase	150V/300V/Auto
	Accuracy	0.2%+0.2%F.S.
	Resolution	0.1V
	Line Regulation	0.10%
	Load Regulation	0.20%
Max.Current / Phase	RMS	4A/2A (150V/300V)
	peak	24A/12A (150V/300V)
<b>Electrical AC Meter</b>		
Power	Range (W)	1.5W~1KW (Model 66201) ; 1.5W~10KW (Model 66202)
	Power Factor Accuracy *2	0.006+(0.003/PF)KHz
Harmonic	Range	2~50 order
<b>DC Measurement (Optional)</b>		
DC Power Supply	Output Voltage	0~64V (> 64V optional)
	Output Current	0~3A (> 3A Optional)
	Ripple and Noise	1400 uVrms & 14 mVp-p / < 1mA
	Line Regulation	0.01% +4mV / 0.01% + 300 μA
	Load Regulation	< 6mV / 0.01% + 300 μA
	Program Accuracy	0.02% + 10mV / 0.01%+1mA
	Read back Accuracy	0.02% + 10mV / 0.01%+1mA
<b>Others</b>		
Dimension (H x W x D)	1081 x 532 x 700 mm	
Weight	100k g	
Power Consumption	300 W	
Operating	100~240V VAC 50/60HZ	
<b>Software Support DC Source</b>		
Chroma 58221-200-2, Chroma 6200P-300-8, Chroma 11200 (650V), Chroma 11200 (800V), Keithley 24XX Series		

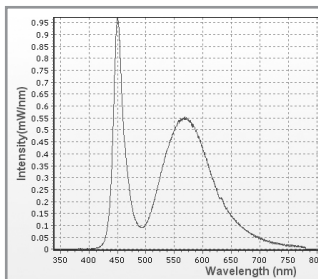
**Notes \*1 :** The unit under test is 10W halogen lamp

**Notes \*2 :** The PF spec. applies only when the signals are higher then 50% of the selected voltage and current ranges

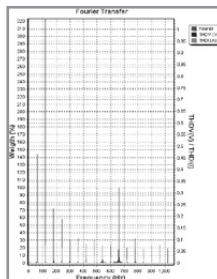
## Analysis Tools



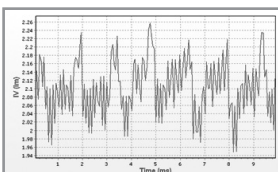
**Power Analysis :**  
Im, Im/W, PF, Power



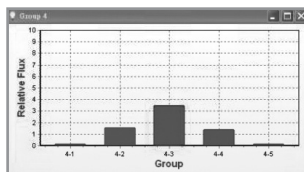
**LED Spectrum Analysis :**  
CCT, CRI, Duv



**THD Analysis**



**Flicker Analysis**



**Flicker Analysis**

<b>TO-CAN/CoC Burn In System</b>	<b>7-1</b>
<b>Laser Diode Characterization System</b>	<b>7-5</b>
<b>TOSA/BOSA Temperature Control System</b>	<b>7-7</b>
<b>TO-CAN Package Inspection System</b>	<b>7-9</b>



**TO-CAN/CoC Burn In System**



**Laser Diode Characterization System**



**TOSA/BOSA Temperature Control System**



**TO-CAN Package Inspection System**



Half height rack

### KEY FEATURES

- For Burn-In, Reliability and Life Testing
- Up to 128 laser diodes per module
- Up to 10 modules (1280 laser diodes) per systems
- ACC and APC control modes
- Individual channel driving and measurement
- Driving current 500 mA per channel and up
- Precise temperature control up to 120 °C
- Individual module operation
- Customization for device form factor upon request

### Burn-in, Reliability & Life Test

The Chroma 58603 is a high density, multifunction, and temperature controlled module for laser diode burn-in and lifetime tests. Each module has up to 128 discrete channels which can source current and measure voltage in various control modes as described below.

### Auto Current Control Mode (ACC)

In auto current control (ACC) mode, the control circuit will provide the preset current to each laser diode with high stability. No matter how the device resistance and temperature change, the current will be kept constant over the test period. The device voltage will be recorded as a quality reference parameter.

### Auto Power Control Mode (APC)

With feedback signal from the optional external Photo Diode PCB, the control circuit can adjust the laser diode current automatically to keep constant feedback signal strength, which means the optical output of the laser diode is maintained constant over the test period. The device voltage and current are recorded as quality parameters for reference.

### Temperature Control

A proprietary designed heat plat will control the laser diode case temperature with high accuracy, excellent stability, and good uniformity. Compared with oven or chamber types of laser diode burn-in systems, our solution is much more compact, easier to operate, better performance, and energy saving. Customers gain benefit for small footprint, versatile usage, and easy maintenance.

### Individual Module Operation

Modules are mounted in a 19" rack to form a system. Each module is a 3U height drawer to fit in the rack. Customers can set different modules in different temperatures, operated in different control modes, and with different start and stop times. This provides great flexibility in operation.

### Protection and Individual Channel Shutdown

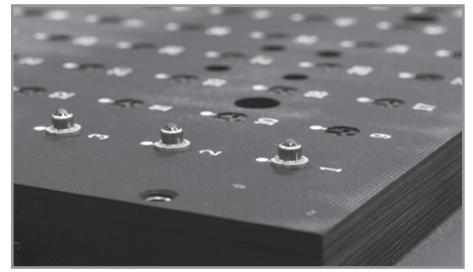
The control circuit is specially designed for protecting laser diodes. No rush current or voltage will occur to hurt the devices. High/Low limits of current and voltage can be set to perform shutdown protection. When abnormality happens, only the particular channel will be shutdown while others are running normally. Besides the protection functions implemented in the control circuit, isolation and ESD protection are also taken care in system design.

### Auto Data Recovery after Communication Interruption

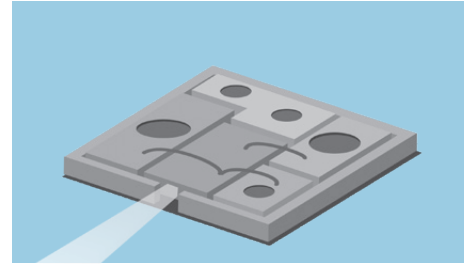
The burn-in data are stored in system PC and optional remote servers. If the communication between the module and PC is broken temporarily, the data will be buffered in the module up to 8 hours or even longer. After the communication is restored, the buffered data will be dumped to the PC/server without loss.

### User Friendly Softpanel

The soft panel provides an intuitive visual interface that one can check certain device at certain module with some simple mouse-clicks anytime during the tests. The burn-in raw data are stored in Microsoft Excel compatible format for further analyses. Optional barcode system can be cooperated for test management.



TO-CAN carrier



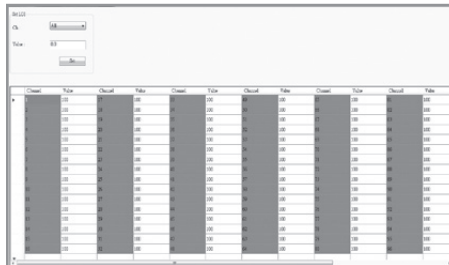
CoC carrier



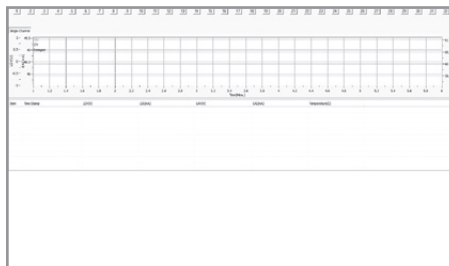
CoC carrier



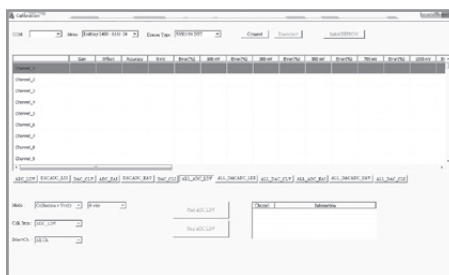
Optical module



Flexible to choose condition



Comprehensive test data



Full height rack



SPECIFICATIONS		
<b>Model</b>		<b>58603</b>
<b>Module</b>		
Channel Number	up to 128	
Laser Diode Type	TO-46, TO-56, CoC, CoS	
Test Function	ACC, APC (optional)	
Burn-in Record Time	1 min to 5000 hours	
Communication Port	RS232	
Change Kit	DUT carrier board	
<b>Auto Current Control Mode</b>		
Current Range	0~500 mA <sup>*1</sup>	
Current Setting Resolution	0.02 mA	
Current Accuracy	1%+1mA	
Compliant Voltage	4 V	
Voltage Measurement Range	4 V	
Voltage Measurement Resolution	200uV	
Voltage Measurement Accuracy	1%+10mV	
<b>Auto Power Control Mode (Optional)</b>		
External PD type	Si or InGaAs <sup>*2</sup>	
Wavelength Range	390 to 1700 nm	
PD Current Stability	1%	
LD Current Range	0~500 mA	
LD Current Measurement Accuracy	1%+1mA	
LD Compliant Voltage	4 V	
LD Voltage Measurement Accuracy	1% + 10mV	
<b>Temperature Control</b>		
Temperature Measuring Range	0~150 °C	
Temperature Setting Range	40~120 °C	
Temperature Setting/Reading Resolution	0.1 °C	
Temperature Stability	0.2 °C	
Temperature Accuracy	1 °C	
Temperature Uniformity	±(1 °C + 1.2% ΔT)	
<b>System</b>		
Configuration	23" rack, half or full height	
Number of Modules	up to 10 (For full height rack)	
DUTs per system	up to 1280 (For full height rack)	
CommunicationPort	Ethernet to server	
Dimensions (H x W x D)	Half height rack , 3 modules	1600 x 600 x 900 mm
	Full height rack , 10 modules	2000 x 600 x 900 mm
Weights	Half height rack , 3 modules	230kg
	Full height rack , 10 modules	500kg
Power Requirements	Half height rack , 3 modules	AC 220V ± 10%, 50/60Hz, 11.4A, 2.5KW
	Full height rack , 10 modules	AC 220V ± 10%, 50/60Hz, 20A, 4.4KW
Environment Temperature	20~30°C	
Humidity	<80% RH, non-condensing	

**Note \*1** : Can be customized for other specifications

**Note \*2** : Wavelength dependent, customized PD types upon request

**Note \*3** : Thermal platform temperature without DUT loading,  $\Delta T = | \text{ambient temperature} - \text{setting temperature} |$

## ORDERING INFORMATION

**58603** : TO-CAN/CoC Burn In System



### KEY FEATURES

- Applicable for burn-in, reliability and life testing
- ACC and APC control modes
- Individual channel driving and measurement
- Driving current 500 mA per channel and up
- Precise temperature control up to 125 °C
- Individual module operation

### Burn-in, Reliability & Life Test

The Chroma 58604 is a high density, multifunction, and temperature controlled module for laser diode burn-in and lifetime tests. Each module has up to 256 SMU channels which can source current and measure voltage in various control modes as described below.

### Auto Current Control Mode (ACC)

In auto current control (ACC) mode, the control circuit will provide the preset current to each laser diode with high stability. No matter how the device resistance and temperature change, the current will be kept constant over the test period. The device voltage will be recorded as a quality reference parameter.

### Auto Power Control Mode (APC)

With feedback signal from the optional external Photo Diode PCB, the control circuit can adjust the laser diode current automatically to keep constant feedback signal strength, which means the optical output of the laser diode is maintained constant over the test period. The device voltage and current are recorded as quality parameters for reference.

### Temperature Control

A proprietary designed heat plat will control the laser diode case temperature with high accuracy, excellent stability, and good uniformity. Compared with oven or chamber types of laser diode burn-in systems, our solution is much more compact, easier to operate, better performance, and energy saving. Customers gain benefit for small footprint, versatile usage, and easy maintenance.

### Individual Module Operation

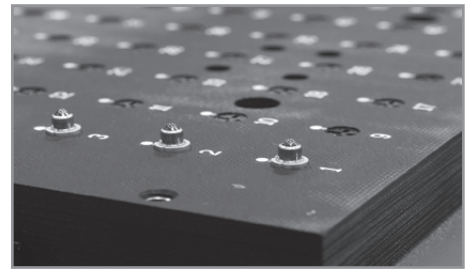
Customers can set different modules in different temperatures, operated in different control modes, and with different start and stop times. This provides great flexibility in operation.

### Protection and Individual Channel Shutdown

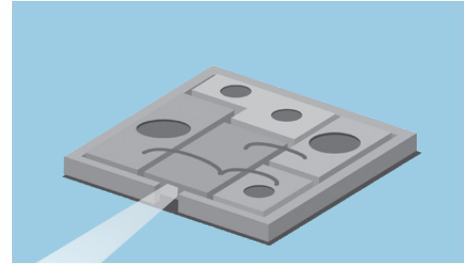
The control circuit is specially designed for protecting laser diodes. No rush current or voltage will occur to hurt the devices. High/Low limits of current and voltage can be set to perform shutdown protection. When abnormality happens, only the particular channel will be shutdown while others are running normally. Besides the protection functions implemented in the control circuit, isolation and ESD protection are also taken care in system design.

### Auto Data Recovery after Communication Interruption

The burn-in data are stored in system PC and optional remote servers. If the communication between the module and PC is broken temporarily, the data will be buffered in the module up to 6 hours or even longer. After the communication is restored, the buffered data will be dumped to the PC/server without loss.



TO-CAN carrier



CoC carrier



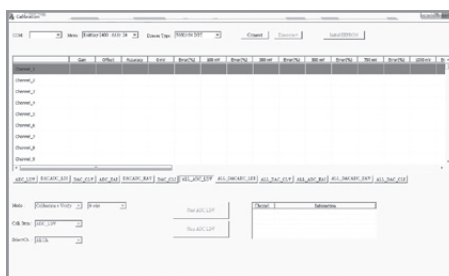
Test Fixture

Channel	Type	Current	Voltage	Time
1	ACC	100.00	1.20	00:00:00
2	ACC	100.00	1.20	00:00:00
3	ACC	100.00	1.20	00:00:00
4	ACC	100.00	1.20	00:00:00
5	ACC	100.00	1.20	00:00:00
6	ACC	100.00	1.20	00:00:00
7	ACC	100.00	1.20	00:00:00
8	ACC	100.00	1.20	00:00:00
9	ACC	100.00	1.20	00:00:00
10	ACC	100.00	1.20	00:00:00

Flexible to choose condition

Channel	Type	Current	Voltage	Time	Temp	Power	Resistance
101	ACC	100.00	1.20	00:00:00	25.00	120.00	1.20
102	ACC	100.00	1.20	00:00:00	25.00	120.00	1.20
103	ACC	100.00	1.20	00:00:00	25.00	120.00	1.20
104	ACC	100.00	1.20	00:00:00	25.00	120.00	1.20
105	ACC	100.00	1.20	00:00:00	25.00	120.00	1.20
106	ACC	100.00	1.20	00:00:00	25.00	120.00	1.20
107	ACC	100.00	1.20	00:00:00	25.00	120.00	1.20
108	ACC	100.00	1.20	00:00:00	25.00	120.00	1.20
109	ACC	100.00	1.20	00:00:00	25.00	120.00	1.20
110	ACC	100.00	1.20	00:00:00	25.00	120.00	1.20

Comprehensive test data



GUI calibration interface

SPECIFICATIONS	
<b>Model</b>	<b>58604</b>
<b>SMU Module</b>	
Channel Number	up to 256
Laser Diode Type	TO-46, TO-56, CoC
Test Function	ACC (standard) APC, LIV (optional)
Burn-in Record Time	1 min to 5000 hours
<b>Auto Current Control Mode</b>	
Current Range	± 500 mA
Current Accuracy	0.2% F.S.
Compliant Voltage	± 7 V
Voltage Measurement Range	± 7 V
Voltage Measurement Accuracy	0.2% F.S.
<b>Auto Power Control Mode (Optional)</b>	
External PD type	Si or InGaAs *1
Wavelength Range	400 ~ 1600 nm *1
LD Current Range	± 500 mA
LD Current Measurement Accuracy	0.2% F.S.
LD Compliant Voltage	± 7V
LD Voltage Measurement Accuracy	0.2% F.S.
<b>Temperature Control</b>	
Temperature Measuring Range	Ambient ~ 125 °C
Temperature Setting Range	45~125 °C
Temperature Setting/Reading Resolution	0.1 °C
Temperature Stability *3	1 °C
Temperature Uniformity	± (1 °C + 1.2% Δ T) *2
<b>System</b>	
CommunicationPort	Ethernet to server
Dimensions (D x W x H)	1,300 mm x 900 mm x 1,900 mm
Weights	500 ± 50 kg
Power Requirements	187 ~ 250 Vac (3 Phase 4 Wire, Δ Connection ) or 323 ~ 437 Vac (3 Phase 5 Wire, Y Connection) / 45 ~ 65 Hz
Environment Temperature	20~30 °C
Humidity	<80% RH, non-condensing
Compressed Air	5 kgf/cm <sup>3</sup> , 30 L/min.; 0.5 Mpa

**Note \*1** : Wavelength dependent, customized PD types upon request

**Note \*2** : Thermal platform temperature without DUT loading,  $\Delta T = | \text{ambient temperature} - \text{setting temperature} |$

**Note \*3** : 1 °C = (Max T - Min T) within 48 hrs burn-in time

#### ORDERING INFORMATION

**58604** : TO-CAN/CoC Burn In System



### KEY FEATURES

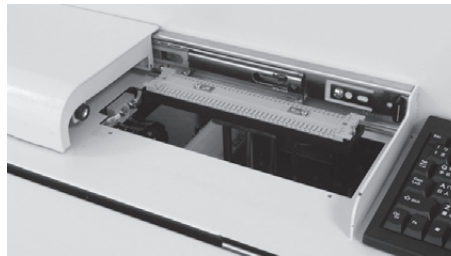
- Full turnkey automated test for edge-emitting laser diodes
- High precision and large capacity carrier, interchangeable with other automated equipment
- Fully automated alignment for fiber-coupled tests
- Automated optical inspection to decrease mechanical positioning delays
- Highly accurate TEC temperature controller with stability up to  $\pm 0.01^\circ\text{C}$
- PXI-Based SMU and power meter for fast test times
- Full suite of software analysis tools for laser diode characterization (Ith, Rs, Vf, slope efficiency,  $\lambda_p$ , and etc.)

Laser Diodes are becoming more ubiquitous. Current applications range from medical and defense, to being the critical backbone of the world's fiber optic communication networks. There are several highly precise processes involved in the production of Laser Diodes. These processes are all quite cost intensive ranging from wafer growth all the way to fibre alignment and package high speed testing.

The Chroma 58620 Laser Diode Characterization Station is a state-of-the-art full turnkey system designed specifically for Laser Diodes. Its features range from macro inspection of the facet or aperture active area to a full suite of electro-optical parametric tests. When Chroma's high capacity carrier is used, multiple devices can be rapidly repeatably indexed improving not only test times but the reliability of the tests themselves. The Chroma 58620 is equipped with a highly stable, large scale, temperature control platform to provide the ability to incorporate R&D style tests in a production environment. This enables the ability to study correlation between laser diode forward current and temperature.

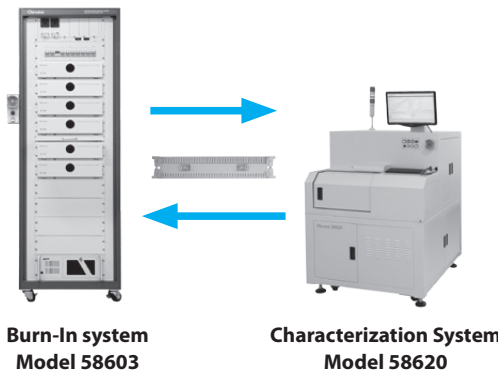
### Ultra-precise Carrier Design

Chroma's high precision carriers can be adapted to suit multiple form factors such as Chip on Carrier, Submounts, or Laser-Bar's. The innovative bi-lateral design is symmetrical with components placed on both sides to allow for a larger volume of components. The carrier is multi-layered to allow for components to be easily placed in their respective pockets yet secured once the other layers are mounted. The thermal interface structure allows for efficient component thermal contact along with a high degree of temperature control during heating and cooling cycles. At the touch of a button, an operator can perform full-scale automated testing once a carrier has been inserted.



### Customized & Sharing Carrier

From developed technology in Semiconductor IC test technology, Chroma 58620 introduces batch processing through the sharing carrier and changing kit to the Laser Diode industry. The carrier protects the laser diode from being handled and damaged as it is processed as test lots through the burn-in and test process while providing the hooks for data tracking thus increasing both productivity and yields. This same carrier is designed to operate with the Chroma 58603 Optoelectronic SMU Module for seamless burn-in & test processing. Through a 58620 change kit, as the laser diode under test changes (by evolving design or new product), the systems can adapt to various form factors and features. This flexibility allows for one solution to potentially test TO-Can, Chip on Carrier, Laser-bar, etc.

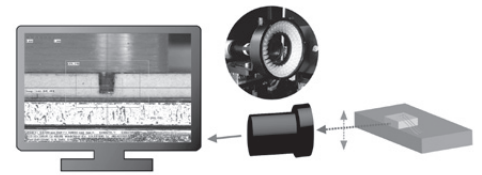


**Burn-In system  
Model 58603**

**Characterization System  
Model 58620**

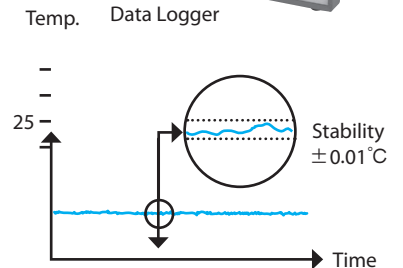
### Auto-alignment Fiber with AOI Assistance

One of the primary uses of high performance laser diodes are in the fields of optical data and telecommunications where the requirements for fiber coupling are quite stringent. If most DC parametric and optical characteristics are understood before a laser diode is inserted into the final product there is a greater cost savings and higher degree of in-field reliability. The Chroma 58620 is equipped with a fully automated alignment station to simulate a real-world fiber package coupling test to predict coupling efficiencies and spectral performance. Multiple optical heads and fibers may be used and coupled to an optical receiver such as an Optical Spectrum Analyzer (OSA) to analyze full spectral characteristics such as Side Mode Suppression Ratio and Center Wavelength ( $\lambda_p$ ,  $\lambda_c$ ). Since every device is traceable with data, the Chroma 58620 affords the ability to correlate unpackaged optical performance with final package performance and helps in justifying a reduced final package test requirement.



### High Precision Control Platform

External and Internally induced thermal stresses on Laser Diodes strongly influence spectral and other electro-optical characteristics. Due to these issues, the Chroma 58620 includes a temperature control platform using a high precision Chroma 54130 - 300W TEC Controller and a Chroma 51101 Data Logger. These are highly regarded as world class instruments to ensure the uniformity of the carrier temperature and hence the devices under test. There are several thermal sensors placed along the carrier platform to ensure both a high degree of temperature uniformity and stability.

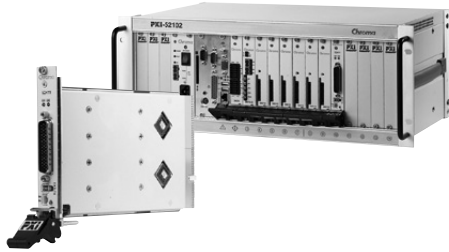


**TEC Controller**



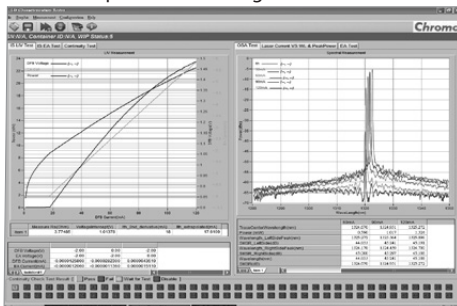
## PXI Test Platform

Chroma's PXI Turnkey Test Solutions product offers an open and flexible platform that can be rapidly integrated into production. High performance test instruments such as Chroma 52400-Series High Precision Source Measure Unit (SMU) along with the Chroma 52961 Optical Power Meter (with various wavelength detectors) can perform an ultra-fast current source and detection sweep with a high dynamic range (80dB) for testing various Laser Diode demonstrating a wide range of output power and irradiance characteristics.



## Friendly and Flexible User Interface

The Chroma 58620 is equipped with a completed Graphical User Interface (GUI) which includes recipe generation, test execution, and data management. There are checks and balances to ensure correct part placement in the carrier such as enabling the user to photograph every device and provide an ability to adjust before testing begins, saving time. Recipe generation enables the user to create test plans for an entire carrier down to the device level. Test execution provides the user with an in-depth window into the performance of every DUT from tabular opto-electronic parameters to graphical curves of spectral magnitude or any combination thereof. Depending on how test limits are managed, the Chroma 58620 can be a dumb data gathering tool with no pass/fail criteria or provide the user with an accurate picture of final test yield. Once tests are performed, Data Management is extremely flexible ranging from viewing on the tester itself to remote database and the file storage systems for cross-enterprise data sharing.



Flexible User Interface

## ORDERING INFORMATION

**58620** : Laser Diode Characterization System

SPECIFICATIONS	
<b>Model</b>	<b>58620</b>
<b>Device Under Test</b>	
Form Factor	CoC, CoS
Channels in Carrier	80 Channels per cycle *1
<b>Current Ranges (Chroma Model 52401)</b>	
Current Range (Source & Measurement)	± 200nA / 2µA / 20µA / 200µA / 2mA / 20mA / 200mA
Current Resolution	± 1.6pA/ ± 16pA/ ± 160pA/ ± 1.6nA/ ± 16nA/ ± 160nA/ ± 1.6µA
Current Accuracy (Source & Measurement)	I range ≥ 1mA : 0.1% + 0.1% FS ; I range < 1mA : 0.05%+0.2% FS
<b>Voltage Ranges</b>	
Compliance Voltage Range	± 0.5V/1V/2.5V/5V/10V/25V
Compliance Voltage Accuracy	≥ 1V: 0.05% + 0.01%FS ; <1V: 0.05% + 0.1%FS
Voltage Measurement	± 3.8nV~ ± 25V
Voltage Measurement Accuracy	0.05% + 38nV @0.5V to 0.05% + 1.9mV @25V
<b>Test Parameters</b>	
Electrical	L-I-V Curves, Ith, Vf, Rs, Linearity (Kink)
Spectral	Peak wavelength, SMSR, etc.
<b>Optical Spectrum Analyzer*(Optional)</b>	
Wavelength Range	700 nm to 1700 nm
Resolution Bandwidth	< 0.1 nm
SMSR Measurement	> 40 dB
Wavelength Accuracy	± 0.03 nm
<b>Temperature Control</b>	
Temperature Range	25 °C ~85°C ; -5°C ~85°C (optional)
Temperature Accuracy	0.3 °C
Temperature Uniformity	± (0.5°C+1% ΔT) *3
<b>Mechanical Specification</b>	
Motion Stage Travel Distance	400 mm
Minima Fine Stage Resolution	20 nm
System Size (W x D x H)	1000 mm x 1200 mm x 1350 mm
System Weight	400 ± 20 Kg
Power Input	220V single phase , 50/60 Hz
Water flow Rate	<3~5 lpm
Operating Environment	Temperature : 20°C ~25 °C ; Humidity : <70%
<b>Software</b>	
Operating System Supported	Microsoft Windows® 2000, XP or 7

**Note \*1** : Capacity of carrier depends on the DUT size and form factor

**Note \*2** : Chroma 58620 is compatible with multiple Optical Spectrum Analyzers. Please inquire for further details.

**Note \*3** : ΔT = I Ambient temperature - setting temperature I

Video & Color  
Flat Panel Display  
Lighting  
LED/  
Optical Devices  
Photovoltaic test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



## KEY FEATURES

- Wide temperature range (-40°C~ 85°C)
- Excellent temperature uniformity to make sure all DUTs are under the same temperature condition
- Within  $\pm 0.5^\circ\text{C}$  temperature stability
- Fast heating and cooling to shorten testing time
- Temperature control up to 72 DUTs at the same time to increase testing output
- In mass production, TOSA/BOSA provides:
  - Electrical test connector
  - Optical fiber connector

\* Dependent on DUT form factor

## Fast Heating and Cooling

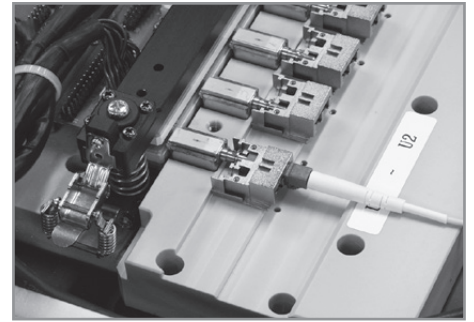
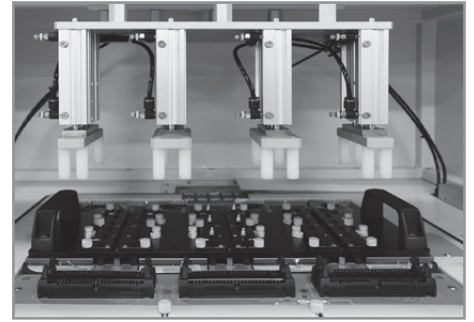
Currently TOSA/BOSA temperature control system is required to perform tri-state temperature tests during mass production. The 58690/58691 configured with Chroma high precision TEC controller. Excellent temperature control technique make tri-temperature cycle (including soaking time) within 25 minutes to significantly increase the mass production.

## High Precision Customized Fixtures

Chroma provides high precision fixtures for various TOSA/BOSA packing types to use. The fixtures comprise the temperature control platform required by DUT. Moreover, electrical and optical connection interfaces are conceived for testing the optical and electrical characteristics on DUT. The fixtures are easy for the user to place DUTs in the temperature control system and connect to the testing system on user site directly. Different channels of fixtures are also provided for different DUT packing types. The TO-56 packing type TOSA, for example, can support up to 72 channels increasing throughput of production lines.

## User Friendly Interface

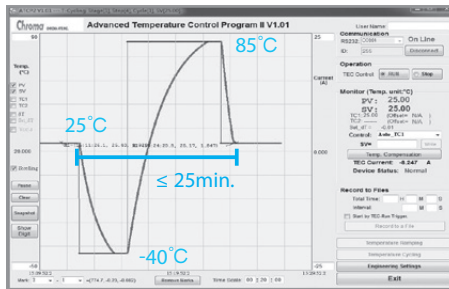
An user interface is provided to configure the 58690/58691 and TEC controller. It allows the user to set up and read temperature parameters, check TEC current and temperature vs. time curve, record data to documents, set temperature cycling and rising/falling speed, etc. The PID, current limit and other essential settings are set in engineering mode.



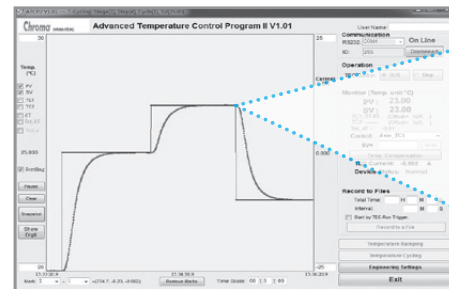
TOSA (transmitter optical sub assembly) and BOSA (bi-directional optical sub assembly) are very important components for optical communication. Since the characteristics of TOSA and BOSA are sensitive to temperature (such as threshold current and wavelength), they need to go through temperature testing before shipment. The Chroma 58690/58691 are models with novel technology specially designed for TOSA and BOSA testing. Integrating with the outstanding temperature control technology, the 58690/58691 are temperature control systems devised specifically for TOSA and BOSA featured in fast heating, cooling and excellent temperature uniformity that can substantially increase the test throughput.

## Excellent Temperature Uniformity

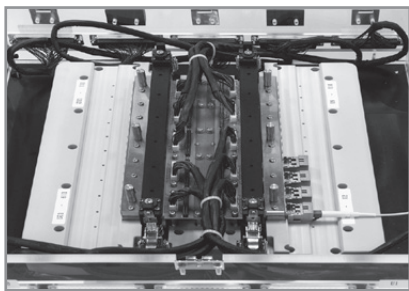
Different from warming up the ambient air surrounding the DUT to get the temperature control effect, Chroma 58690/58691 use contact temperature platform design to make the carrier's temperature achieve perfect control and uniformity when working with a high precision TEC controller. The temperature platform presents excellent temperature uniformity as there are 4 temperature sensors evenly distributed on it with a temperature feedback controller in the center.



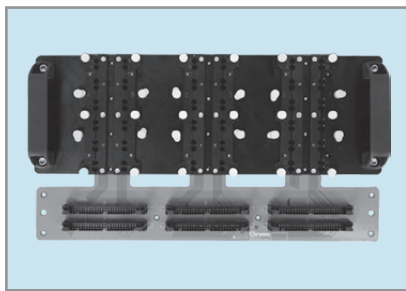
Fast Heating and Cooling



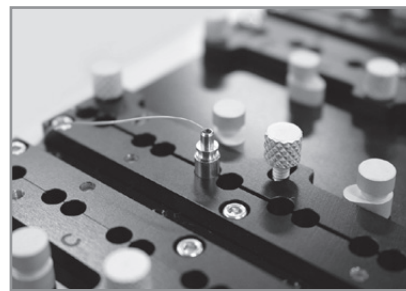
Excellent Temperature Control Ability



TOSA/BOSA Temperature Control Fixture (58690)



TOSA/BOSA Temperature Control Fixture (58691)



Optical Communication Devices Test Application

SPECIFICATIONS		
Model	58690	58691
<b>Device Under Thermal Control</b>		
Form Factor	QFSP TOSA	Cylindrical TOSA, BOSA
Temperature Area	440 x 350 (mm)	440 x 350 (mm)
DUT Number <sup>*1</sup>	20 typically	72 typically
Communication Port	Ethernet	Ethernet
<b>Temperature Control</b>		
Temperature Setting Range	-40 to 85°C	-40 to 85°C
Temperature Setting/Reading Resolution	0.01°C	0.01°C
Temperature Control Stability <sup>*2</sup>	< ±0.5°C	< ±0.5°C
Temperature Uniformity	< ±(1+1% ΔT) <sup>*3</sup>	< ±(1+1% ΔT) <sup>*3</sup>
Temperature Cycle <sup>*2</sup>	≅ 25 minutes typically	≅ 25 minutes typically
<b>Mechanical Specifications</b>		
Dimension (W x D x H)	700mm x 900mm x 1511mm	700mm x 900mm x 1511mm
System Weight	220kg	220kg
<b>Facility</b>		
Power Requirement	220 VAC, 50/60Hz, 2kW	220 VAC, 50/60Hz, 2kW
Operation Temperature	10 to 35°C	10 to 35°C
Dry Air	Meets ISO 8573.1:2001 Class 2.1.2 Flow Rate ≧ 50 LPM	Meets ISO 8573.1:2001 Class 2.1.2 Flow Rate ≧ 50 LPM

**Note \*1** : Dependent on DUT form factor (e.g. 64 channel for TOSA TO-CAN form factor)

**Note \*2** : Under the condition that is without loading and stable thermal loading

**Note \*3** : ΔT = | ambient temperature – setting temperature |

## ORDERING INFORMATION

**58690** : OSA/BOSA Temperature Control System

**58691** : OSA/BOSA Temperature Control System

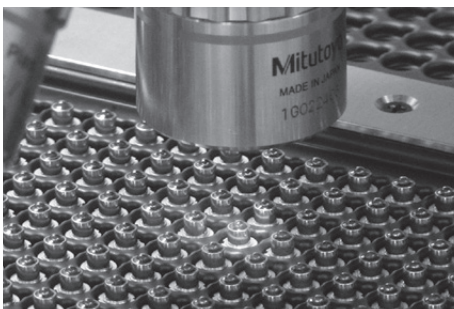


### KEY FEATURES

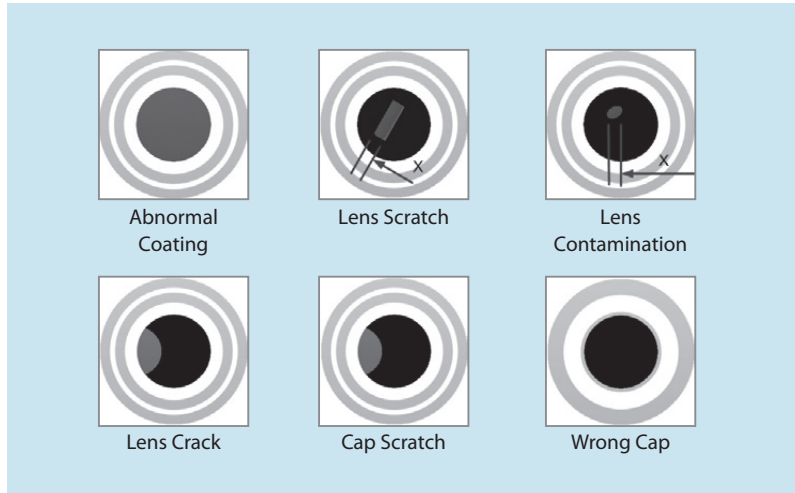
- It can inspect lens scratch, crack, particle and metal cap defect of TO-CAN package
- Auto focus function can overcome height variation from tray or package
- Defect criteria editor for versatile pass/fail criteria setting
- Higher reliability and repeatability than visual inspection
- Throughput is higher than UPH 3600
- Reduce time of operator loading/unloading because of auto-cassette function
- Provide customized inspection report and defect images for defect analysis

Chroma 7925 is an automatic inspection system for TO-CAN package. The appearance defects over 30 μm like lens scratch, partial are clearly conspicuous by using advanced illumination technology. Because the height variation of tray and package exists, Chroma 7925 can calculate the focus distance and compensate to overcome the variation with auto focus function.

User can edit his own defect criteria for versatile pass/fail rule setting and pick by the defect code. The whole machine process is automatic during load, inspection, pick to unload. It greatly reduces the opportunity of operator error and abnormal process. Engineer can get a detail inspection raw data and defect images. It is more helpful to analysis the process problem and increase the yield for using the data got from Chroma 7925.



### TO-CAN DEFECT ITEMS



### SPECIFICATIONS

<b>Model</b>	<b>7925</b>
<b>Target</b>	TO-CAN package
<b>Tray Size</b>	< 6" (width) X 6" (Length)
<b>Station Layout</b>	Optical side inspector X1 Auto cassette X 2 Picker X1
<b>Throughput</b>	UPH 3600 (depends on the numbers of lighting)
<b>Stages</b>	X, Y axis motorized stages
<b>Algorithm</b>	Provide enable/ disable function and external algorithm interface
<b>Image Save</b>	All/ defect/ none image selectable
<b>Monitor</b>	Real-time tray map
<b>Report</b>	*.txt, including chip position, defect type
<b>Dimension</b>	1500mm x 1200 mm x 1800mm

### ORDERING INFORMATION

**7925** : TO-CAN Package Inspection System



Dotted lines for text entry.

Video & Color

Flat Panel Display

LED/ Lighting

Optical Devices

Photovoltaic Test & Automation

Automated Optical Inspection

Power Electronics

Battery Test & Automation

Passive Component

Electrical Safety

Semiconductor/ IC

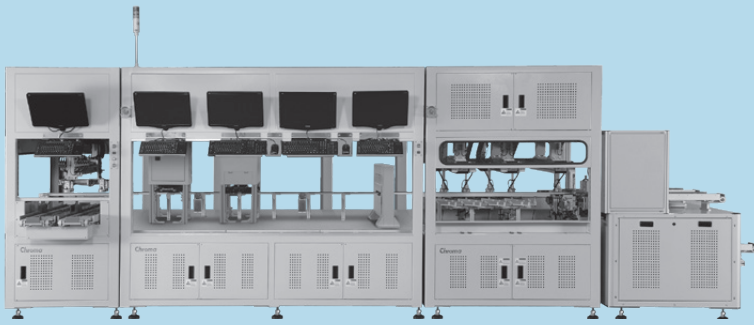
PXI Test & Measurement

General Purpose

Intelligent Manufacturing System

Turnkey Test & Automation

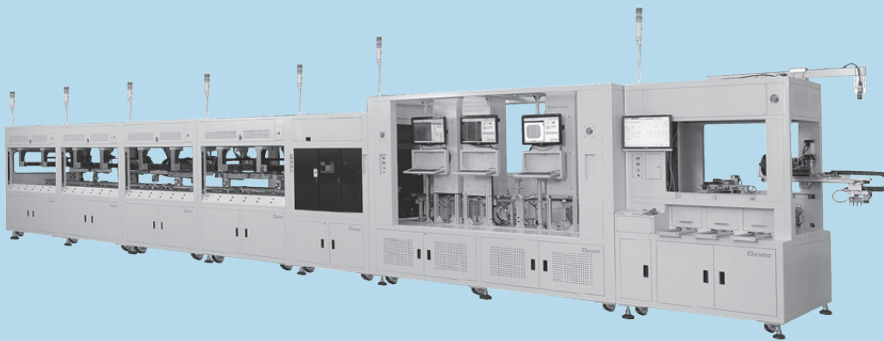
<b>Solar Wafer Inspection System</b>	<b>8-1</b>
<b>Solar Cell Inspection Test/Sorting System</b>	<b>8-2</b>
<b>Solar Wafer Automatic Unloader</b>	<b>8-5</b>
<b>Solar Wafer/Cell Diffusion Loader/Unloader</b>	<b>8-6</b>
<b>Automatic Optical Solar Wafer/Cell Inspection System</b>	<b>8-7</b>
<b>c-Si Solar Cell Tester</b>	<b>8-11</b>



Solar Wafer Inspection System



Solar Wafer/Cell Diffusion Loader/Unloader



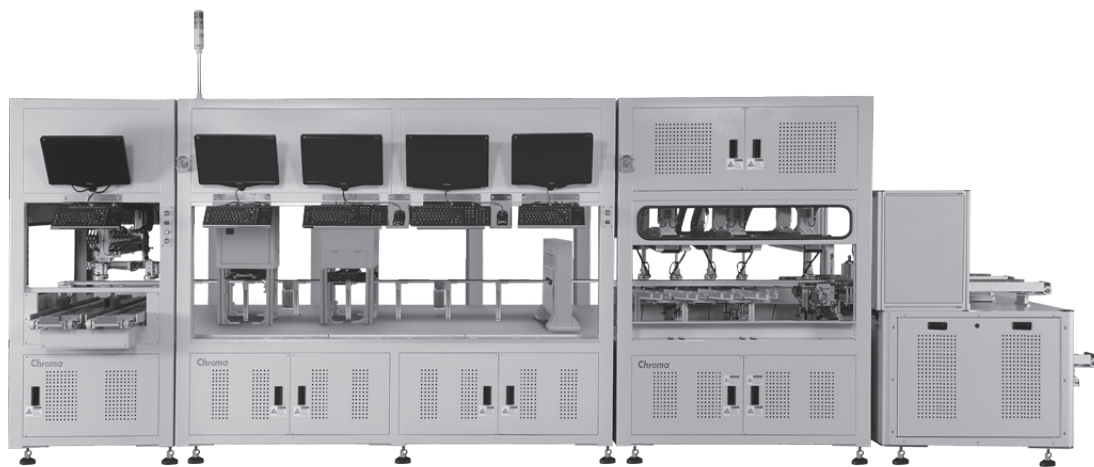
Solar Cell Inspection Test/Sorting System



Automatic Optical Solar Wafer/Cell Inspection System



c-Si Solar Cell Tester



## KEY FEATURES

- Good for 5 inches and 6 inches wafer
- High throughput and low breakage rate  $\leq 0.1\%$
- 2D geometry inspection
- Surface inspection
- Micro Crack inspection
- Saw Mark Inspection
- Resistivity/ Thickness tester
- Lifetime tester
- Easy trouble shooting
- Loader : coin stack
- Unload : Coin stack / cassette

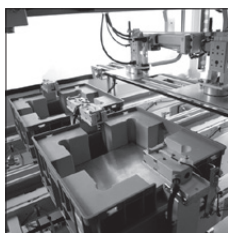
Integrated with 2D Geometry, Surface, Micro Crack, Saw mark inspection system and Resistivity & Thickness, Lifetime tester by customer defined, Chroma 3710-HS is a fully user configuration wafer sorter system with very low breakage rate and high through put.

Chroma 3710-HS solar wafer inspection system is ideal for PV incoming process. Plus wafer can be sorted by user defined algorithm fully automatically into coin stack or cassette. The unique auto coin stack/cassette exchange feature eliminates system down time when changing full coin stack/cassette to empty coin stack/cassette manually.

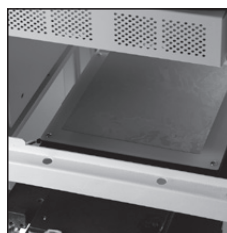
For the breakage rate that is one of the key concern for PV wafer handling system. The 3710-HS uses state-of-the-art cell transportation technique to ensure minimum breakage rate.

## ORDERING INFORMATION

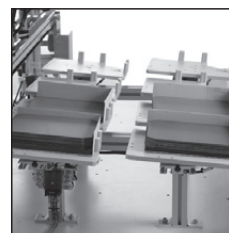
**3710-HS** : Solar Wafer Inspection System



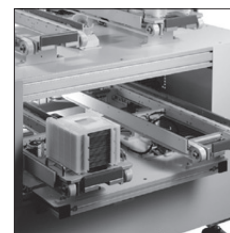
Loading



Optical Inspection



Sorter



Unloading





### KEY FEATURES

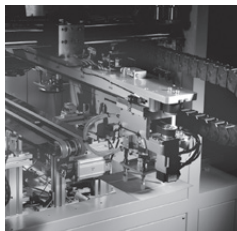
- Good for 5 inches and 6 inches mono/multi-crystalline silicon cells
- High throughput and low breakage rate  $\leq 0.1\%$
- Loader can automatically pick up and place cell finished by firing
- Efficiency and Color classes and Sorting Bins can be defined by customers' request
- Integrated with Inspector and IV Tester by customers' request
- High cell positioning repeatability to ensure consistent test result
- Sorting Bins can be extended by module

Chroma 3730 Solar Cell Inspection Test/Sorting System is ideal for PV backend process. In loader it can automatically pick up and place PV cell finished by firing. Then it will inspect cell surface and backside defects and will automatically sort the cells into carrier by different efficiency and color classes defined by customers' request.

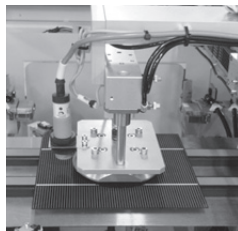
Breakage rate is one of the key concern for PV cell handling system. Chroma 3730 uses state-of-the-art cell transportation technique to ensure minimum breakage rate. Based on customer's requirement of different processes, the carrier type and the amount of sorting bins also can be designed and adjusted.

### ORDERING INFORMATION

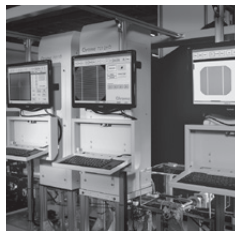
**3730** : Solar Cell Inspection Test/Sorting System



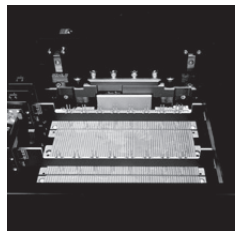
Firing Unload



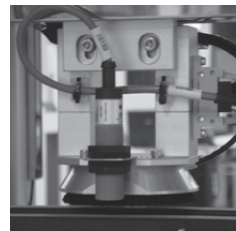
Loading



AOI



IV Testing



Sorting



### KEY FEATURES

- Good for 6 inches mono/multi crystalline silicon cells
- High throughput and low breakage rate  $\leq 0.1\%$
- Integrated with automatic optical inspectors by customers' request
- Color classification and sorting bins can be defined by customers' request
- Efficiency can be defined by customers' request
- Sorting bin can be extended by module

Chroma 3730-E is an economical type of solar cell inspection testing/sorting system. It is an ideal design and suitable for PV backend process. Solar cells can be loaded into loader from inline co-firing tool directly or from manual loading ports. The cells will be transferred to automatic optical inspectors for a back-side cell quality inspection, a front-side cell quality inspection, and color classification. Besides automatic optical testing, the cells can be measured for IV efficiency via IV tester. Finally, the cells will be put in the corresponding bins based on the automatic optical & IV efficiency testing results.

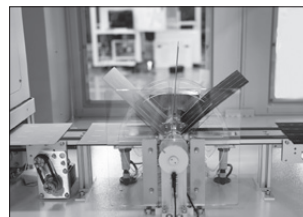
The breakage rate is one of the key concerns for PV cell handling system. Chroma 3730-E uses state-of-the-art cell transportation technique to ensure the minimum breakage rate. Based on the customer's requirements of different process, the carrier type and the amount of sorting bins can be designed and adjusted.

### ORDERING INFORMATION

**3730-E** : Solar Cell Inspection Test/Sorting System  
**7200 Series** : Automatic Optical Solar Wafer/Cell Inspection System



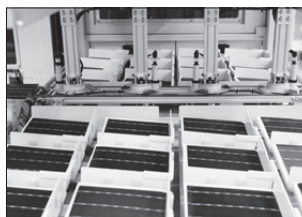
Loading



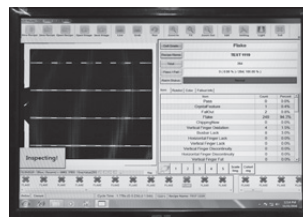
Flipping



AOI



Sorting



GUI



## KEY FEATURES

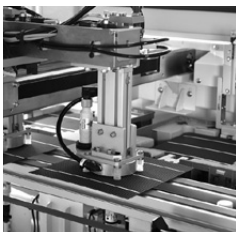
- Good for 6 inches mono/multi-crystalline silicon cells
- Inline structure un-loader together with firing furnace including cells position pre-capture CCD and Bernoulli Arm picking up cells to conveyor speedy
- Flexible design of buffer loader to support engineer/operator during production maintenance period no matter frontend or backend side
- High throughput and low breakage rate < 0.1%.
- High integration capability with customized optical inspector and IV tester
- Customized efficiency, Color classes and sorting Bins
- High cell positioning repeatability to ensure consistent result
- Extendable sorting bins module to fulfill customer request
- MES systems for instant production result analysis
- Lane by lane controller for engineer maintenance easy

Chroma 3760 Solar Cell Inspection Test/Sorting System is an ideal design and suitable for PV backend process. There will be a detection CCD and an Arm to proceed the cell pick and place from Firing furnace to conveyor. The cells will be transferred to Automatically Optical Inspector for cells quality inspection and IV Tester for efficiency measurement. Finally the cells will be put in the corresponding Sorting Bins based on above testing results.

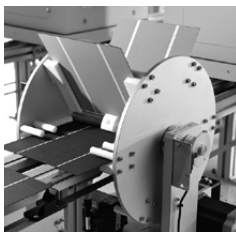
The breakage rate is one of the key concerns for PV cell handling system. Chroma 3760 uses state-of-the-art cell transportation technique to ensure the minimum breakage rate. Based on the customer's requirement of different process, the carrier type and the amount of sorting bins can be designed and adjusted.

## ORDERING INFORMATION

**3760** : Solar Cell Inspection Test/Sorting System



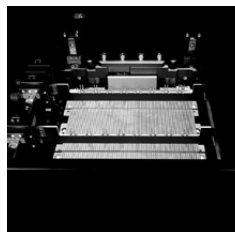
Loading



Flipping



AOI



IV Testing



Sorting



#### KEY FEATURES

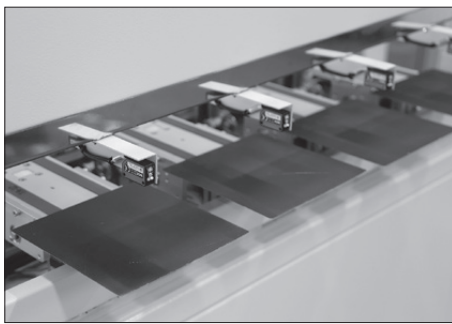
- Easy to connect to versatile upstream tools
- Wafer damage & overlap check
- $\theta$  offset
- X&Y shift offset
- NG bin for failed wafer
- Low breakage rate
- Dual-lane output
- Mirror type is available

Chroma 3715 is an automatic solar wafer unloader that can connect to various upstream tools, i.e. resist stripper, developer, etching tool or isolation tool...etc. It is equipped with CCD detectors on the input to inspect damage and overlap of wafers coming from upstream process.

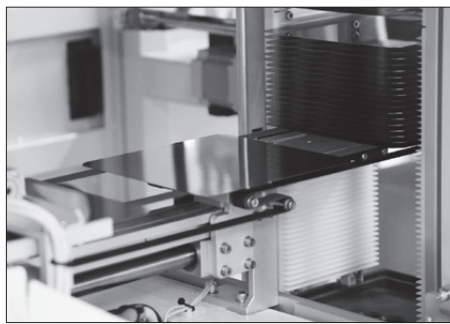
The input pick-and-place arm performs  $\theta$  offset while transferring wafers from input to output conveyors. Chuck and output CCD detectors are equipped in the output conveyors to perform X&Y shift offset. As last, wafers are transferred to cassettes for unloading.

#### ORDERING INFORMATION

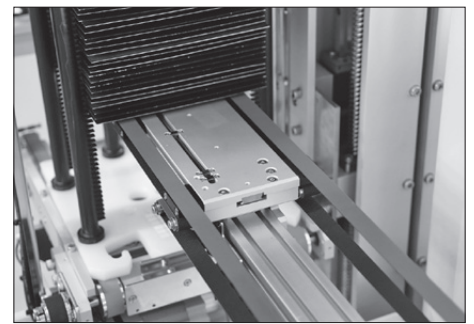
**3715** : Solar Wafer Automatic Unloader



Loading



X&Y shift offset



Unloading





### KEY FEATURES

- Low Breakage rate
- High Throughput
- Flex picker robot transfer
- Surface Inspection : Option
- Loader: Quartz Boat
- Unload : Coin stack / Cassette (option)

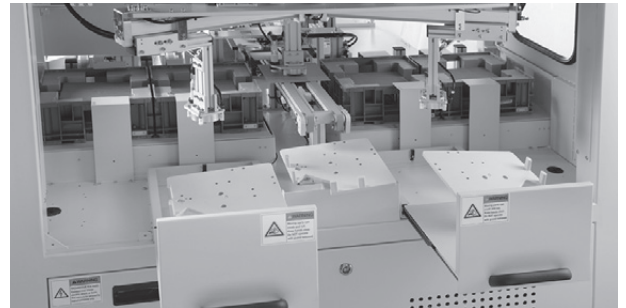
Furnace tube process is commonly used for wafer phosphorous diffusion . Chroma is not only providing short boat but also long boat for diffusion process loader/Unloader system to our customers. High speed flex picker robots are used on wafer transfer . Chroma provide the lower breakage, high throughout and low cost loader and unloader system in diffusion process and met our customer all of diffusion process function requirement.

### ORDERING INFORMATION

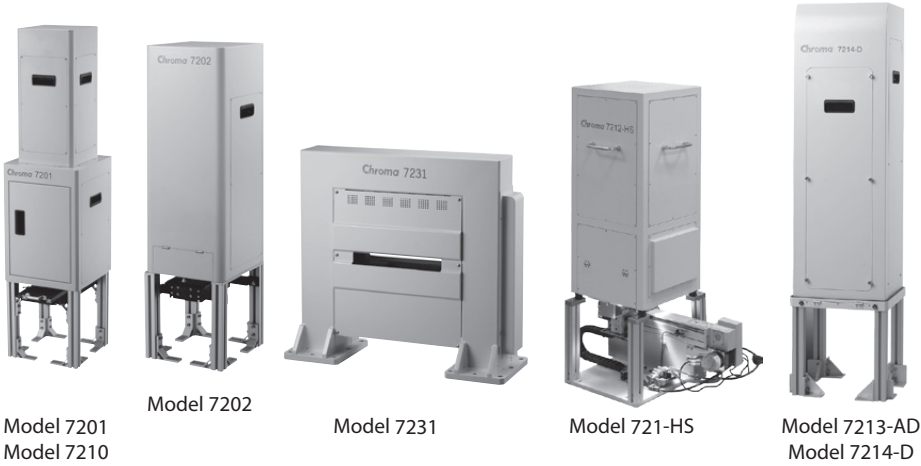
**3775** : Solar Wafer/Cell Diffusion Loader/Unloader Equipment



Loading

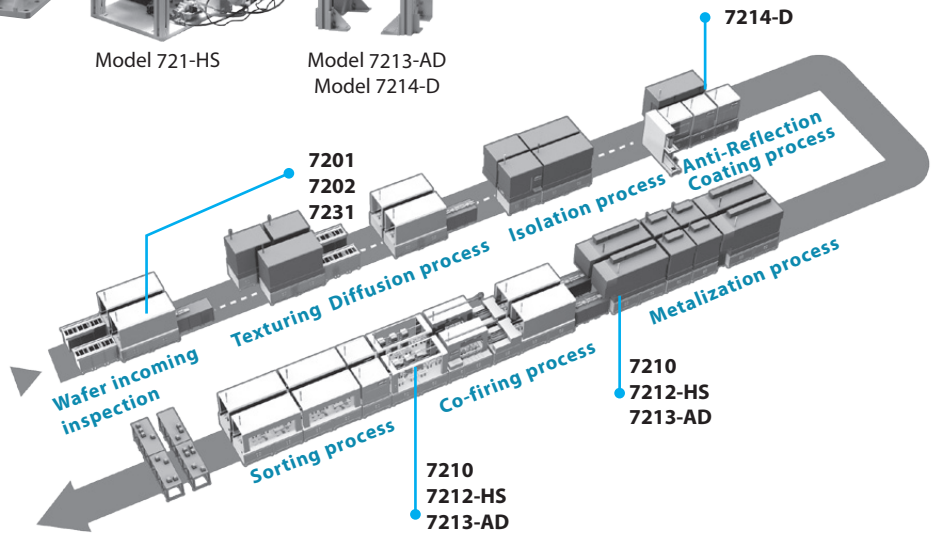


Unloading



## KEY FEATURES

- Adjustable criteria for different process application or model
- Flexible algorithms programming editor for mono-crystalline and multi-crystalline silicon solar cells
- Multiple interface to communicate with manufacturing equipment or information system
- Various defects inspection capability from multilayer LED lighting design
- Flexible design that can be easily integrated to your in-line printing system and sorting system



Among several factors for PV to achieve grid-parity, reliability of the PV modules plays an important role. Since it's known that some of the cell defects such as edge chips/ flakes, bumps of cell surface were proved to be source of infant mortality of the c-Si PV modules, therefore, to detect those defects is very important for c-Si cell manufacturers. However, most of cell defects are inherited by wafers. Therefore, both cell and wafer defect inspections are crucial to final PV module quality and reliability.

Due to the increasing BIPV and rooftop application, even for those defects that does not directly link to reliability issues such as water mark, surface stain, have to be detected and considered as fail or secondary grade of cells for c-Si cell buyers.

Conventionally, those defects were visually inspected by operators. But, the inconsistent inspect result makes fully automatic optical inspection (AOI) solution becomes unavoidable equipment for c-Si cell & wafer lines.

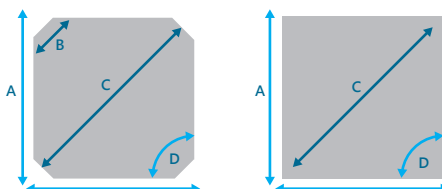
Chroma 7200 series are specially designed for detecting wide variety of defects observed for c-Si cells & wafers for all sizes and crystallizations. Base on the process needs, eight inspectors are available for both incoming wafer and final cell sorting requirements.

Function Guide	7201	7202	7210	7212-HS	7231	7213-AD	7214-D
Sawmark					✓		
Geometry (Length, angle, and etc)	✓						
Surface stain (Particle, water mark, finger print, and etc)	✓	✓	✓	✓		✓	✓
Printing defect (Fat, interruptions, nodes...etc)			✓	✓		✓	
Color defect (Coloring, variation, spot, and etc)			✓	✓			✓

## Solar Wafer Geometry and Surface Inspector Model 7201

The Chroma 7201 was designed to measure wafer lengths, widths, diagonal, orthogonal and chamfer size and angle, it is also capable to detect surface stains. User friendly software and GUI enable versatile parameter settings and result, it also provides defect display and storage function for further analysis or potential MES/CIM integration.

- Capable to be integrated to any wafer sorters
- Flexible algorithms editor for mono-crystalline, multi-crystalline and quasi-crystalline wafers, and works for both 5" and 6"
- Multiple interface to communicate with different equipment or manufacturing execution system (MES)
- Ready for diamond-saw wafers inspection
- Self-monitor and calibration system



### Illustration on 7201 inspection items

- A: Side length
- B: Chamfer length
- C: Diagonal
- D: Orthogonal
- E: V-cut
- F: Stain

## Solar Wafer Quality Inspector Model 7202

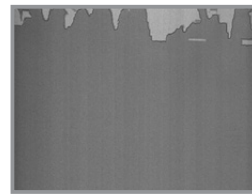
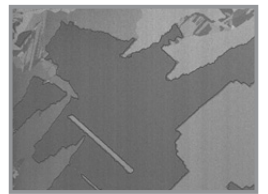
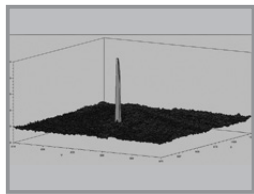
In the design of 7202, Chroma applied an unique optical design that ensures the result of grain-size calculation is highly repetitive. Since the classification of different grain-size could be quantified, the inspected wafers can be applied to the proper cell manufacturing lines to get highest possible cell efficiency.

Pinhole defect can also be detected by 7202. The pinhole defect is known to be cause of  $\mu$ -crack or severe local shunting that will lead to reliability issue to the PV module.

- Capable to be integrated to any wafer sorters
- Flexible algorithms editor for mono-crystalline, multi-crystalline and quasi-crystalline wafers, and works for both 5" and 6"
- Multiple interface to communicate with different equipment or manufacturing execution system(MES)
- Unique illumination design to ensure the repeatability of grain-size



Analysis on pinhole defect

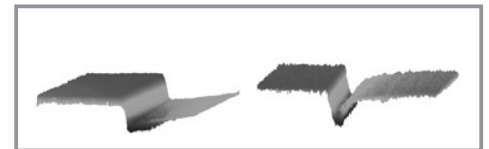


Examples on the grain-size inspection result on 7202

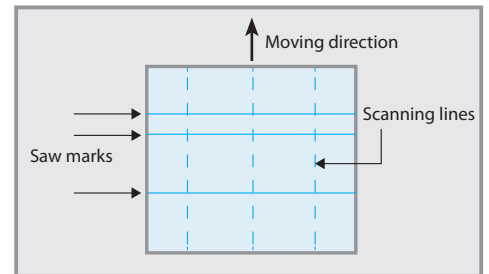
## Solar Wafer Sawmark Inspector Model 7231

Sawmarks happened during the wafering process because of the impurities or vibration of the wires. It happens sometimes in near the edge and sometimes in the center. By following the British standard of EN 50513 2009, Chroma is able to provide the solution that also sense the sawmarks in the center.

- Capable to be integrated to any wafer sorters
- Flexible algorithms editor for mono-crystalline, multi-crystalline and quasi-crystalline wafers, and works for both 5" and 6"
- Multiple interface to communicate with different equipment or manufacturing execution system(MES)
- Follow the British standard of EN 50513 2009 to measure different wafer properties



Different sawmark profiles



Sawmark inspection methodology

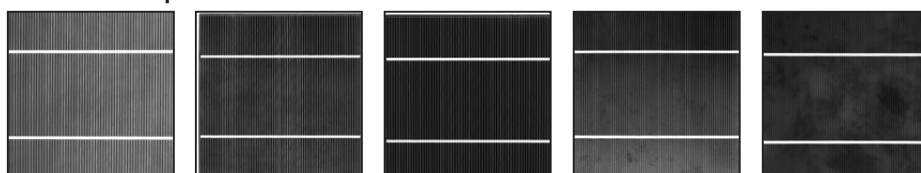
## Solar Cell Quality Inspector Model 7210

Chroma 7210 has built two functions which are color sorting and printing inspection in one structure. With the compact "2 in 1" design, it not only optimizes the floor space but also maximizes the performance. As the "metallization" technology goes further in PV industry, the finger width has become narrower. Experts believe that practical finger width through "screen printing" technology would be narrower than  $40 \mu\text{m}$  in the near future, and Chroma's 7210 is able to provide  $33 \mu\text{m}/\text{pixel}$ \* solution for Photovoltaic technology innovators.

The Chroma c-Si cell coloring theory was designed to provide high repetitive color classification for c-Si PV cells. The CIE 1931 Lab color space and up to  $60 \times 60$  grids for entire cell surface allow Chroma to provide numeric color severities down to 3600 blocks throughout the cell under test. Using the color information of each block and the customized algorithm, the user may determine the represented color for non-uniform color cells such as poly-crystalline cells or the cells have uneven anti-reflection coating thickness.

Note \* : When working with Chroma 3730 Series

### 7210 Color Examples



Light Blue

Blue

Dark Blue

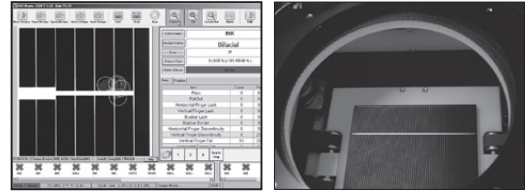
Color Variance

Mix Color

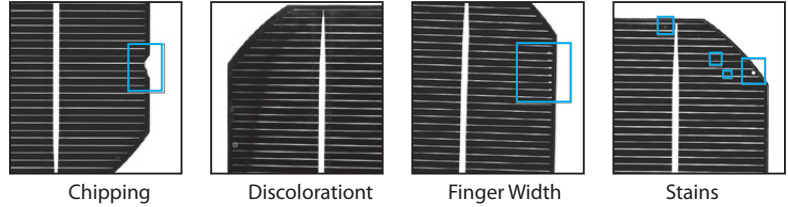
All specifications are subject to change without notice.



The defects caused by front-side (sunny side) printing process of c-Si PV cells may impact the performance, reliability or appearance. Therefore, a reliable and repetitive inspection of defects such as losing Ag paste on busbars, gridline interruptions, printing shift or rotation, water mark etc., has to be performed to ensure the quality before shipment. The Chroma 7210 solar cell quality classifier has equipped with a high resolution camera and superior software algorithm to recognize the unwanted defects on the front-side of c-Si PV cells.



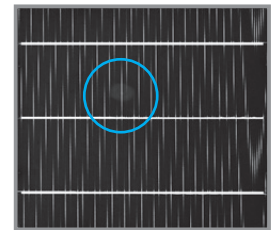
The 7210 can be used right after the front-side process to retire cells with major defects. This allows best use of the capacity for the processes like I-V testing and sorting which are known as the bottlenecks of c-Si cell line. It can be integrated into in-line or off-line sorter for final inspection prior to shipping. The 7210 can also detect cells' back side surface defects and color classification.



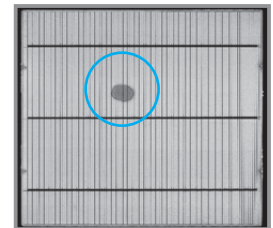
The 7210's backside inspection is applied on screen printing defect detection and color classification for Bifacial production. As to PERC production, the 7210 also provides defect detections for both screen printing and laser process.

### Solar Cell Front-side Printing and Surface Defect Inspector (High-Speed) Model 7212-HS

The Chroma 7212-HS is a line scan AOI inspector that can provide superior defect inspection for PV cells. As the fine grid printing process goes even faster than before, a reliable printing quality inspector is required to reduce the cost during PV cells metallization. The Chroma 7212-HS is able to provide 14µm/pixel resolution that can stop even the finest finger interruptions during the metallization process, and also feed back to the operator for instant response to improve the production yield rate.



Stain shown before detection



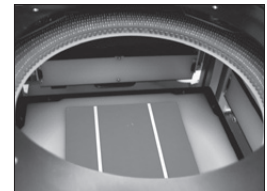
Stain shown after detection

The Chroma 7212-HS can also use 20µm/pixel resolution to make the final quality judgment on the PV cell sorting process. The optical design in Chroma 7212-HS is even better. It can provide superior inspections for defects like stains and finger prints, which have been hurdles in other PV AOI products.

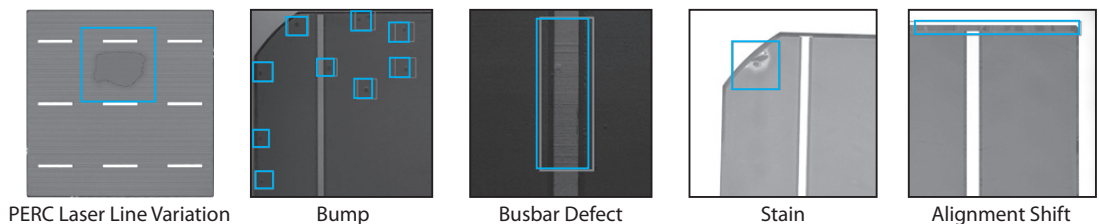
- Integrated with screen printing line and cell sorting lines from any manufacturers
- Flexible and intuitive SW user interface
- Resolution down to 14 µm/pixel
- Superior stain defects detection

### Solar Cell Backside Printing and Surface Inspector Model 7213-AD

Defects caused by back-side printing process of c-Si PV cells will also cause performance, reliability impact. Among all the back-side printing defects, bumps caused by improper printing may cause high cell breakage rate during lamination of c-Si module process. Chroma 7213-AD c-Si cell back-side printing inspector uses unique lighting technique to detect common back-side printing defects plus most demanding bumps.



The 7213-AD can be used after back-side process to retire cells with major defects. It can also be integrated to in-line or off-line sorter for final inspection prior to shipping.





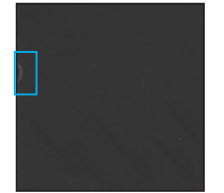
## Solar Cell Anti-Reflection Coating Inspector Model 7214-D

Chroma 7214-D is the inspector for Anti-reflection coating process. With 4M mono CCD and Chroma's experience RGB illumination design, we could assure that each defined defectives could be identified through our customized setup. Chroma 7214-D can be used right after anti-reflection coating process to ensure only cells with acceptable color uniformity go down to metallization process. And the fail cells may then be sent for re-work.

With our flexible and hierarchy software design, customer could set up the criteria to inspect their unique defect that is generated because of different PECVD machines.

7214-D Inspection Items :

- Color difference
- Stripe shape watermark
- Belt mark
- Stacking cells
- Brownish stains
- Particles
- Acid mark
- Chipping



## SPECIFICATIONS

Model	7201	7202	7231
<b>Description</b>	Solar wafer geometry & surface inspector	Solar wafer quality inspector	Solar wafer sawmark inspector
<b>Wafer size</b>	5" or 6" wafers, for mono c-Si, multi c-Si and quasi mono c-Si		
<b>Detection limit</b>	80µm	80µm	5µm
<b>Speed</b>	NA *3	350mm/s	350mm/s
<b>Inspection items</b>	Length, Width, Diagonal, Chamfer length, Pinhole, Stain, Chipping, Grain-size, Sawmark, backside		
<b>UPH*2</b>	3000~3600		
<b>Interface</b>	TCP/IP ; Option: IO,RS-232		
<b>Options</b>	RAID, UPS, MES,		

Model	7210	7212-HS/C8	7212-HS/M12
<b>Camera</b>	25M mono CCD	8K linescan	12K linescan
<b>Resolution</b>	33µm/pixel *1	20µm/pixel	14µm/pixel
<b>Speed</b>	NA	350mm/s	500mm/s
<b>Light Source</b>	LED strobe lighting	RGB LED strobe lighting	
<b>Application</b>	Frontside defect and color inspection	Frontside defect inspection	
<b>Lens</b>	Low distortion lens		
<b>Dimension</b>	320mm x 324mm x 1032mm	340mm x 380mm x 760mm	
<b>Weight</b>	60 kg	70 kg	
<b>Accessory</b>	External keyboard, mouse, PC, monitor		
<b>Interface</b>	Ethernet, Option : IO, RS-232		

Model	7213-AD	7214-D
<b>Camera</b>	4M mono CCD	4M mono CCD
<b>Resolution</b>	90µm/pixel	90µm/pixel
<b>Speed</b>	NA	NA
<b>Light Source</b>	LED strobe lighting	WRGB LED strobe lighting
<b>Application</b>	Backside defect inspection	Anti-reflection coating inspection
<b>Lens</b>	Low distortion lens	
<b>Dimension</b>	320mm x 324mm x 1032mm	
<b>Weight</b>	60 kg	
<b>Accessory</b>	External keyboard, mouse, PC, monitor	
<b>Interface</b>	Ethernet, Option : IO, RS-232	

**Note \*1** : When work with Chroma 3730

**Note \*2**: When work with Chroma 3710-HS

**Note \*3** : On-fly inspection on demand, maximum speed is 250mm/s

## ORDERING INFORMATION

**7201** : Solar wafer geometry and surface inspector  
**7202** : Solar Wafer Quality Inspector  
**7231** : Solar Wafer Sawmark Inspector  
**7210** : Solar Cell Quality Inspector

**7212-HS** : Solar Cell Front-side Printing and Surface Defect Inspector  
**7213-AD** : Solar Cell Backside Printing and Surface Inspector  
**7214-D** : Solar Cell Anti-reflection Coating Inspector

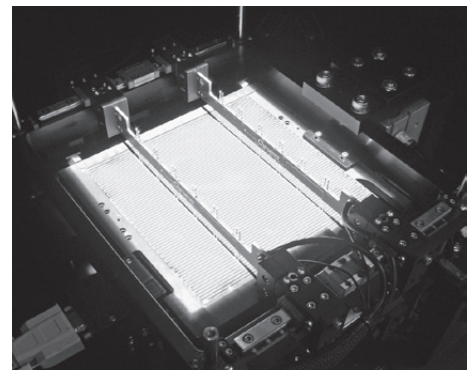


I-V test is the most important test for PV cell/module manufacturing because the measured power rating or efficiency of the cell or module directly affect the selling price of the product. Therefore, highly accurate and repeatable I-V test result is not only for quality issue but also for Business issue.

However, PV cell I-V testing represents several technical challenges; therefore, it's extremely hard to achieve stable and accurate test results even if class AAA type of solar simulator is used. Those challenges include:

- Spectral mismatch correction
- Minimize impact of non-uniformity
- Simultaneous measurement to avoid error caused by temporal instability of irradiance intensity
- Temperature correction or control to STC or desired temperature
- Low stress probing to avoid cell breakage
- Maximize probe-contact repeatability & minimize probing shadow

Chroma 58301 c-Si Solar Cell (Crystalline Silicon) Tester is ideal for both RD & in-line production (see Chroma 3720) application. Using Wacom® class AAA+ solar simulator, comprehensive irradiance/temperature correction technique and probing system, Chroma 58301 c-Si Solar Cell Tester achieves the highest test repeatability and measurement accuracy for most demanding customers.



### ORDERING INFORMATION

**58301:** c-Si Solar Cell Tester

### SYSTEM FEATURES

- Measurements: Eff, Pmpp, Imp, Vmpp, Isc, Voc, FF, Rshunt, Rs, Irev.
- Full four-quadrant source for both light forward/reverse & dark forward / reverse test
- Class AAA+ solar simulator
- Versatile system software and user editable test sequences
- Low stress probe
- Patterned probe-bar to ensure minimum probe shadow
- PV cell sorter integration (Chroma 3720)

SPECIFICATIONS	
Model	58301
<b>Solar Simulator Section</b>	
Lamp Type	Xenon Short Arc
Lamp Life	1,200 hrs
Illumination Area	163mm x163mm
Light Source	Steady State (w/Shutter Control)
Air Mass	AM1.5G (IEC60904-3)
Irradiation Intensity	100mW/cm2 ± 15% (1 Sun ± 15%)
Spectral Mismatch	± 25% or Better
Positional Non-uniformity	2% or Better
Temporal Stability	1% or Better
Light Collimation	<5°
<b>Power Section</b>	
<b>Voltage</b>	
Voltage Forward Range	20V
V <sub>FORWARD</sub> Program Resolution	16 bits
V <sub>FORWARD</sub> Ripple	<3mVrms
Voltage Reverse Range	-20V
V <sub>REVERSE</sub> Program Resolution	16 bits
V <sub>REVERSE</sub> Ripple	<3mVrms
Transient Response Time	< 100µs
Load regulation	0.002% F.S.
Line regulation	0.002% F.S.
Slew Rate	1V/µs
<b>Current</b>	
Current Forward Range	20A
I <sub>FORWARD</sub> Program Resolution	16 bits
I <sub>FORWARD</sub> Ripple	<0.03%
Current Reverse Range	-20A
I <sub>REVERSE</sub> Program Resolution	16 bits
Transient Response Time	< 75µs
Load regulation	1mA

Line regulation	0.005% F.S.
Slew Rate	1.25A/µs
<b>Power</b>	
Power Rating	400W
<b>Measurement Section</b>	
<b>Voltage</b>	
Voltage Measurement Range - Forward	1V
V <sub>FORWARD</sub> Measurement Resolution	16 bits
V <sub>FORWARD</sub> Measurement Accuracy	0.05% F.S.
Measurement Points per I-V - Forward	40-200 programmable
Voltage Measurement Range - Reverse	-15V
V <sub>REVERSE</sub> Measurement Resolution	16 bits
V <sub>REVERSE</sub> Measurement Accuracy	0.05% F.S.
Measurement Points per I-V - Reverse	40-100 programmable
<b>Current</b>	
Current Measurement Range - Forward	10A/20A
I <sub>FORWARD</sub> Measurement Resolution	16 bits
I <sub>FORWARD</sub> Measurement Accuracy	0.1% F.S.
Measurement Points per I-V - Forward	40-200 programmable
Current Measurement Range - Reverse	-0.1A/-1A/-15A
I <sub>REVERSE</sub> Measurement Resolution	16 bits
I <sub>REVERSE</sub> Measurement Accuracy	0.1% F.S.
Measurement Points per I-V - Reverse	40-100 programmable
<b>Irradiance (Forward Only)</b>	
Input Range	200mV
Irradiance Measurement Resolution	16 bits
Irradiance Measurement Accuracy	500uV
Measurement Points per I-V - Forward	40-200 programmable
<b>Temperature Sensing Section</b>	
Measurement Type	IR/Thermopile
Temperature Range	0~500°C
Reproducibility	± 0.5°C



# Automated Optical Inspection (AOI) Solution

<b>Video Microscope</b>	<b>9-1</b>
<b>3D Optical Profiler</b>	<b>9-3</b>
<b>Double Sided Wafer Inspection System</b>	<b>9-5</b>
<b>Wafer Inspection System</b>	<b>9-7</b>

Selection Guide			
Model	Primary Function	Examples of Inspection Applications	Page
<b>7200 Series</b>	Automatic Optical Solar Wafer/Cell Inspection Modules : Solar Wafer Geometry and Surface Inspector (7201) Solar Wafer Quality Inspector (7202) Solar Wafer Sawmark Inspector (7231) Solar Cell Quality Inspector (7210) Solar Cell Front-side Printing and Surface Defect Inspector (7212-HS) Solar Cell Backside Printing and Surface Inspector (7213-AD) Solar Cell Anti-Reflection Coating Inspector (7214-D)	Solar wafers, solar cells	<b>8-5</b>
<b>7310</b>	Video Microscope	Capacitors, Resistors, PCB, connectors, fiber connectors, SMD, die chips, textiles, etc.	<b>9-1</b>
<b>7503</b>	Sub-nano 3D Optical Profiler	Display : Photo spacers, prism sheets of LCD PCB : laser via, wire high, wide, pitch MEMS : printer nozzles, hard disk read heads Semiconductor : thin film transistors	<b>9-3</b>
<b>7925</b>	TO-CAN Package Inspection System	TO-CAN package	<b>7-7</b>
<b>7936</b>	Double Sided Wafer Inspection System	Top side and back side of laser diodes, photo diodes, and LED chips	<b>9-5</b>
<b>7940</b>	Wafer Inspection System	Laser diodes, Photo diodes, and LED chips	<b>9-7</b>





**Video Microscope**



**3D Optical Profiler**



**Double Sided Wafer Inspection System**



**Wafer Inspection System**



The 7310 video microscope is a color CCD video-based microscope system that allows you to clearly view small objects on any TV monitor or video projector. Unlike conventional optical microscopes that are complicated and intimidating for the viewer to use, the 7310 is an easy-to-use and friendly video-based system. High resolution video viewing eliminates the operator eyestrain and fatigue associated with conventional and binocular microscopes and the unnatural "hologram effect" of optical projection systems.

connecting the video output of 7310 directly to an optional Color Video Printer, Video Tape Recorder (VTR), or Personal Computer (PC with appropriate image capture card installed).

Two illumination heads of contact and non-contact measurement are available. The user can use the one that meets versatile applications of top-view angle or oblique-view angle. The compact size allows it to be hand held for observation anywhere, anytime. More than one person can observe the same clear image on the color monitor for discussion getting the best results and solutions.

The 7310 guided LED light surrounds the lens and automatically provides the best illumination for you to obtain the optimum viewing angle and color of the target object on the video monitor. By using the advanced automatic gain control of DSP technology, it gives the user distortion-free microscope quality images.

The Chroma video microscope offers the sophisticated inspection methods in the applications of semiconductor, SMD PCB, electronics, tab and wire bonding, hybrid circuit, metal works, quality control, textiles, etc. The versatile and easy-to-use product introduces wholly new ways of treatment. It makes you work faster and more effectively than before.

With the frame freeze button and memory switch, it allows you to freeze the images with one, or one-two frame on the screen. Image retention on hard copy and image storage are possible by simply

## FUNCTIONS

### Handy Type Easy to Operate

It can be held by hand easily to view the object in clear image without adjusting the focus

### Picture Freeze

You can freeze the frame and release it easily by touching the frame freeze button on the handle. Besides, you are also able to use remote cord to freeze the frame via the terminal on the rear panel.

### Frame Split

If you need to compare two objects, you can choose one-two frame on the screen by switching the "Memory" to "2".

### Measurement for Multiple Masks

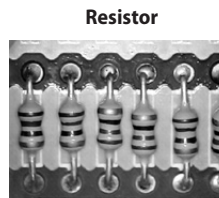
The mask designed for multiple functions can be used with magnification lens to observe the object with non-contact, contact and oblique for three-dimension effect.

### Fully Field Use

It provides complete lens combination from magnification 5X to 1000X with maximum working distance up to 18cm. To work with appropriate accessories and measurement software, the Measurement Master can meet the different requirements for various industries.

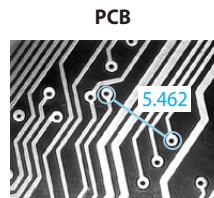
### Multiple Peripherals Support

The 7310 can connect diverse recording media, color displays, and PC environment (with appropriate interface card installed) via the video out terminal. You can select the desired peripheral.



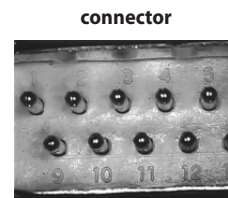
Resistor

20X Contact



PCB

20X Non-Contact  
with Measurement Master



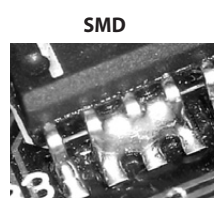
connector

20X Non-Contact



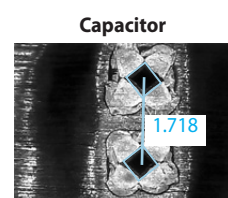
Screw Driver

40X Contact  
with Measurement Master



SMD

40X Oblique



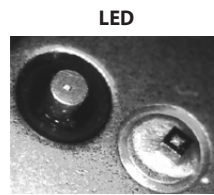
Capacitor

100X Non-Contact  
with Measurement Master



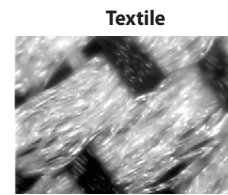
Screw

100X Non-Contact  
with Measurement Master



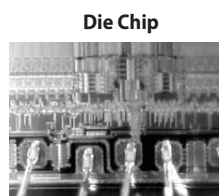
LED

100X Non-Contact



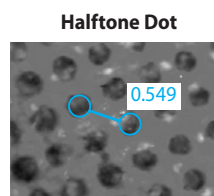
Textile

200X Contact



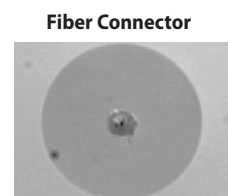
Die Chip

200X Non-Contact



Halftone Dot

200X Non-Contact  
with Measurement Master



Fiber Connector

1000X Non-Contact

SPECIFICATIONS	
<b>Model</b>	<b>7310</b>
<b>Camera</b>	
<b>Image Pickup Sensor</b>	1/3 inch CCD
<b>Total Pixels</b>	
NTSC	811 (H) x 508 (V)
PAL	795 (H) x 596 (V)
<b>Scanning Method</b>	2:1 interlaced
<b>Scanning Frequency</b>	
NTSC	15.734 KHz (H) x 59.94 Hz (V)
PAL	15.625 KHz (H) x 50.00 Hz (V)
<b>S/N</b>	46dB
<b>AGC</b>	DSP Control
<b>White Balance</b>	Automatic
<b>Operating Environment</b>	
<b>Operating Temperature</b>	-5 to 40°C
<b>Operating Humidity</b>	35 to 80% R.H. (without condensation)
<b>Light Source</b>	
<b>Lamp</b>	White LED
<b>Service Life of Lamp</b>	5000 hrs (avg.)
<b>Color Temperature</b>	7100°k (max)
<b>Intensity Regulation</b>	Auto
<b>Others</b>	
<b>Still Picture</b>	1, 1/2 frame
<b>Supply Voltage</b>	1Ø 110~240V ± 10% V <sub>LN</sub> , 47~63Hz; DC 12V 0.5A
<b>Power Consumption</b>	Less than 6W
<b>Dimension (H x W x D)</b>	Probe (without Lens Head): 57 x 50 x 160 mm / 2.24 x 1.97 x 6.30 inch Stand: 60 x 125 x 190 mm / 2.36 x 4.92 x 7.48 inch
<b>Weight</b>	Probe (without Lens Head): 220g / 0.48 lbs Stand: 1.0 kg / 2.2 lbs
<b>Camera Probe Length</b>	1.5m / 59.05 inch
<b>Outputs</b>	
<b>Video Output</b>	VBS1.0Vp-p/75Ω RCA Type

## ORDERING INFORMATION

- 7310** : Video Microscope -NTSC, Adapter (Mark I)  
**7310** : Video Microscope -PAL, Adapter (Mark I)  
**A730001** : 20X Magnification Lens  
**A730002** : 40X Magnification Lens  
**A730003** : 200X Magnification Lens  
**A730007** : 100X Magnification Lens  
**A730009** : Suitcase  
**A730011** : 400X Magnification Lens  
**A730012** : 650X Magnification Lens (Constant Focus)  
**A730013** : 1000X Magnification Lens  
**A730015** : 35X Polarization Magnification Lens  
**A730016** : 40X LWD Magnification Lens  
**A730025** : Copy Stand (Mark I)  
**A731008** : Long Rod for Copy Stand  
**A731026** : 5X-15X Adjustable Magnification Lens  
**A731027** : 20X Polarization Magnification Lens  
**A731028** : 40X Polarization Magnification Lens  
**A731029** : 650X Adjustable Magnification Lens (Adjustable Focus)  
**A731030** : Remote cable for freeze  
**A731034** : USB Video Grabber

MAGNIFICATION LENS					
Model		A731026	A730001	A731027	A730015
<b>Magnification on 14" monitor</b>		5-15X	20X	20X Polarization	35X Polarization
<b>Illumination Head</b>		Non-contact	Contact, Non-contact, Oblique, Diffusion	Non-contact	Contact
<b>View Area</b>	Horizontal length	56 / 18.7mm	14mm	14mm	8mm
	Vertical length	42 / 14mm	11mm	11mm	6mm
	Diagonal length	70 / 23.4mm	17.8mm	17.8mm	10mm
<b>Depth-Of-Field</b>		≦ 18 / 7mm	≦ 8.8mm	≦ 8.8mm	≦ 3.3mm
<b>Working distance (non-contact lightguide applied)</b>		160 / 40mm	50mm	40mm	(Contact type only)

Model		A730002	A730028	A730016	A730007
<b>Magnification on 14" monitor</b>		40X	40X Polarization	40X LWD	100X
<b>Illumination Head</b>		Contact, Non-contact, Oblique, Diffusion	Non-contact	None	Contact Non-contact
<b>View Area</b>	Horizontal length	7.5mm	7.5mm	7.5mm	2.8mm
	Vertical length	6mm	6mm	6mm	2.2mm
	Diagonal length	9.6mm	9.6mm	9.6mm	3.56mm
<b>Depth-Of-Field</b>		≦ 3.85mm	≦ 3.85mm	≦ 3.5mm	≦ 0.55mm
<b>Working Distance (non-contact lightguide applied)</b>		30mm	18mm	179.5mm	4mm

Model		A730003	A730011	A731029	A730013
<b>Magnification on 14" monitor</b>		200X	400X	650X	1000X
<b>Illumination Head</b>		Contact, Non-contact	Contact, Non-contact	adjustable Focus	Contact, Non-contact
<b>View Area</b>	Horizontal length	1.4mm	0.7mm	0.43mm	0.28mm
	Vertical length	1.1mm	0.52mm	0.32mm	0.21mm
	Diagonal length	1.78mm	0.87mm	0.53mm	0.35mm
<b>Depth-Of-Field</b>		≦ 0.22mm	≦ 0.055mm	≦ 0.07mm	≦ 0.066mm
<b>Working Distance (non-contact lightguide applied)</b>		4mm	2.5mm	1.4mm	3.6mm



Chroma 7503 is a sub-nano 3D Optical Profiler developed using the technology of white light interference to measure and analyze the surface profile of micro-nano structures with sophisticated scanning system and innovative algorithms. It can work with color or monochrome camera as required for 2D and microscope measurements.

The latest system modular design of Chroma 7503 has flexible configurations that can comply with diversified test applications. When equipped with electric nose gear, maximum 5 types of lens can be mounted and switched directly for use without changing manually. In addition the equipped electrical adjustment mobile platform is able to adjust and position the sample automatically. The large scanning range of vertical and horizontal axis is applicable for various auto measurements. Nondestructive and rapid surface texture measurement as well as analysis can be done on the sample without any preprocessing that is most suitable for R&D, production, process improvement and academic research.

The height resolution Chroma 7503 is up to 0.1 nm and it can achieve 100mm when Z vertical axis is used to measure the scanning stroke. Also the horizontal axis is able to reach sub-micro resolution with scanning range up to 150 × 150mm when a PC is used to control the mobile platform as demand. The fast calibration procedure and algorithm theory enables the system calibration result to be traced to NIST standard. Combined with several innovative, robust and reliable algorithms, Chroma 7503 has the quality of high precision and large scale measurement.

The configured auto scanning platform is able to find the best focus position via the automated vertical axis mobile platform with rapid autofocus algorithm. Moreover, the tilt adjustment platform is able to level the unit under test within a few seconds without complex operations.

The commercial white light interference analyzers frequently use the centroid algorithm to calculate the surface height. Since the light diffraction causes incorrect height calculation of some positions and results wrong profiling data. Chroma 7503 applies the most advanced 3D Profiler Master software along with the interference signal process algorithm of Chroma to analyze the spectrum of white light interference and prevent the boundary error problem. The system has dark point process function to filter out and correct the data that is incapable of creating interference to reduce the error in measurement. Since the dark point process runs while the data is retrieving, the dark point filter function can be executed effectively; meanwhile the correction is made by referencing the surrounding data that makes the measurement more robust and reliable.

STA (Surface Texture Analysis) Master software analyzes and corrects the data of surface texture, also provides complete profiles in icon. It has more than 150 lines or surfaces profiling parameters including roughness, ripple, flatness, apex and valley. The high pass filter, low pass filter, fast Fourier transformation and cusp removal space filter tools allow the user to filter out the high/low/bandpass signals. The software has polynomial fitting, region growth, the entire surface and multiple area leveling tools that can be used in data processing and analysis flexibly.

In many hi-tech industries such as semiconductor, flat panel display, fiber communication, MEMS, biomedical and electronic packaging, the accuracy of micro structure surface texture determines the performance and function of the product, thus it needs to be monitored for quality during manufacturing. Chroma 7503 has many surface measurement parameters such as section height, included angle, area, dimension, roughness, ripple, film thickness and flatness that can meet the requirements of the industries and R&D units.

Chroma 7503 has 2D and 3D measurements with fast switch of ratio and large area map interlinking function that can cope with various applications' needs. Furthermore, the flexible modular design allows customization for practical use to gain the balance between price and performance. Chroma 7503 is the best choice for improving efficiency and saving cost.

#### KEY FEATURES

- Up to 0.1 nm height resolution for measurement
- Use white light interference measurement technique to do nondestructive and rapid surface texture measurement and analysis
- Modularized design to select parts based on test demands or budget concerns
- Work with color or monochrome camera to do 2D measurement and enable the measuring microscope function
- Equipped with electric nose gear to mount various lens for switch programmatically
- LED or halogen light source for selection
- Measurement range 150 mm x150 mm
- Integrate low magnification lens (5X & 2.5X ratio) for large area 3D measurement
- Provide various surface measurement parameters, such as sectional difference, included angle, area, dimension, roughness, waviness, film thickness and flatness
- Equipped with dark point and boundary error correction algorithms
- Friendly user interface with simple graphical control system and 3D graphics display
- Exchangeable file format to save and read various 3D profile file formats
- Powerful STA (Surface Texture Analysis) Master software providing more than 150 lines and surfaces profiling parameters
- Automated rapid self calibration to ensure the system's measurement capability
- Provide Chinese/English user interface for switch
- Provide measurement script for auto test

#### ORDERING INFORMATION

**7503** : Sub-nanometer 3D Optical Profiler

**Imaging system:** 640x480 pixel (mono), 640x480 pixel (color), 1000x1000 pixel (mono) <sup>\*1</sup>, 1000x1000 pixel (color) <sup>\*1</sup>

**Interference objective lens:** 2.5X <sup>\*2</sup>, 5X, 10X, 20X, 50X, 100X

**Conventional objective lens:** 5X, 10X, 20X, 50X, 100X

**Tube lens:** 0.45X, 0.5X, 1.0X

**Nose gear:**

None, Manual rotary 5 holes, Electric rotary 5 holes

**Light Source:**

White light LED, Halogen, Mono LED

**Anti-vibration table**

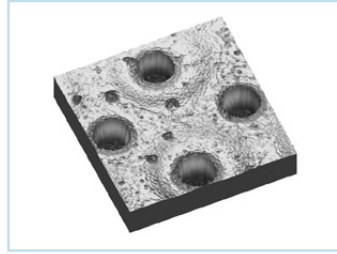
**Software:** STA Master



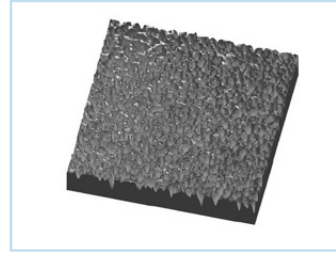
## Application Examples



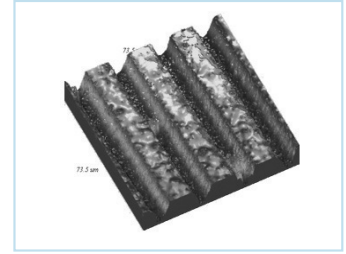
LCD-Photo Spacer



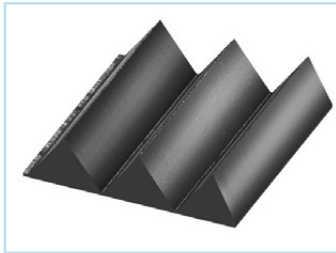
PCB-Laser Via



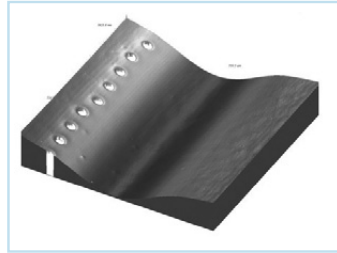
Material-Rough Surface



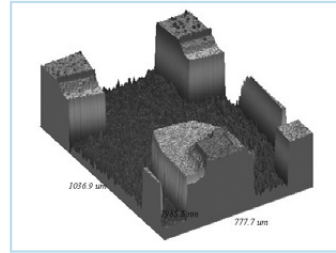
PCB-Wire high, wide, pitch



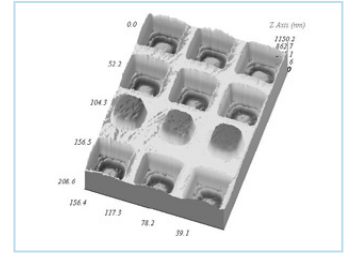
LCD-Prism Sheet



MEMS-Printer Nozzle



MEMS-Hard Disk Read Head



Semiconductor-Thin Film Transistor

## SPECIFICATIONS

Model			7503
Measurement			Noncontact 3D & 2D measurements
Imaging system (CCD video camera)			640x480 pixel (mono), 640x480 pixel (color) Optional 1000x1000 pixel (mono), 1000x1000 pixel (color) *1
Interference objective lens			2.5X *2, 5X, 10X, 20X, 50X, 100X
Conventional objective lens			5X, 10X, 20X, 50X, 100X
Supported tube lens ratio			0.45X, 0.5X, 1.0X
Nose gear			Standard : Electric rotary 5 holes Optional : None, Manual rotary 5 holes
Light Source			White light LED Optional Halogen
Measurement Mode *3			PSI, VSI
XY automatic platform	Stroke		150 mm
	Resolution		2 μm (auto version)
	Load capacity		≦ 1.1 Kg (without carrying tray)
	Control mode		Auto
Level Measurement Range			150 x 150 mm
Z axis	Stroke		100 mm electrical platform, optional for 100 mm manual platform
	Resolution		< 0.5 μm (Electrical platform)
Level adjustment platform			Manual 2 axes, ± 6°
PZT Scan	Stroke		100 μm, optional 400 μm
	Accuracy (Step Height)	VSI	≦ 1.5 % *4
Vertical direction	Repeatability (Step Height)	PSI	≦ 5.0 % *5
		VSI	≦ 0.14 % *4
	Scan speed	PSI	≦ 1.7 % *5
		PZT	12 μm / sec
Operating system			Microsoft Window *7 (32-bit)
Operating environment			Noise : ≤ 60db Vibration : VC-C or above
Input voltage range			1Ø 110~240V ± 10% V <sub>LN</sub> , 47~63Hz, 50VA
Operating temperature/ humidity			15~35°C (47°F to 67°F) ; less than 75 % relative humidity (non condensing)
Dimension (H x W x D)			1800 x 760 x 760 mm / 70.87 x 29.92 x 29.92 inch
Weight			Approx. 220 Kg / 485 lbs *6
Certification			CE

**Note\*1:** Only support 1.0X tube lens ratio

**Note\*2:** 2.5X objective lens have special working distance with other objective lens

**Note\*3:** VSI: Vertical Scanning Interferometry; PSI: Phase Shift Interference

**Note\*4:** Measured with 8.0 μm standard step height

**Note\*5:** Measured with 46nm standard step height

**Note\*6:** The actual weight varies with selected option

All specifications are subject to change without notice.



The Chroma 7936 double sided wafer inspection system is an automatic inspection system for after-dicing wafer chip. It can do double sided inspection simultaneously. The appearance defects of wafer chip are clearly conspicuous when the advanced illumination technology is in use. Illumination and camera acquisition mode can be adjusted for various wafer process, like vertical chip, VCSEL or flip chip.

Applied with high speed camera and inspection algorithms, the Chroma 7936 can inspect a 2" LED wafer in 4.5 minutes with throughput about 35msec/ chip. The Chroma 7936 also provides auto focus and warpage compensation function to solve wafer warpage and chuck leveling problems. It has two magnifications for selection by applicable chip size or defect size. The minimum resolution is 0.7um that is capable of detecting 2 um defect size.

### KEY FEATURES

- Double-sided inspection simultaneously
- Maximum 8 in. wafer handling capability (10 in. inspection area)
- Unique detection algorithm can be replaced or added for different customer or product
- No precise wafer loading is required for auto alignment
- Edge finding to test various wafer shapes
- Defect criteria editor for versatile pass/fail settings
- Defect detection rate > 99%
- Able to combine AOI and upstream data to form a final mapping file for uploading to next processing device
- Customized inspection report for defect analysis

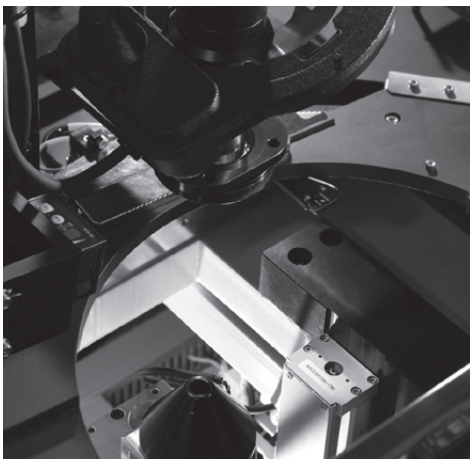
### System Function

After the tape expansion process, the arrangement of dies on wafer may be formed an irregular alignment. Chroma 7936 also offers software alignment function to adjust wafer alignment angle for scan. In addition, Chroma 7936 owns a friendly user interface to reduce user's learning time. All of inspection information is visualized for easy reading, like mapping map, defect region, inspection results.

### Defect Analysis

All of inspection result raw data are recorded not only pass/fail and bin data. This is easily to analysis an optimal parameter that achieves the balance overkill and underkill. The data also helps to monitor the defect trend caused by the production process, and feedback to production unit in advance.

In conclusion, Chroma 7936 is an ideal cost and performance selection for wafer chip inspection process.

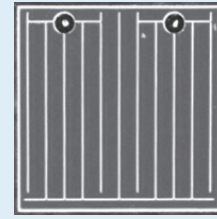


Item	Measurement	Target/Min/Max/Defect	Unit	Actual	Defect	Appr/Defect/Min/Max	Min/Max/Defect	Long/Defect/Min/Max	Short/Defect/Min/Max	W
20101	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20103	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20104	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20106	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20107	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20108	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20109	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20111	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20112	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20113	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20114	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20116	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20117	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20118	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20119	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20121	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20122	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20123	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

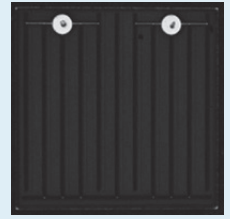
Detail defect raw data for analysis

### Application for vertical LED chip

#### LED Top Side Inspection Items

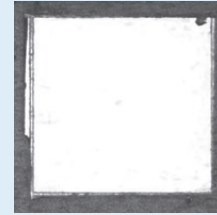


- Pad Defect
- Pad Residue
- ITO Peeling
- Finger Broken

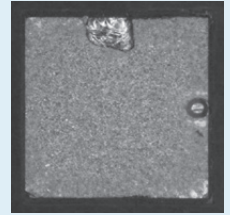


- Mesa Abnormality
- Epi Defect
- Chipping
- Chip Residue

#### LED Back Side Inspection Items

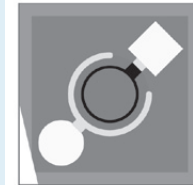


- Cutting Abnormality
- Pad Bump



- Chipping
- Metal Lack

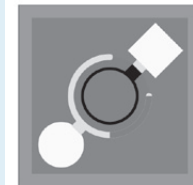
### Application for vertical LED chip



Ball Missing



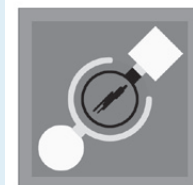
Ball Chipping



Ball Shift



Lead Short



Lead oPEN



Lead Notch

SPECIFICATIONS	
<b>Model</b>	<b>7936</b>
<b>Suitable Chip and Package Type</b>	
Applicable Ring	Grip ring holder or wafer holder
Inspection Area	10" , suit for 6" LED expanding wafer and 8" sawing wafer
Chip Size	125umX125um ~1.2mmX1.2mm
Chip Height	10um~1.5mm
Suitable Package	Vertical chip, flip chip
<b>Inspection</b>	
Camera	5M Color Camera X 2
Light Source	LED co-axis light, ring light, back light
Magnification	2X, 5X objective lens selectable
Throughput	For LED, 2" wafer in 4.5 minutes at 2 lights
Algorithm	Pad defect, mesa defect, chipping defect, double chips and emitting area defect
External Interface	Provide external algorithm interface to replace or add new inspection algorithm
<b>System</b>	
Loading/ unloading	Auto load port X 2
Warpage Compensation	Software auto focus to overcome wafer warpage
PC	X1
<b>Software Function</b>	
Monitor	Real-time wafer map display
Image Storage	All/ defect image saving selectable
Report	Including chip position, defect type, inspection results
Cassette Selection	Programmable cassette selection and scheduling
<b>Facility Requirement</b>	
Dimension	1200mm x 800 mm x 1550mm
Weight	800kg
Power	AC 220V ± 10%, 50/60 Hz, 1 Φ , 2KW
Compressed Air	0.6 MPa
Operation Temperature	+5°C ~40 °C
Operation Humidity	20%~65% R.H.
Operation Humidity	20%~65% R.H.

## ORDERING INFORMATION

**7936** : Double Sided Wafer Inspection System



Chroma 7940 wafer chip inspection system is an automated inspection system for post-diced wafer chip inspection. It is capable of inspecting both top and bottom view of the wafer chip simultaneously. Utilizing an advanced illumination technology and color camera acquisition, the system can be customized for various wafer processes and test configuration such as vertical chip or flip chip inspection.

With high-speed camera and inspection algorithms, Chroma 7940 can inspect up to 6" wafer in 3 minutes with a throughput of up to 15 msec./chip. It provides auto focus and compensation for wafer warpage and leveling of an uneven chuck. 2X and 5X magnifications with 1.3µm/pixel and 0.5µm/pixel resolutions respectively are used to detect various defects down to 1.5µm in size.

### KEY FEATURES

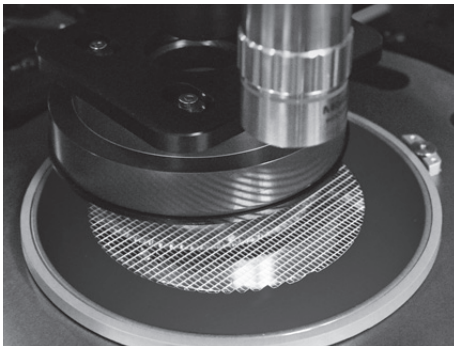
- Simultaneous double side color inspection
- 6" wafer / 8" inspection area
- Automatic wafer alignment
- Wafer shape / edge identification
- Unique defect detection algorithm
- Versatile defect criteria definitions
- Complete defect classification
- Defect detection rate > 99%
- Wafer mapping
  - Yield
  - Up/down stream operation

### System Function

After tape expansion, individual chip orientation may become irregular and chip realignment is needed during the inspection process. Chroma 7940 includes a software alignment function that automatically adjusts wafer alignment angle for precision scanning. The system comes with an easy-to-read and user-friendly interface that significantly reduces user's learning time while providing visual wafer mapping of defect regions and inspection result.

### Defect Analysis

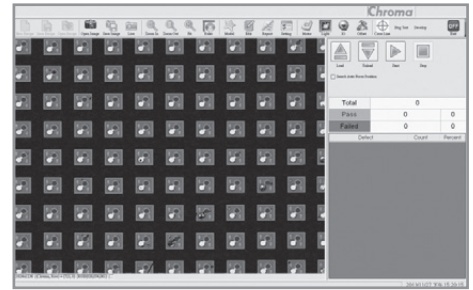
Besides pass/fail inspection and bin data, all raw data for the inspection result may be recorded for further analysis. This database makes it easy to analyze and obtain optimal parameters for balancing the over-kill and under-kill. It is also used to monitor defect trend caused by the production process, therefore capable of providing advanced feedback for production control.



Line	WaferID	Coordinate	DefectID	DefectType	DefectArea	DefectLength	DefectWidth	DefectDepth	DefectColor	DefectStatus
1	1001	100	100	100	100	100	100	100	100	100
2	1001	100	100	100	100	100	100	100	100	100
3	1001	100	100	100	100	100	100	100	100	100
4	1001	100	100	100	100	100	100	100	100	100
5	1001	100	100	100	100	100	100	100	100	100
6	1001	100	100	100	100	100	100	100	100	100
7	1001	100	100	100	100	100	100	100	100	100
8	1001	100	100	100	100	100	100	100	100	100
9	1001	100	100	100	100	100	100	100	100	100
10	1001	100	100	100	100	100	100	100	100	100
11	1001	100	100	100	100	100	100	100	100	100
12	1001	100	100	100	100	100	100	100	100	100
13	1001	100	100	100	100	100	100	100	100	100
14	1001	100	100	100	100	100	100	100	100	100
15	1001	100	100	100	100	100	100	100	100	100
16	1001	100	100	100	100	100	100	100	100	100
17	1001	100	100	100	100	100	100	100	100	100
18	1001	100	100	100	100	100	100	100	100	100
19	1001	100	100	100	100	100	100	100	100	100
20	1001	100	100	100	100	100	100	100	100	100
21	1001	100	100	100	100	100	100	100	100	100
22	1001	100	100	100	100	100	100	100	100	100
23	1001	100	100	100	100	100	100	100	100	100
24	1001	100	100	100	100	100	100	100	100	100
25	1001	100	100	100	100	100	100	100	100	100
26	1001	100	100	100	100	100	100	100	100	100
27	1001	100	100	100	100	100	100	100	100	100
28	1001	100	100	100	100	100	100	100	100	100
29	1001	100	100	100	100	100	100	100	100	100
30	1001	100	100	100	100	100	100	100	100	100
31	1001	100	100	100	100	100	100	100	100	100
32	1001	100	100	100	100	100	100	100	100	100
33	1001	100	100	100	100	100	100	100	100	100
34	1001	100	100	100	100	100	100	100	100	100
35	1001	100	100	100	100	100	100	100	100	100
36	1001	100	100	100	100	100	100	100	100	100
37	1001	100	100	100	100	100	100	100	100	100
38	1001	100	100	100	100	100	100	100	100	100
39	1001	100	100	100	100	100	100	100	100	100
40	1001	100	100	100	100	100	100	100	100	100
41	1001	100	100	100	100	100	100	100	100	100
42	1001	100	100	100	100	100	100	100	100	100
43	1001	100	100	100	100	100	100	100	100	100
44	1001	100	100	100	100	100	100	100	100	100
45	1001	100	100	100	100	100	100	100	100	100
46	1001	100	100	100	100	100	100	100	100	100
47	1001	100	100	100	100	100	100	100	100	100
48	1001	100	100	100	100	100	100	100	100	100
49	1001	100	100	100	100	100	100	100	100	100
50	1001	100	100	100	100	100	100	100	100	100

Detail defect raw data for analysis

### Applications for Laser Diodes & Photo Diodes

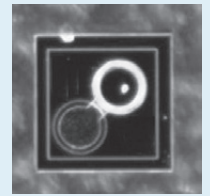


### Laser Diodes & Photo Diodes Inspection Items

#### Top Side Defects

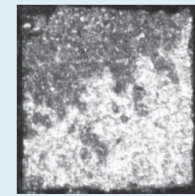


- Photosensitive Region Defect
- Bond Pad Defect
- Passivation Film Defect

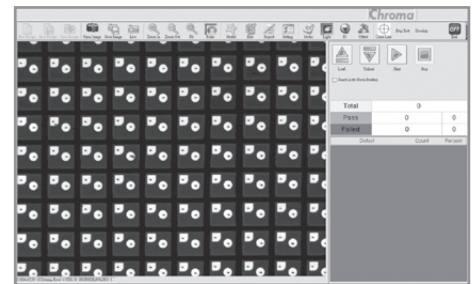


- Scribe Line Defect
- Chipping
- Double Chip

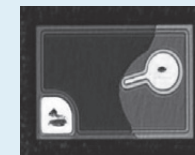
#### Back Side Defects



### Application for LED Chips



### LED Inspection Items



- Pad Defect
- Pad Residue
- ITO Peeling
- Finger Broken



- Mesa Abnormality
- Epi Defect
- Chipping
- Chip Residue



SPECIFICATIONS	
<b>Model</b>	<b>7940</b>
<b>Suitable Chip and Package Type</b>	
Applicable Ring	Grip ring or wafer frame
Inspection Area	8 inches
Chip Size	125um x 125um ~ 2.2mm x 2.2mm at 5X magnification
Suitable Package	LED vertical chip, flip chip, VCSEL
<b>Inspection</b>	
Camera	25M Color Camera x 2
Light Source	LED co-axis light, ring light, back light
Magnification	2X, 5X objective lens selectable
Resolution	1.28um/pixel (2X), 0.5um/pixel (5X)
Throughput	6" wafer in 3 minutes at 2 lights, 2X magnification
Algorithm	- Pad defect, mesa defect, chipping defect, double chips and emitting area defect - Provide algorithm interface to replace or add new inspection algorithm
<b>System</b>	
Cassette Load Port	Auto load ports x 3
Warpage Compensation	software auto focus to overcome wafer warpage
PC	x 1
<b>Software Function</b>	
Monitor	Real-time wafer map display
Image Storage	All/defect image saving selectable
Report	Including chip position, defect type, inspection results
Cassette Selection	Programmable cassette selection and scheduling
<b>Facility Requirement</b>	
Dimension (WxDxH)	1950 mm x 1650 mm x 1750 mm
Weight	2000 kg
Power	AC 220V ± 10%, 50/60 Hz, 1 Φ, 3KW
Compressed Air	0.6 MPa
Operation Temperature	+5°C ~40°C
Operation Humidity	20%~60% R.H.

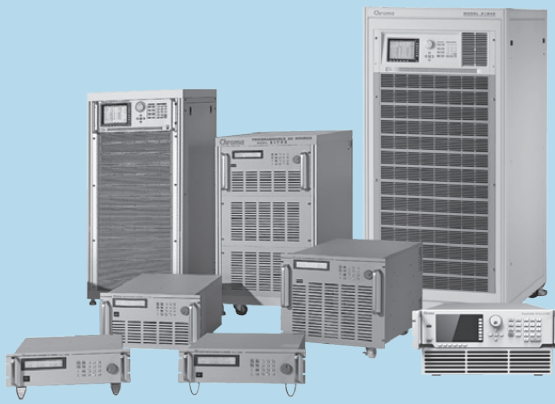
## ORDERING INFORMATION

**7940** : Wafer Inspection System

- Video & Color
- Flat Panel Display
- Lighting LED/
- Optical Devices
- Photovoltaic Test & Automation
- Automated Optical Inspection
- Power Electronics
- Battery Test & Automation
- Passive Component
- Electrical Safety
- Semiconductor/IC
- PXI Test & Measurement
- General Purpose
- Intelligent Manufacturing System
- Turnkey Test & Automation

<b>Selection Guides</b>	<b>10-1</b>
<b>DC Electronic Load</b>	<b>10-5</b>
<b>AC Electronic Load</b>	<b>10-40</b>
<b>AC Power Source</b>	<b>10-42</b>
<b>Digital Power Meter</b>	<b>10-58</b>
<b>DC Power Supply</b>	<b>10-62</b>
<b>Automatic Test System</b>	<b>10-78</b>

## Automatic Test System



AC Source



DC Electronic Load

AC Electronic Load

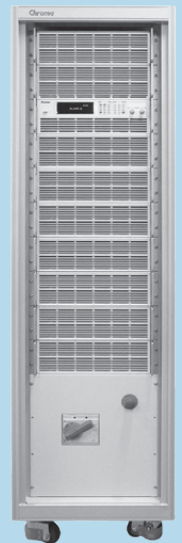


Digital Power Meter

DC Power Supply



Burn-in  
DC Power Supply



Solar Array Simulation  
DC Power Supply

DC Electronic Load Selection Guide						
Series	6310A Series	6330A Series	63200A Series	63200E Series	63600 Series	63800 Series
<b>Power Rating (Modular)</b>	200W, 100Wx2(Dual), 30W&250W, 300W, 350W, 600W, 1200W	200W, 100Wx2(Dual), 30W&250W, 300W, 350W, 600W, 1200W	2kW, 3kW, 4kW, 5kW, 6kW, 8kW, 10kW, 12kW, 15kW, 18kW, 20kW, 24kW	2kW, 3kW, 4kW, 5kW, 6kW, 8kW, 10kW, 12kW, 15kW, 18kW, 20kW, 24kW	100Wx2(Dual), 300W, 400W	1800W, 3600W, 4500W
<b>Current</b>	Up to 240A	Up to 240A	Up to 2000A	Up to 2000A	Up to 80A	Up to 45A
<b>Voltage</b>	Up to 600V	Up to 600V	Up to 1200V	Up to 1200V	Up to 600V	Up to 500V
<b>Configuration</b>	Modular	Modular	Stand-Alone	Stand-Alone	Modular	Stand-Alone
<b>Max. Channel / Mainframe</b>	8	8	1	1	10	1
<b>Operating Mode</b>	CC/CR/CV/CP	CC/CR/CV/CP	CC/CR/CV/CP/CZ	CC/CR/CV/CP/CZ	CC/CR/CV/CP/CZ	CC/CR/CV/CP/ DC Rectified
<b>Slew Rate</b>	Up to 10A/μs	Up to 10A/μs	Up to 80A/μs	Up to 20A/μs	Up to 8A/μs	Up to 600A/ms
<b>Dynamic Loading</b>	Y	Y	Y	Y	Y	-
<b>Measurement</b>	V, I, P	V, I, P	V, I, P, Vpeak	V, I, P, Vpeak	V, I, P, Vpeak	V, I, P, R
<b>External Waveform Control</b>	-	-	Y	-	Y	-
<b>User Defined Waveform</b>	-	-	Y	-	Y	-
<b>Short Circuit Test</b>	Y	Y	Y	Y	Y	Y
<b>Von Point Control</b>	Y	Y	Y	Y	Y	-
<b>V&amp;I Monitor</b>	-	-	Y	Y	Y	Y
<b>Synchronize Dynamic</b>	-	Y	Y	Y	Y	-
<b>Synchronize Control Multi-load</b>	Y	Y	Y	Y	Y	-
<b>Master/Slave Parallel Mode</b>	-	Y	Y	Y	Y	Y
<b>Data Setting (Rotary)</b>	Y	Y	Y	Y	Y	Y
<b>Data Setting (Keypad)</b>	Y	Y	Y	Y	-	Y
<b>Status Storage (100 files)</b>	Y	Y	Y	Y	Y	Y
<b>Remote Controller</b>	Option	Option	-	-	-	-
<b>GO/NG Test</b>	Y	Y	Y	Y	Y	-
<b>Fan Speed Control</b>	Y	Y	Y	Y	Y	Y
<b>Self Test at Power On</b>	Y	Y	Y	Y	Y	Y
<b>Programmable Test (10 Pro.)</b>	Y	Y	Y	Y	Y	-
<b>RS-232 Interface</b>	Standard	Standard	-	-	-	Standard
<b>GPIB Interface</b>	Option	Option	Option	Option	Option	Standard
<b>USB Interface</b>	Option	Option	Standard	Standard	Standard	-
<b>Ethernet Interface</b>	-	-	Option	Option	Option	-
<b>PAGE</b>	<b>10-5</b>	<b>10-30</b>	<b>10-12</b>	<b>10-21</b>	<b>10-36</b>	<b>10-40</b>



## AC Power Source Selection Guide

### Step 1 by Function

Series	6400 Series	6500 Series	61500 Series	61600 Series	61700 Series	61800 Series
Power Measurement	Standard	Standard	Standard	Standard	Standard	Standard
PLD Simulation	-	Standard	Standard	-	Option	Standard
Arbitrary Waveform	-	-	Standard	-	-	Standard
DC Output	-	-	Standard	Standard	Standard	Standard
Programmable Output Impedance	-	-	Standard	-	-	-
Harmonic Measurement	-	-	Standard	-	-	Standard
IEC Regulation Testing	-	Standard	Standard	-	-	Standard
GPIB Interface	Option	Option	Option	Option	Option	Standard
RS-232 Interface	Option	Option	Option	Option	Option	Standard
PAGE	10-54	10-56	10-42	10-46	10-50	10-52

### Step 2 by Model

Series	6400 Series		6500 Series		61500 Series		61600 Series		61700 Series	61800 Series
Power	1 Ø	3 Ø	1 Ø	3 Ø	1 Ø	3 Ø	1 Ø	3 Ø	3 Ø	1 Ø/3 Ø
500VA	-	-	-	-	61501	-	61601	-	-	-
1000VA	-	-	-	-	61502	-	61602	-	-	-
1200VA	-	-	6512	-	-	-	-	-	-	-
1500VA	6415	-	-	-	61503	-	61603	-	61701	-
2000VA	6420	-	6520	-	61504	-	61604	-	-	-
3000VA	6430	-	6530	-	-	-	-	-	61702	-
4000VA	-	-	-	-	61505	-	61605	-	-	-
4500VA	-	-	-	-	-	-	-	-	61703	-
6000VA	6460	-	6560	-	61509	-	61609	-	61704	-
9000VA	6463	-	6590	-	-	-	-	-	-	-
12000VA	6490	-	-	-	61511	-	61611	-	61705	-
18000VA	-	-	-	-	61512	-	61612	-	-	-
30000VA	-	-	-	-	61511 + A615103	-	61611 + A615103	-	-	61830
36000VA	-	-	-	-	61512 + A615103	-	61612 + A615103	-	-	-
45000VA	-	-	-	-	-	-	-	-	-	61845
60000VA	-	-	-	-	-	-	-	-	-	61860
PAGE	10-54		10-56		10-42		10-46		10-50	10-52

## Power Meter Selection Guide

Series	66201	66202	66203	66204	66205
Channel	1	1	3	4	1
Max. Voltage range	500Vrms	500Vrms	600Vrms	600Vrms	600Vrms
Max. Current range	4Arms	20Arms	20Arms	20Arms	30Arms
Frequency	15Hz-10kHz	15Hz-10kHz	10Hz-10kHz	10Hz-10kHz	10Hz-10kHz
Graphical Display	-	-	-	-	-
Result storage	-	-	-	-	-
Rotary / keypad Data input	-	-	-	-	-
GPIB Interface	V	V	V	V	V
RS-232 Interface	-	-	-	-	-
USB Interface	V	V	V	V	V
Centronics Interface	-	-	-	-	-
Parameters	V, I, PF, W, VA, P, CF, Vpk, Ipk	V, I, F, PF, W, Wr, Wa, P, CF, Vpk, Ipk, Ip-p, THD, E	V, I, F, PF, W, VAR, VA, CF, Vpk, Ipk, THD, E, EFF	V, I, F, PF, W, VAR, VA, CF, Vpk, Ipk, THD, E, EFF	V, I, F, PF, W, VAR, VA, CF, Vpk, Ipk, THD, E, EFF
AC/DC Measurement mode	DC, AC+DC	DC, AC+DC	DC, AC+DC	DC, AC+DC	DC, AC+DC
40th Harmonics Measurement Capability	-	V	V	V	V
Pre-Compliance IEC 61000-3-2	-	Software	Software	Software	Software
DFT & DSP Technology	V	V	V	V	V
Waveform display	Software	Software	Software	Software	Software
Waveform moving cursor	-	-	-	-	-
Waveform trigger function	-	-	-	-	-
Recording function	Software	Software	Software	Software	Software
Stand alone operating	V	V	V	V	V
PAGE	10-58	10-58	10-58	10-58	10-58

# Selection Guides

DC Power Supply Selection Guide								
Model	62000B Series / 1.5KW		62000H Series 2KW & 5KW & 10KW & 15KW		62000P Series 600W & 1.2KW & 2.4KW & 5KW		62000L Series 108W & 150W	
Volts	Amps	Model	Amps	Model	Amps	Model	Amps	Model
0-15	1-90	<b>62015B-15-90</b>						
0-30	1-50	<b>62015B-30-50</b>	0-250A/ 0-375A	<b>62075H-30/ 62100H-30</b>	0-80	<b>62006P-30-80</b>		
0-36							0-7A	<b>62010L-36-7</b>
0-40			0-125A/ 0-250A/ 0-375A	<b>62050H-40/ 62100H-40/ 62150H-40</b>	0-120	<b>62012P-40-120/ 62024P-40-120</b>		
0-60	1-25	<b>62015B-60-25</b>					0-6A	<b>62015L-60-6</b>
0-80	1-18	<b>62015B-80-18</b>			0-60	<b>62012P-80-60/ 62024P-80-60</b>		
0-100			0-250A/ 0-375A	<b>62100H-100P/ 62150H-100P</b>	0-25/ 0-50/ 0-100	<b>62006P-100-25/ 62012P-100-50/ 62024P-100-50/ 62050P-100-100</b>		
0-150	1-10	<b>62015B-150-10</b>	0-40A	<b>62020H-150S</b>				
0-300					0-8	<b>62006P-300-8</b>		
0-450			0-11.5A/ 0-23A/ 0-34A	<b>62050H-450/ 62100H-450/ 62150H-450</b>				
0-600			0-8.5A/ 0-17A/ 0-25A	<b>62050H-600/62050H-600S 62100H-600/62100H-600S 62150H-600/62150H-600S</b>	0-8	<b>62012P-600-8/ 62024P-600-8</b>		
0-1000			0-10A/ 0-15A	<b>62100H-1000/ 62150H-1000/ 62150H-1000S</b>				
<b>PAGE</b>	<b>10-76</b>		<b>10-66, 10-70</b>		<b>10-62</b>		<b>10-74</b>	

## Automatic Test System Selection Guide

System Model	8000	8020	8200	8491
<b>UUT Type</b>				
Battery Charger	V	V		
Switching Mode Rectifier	V			
Switching Power Supply (Multi-Output)	V	V	V	
Adapter	V	V	V	
DC to DC Converter	V			
DC Power Supply	V			
LED Power Driver			V	V
EV Power Electronics	V			
PV Inverter	V			
<b>Functionality</b>				
Open System Architecture	V			V
Optional Instrument Extendible	V			V
Support Windows 98/NT/2000 or higher	V	V	V	V
User Permission Setting	V	V	V	V
System Administrator Access Log	V	V		V
Network Management	V	V		V
Support Shop Floor Control Software *1	V	V	V	V
Test Report Editing	V	V	V	V
Test Item Editing	V			V
Test Program Editing	V	V	V	V
Test Program Saving	V	V	V	V
Debug Run	V			V
GO/NO GO Test	V	V	V	V
Statistical Analysis Control	V	V	V	V
Test Report Printing	V	V	V	V
On-Line Control *2	V			V
Report Wizard *3	V			V
<b>PAGE</b>	<b>10-78</b>	<b>10-85</b>	<b>10-84</b>	<b>10-86</b>

### Notes:

#### 1. Support Shop Floor Control Software:

The system can work with Shop Floor Control Software used on manufacturing production line to attain overall factory control and remote control through internet.

#### 2. On-Line Control:

Enables users to operate all instruments on-line via one computer screen, incorporating the test values from individual instruments to save time and resources.

#### 3. Report Wizard:

Automatically generates various R&D reports including oscilloscope waveform and the others to meet customer's needs and reduce the report preparation time.



### KEY FEATURES

- Max Power: 200W, 100W × 2(Dual), 30W & 250W, 300W, 350W, 600W, 1200W
- Wide range 0~600V operating voltage
- Compatibility between 6310 and 6310A
- Up to 8 channels in one mainframe, for testing multiple output SMPS
- Parallel load modules up to 1400W for high current and power application
- Synchronization with multiple loads
- Flexible CC, CR, CP and CV operation modes
- Dynamic loading with speeds up to 20kHz
- Fast response of 0.32mA/μs~10A/μs slew rate
- Minimum input resistance allowing load to sink high current at low voltage (63123A : 0.6V@70A)
- Real time power supply load transient response simulation and output measurement
- User programmable 100 sequences. Front panel input status for user-friendly operating
- High/Low limits of testing parameters to test GO/NG
- Digital I/O control
- Over current protection (OCP) testing function
- 16-bit precision voltage and current measurement with dual-range
- Remote sensing capability
- Short circuit test
- Self-test at power-on
- Full Protection: OC, OP, OT protection and OV alarm
- USB, GPIB & RS-232 interfaces

The Chroma 6310A series Programmable DC Electronic Load is suitable for the test and evaluation of multi-output AC/DC power supplies, DC/DC converters, chargers and power electronic components. It is ideal for applications in research and development, production, and incoming inspection. The system is configured by plugging the user selectable load modules into the system mainframe. The user interfaces include an ergonomically designed user friendly keypad on the front panel and the following computer interfaces: RS-232, USB or GPIB.

The 6310A series has a self-diagnosis routine to maintain instrument performance. It also provides OP, OC, OT protection and alarm indicating OV, reverse polarity protection to guarantee quality and reliability for even the most demanding engineering testing and ATE applications.

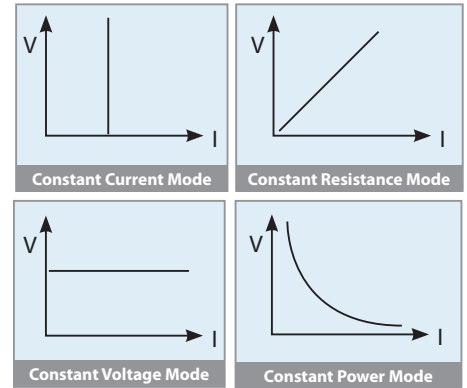
### Module Load Design

The Chroma 6314A 1400W and 6312A 700W electronic load mainframes accept the user-installable 6310A series load modules for easy system configuration and will mount in a 19" instrument rack.

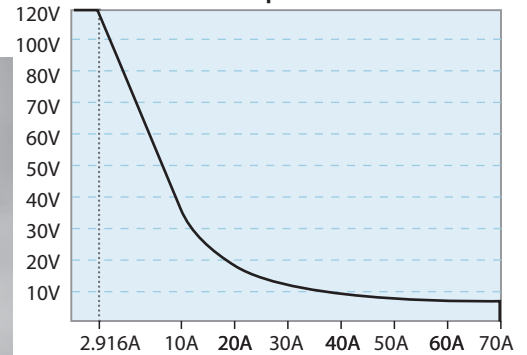


### Application of Specific Load Simulation

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



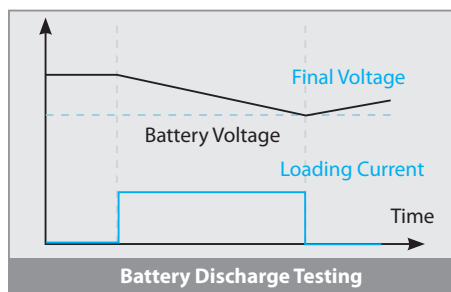
### Model 63123A Input Characteristics



### Timing Function

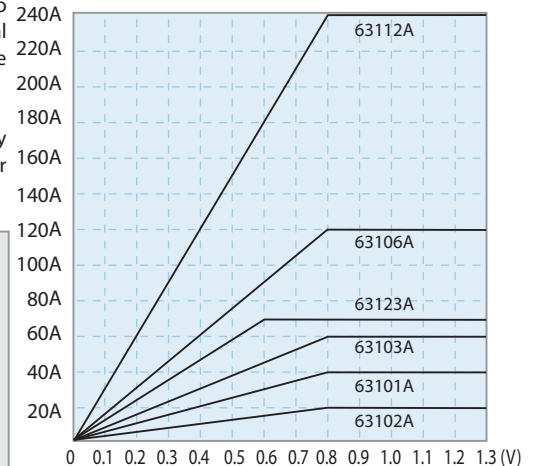
The 6310A series of loads include a unique timing & measurement function, which allows precise time measurements in the range of 1ms to 86,400s. This feature allows the user to set the final voltage & timeout values for battery discharge testing and other similar applications.

The Timing function can be used in testing battery and super capacitor discharge, or other similar applications.



### Low Voltage Characteristics (Typical)

Model 63101A/63102A/63103A/  
63106A/63112A/63123A

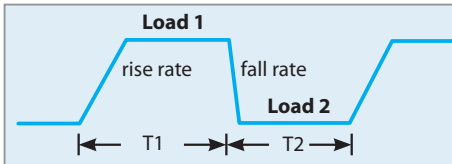


Note: All specifications are measured at load input terminals. (Ambient Temperature of 25°C)

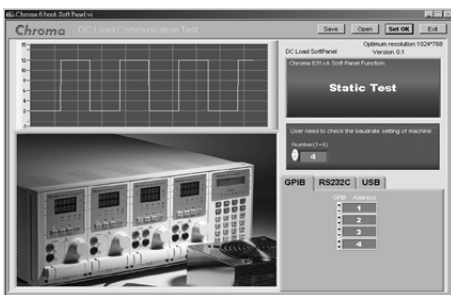


## Dynamic Loading and Control

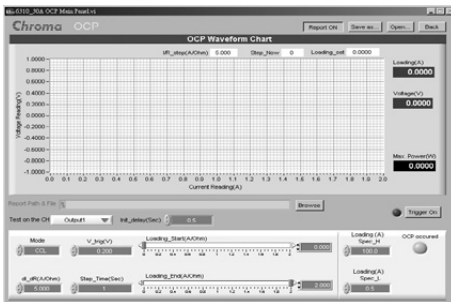
Modern electronic devices operate at very high speeds and require fast dynamic operation of their power providing components. To satisfy these testing applications, the 6310A loads offer high speed, programmable dynamic load simulation and control capability. The figure below shows the programmable parameters of the 6310A modules.



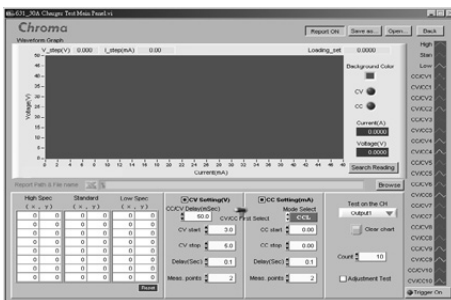
## Soft Panel



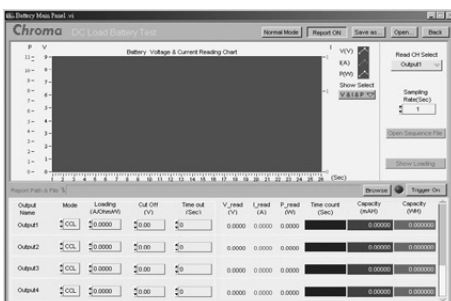
Main Operation Menu



OCP Test



Charger Test



Battery Discharge Test

## 6310A Series DC Electronic Load Family



6314A : 4 in 1 Mainframe



6312A : 2 in 1 Mainframe



A631001: Remote Controller

Mainframe Model	6312A	6314A
Number of slots	2	4
Operating Temperature	0~40°C	0~40°C
Input Rating	1Ø 100/200Vac ± 10% V <sub>LN</sub> , 47~63Hz; 1Ø 115/230Vac ± 10% V <sub>LN</sub> , 47~63Hz	1Ø 100/200Vac ± 10% V <sub>LN</sub> , 47~63Hz; 1Ø 115/230Vac ± 10% V <sub>LN</sub> , 47~63Hz
Dimensions (HxWxD)	194x275x550mm / 7.6x10.8x21.7inch	194x439x550mm / 7.6x17.3x21.7inch
Weight	15 kg / 33.1 lbs	21.5 kg / 47.4 lbs

## ORDERING INFORMATION

- 6312A : Mainframe for 2 Load Modules
- 6314A : Mainframe for 4 Load Modules
- 63101A : Load Module 80V/40A/200W
- 63102A : Load Module 80V/20A/100W x 2
- 63103A : Load Module 80V/60A/300W
- 63105A : Load Module 500V/10A/300W
- 63106A : Load Module 80V/120A/600W
- 63107A : Load Module 80V/5A & 40A/30W & 250W
- 63108A : Load Module 500V/20A/600W
- 63112A : Load Module 80V/240A/1200W
- 63123A : Load Module 120V/70A/350W
- A631000 : GPIB Interface for Model 6314A/6312A Mainframe
- A631001 : Remote Controller
- A631003 : USB Interface for Model 6314A/6312A Mainframe
- A631005 : Softpanel for 6310A/6330A series
- A631006 : Rack Mounting Kit for Model 6312A Mainframe
- A631007 : Rack Mounting Kit for Model 6314A Mainframe
- A800042 : Test Fixture
- LED Load Simulator for LED Driver Test
- 63110A : Load Module 500V/2A/100W x 2
- 63113A : Load Module 300V/20A/300W
- 63115A : Load Module 600V/20A/300W

SPECIFICATIONS-1						
Model	63101A		63102A (100Wx2)		63103A	
Power	20W	200W	20W	100W	30W	300W
Current	0~4A	0~40A	0~2A	0~20A	0~6A	0~60A
Voltage *3	0~80V		0~80V		0~80V	
Typical Min. Operation Voltage (DC)*1	0.4V@2A	0.4V@20A	0.4V@1A	0.4V@10A	0.4V@3A	0.4V@30A
	0.8V@4A	0.8V@40A	0.8V@2A	0.8V@20A	0.8V@6A	0.8V@60A
<b>Constant Current Mode</b>						
Range	0~4A	0~40A	0~2A	0~20A	0~6A	0~60A
Resolution	1mA	10mA	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.
<b>Constant Resistance Mode</b>						
Range	0.0375Ω~150Ω (200W/16V) 1.875Ω~7.5kΩ (200W/80V)		0.075Ω~300Ω (100W/16V) 3.75Ω~15kΩ (100W/80V)		0.025Ω~100Ω (300W/16V) 1.25Ω~5kΩ (300W/80V)	
Resolution*5	6.667mS (200W/16V) 133μS (200W/80V)		3.333mS (100W/16V) 66.667μS (100W/80V)		10mS (300W/16V) 200μS (300W/80V)	
Accuracy	150Ω: 0.1S+ 0.2% 7.5kΩ: 0.01S + 0.1%		300Ω: 0.1S + 0.2% 15kΩ: 0.01S + 0.1%		100Ω: 0.1S+ 0.2% 5kΩ: 0.01S+ 0.1%	
<b>Constant Voltage Mode</b>						
Range	0~80V		0~80V		0~80V	
Resolution	20mV		20mV		20mV	
Accuracy	0.05% + 0.1%F.S.		0.05% + 0.1%F.S.		0.05% + 0.1%F.S.	
<b>Constant Power Mode</b>						
Range	0~20W	0~200W	0~20W	0~100W	0~30W	0~300W
Resolution	5mW	50mW	5mW	25mW	7.5mW	75mW
Accuracy	0.5% + 0.5%F.S.		0.5% + 0.5%F.S.		0.5% + 0.5%F.S.	
<b>Dynamic Mode</b>						
Dynamic Mode	C.C. Mode		C.C. Mode		C.C. Mode	
T1 & T2	0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms	
Accuracy	1μs/1ms+100ppm		1μs/1ms+100ppm		1μs/1ms+100ppm	
Slew Rate	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
Resolution	0.64mA/μs	6.4mA/μs	0.32mA/μs	3.2mA/μs	0.001A/μs	0.01A/μs
Accuracy	10% ± 20μs		10% ± 20μs		10% ± 20μs	
Min. Rise Time	10μs (Typical)		10μs (Typical)		10μs (Typical)	
Current	0~4A	0~40A	0~2A	0~20A	0~6A	0~60A
Resolution	1mA	10mA	0.5mA	5mA	1.5mA	15mA
Accuracy	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
Resolution	0.25mV	1.25mV	0.25mV	1.25mV	0.25mV	1.25mV
Accuracy	0.025% + 0.025%F.S.		0.025% + 0.025%F.S.		0.025% + 0.025%F.S.	
<b>Current Read Back</b>						
Range	0~4A	0~40A	0~2A	0~20A	0~6A	0~60A
Resolution	0.0625mA	0.625mA	0.03125mA	0.3125mA	0.09375mA	0.9375mA
Accuracy	0.05% + 0.05%F.S.		0.05% + 0.05%F.S.		0.05% + 0.05%F.S.	
<b>Power Read Back*2</b>						
Range	0~20W	0~200W	0~20W	0~100W	0~30W	0~300W
Accuracy	0.1% + 0.1%F.S.		0.1% + 0.1%F.S.		0.1% + 0.1%F.S.	
<b>Protective Section</b>						
Over Power Protection	Yes		Yes		Yes	
Over Current Protection	Yes		Yes		Yes	
Over Temperature Protection	Yes		Yes		Yes	
Over Voltage Alarm*3	Yes		Yes		Yes	
<b>General</b>						
<b>Short Circuit</b>						
Current (CC)	-	≒ 40A	-	≒ 20A	-	≒ 60A
Voltage (CV)	-	0V	-	0V	-	0V
Resistance (CR)	-	≒ 0.0375Ω	-	≒ 0.075Ω	-	≒ 0.025Ω
Power (CP)	-	≒ 200W	-	≒ 100W	-	≒ 300W
Input Resistance (Load Off)	100kΩ (Typical)		100kΩ (Typical)		100kΩ (Typical)	
Temperature Coefficient	100PPM/°C (Typical)		100PPM/°C (Typical)		100PPM/°C (Typical)	
Power	Supply from 6314A Mainframe		Supply from 6314A Mainframe		Supply from 6314A Mainframe	
Dimensions (HxWxD)	172x82x489.5mm / 6.8x3.2x19.3inch		172x82x489.5mm / 6.8x3.2x19.3inch		172x82x489.5mm / 6.8x3.2x19.3inch	
Weight	4.2 kg / 9.3 lbs		4.2 kg / 9.3 lbs		4.2 kg / 9.3 lbs	
Operating Range	0~40°C		0~40°C		0~40°C	
EMC & Safety	CE		CE		CE	

SPECIFICATIONS-2								
Model	63105A		63106A		63107A (30W & 250W)			
Power	30W	300W	60W	600W	30W	30W	250W	
Current	0~1A	0~10A	0~12A	0~120A	0~5A	0~4A	0~40A	
Voltage*3	0~500V		0~80V		0~80V			
Typical Min. Operation Voltage (DC)*1	1.0V@0.5A	1.0V@5A	0.4V@6A	0.4V@60A	0.4V@2.5A	0.4V@2A	0.4V@20A	
	2.0V@1A	2.0V@10A	0.8V@12A	0.8V@120A	0.8V@5A	0.8V@4A	0.8V@40A	
<b>Constant Current Mode</b>								
Range	0~1A	0~10A	0~12A	0~120A	0~5A	0~4A	0~40A	
Resolution	0.25mA	2.5mA	3mA	30mA	1.25mA	1mA	10mA	
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%+0.1%F.S.	0.1%+0.2%F.S.	
<b>Constant Resistance Mode</b>								
Range	1.25Ω~5kΩ (300W/125V) 50Ω~200kΩ (300W/500V)		12.5mΩ ~ 50 Ω (600W/16V) 0.625 Ω~2.5kΩ (600W/80V)		0.3 Ω~1.2kΩ (30W/16V) 15 Ω~60kΩ (30W/80V)		0.0375 Ω~150 Ω (250W/16V) 1.875 Ω~7.5kΩ (250W/80V)	
Resolution*5	200μS (300W/125V) 5μS (300W/500V)		20mS (600W/16V) 400μS (600W/80V)		833μS (30W/16V) 16.67μS (30W/80V)		6.667μS (250W/16V) 133μS (250W/80V)	
Accuracy	5kΩ: 20mS+ 0.2% 200kΩ: 5mS+ 0.1%		50 Ω: 0.4S + 0.5% 2.5kΩ: 0.04S + 0.2%		1.2kΩ: 0.1S + 0.2% 60kΩ: 0.01S + 0.1%		150 Ω: 0.1S + 0.2% 7.5kΩ: 0.01S + 0.1%	
<b>Constant Voltage Mode</b>								
Range	0~500V		0~80V		0~80V			
Resolution	125mV		20mV		20mV			
Accuracy	0.05% + 0.1%F.S.		0.05% + 0.1%F.S.		0.05% + 0.1%F.S.			
<b>Constant Power Mode</b>								
Range	0~30W	0~300W	0~60W	0~600W	0~30W	0~30W	0~250W	
Resolution	7.5mW	75mW	15mW	150mW	7.5mW	7.5mW	62.5mW	
Accuracy	0.5% + 0.5%F.S.		0.5% + 0.5%F.S.		0.5% + 0.5%F.S.			
<b>Dynamic Mode</b>								
Dynamic Mode	C.C. Mode		C.C. Mode		C.C. Mode			
T1 & T2	0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms			
Accuracy	1μs/1ms+100ppm		1μs/1ms+100ppm		1μs/1ms+100ppm			
Slew Rate	0.16~40mA/μs	1.6~400mA/μs	0.002~0.5A/μs	0.02~5A/μs	0.8~200mA/μs	0.64~160mA/μs	6.4~1600mA/μs	
Resolution	0.16mA/μs	1.6mA/μs	0.002A/μs	0.02A/μs	0.8mA/μs	0.64mA/μs	6.4mA/μs	
Accuracy	10% ±20μs		10% ±20μs		10% ±20μs			
Min. Rise Time	24μs (Typical)		10μs (Typical)		10μs (Typical)			
Current	0~1A	0~10A	0~12A	0~120A	0~5A	0~4A	0~40A	
Resolution	0.25mA	2.5mA	3mA	30mA	1.25mA	1mA	10mA	
Accuracy	0.4%F.S.		0.4%F.S.		0.4%F.S.			
<b>Measurement Section</b>								
<b>Voltage Read Back</b>								
Range	0~125V	0~500V	0~16V	0~80V	0~16V	0~80V	0~16V	0~80V
Resolution	2mV	8mV	0.25mV	1.25mV	0.25mV	1.25mV	0.25mV	1.25mV
Accuracy	0.025% + 0.025%F.S.		0.025% + 0.025%F.S.		0.025% + 0.025%F.S.			
<b>Current Read Back</b>								
Range	0~1A	0~10A	0~12A	0~120A	0~5A	0~4A	0~40A	
Resolution	0.016mA	0.16mA	0.1875mA	1.875mA	0.078125mA	0.0625mA	0.625mA	
Accuracy	0.05% + 0.05%F.S.		0.05% + 0.05%F.S.		0.05% + 0.05%F.S.			
<b>Power Read Back*2</b>								
Range	0~30W	0~300W	0~60W	0~600W	0~30W	0~30W	0~250W	
Accuracy	0.1% + 0.1%F.S.		0.1% + 0.1%F.S.		0.1% + 0.1%F.S.			
<b>Protective Section</b>								
Over Power Protection	Yes		Yes		Yes			
Over Current Protection	Yes		Yes		Yes			
Over Temperature Protection	Yes		Yes		Yes			
Over Voltage Alarm*3	Yes		Yes		Yes			
<b>General</b>								
<b>Short Circuit</b>								
Current (CC)	-	≒10A	-	≒120A	-	-	≒40A	
Voltage (CV)	-	0V	-	0V	-	-	0V	
Resistance (CR)	-	≒1.25Ω	-	≒0.0125Ω	-	-	≒0.0375Ω	
Power (CP)	-	≒300W	-	≒600W	-	-	≒250W	
Input Resistance (Load Off)	100kΩ (Typical)		100kΩ (Typical)		100kΩ (Typical)			
Temperature Coefficient	100PPM/°C (Typical)		100PPM/°C (Typical)		100PPM/°C (Typical)			
Power	Supply from 6314A Mainframe		Supply from 6314A Mainframe		Supply from 6314A Mainframe			
Dimensions (HxWxD)	172x82x489.5mm / 6.8x3.2x19.3inch		172x164x489.5mm / 6.8x6.5x19.3inch		172x82x489.5mm / 6.8x3.2x19.3inch			
Weight	4.2 kg / 9.3 lbs		7.3 kg / 16.1 lbs		4.5 kg / 9.9 lbs			
Operating Range	0~40°C		0~40°C		0~40°C			
EMC & Safety	CE		CE		CE			

Video & Color  
Flat Panel Display  
LED/Lighting  
Optical Devices  
Photovoltaic Test  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation

SPECIFICATIONS-3						
Model	63108A		63112A		63123A	
Power	60W	600W	120W	1200W	350W	
Current	0~2A	0~20A	0~24A	0~240A	0~7A	0~70A
Voltage*3	0~500V		0~80V		0~120V	
Typical Min. Operation Voltage (DC)*1	1.0V@1A 2.0V@2A	1.0V@10A 2.0V@20A	0.4V@12A 0.8V@24A	0.4V@120A 0.8V@240A	0.05V@3.5A 0.1V@7A	0.3V@35A 0.6V@70A
<b>Constant Current Mode</b>						
Range	0~2A	0~20A	0~24A	0~240A	0~7A	0~70A
Resolution	0.5mA	5mA	6mA	60mA	0.125mA	1.25mA
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%+0.1%F.S.
<b>Constant Resistance Mode</b>						
Range	0.625 Ω ~ 2.5k Ω (600W/125V) 25 Ω ~ 100k Ω (600W/500V)		6.25m Ω ~ 25 Ω (1200W/16V) 0.3125 Ω ~ 1.25k Ω (1200W/80V)		0.015 Ω ~ 150 Ω (350W/24V)*4 2 Ω ~ 2k Ω (350W/120V)	
Resolution*5	400μS (600W/125V) 10μS (600W/500V)		40mS (1200W/16V) 800μS (1200W/80V)		1.33mS (350W/24V)*4 10μS (350W/120V)	
Accuracy	2.5k Ω : 50mS + 0.2% 100k Ω : 5mS + 0.1%		25 Ω : 0.8S + 0.8% 1.25k Ω : 0.08S + 0.2%		150 Ω : 67mS + 0.1% 2k Ω : 5mS + 0.2%	
<b>Constant Voltage Mode</b>						
Range	0~500V		0~80V		0~120V	
Resolution	125mV		20mV		2mV	
Accuracy	0.05% + 0.1%F.S.		0.05% + 0.1%F.S.		0.05% + 0.1%F.S.	
<b>Constant Power Mode</b>						
Range	0~60W	0~600W	0~120W	0~1200W	0~35W	0~350W
Resolution	15mW	150mW	30mW	300mW	2.5mW	25mW
Accuracy	0.5% + 0.5%F.S.		0.5% + 0.5%F.S.		0.5% + 0.5%F.S.	
<b>Dynamic Mode</b>						
Dynamic Mode	C.C. Mode		C.C. Mode		C.C. MODE	
T1 & T2	0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms~50ms/Res: 5μs 0.1ms~500ms / Res: 25μs 10ms~50s / Res: 2.5ms	
Accuracy	1μs/1ms+100ppm		1μs/1ms+100ppm		1μs /1ms+100ppm	
Slew Rate	0.32~80mA/μs	3.2~800mA/μs	0.004~1A/μs	0.04~10A/μs	0.001~0.25A/μs	0.01~2.5A/μs
Resolution	0.32mA/μs	3.2mA/μs	0.004A/μs	0.04A/μs	0.001A/μs	0.01A/μs
Accuracy	10% ± 20μs		10% ± 20μs		10% ± 20μs	
Min. Rise Time	24μs (Typical)		10μs (Typical)		25μs (Typical) *6	
Current	0~2A	0~20A	0~24A	0~240A	0~7A	0~70A
Resolution	0.5mA	5mA	6mA	60mA	0.125mA	1.25mA
Accuracy	0.4%F.S.		0.4%F.S.		0.1% F.S.	
<b>Measurement Section</b>						
<b>Voltage Read Back</b>						
Range	0~125V	0~500V	0~16V	0~80V	0~24V	0~120V
Resolution	2mV	8mV	0.25mV	1.25mV	0.4mV	2mV
Accuracy	0.025% + 0.025%F.S.		0.025% + 0.025%F.S.		0.025%+0.015% F.S.	
<b>Current Read Back</b>						
Range	0~2A	0~20A	0~24A	0~240A	0~7A	0~70A
Resolution	0.03125mA	0.3125mA	0.375mA	3.75mA	0.125mA	1.25mA
Accuracy	0.05% + 0.05%F.S.		0.075% + 0.075%F.S.		0.04%+0.04% F.S.	
<b>Power Read Back*2</b>						
Range	0~60W	0~600W	0~120W	0~1200W	0~35W	0~350W
Accuracy	0.1% + 0.1%F.S.		0.1% + 0.1%F.S.		0.1%+0.1% F.S.	
<b>Protective Section</b>						
Over Power Protection	Yes		Yes		Yes	
Over Current Protection	Yes		Yes		Yes	
Over Temperature Protection	Yes		Yes		Yes	
Over Voltage Alarm*3	Yes		Yes		Yes	
<b>General</b>						
<b>Short Circuit</b>						
Current (CC)	-	≅ 20A	-	≅ 240A	-	≅ 70A
Voltage (CV)	-	0V	-	0V	-	0V
Resistance (CR)	-	≅ 0.625 Ω	-	≅ 0.00625 Ω	-	≅ 0.01 Ω
Power (CP)	-	≅ 600W	-	≅ 1200W	-	≅ 350W
Input Resistance (Load Off)	100k Ω (Typical)		100k Ω (Typical)		800k Ω (Typical)	
Temperature Coefficient	100PPM/°C (Typical)		100PPM/°C (Typical)		100PPM/°C (Typical)	
Power	Supply from 6314A Mainframe		Supply from 6314A Mainframe		Supply from 6314A Mainframe	
Dimensions (HxWxD)	172x164x489.5mm / 6.8x6.5x19.3inch		172x329x495mm / 6.8x12.9x19.5inch		172x82x489.5mm / 6.8x3.2x19.3inch	
Weight	7.3 kg / 16.1 lbs		14 kg / 30.8 lbs		4.2kg / 9.3 lbs	
Operating Range	0~40°C		0~40°C		0~40°C	
EMC & Safety	CE		CE		CE	

**NOTE\*1** : Low voltage operation, under 0.8 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

**NOTE\*2** : Power F.S. = Vrange F.S. x Irange F.S.

**NOTE\*3** : When the operating voltage exceeds the rated voltage for 1.02 times, a warning will occur and if it exceeds 1.1 times of the rated voltage, it would cause permanent damage to the device.

**NOTE\*4** : Please refer to user's manual for detail specifications.

**NOTE\*5** : S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.

**NOTE\*6** : The loading current should be 0.35A at least.





### KEY FEATURES

- Unique LED mode for LED power driver test
- Programmable LED dynamic resistance ( $R_d$ )
- Programmable internal resistance ( $R_r$ ) for simulating LED ripple current
- Fast response for PWM dimming test
- Up to eight channels in one mainframe
- 16-bit precision voltage and current measurement with dual-range
- Full Protection: OC, OP, OT protection and OV alarm

As a constant current source, the LED power driver has an output voltage range with a constant output current. LED power drivers are usually tested in one of the following ways:

1. With LEDs
2. Using resistors for loading
3. Using Electronic Loads in Constant Resistance (CR) mode, or Constant Voltage (CV) mode

However, all these testing methods, each of them has their own disadvantages.

As shown on the V-I curve in Figure 1, the LED has a forward voltage  $V_f$  and a dynamic resistance ( $R_d$ ). When using a resistor as loading, the V-I curve of the resistor is not able to simulate the V-I curve of the LED as shown on Figure 1. This may cause the LED power driver to not start up due to the difference in V-I characteristic between the resistors and the LEDs. When using Electronic Loads, the CR and CV mode settings are set for when the LED is under stable operation and therefore, is unable to simulate turn on or PWM brightness control characteristics. This may cause the LED power driver to function improperly or trigger its protection circuits. These testing requirements can be achieved when using a LEDs as a load; however, issues regarding the LED aging as well as different LED power drivers may require different types of LEDs or a number of LEDs. This makes it inconvenient for mass production testing.



63113A/63115A

Chroma has created the industries first LED Load Simulator for simulating LED loading with our 63110A/63113A/63115A load model from our 6310A series Electronic Loads. By setting the LED power driver's output voltage, and current, the Electronic Load can simulate the LED's loading characteristics. The LED's forward voltage and operating resistance can also be set to further adjust the loading current and ripple current to better simulate LED characteristics. The 63110A design also has increased bandwidth to allow for PWM dimming testing.

Figure 2 shows the dimming current waveform of the LED. Figure 3 shows the dimming current waveform when using 63110A as a load. The 6314A holds up to four 63110A load modules, which will result in an 8-channel 100W/channel load with standard front-panel inputs. This makes it ideal for testing single output and multiple output LED driver. Additionally, the GO/NG output port is useful for UUT's pass/fail testing on an automated production line. All modules on the 6314A/6312A mainframe share a common GPIB address to synchronize and speed up the control of the load modules and the read-back of data.

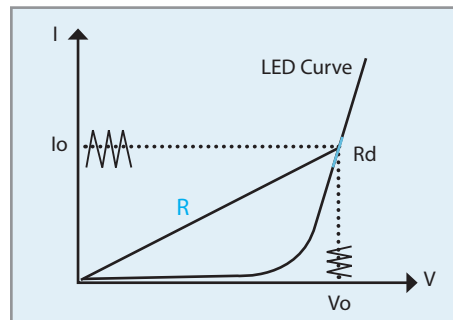


Figure 1 LED V-I Characteristics

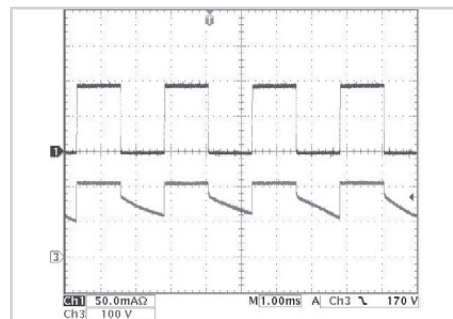


Figure 2 - LED dimming test

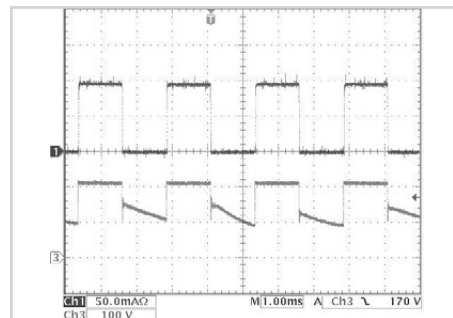


Figure 3 - 63110A dimming test

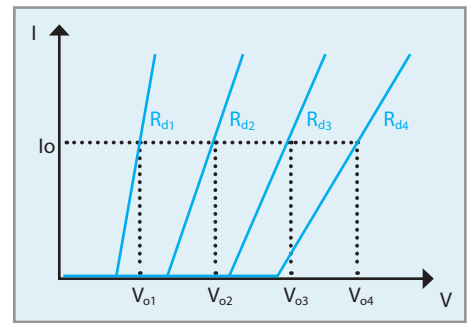


Figure 4 - Simulate different number of LEDs

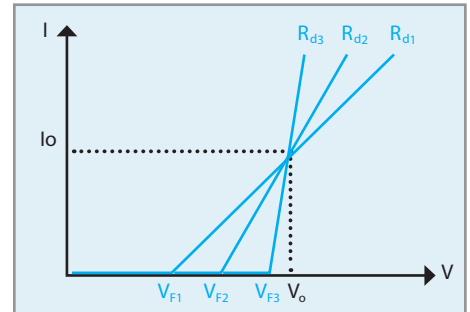


Figure 5 - Simulate different characteristic of LEDs



6312A : 2 in 1 Mainframe



6314A : 4 in 1 Mainframe

Video & Color  
Flat Panel Display  
LED/ Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/ IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation

SPECIFICATIONS						
Model	63110A (100Wx2)		63113A		63115A	
Power	100W		300W		300W	
Current	0~0.6A	0~2A	0~5A	0~20A	0~5A	0~20A
Voltage *1	0~500V		0~300V		0~600V	
Min. Operating Voltage	6V@2A		4V@20A		4V@20A	
<b>Constant Current Mode</b>						
Range	0~0.6A	0~2A	0~5A	0~20A	0~5A	0~20A
Resolution	12μA	40μA	100μA	400μA	100μA	400μA
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.
<b>Constant Resistance Mode</b>						
Range	CRL : 3 Ω ~1k Ω (100W/100V) CRH : 10 Ω ~10k Ω (100W/500V)		CRL @ CH : 0.2 Ω ~200 Ω (300W/60V) CRL @ CL : 0.8 Ω ~800 Ω (300W/60V) CRH @ CL : 4 Ω ~4k Ω (300W/300V)		CRL @ CH : 0.2 Ω ~200 Ω (300W/60V) CRL @ CL : 0.8 Ω ~800 Ω (300W/60V) CRH @ CL : 8 Ω ~8k Ω (300W/600V)	
Resolution*2	CRL : 62.5μS CRH : 6.25μS		CRL @ CH : 100μS CRL @ CL : 25μS CRH @ CL : 5μS		CRL @ CH : 100μS CRL @ CL : 25μS CRH @ CL : 2.5μS	
Accuracy	1k Ω : 4mS+0.2% 10k Ω : 1mS+0.1%		0.2% (setting + range)		0.2% (setting + range)	
<b>Constant Voltage Mode</b>						
Range	0~500V		0~300V		0~600V	
Resolution	20mV		6mV		12mV	
Accuracy	0.05% + 0.1%F.S.		0.05% + 0.1%F.S.		0.05% + 0.1%F.S.	
<b>LED Mode</b>						
Range	Operating Voltage: 0~100V/0~500V R <sub>d</sub> Coefficient : 0.001~1 V <sub>F</sub> : 0~100V/0~500V Current : 0~2A R <sub>d</sub> : 1 Ω ~1k Ω /10 Ω ~10k Ω		Operating Voltage : 0~60V/0~300V R <sub>d</sub> Coefficient : 0.001~1 V <sub>F</sub> : 0~60V/0~300V LEDL @ CH : 0~60V- 0~20A (R <sub>d</sub> : 0.05 Ω ~50 Ω) LEDL @ CL : 0~60V- 0~5A (R <sub>d</sub> : 0.8 Ω ~800 Ω) LEDH @ CL : 0~300V- 0~5A (R <sub>d</sub> : 4 Ω ~4k Ω)		Operating Voltage : 0~60V/0~600V R <sub>d</sub> Coefficient : 0.001~1 V <sub>F</sub> : 0~60V/0~600V LEDL @ CH : 0~60V- 0~20A (R <sub>d</sub> : 0.05 Ω ~50 Ω) LEDL @ CL : 0~60V- 0~5A (R <sub>d</sub> : 0.8 Ω ~800 Ω) LEDH @ CL : 0~600V- 0~5A (R <sub>d</sub> : 8 Ω ~8k Ω)	
Resolution *2	V <sub>o</sub> : 4mV/20mV I <sub>o</sub> : 0.1mA R <sub>d</sub> Coefficient : 0.001 R <sub>d</sub> : 62.5μS/6.25μS V <sub>F</sub> : 4mV/20mV		V <sub>o</sub> : 1.2mV/6mV I <sub>o</sub> : 100μA/400μA R <sub>d</sub> Coefficient : 0.001 R <sub>d</sub> : 400μS / 25μS / 5μS V <sub>F</sub> : 1.2mV/ 6mV		V <sub>o</sub> : 1.2mV/12mV I <sub>o</sub> : 100μA/400μA R <sub>d</sub> Coefficient : 0.001 R <sub>d</sub> : 400μS/25μS/2.5μS V <sub>F</sub> : 6mV/ 60mV	
<b>Dynamic Mode</b>						
Dynamic Mode	--		C.C. Mode		C.C. Mode	
T1 & T2	--		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms	
Accuracy	--		1μs/1ms+100ppm		1μs/1ms+100ppm	
Slew Rate	--		0.8~200mA/μs      3.2~800mA/μs		0.8~200mA/μs      3.2~800mA/μs	
Resolution	--		0.8mA/μs      3.2mA/μs		0.8mA/μs      3.2mA/μs	
Accuracy	--		10% ±20μs		10% ±20μs	
Min. Rise Time	--		25μs (Typical)		25μs (Typical)	
Current	--		0~5A      0~20A		0~5A      0~20A	
Resolution	--		100μA      400μA		100μA      400μA	
Accuracy	--		0.4%F.S.		0.4%F.S.	
<b>Measurement Section</b>						
Voltage Read Back						
Range	0~100V	0~500V	0~60V	0~300V	0~60V	0~600V
Resolution	2mV	10mV	1.2mV	6mV	1.2mV	12mV
Accuracy	0.025%+0.025% F.S.		0.025%+0.025% F.S.		0.025%+0.025% F.S.	
Current Read Back						
Range	0~0.6A	0~2A	0~5A	0~20A	0~5A	0~20A
Resolution	12μA	40μA	100μA	400μA	100μA	400μA
Accuracy	0.05%+0.05% F.S.		0.05%+0.05% F.S.		0.05%+0.05% F.S.	

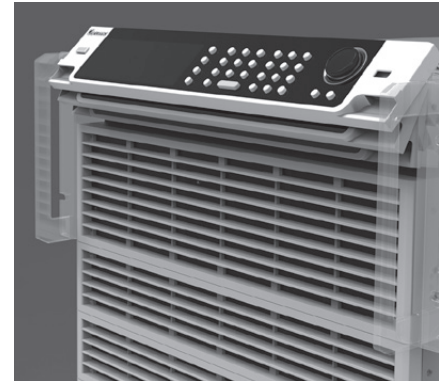
**NOTE\*1** : If the operating voltage exceeds 1.1 times of the rated voltage, it would cause permanent damage to the device.

**NOTE\*2** : S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.

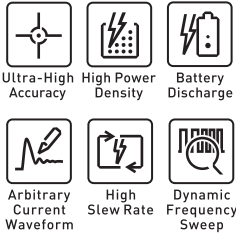


auto-frequency sweep function, which enables detecting a UUTs worst case output deviation across a wide range of current frequencies.

As each model of the 63200A series has 3 power ranges, they can precisely measure the voltage and current in real time. Since short circuit testing is one of the essential power testing items, the 63200A series provides short circuit simulation to effectively solve the application demands for power and automated testing. With the vacuum florescent display (VFD) and rotary knob, the 63200A series loads offer versatile front panel operation. Users are able to control the 63200A family remotely via standard USB or optional Ethernet and GPIB interfaces. The embedded PWM fan speed control reduces noise caused by fans.



Flippable Front Panel for 7U/10U/13U models



## KEY FEATURES

- Rated power : 2kW, 3kW, 4kW, 5kW, 6kW, 8kW, 10kW, 12kW, 15kW, 18kW, 20kW, 24kW, max. 240kW (parallel)
- Voltage range: 150V, 600V, 1200V
- Current range: 2,000A max. per unit
- CC, CR, CV & CP operation modes
- CR+CC, CR+CV, CC+CV complex modes
- Up to 10 units master/slave parallel control
- Dynamic synchronous control in static and dynamic loads
- User defined waveform (UDW)
- CZ mode for turn on capacitive load simulation
- External loading current simulation
- Auto frequency sweep up to 50kHz
- Real time power supply load transient response simulation & Vpk+/- measurement
- User programmable 255 sequential front panel input status
- Ultra high precision voltage & current measurement
- Precision high speed digitizing measurement/ data capture
- Voltage, current & Pmax measurement for OCP/OLP testing
- Timing & discharging measurement for batteries
- Instant overpower loading
- Short circuit simulation
- Smart fan control
- Full protection: OC (adjustable), OT, OP (adjustable) protection & OV warning
- Standard USB, optional Ethernet and GPIB interfaces

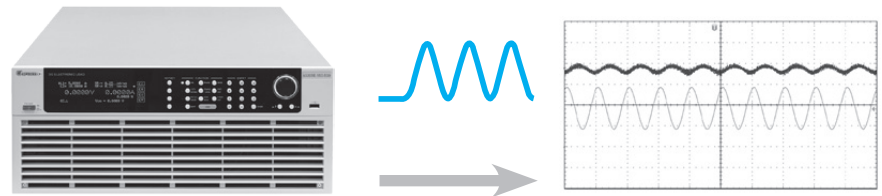
The 63200A series high power DC electronic loads are designed for testing a wide range of power conversion products including AC/DC and server power supplies, DC/DC converters, EV batteries, automotive charging stations, and other power electronics components.

The 63200A series have three operating voltage choices, 150V, 600V & 1,200V, with models covering power levels from 2kW to 24kW and up to 2,000A in a single unit.

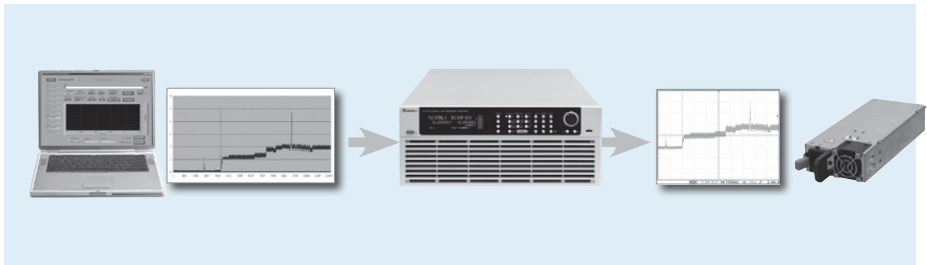
The DC loads have unique user defined waveform (UDW) capability and external analog modulating input for simulating real-world, custom waveforms. Another distinct feature is the dynamic

## Sine Wave Dynamic Load

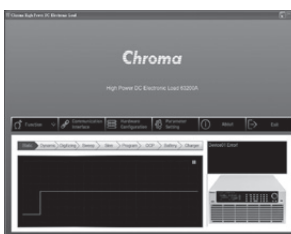
The 63200A series has a unique sine wave loading function which allows setting of a current bias (I\_DC), a loading sine wave (I\_AC) and sine wave frequency. The sine wave loading must be greater or equal to zero ampere. This function can be used for D/D, server power supplies and fuel cells for DCIR testing.



## User Defined Waveforms



## Softpanel



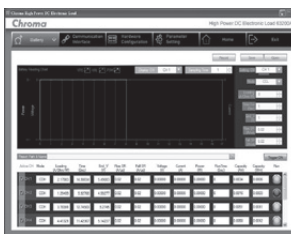
Main



Over Current Protection



User Defined Waveforms



Battery Discharge



Sine Wave



Program

- Video & Color
- Flat Panel Display
- LED/ Lighting
- Optical Devices
- Photovoltaic Test & Automation
- Optical Inspection
- Automated
- Power Electronics
- Battery Test & Automation
- Passive Component
- Electrical Safety
- Semiconductor/ IC
- PXI Test & Measurement
- General Purpose
- Intelligent Manufacturing System
- Turnkey Test & Automation

SPECIFICATIONS-1 (150V)									
150V Models	63202A-150-200			63203A-150-300			63204A-150-400		
Voltage*2	0~150V			0~150V			0~150V		
Current	0~20A	0~100A	0~200A	0~30A	0~150A	0~300A	0~40A	0~200A	0~400A
Power*3	0~2,000W			0~3,000W			0~4,000W		
<b>Static Mode</b>									
Min. Operating Voltage (DC)	1.5V @20A	1.5V @100A	1.5V @200A	1.5V @30A	1.5V @150A	1.5V @300A	0.18V @40A	0.9V @200A	1.8V @400A
<b>Constant Current Mode</b>									
Range	0~20A	0~100A	0~200A	0~30A	0~150A	0~300A	0~40A	0~200A	0~400A
Accuracy*4	0.05%+0.05%F.S.			0.05%+0.05%F.S.			0.05%+0.05%F.S.		
<b>Constant Resistance Mode</b>									
Range	0.015 Ω -150 Ω (16V/2kW) 0.06 Ω -600 Ω (80V/2kW) 1.5 Ω -3000 Ω (150V/2kW)			0.01 Ω -100 Ω (16V/3kW) 0.04 Ω -400 Ω (80V/3kW) 1 Ω -2000 Ω (150V/3kW)			0.0075 Ω -75 Ω (16V/4kW) 0.03 Ω -300 Ω (80V/4kW) 0.75 Ω -1500 Ω (150V/4kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
<b>Constant Voltage Mode</b>									
Range	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V
Accuracy	0.025%+0.025%F.S.			0.025%+0.025%F.S.			0.025%+0.025%F.S.		
<b>Constant Power Mode</b>									
Range	0~200W	0~1,000W	0~2,000W	0~300W	0~1,500W	0~3,000W	0~400W	0~2,000W	0~4,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
<b>Dynamic Mode</b>									
Slew rate	0.2mA/μs~ 2A/μs	1mA/μs~ 7A/μs	2mA/μs~ 14A/μs	0.2mA/μs~ 3A/μs	1mA/μs~ 10.5A/μs	2mA/μs~ 21A/μs	0.5mA/μs~ 4A/μs	2mA/μs~ 14A/μs	5mA/μs~ 28A/μs
Resolution	0.2mA/μs	1mA/μs	2mA/μs	0.2mA/μs	1mA/μs	2mA/μs	0.5mA/μs	2mA/μs	5mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
<b>Others</b>									
Power Consumption	160VA(max)			160VA(max)			200VA(max)		
Dimension (HxWxD)	132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			177 x 428 x 647 mm / 6.97 x 16.85 x 25.47 inch		
Weight	30kg / 66 lbs			30kg / 66 lbs			35kg / 77.2 lbs		

SPECIFICATIONS-2 (150V)									
150V Models	63205A-150-500			63206A-150-600			63208A-150-800		
Voltage*2	0~150V			0~150V			0~150V		
Current	0~50A	0~250A	0~500A	0~60A	0~300A	0~600A	0~80A	0~400A	0~800A
Power*3	0~5,000W			0~6,000W			0~8,000W		
<b>Static Mode</b>									
Min. Operating Voltage (DC)	0.15V @50A	0.75V @250A	1.5V @500A	0.18V @60A	0.9V @300A	1.8V @600A	0.18V @80A	0.9V @400A	1.8V @800A
<b>Constant Current Mode</b>									
Range	0~50A	0~250A	0~500A	0~60A	0~300A	0~600A	0~80A	0~400A	0~800A
Accuracy*4	0.05%+0.05%F.S.			0.05%+0.05%F.S.			0.05%+0.05%F.S.		
<b>Constant Resistance Mode</b>									
Range	0.005 Ω ~50 Ω (16V/5kW) 0.02 Ω ~200 Ω (80V/5kW) 0.5 Ω ~1,000 Ω (150V/5kW)			0.005 Ω ~50 Ω (16V/6kW) 0.02 Ω ~200 Ω (80V/6kW) 0.5 Ω ~1,000 Ω (150V/6kW)			0.0038 Ω ~37.5 Ω (16V/8kW) 0.015 Ω ~150 Ω (80V/8kW) 0.375 Ω ~750 Ω (150V/8kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
<b>Constant Voltage Mode</b>									
Range	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V
Accuracy	0.025%+0.025%F.S.			0.025%+0.025%F.S.			0.025%+0.025%F.S.		
<b>Constant Power Mode</b>									
Range	0~500W	0~2,500W	0~5,000W	0~600W	0~3,000W	0~6,000W	0~800W	0~4,000W	0~8,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
<b>Dynamic Mode</b>									
Slew rate	0.5mA/μs~ 5A/μs	2mA/μs~ 17.5A/μs	5mA/μs~ 35A/μs	0.5mA/μs~ 6A/μs	2mA/μs~ 21A/μs	5mA/μs~ 42A/μs	1mA/μs~ 8A/μs	5mA/μs~ 24A/μs	10mA/μs~ 48A/μs
Resolution	0.5mA/μs	2mA/μs	5mA/μs	0.5mA/μs	2mA/μs	5mA/μs	1mA/μs	5mA/μs	10mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
<b>Others</b>									
Power Consumption	200VA(max)			200VA(max)			400VA(max)		
Dimension (HxWxD)	177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch		
Weight	35kg / 77.2 lbs			35kg / 77.2 lbs			70kg / 154.3 lbs		



SPECIFICATIONS-3 (150V)									
150V Models	63210A-150-1000			63212A-150-1200			63215A-150-1500		
Voltage*2	0~150V			0~150V			0~150V		
Current	0~100A	0~500A	0~1,000A	0~120A	0~600A	0~1,200A	0~150A	0~750A	0~1,500A
Power*3	0~10,000W			0~12,000W			0~15,000W		
Static Mode									
Min. Operating Voltage (DC)	0.15V @100A	0.75V @500A	1.5V @1,000A	0.18V @120A	0.9V @600A	1.8V @1,200A	0.18V @150A	0.9V @750A	1.8V @1,500A
Constant Current Mode									
Range	0~100A	0~500A	0~1,000A	0~120A	0~600A	0~1,200A	0~150A	0~750A	0~1,500A
Accuracy*4	0.05%+0.05%F.S.			0.05%+0.05%F.S.			0.05%+0.05%F.S.		
Constant Resistance Mode									
Range	0.0025 Ω ~25 Ω (16V/10kW) 0.01 Ω ~100 Ω (80V/10kW) 0.25 Ω ~500 Ω (150V/10kW)			0.0025 Ω ~25 Ω (16V/12kW) 0.01 Ω ~100 Ω (80V/12kW) 0.25 Ω ~500 Ω (150V/12kW)			0.0017 Ω ~16.6667 Ω (16V/15kW) 0.0067 Ω ~66.6667 Ω (80V/15kW) 0.167 Ω ~333.334 Ω (150V/15kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V
Accuracy	0.025%+0.025%F.S.			0.025%+0.025%F.S.			0.025%+0.025%F.S.		
Constant Power Mode									
Range	0~1,000W	0~5,000W	0~10,000W	0~1,200W	0~6,000W	0~12,000W	0~1,500W	0~7,500W	0~15,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	1mA/μs~ 10A/μs	5mA/μs~ 27.5A/μs	10mA/μs~ 55A/μs	1mA/μs~ 12A/μs	5mA/μs~ 30A/μs	10mA/μs~ 60A/μs	2mA/μs~ 15A/μs	10mA/μs~ 32A/μs	20mA/μs~ 64A/μs
Resolution	1mA/μs	5mA/μs	10mA/μs	1mA/μs	5mA/μs	10mA/μs	2mA/μs	10mA/μs	20mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	400VA(max)			400VA(max)			600VA(max)		
Dimension (HxWxD)	307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch		
Weight	70kg / 154.3 lbs			70kg / 154.3 lbs			97kg / 213.8 lbs		

SPECIFICATIONS-4 (150V)									
150V Models	63218A-150-1800			63220A-150-2000			63224A-150-2000		
Voltage*2	0~150V			0~150V			0~150V		
Current	0~180A	0~900A	0~1,800A	0~200A	0~1,000A	0~2,000A	0~200A	0~1,000A	0~2,000A
Power*3	0~18,000W			0~20,000W			0~24,000W		
Static Mode									
Min. Operating Voltage (DC)	0.18V @180A	0.9V @900A	1.8V @1,800A	0.18V @200A	0.9V @1,000A	1.8V @2,000A	0.18V @200A	0.9V @1,000A	1.8V @2,000A
Constant Current Mode									
Range	0~180A	0~900A	0~1,800A	0~200A	0~1,000A	0~2,000A	0~200A	0~1,000A	0~2,000A
Accuracy*4	0.05%+0.05%F.S.			0.05%+0.05%F.S.			0.05%+0.05%F.S.		
Constant Resistance Mode									
Range	0.0017 Ω -16.6667 Ω (16V/18kW) 0.0067 Ω -66.6667 Ω (80V/18kW) 0.167 Ω -333.334 Ω (150V/18kW)			0.0013 Ω -12.5 Ω (16V/20kW) 0.005 Ω -50 Ω (80V/20kW) 0.125 Ω -250 Ω (150V/20kW)			0.0013 Ω -12.5 Ω (16V/24kW) 0.005 Ω -50 Ω (80V/24kW) 0.125 Ω -250 Ω (150V/24kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V
Accuracy	0.025%+0.025%F.S.			0.025%+0.025%F.S.			0.025%+0.025%F.S.		
Constant Power Mode									
Range	0~1,800W	0~9,000W	0~18,000W	0~2,000W	0~10,000W	0~20,000W	0~2,400W	0~12,000W	0~24,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	2mA/μs~ 18A/μs	10mA/μs~ 36A/μs	20mA/μs~ 72A/μs	2mA/μs~ 20A/μs	10mA/μs~ 40A/μs	20mA/μs~ 80A/μs	2mA/μs~ 20A/μs	10mA/μs~ 40A/μs	20mA/μs~ 80A/μs
Resolution	2mA/μs	10mA/μs	20mA/μs	2mA/μs	10mA/μs	80mA/μs	2mA/μs	10mA/μs	20mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	600VA(max)			800VA(max)			800VA(max)		
Dimension (HxWxD)	441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch		
Weight	97kg / 213.8 lbs			125kg / 275.6 lbs			125kg / 275.6 lbs		

SPECIFICATIONS-5 (600V)									
600V Models	63202A-600-140			63203A-600-210			63204A-600-280		
Voltage*2	0~600V			0~600V			0~600V		
Current	0~14A	0~70A	0~140A	0~21A	0~105A	0~210A	0~28A	0~140A	0~280A
Power*3	0~2,000W			0~3,000W			0~4,000W		
Static Mode									
Min. Operating Voltage (DC)	1.4V @14A	7V @70A	14V @140A	1.4V @21A	7V @105A	14V @210A	1.4V @28A	7V @140A	14V @280A
Constant Current Mode									
Range	0~14A	0~70A	0~140A	0~21A	0~105A	0~210A	0~28A	0~140A	0~280A
Accuracy*4	0.05%+0.05%F.S.			0.05%+0.05%F.S.			0.05%+0.05%F.S.		
Constant Resistance Mode									
Range	0.15Ω~1,500Ω (80V/2kW) 0.6Ω~6,000Ω (150V/2kW) 6Ω~12,000Ω (600V/2kW)			0.1Ω~1,000Ω (80V/3kW) 0.4Ω~4,000Ω (150V/3kW) 4Ω~8,000Ω (600V/3kW)			0.075Ω~750Ω (80V/4kW) 0.3Ω~3,000Ω (150V/4kW) 3Ω~6,000Ω (600V/4kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V
Accuracy	0.025%+0.025%F.S.			0.025%+0.025%F.S.			0.025%+0.025%F.S.		
Constant Power Mode									
Range	0~200W	0~1,000W	0~2,000W	0~300W	0~1,500W	0~3,000W	0~400W	0~2,000W	0~4,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	0.2mA/μs~ 0.6A/μs	1mA/μs~ 3A/μs	2mA/μs~ 6A/μs	0.2mA/μs~ 0.9A/μs	1mA/μs~ 4.5A/μs	2mA/μs~ 9A/μs	0.4mA/μs~ 1.2A/μs	2mA/μs~ 6A/μs	4mA/μs~ 12A/μs
Resolution	0.2mA/μs	1mA/μs	2mA/μs	0.2mA/μs	1mA/μs	2mA/μs	0.4mA/μs	2mA/μs	4mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	160VA(max)			160VA(max)			200VA(max)		
Dimension (HxWxD)	132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			177 x 428 x 647 mm / 6.97 x 16.85 x 25.47 inch		
Weight	30kg / 66 lbs			30kg / 66 lbs			35kg / 77.2 lbs		

SPECIFICATIONS-6 (600V)									
600V Models	63205A-600-350			63206A-600-420			63208A-600-560		
Voltage*2	0~600V			0~600V			0~600V		
Current	0~35A	0~175A	0~350A	0~42A	0~210A	0~420A	0~56A	0~280A	0~560A
Power*3	0~5,000W			0~6,000W			0~8,000W		
Static Mode									
Min. Operating Voltage (DC)	1.4V @35A	7V @175A	14V @350A	1.4V @42A	7V @210A	14V @420A	1.4V @56A	7V @280A	14V @560A
Constant Current Mode									
Range	0~35A	0~175A	0~350A	0~42A	0~210A	0~420A	0~56A	0~280A	0~560A
Accuracy*4	0.05%+0.05%F.S.			0.05%+0.05%F.S.			0.05%+0.05%F.S.		
Constant Resistance Mode									
Range	0.05Ω~500Ω (80V/5kW) 0.2Ω~2,000Ω (150V/5kW) 2Ω~4,000Ω (600V/5kW)			0.05Ω~500Ω (80V/6kW) 0.2Ω~2,000Ω (150V/6kW) 2Ω~4,000Ω (600V/6kW)			0.038Ω~375Ω (80V/8kW) 0.15Ω~1,500Ω (150V/8kW) 1.5Ω~3,000Ω (600V/8kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V
Accuracy	0.025%+0.025%F.S.			0.025%+0.025%F.S.			0.025%+0.025%F.S.		
Constant Power Mode									
Range	0~500W	0~2,500W	0~5,000W	0~600W	0~3,000W	0~6,000W	0~800W	0~4,000W	0~8,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	0.4mA/μs~ 1.5A/μs	2mA/μs~ 7.5A/μs	4mA/μs~ 15A/μs	0.4mA/μs~ 1.8A/μs	2mA/μs~ 9A/μs	4mA/μs~ 18A/μs	0.5mA/μs~ 1.8A/μs	2mA/μs~ 9A/μs	5mA/μs~ 18A/μs
Resolution	0.4mA/μs	2mA/μs	4mA/μs	0.4mA/μs	2mA/μs	4mA/μs	0.5mA/μs	2mA/μs	5mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	200VA(max)			200VA(max)			400VA(max)		
Dimension (HxWxD)	177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch		
Weight	35kg / 77.2 lbs			35kg / 77.2 lbs			70kg / 154.3 lbs		

SPECIFICATIONS-7 (600V)									
600V Models	63210A-600-700			63212A-600-840			63215A-600-1050		
Voltage*2	0~600V								
Current	0~70A	0~350A	0~700A	0~84A	0~420A	0~840A	0~105A	0~525A	0~1,050A
Power*3	0~10,000W								
Static Mode									
Min. Operating Voltage (DC)	1.4V @70A	7V @350A	14V @700A	1.4V @84A	7V @420A	14V @840A	1.4V @105A	7V @525A	14V @1,050A
Constant Current Mode									
Range	0~70A	0~350A	0~700A	0~84A	0~420A	0~840A	0~105A	0~525A	0~1,050A
Accuracy*4	0.05%+0.05%F.S.								
Constant Resistance Mode									
Range	0.025 Ω ~250 Ω (80V/10kW) 0.1 Ω ~1,000 Ω (150V/10kW) 1 Ω ~2,000 Ω (600V/10kW)			0.025 Ω ~250 Ω (80V/12kW) 0.1 Ω ~1,000 Ω (150V/12kW) 1 Ω ~2,000 Ω (600V/12kW)			0.017 Ω ~166.667 Ω (80V/15kW) 0.067 Ω ~666.667 Ω (150V/15kW) 0.67 Ω ~1,333.34 Ω (600V/15kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.								
Constant Voltage Mode									
Range	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V
Accuracy	0.025%+0.025%F.S.								
Constant Power Mode									
Range	0~1,000W	0~5,000W	0~10,000W	0~1,200W	0~6,000W	0~12,000W	0~1,500W	0~7,500W	0~15,000W
Accuracy *5	0.2%+0.2%F.S.								
Dynamic Mode									
Slew rate	0.5mA/μs~ 2.1A/μs	2.5mA/μs~ 10.5A/μs	5mA/μs~ 21A/μs	1mA/μs~ 2.4A/μs	5mA/μs~ 12A/μs	10mA/μs~ 24A/μs	1mA/μs~ 2.7A/μs	5mA/μs~ 13.5A/μs	10mA/μs~ 27A/μs
Resolution	0.5mA/μs	2.5mA/μs	5mA/μs	1mA/μs	5mA/μs	10mA/μs	1mA/μs	5mA/μs	10mA/μs
Accuracy	5% ± 10μs								
Others									
Power Consumption	400VA(max)			400VA(max)			600VA(max)		
Dimension (HxWxD)	307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch		
Weight	70kg / 154.3 lbs			70kg / 154.3 lbs			97kg / 213.8 lbs		

SPECIFICATIONS-8 (600V)									
600V Models	63218A-600-1260			63220A-600-1400			63224A-600-1680		
Voltage*2	0~600V								
Current	0~126A	0~630A	0~1,260A	0~140A	0~700A	0~1,400A	0~168A	0~840A	0~1,680A
Power*3	0~18,000W								
Static Mode									
Min. Operating Voltage (DC)	1.4V @126A	7V @630A	14V @1,260A	1.4V @140A	7V @700A	14V @1,400A	1.4V @168A	7V @840A	14V @1,680A
Constant Current Mode									
Range	0~126A	0~630A	0~1,260A	0~140A	0~700A	0~1,400A	0~168A	0~840A	0~1,680A
Accuracy*4	0.05%+0.05%F.S.								
Constant Resistance Mode									
Range	0.017 Ω -166.667 Ω (80V/18kW) 0.067 Ω -666.667 Ω (150V/18kW) 0.67 Ω -1,333.34 Ω (600V/18kW)			0.013 Ω -125 Ω (80V/20kW) 0.05 Ω -500 Ω (150V/20kW) 0.5 Ω -1,000 Ω (600V/20kW)			0.013 Ω -125 Ω (80V/24kW) 0.05 Ω -500 Ω (150V/24kW) 0.5 Ω -1,000 Ω (600V/24kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.								
Constant Voltage Mode									
Range	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V
Accuracy	0.025%+0.025%F.S.								
Constant Power Mode									
Range	0~1,800W	0~9,000W	0~18,000W	0~2,000W	0~10,000W	0~20,000W	0~2,400W	0~12,000W	0~24,000W
Accuracy *5	0.2%+0.2%F.S.								
Dynamic Mode									
Slew rate	1mA/μs~ 3A/μs	5mA/μs~ 15A/μs	10mA/μs~ 30A/μs	2mA/μs~ 3.3A/μs	10mA/μs~ 16.5A/μs	20mA/μs~ 33A/μs	2mA/μs~ 3.6A/μs	10mA/μs~ 18A/μs	20mA/μs~ 36A/μs
Resolution	1mA/μs	5mA/μs	10mA/μs	2mA/μs	10mA/μs	20mA/μs	2mA/μs	10mA/μs	20mA/μs
Accuracy	5% ± 10μs								
Others									
Power Consumption	600VA(max)			800VA(max)			800VA(max)		
Dimension (HxWxD)	441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch		
Weight	97kg / 213.8 lbs			125kg / 275.6 lbs			125kg / 275.6 lbs		

SPECIFICATIONS-9 (1,200V)									
1,200V Models	63202A-1200-80			63203A-1200-120			63204A-1200-160		
Voltage*2	0~1,200V			0~1,200V			0~1,200V		
Current	0~8A	0~40A	0~80A	0~12A	0~60A	0~120A	0~16A	0~80A	0~160A
Power*3	0~2,000W			0~3,000W			0~4,000W		
Static Mode									
Min. Operating Voltage (DC)	2V @8A	10V @40A	20V @80A	2V @12A	10V @60A	20V @120A	2V @16A	10V @80A	20V @160A
Constant Current Mode									
Range	0~8A	0~40A	0~80A	0~12A	0~60A	0~120A	0~16A	0~80A	0~160A
Accuracy*4	0.04%+0.06%F.S.			0.04%+0.06%F.S.			0.04%+0.06%F.S.		
Constant Resistance Mode									
Range	0.3Ω-3kΩ (150V/2kW) 1.2Ω-12kΩ (600V/2kW) 30Ω-60kΩ (1,200V/2kW)			0.2Ω-2kΩ (150V/3kW) 0.8Ω-8kΩ (600V/3kW) 20Ω-40kΩ (1,200V/3kW)			0.15Ω-1.5kΩ (150V/4kW) 0.6Ω-6kΩ (600V/4kW) 15Ω-30kΩ (1,200V/4kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V
Accuracy	0.025%+0.025%F.S.			0.025%+0.025%F.S.			0.025%+0.025%F.S.		
Constant Power Mode									
Range	0~200W	0~1,000W	0~2,000W	0~300W	0~1,500W	0~3,000W	0~400W	0~2,000W	0~4,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	0.1mA/μs~ 0.4A/μs	0.5mA/μs~ 2A/μs	1mA/μs~ 4A/μs	0.1mA/μs~ 0.6A/μs	0.5mA/μs~ 3A/μs	1mA/μs~ 6A/μs	0.2mA/μs~ 0.8A/μs	1mA/μs~ 4A/μs	2mA/μs~ 8A/μs
Resolution	0.1mA/μs	0.5mA/μs	1mA/μs	0.1mA/μs	0.5mA/μs	1mA/μs	0.2mA/μs	1mA/μs	2mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	160VA(max)			160VA(max)			200VA(max)		
Dimension (HxWxD)	132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch		
Weight	30kg / 66 lbs			30kg / 66 lbs			35kg / 77.2 lbs		

SPECIFICATIONS-10 (1,200V)									
1,200V Models	63205A-1200-200			63206A-1200-240			63208A-1200-320		
Voltage*2	0~1,200V			0~1,200V			0~1,200V		
Current	0~20A	0~100A	0~200A	0~24A	0~120A	0~240A	0~32A	0~160A	0~320A
Power*3	0~5,000W			0~6,000W			0~8,000W		
Static Mode									
Min. Operating Voltage (DC)	2V @20A	10V @100A	20V @200A	2V @24A	10V @120A	20V @240A	2V @32A	10V @160A	20V @320A
Constant Current Mode									
Range	0~20A	0~100A	0~200A	0~24A	0~120A	0~240A	0~32A	0~160A	0~320A
Accuracy*4	0.04%+0.06%F.S.			0.04%+0.06%F.S.			0.04%+0.06%F.S.		
Constant Resistance Mode									
Range	0.1Ω-1kΩ (150V/5kW) 0.4Ω-4kΩ (600V/5kW) 10Ω-20kΩ (1200V/5kW)			0.1Ω-1kΩ (150V/6kW) 0.4Ω-4kΩ (600V/6kW) 10Ω-20kΩ (1200V/6kW)			0.075Ω-0.75kΩ (150V/8kW) 0.3Ω-3kΩ (600V/8kW) 7.5Ω-15kΩ (1200V/8kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V
Accuracy	0.025%+0.025%F.S.			0.025%+0.025%F.S.			0.025%+0.025%F.S.		
Constant Power Mode									
Range	0~500W	0~2,500W	0~5,000W	0~600W	0~3,000W	0~6,000W	0~800W	0~4,000W	0~8,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	0.2mA/μs~ 1A/μs	1mA/μs~ 5A/μs	2mA/μs~ 10A/μs	0.2mA/μs~ 1.2A/μs	1mA/μs~ 6A/μs	2mA/μs~ 12A/μs	0.4mA/μs~ 1.2A/μs	2mA/μs~ 6A/μs	4mA/μs~ 12A/μs
Resolution	0.2mA/μs	1mA/μs	2mA/μs	0.2mA/μs	1mA/μs	2mA/μs	0.4mA/μs	2mA/μs	4mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	200VA(max)			200VA(max)			400VA(max)		
Dimension (HxWxD)	177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch		
Weight	35kg / 77.2 lbs			35kg / 77.2 lbs			70kg / 154.3 lbs		

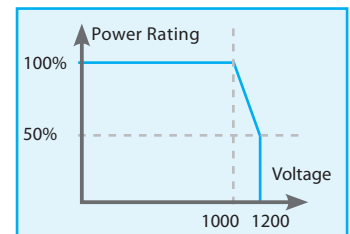


SPECIFICATIONS-11 (1,200V)									
1,200V Models	63210A-1200-400			63212A-1200-480			63215A-1200-600		
Voltage*2	0~1,200V								
Current	0~40A	0~200A	0~400A	0~48A	0~240A	0~480A	0~60A	0~300A	0~600A
Power*3	0~10,000W								
Static Mode									
Min. Operating Voltage (DC)	2V @40A	10V @200A	20V @400A	2V @48A	10V @240A	20V @480A	2V @60A	10V @300A	20V @600A
Constant Current Mode									
Range	0~40A	0~200A	0~400A	0~48A	0~240A	0~480A	0~60A	0~300A	0~600A
Accuracy*4	0.04%+0.06%F.S.								
Constant Resistance Mode									
Range	0.05Ω~0.5kΩ (150V/10kW) 0.2Ω~2kΩ (600V/10kW) 5Ω~10kΩ (1,200V/10kW)			0.05Ω~0.5kΩ (150V/12kW) 0.2Ω~2kΩ (600V/12kW) 5Ω~10kΩ (1,200V/12kW)			0.034Ω~0.333334kΩ (150V/15kW) 0.14Ω~1.33334kΩ (600V/15kW) 3.34Ω~6.66667kΩ (1,200V/15kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.								
Constant Voltage Mode									
Range	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V
Accuracy	0.025%+0.025%F.S.								
Constant Power Mode									
Range	0~1,000W	0~5,000W	0~10,000W	0~1,200W	0~6,000W	0~12,000W	0~1,500W	0~7,500W	0~15,000W
Accuracy *5	0.2%+0.2%F.S.								
Dynamic Mode									
Slew rate	0.4mA/μs~1.4A/μs	2mA/μs~7A/μs	4mA/μs~14A/μs	0.4mA/μs~1.6A/μs	2mA/μs~8A/μs	4mA/μs~16A/μs	0.5mA/μs~1.8A/μs	2mA/μs~9A/μs	5mA/μs~18A/μs
Resolution	0.4mA/μs	2mA/μs	4mA/μs	0.4mA/μs	2mA/μs	4mA/μs	0.5mA/μs	2mA/μs	5mA/μs
Accuracy	5% ± 10μs								
Others									
Power Consumption	400VA(max)			400VA(max)			600VA(max)		
Dimension (HxWxD)	307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch		
Weight	70kg / 154.3 lbs			70kg / 154.3 lbs			97kg / 213.8 lbs		

SPECIFICATIONS-12 (1,200V)									
1,200V Models	63218A-1200-720			63220A-1200-800			63224A-1200-960		
Voltage*2	0~1,200V								
Current	0~72A	0~360A	0~720A	0~80A	0~400A	0~800A	0~96A	0~480A	0~960A
Power*3	0~18,000W								
Static Mode									
Min. Operating Voltage (DC)	2V @72A	10V @360A	20V @720A	2V @80A	10V @400A	20V @800A	2V @96A	10V @480A	20V @960A
Constant Current Mode									
Range	0~72A	0~360A	0~720A	0~80A	0~400A	0~800A	0~96A	0~480A	0~960A
Accuracy*4	0.04%+0.06%F.S.								
Constant Resistance Mode									
Range	0.034Ω~0.333334kΩ (150V/18kW) 0.14Ω~1.33334kΩ (600V/18kW) 3.34Ω~6.66667kΩ (1,200V/18kW)			0.025Ω~0.25kΩ (150V/20kW) 0.1Ω~1kΩ (600V/20kW) 2.5Ω~5kΩ (1,200V/20kW)			0.025Ω~0.25kΩ (150V/24kW) 0.1Ω~1kΩ (600V/24kW) 2.5Ω~5kΩ (1,200V/24kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.								
Constant Voltage Mode									
Range	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V
Accuracy	0.025%+0.025%F.S.								
Constant Power Mode									
Range	0~1,800W	0~9,000W	0~18,000W	0~2,000W	0~10,000W	0~20,000W	0~2,400W	0~12,000W	0~24,000W
Accuracy *5	0.2%+0.2%F.S.								
Dynamic Mode									
Slew rate	0.5mA/μs~2A/μs	2mA/μs~10A/μs	5mA/μs~20A/μs	1mA/μs~2.2A/μs	5mA/μs~11A/μs	10mA/μs~22A/μs	1mA/μs~2.4A/μs	5mA/μs~12A/μs	10mA/μs~24A/μs
Resolution	0.5mA/μs	2mA/μs	5mA/μs	1mA/μs	5mA/μs	10mA/μs	1mA/μs	5mA/μs	10mA/μs
Accuracy	5% ± 10μs								
Others									
Power Consumption	600VA(max)			800VA(max)			800VA(max)		
Dimension (HxWxD)	441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch		
Weight	97kg / 213.8 lbs			125kg / 275.6 lbs			125kg / 275.6 lbs		

GENERAL SPECIFICATIONS			
Voltage	150V	600V	1200V
<b>Static mode</b>			
CZ			
Range		CL : 30 $\mu$ F~50,000 $\mu$ F RL : as CR Ls : 0.1 $\mu$ H~16 $\mu$ H Rs : 30m $\Omega$ ~20 $\Omega$	
Resolution		CL : 1 $\mu$ F Ls : 0.1 $\mu$ H Rs : 1m $\Omega$ RL : as CR	
CC+CV		Refer to CC & CV specifications	
CR+CV		Refer to CR & CV specifications	
CR+CC		Refer to CR & CC specifications	
<b>Dynamic mode</b>			
T1 & T2		0.020~99.999ms/100ms~99,999ms	
Resolution		1 $\mu$ s/1ms	
Accuracy		1 $\mu$ s+100ppm	
Min. rise time *7	10 $\mu$ s (Typical)	20 $\mu$ s (Typical)	20 $\mu$ s (Typical)
<b>Measurement</b>			
<b>Voltage read back</b>			
Range *8		0 ~ rated voltage (three ranges)	
Accuracy		0.015%+0.015%F.S.	
<b>Current read back</b>			
Range		0 ~ rated current (three ranges)	
Accuracy		0.04%+0.04%F.S.	
<b>Power read back</b>			
Range		0 ~ rated power (three ranges)	
Accuracy *5		0.1%+0.1%F.S.	
<b>Battery Discharge</b>			
Range		1s~100,000s	
Resolution		1s	
<b>Monitor</b>			
<b>Voltage Monitor</b>			
Bandwidth		20kHz	
Range	0~150V	0~600V	0~1200V
Output		0~10V	
Accuracy		0.5%F.S.	
Output impedance		10k $\Omega$	
Resolution		4mV	
<b>Current Monitor</b>			
Bandwidth		20kHz	
Range		0 ~ rated current	
Output		0~10V	
Accuracy		0.5%F.S.	
Output impedance		10k $\Omega$	
Resolution		4mV	
<b>Protection</b>			
Over Current		Yes (Settable)	
Over Power		Yes (Settable)	
Over Temperature		Yes	
Over Voltage Alarm		Yes	
Reverse Alarm		Yes	
<b>Interface</b>			
Front USB (Host)		Standard	
Rear USB (Device)		Standard	
GPIB		Optional	
System Bus		Master/Slave	
<b>General</b>			
Input Resistance (Load Off)	800k $\Omega$ (Typical)	1M $\Omega$ (Typical)	2M $\Omega$ (Typical)
Operating Temp		0~40 $^{\circ}$ C	
Storage Temp		-20~80 $^{\circ}$ C	
Line Voltage		100~240 VAC / 47~63Hz	

1. The specifications are guaranteed to meet specified performance at temperature range of 25  $\pm$  5 $^{\circ}$ C.
2. If the operating voltage exceeds the rated voltage for 1.05 times, it would cause permanent damage to the device.
3. The power rating specifications at ambient temperature = 25 $^{\circ}$ C.
4. If the operating current is below range 0.2%, the accuracy specification is 0.1% F.S.
5. Power F.S. = Vrange F.S.x Irang F.S.
6. The specification is valid only for loading current > 4% F.S.
7. The short circuit function simulates full power loading and thus it cannot perform mechanical short circuit.
8. Example : 63200A-1200-400, the voltage ranges are 150V, 600V, and 1,200V.

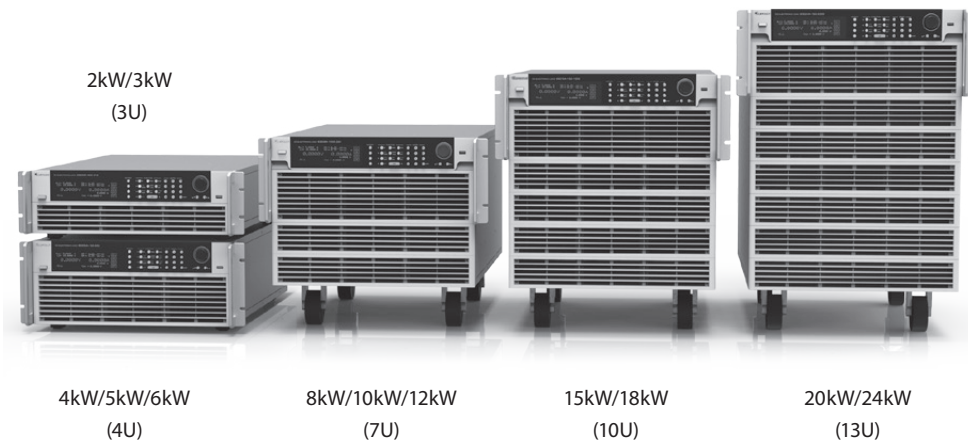


## ORDERING INFORMATION

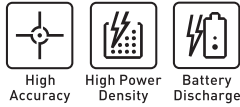
63200A High Power DC Electronic Load				
Model	Voltage	Current	Power	Height
63202A-150-200*	150V	200A	2kW	3U
63203A-150-300		300A	3kW	
63204A-150-400		400A	4kW	
63205A-150-500		500A	5kW	4U
63206A-150-600		600A	6kW	
63208A-150-800		800A	8kW	
63210A-150-1000*		1000A	10kW	7U
63212A-150-1200		1200A	12kW	
63215A-150-1500		1500A	15kW	
63218A-150-1800		1800A	18kW	10U
63220A-150-2000*	2000A	20kW		
63224A-150-2000	2000A	24kW		
63202A-600-140*	600V	140A	2kW	3U
63203A-600-210		210A	3kW	
63204A-600-280		280A	4kW	
63205A-600-350		350A	5kW	4U
63206A-600-420		420A	6kW	
63208A-600-560		560A	8kW	
63210A-600-700*		700A	10kW	7U
63212A-600-840		840A	12kW	
63215A-600-1050		1050A	15kW	
63218A-600-1260		1260A	18kW	10U
63220A-600-1400*	1400A	20kW		
63224A-600-1680	1680A	24kW		
63202A-1200-80*	1200V	80A	2kW	3U
63203A-1200-120		120A	3kW	
63204A-1200-160		160A	4kW	
63205A-1200-200		200A	5kW	4U
63206A-1200-240		240A	6kW	
63208A-1200-320		320A	8kW	
63210A-1200-400*		400A	10kW	7U
63212A-1200-480		480A	12kW	
63215A-1200-600		600A	15kW	
63218A-1200-720		720A	18kW	10U
63220A-1200-800*	800A	20kW		
63224A-1200-960	960A	24kW		

Options	
A600009	GPIB cable (200cm)
A600010	GPIB cable (60cm)
A632000	Softpanel for 63200A Series
A632006	NI USB-6211 Bus-Powered Multifunction DAQ
A636000	GPIB interface
A636010	Ethernet interface
B632000	Handle for 3U models (2kW/3kW)
B632001	Handle for 4U models (4kW/5kW/6kW)
B632002	Rack mounting kit for 7U models (8kW/10kW/12kW)
B632003	Rack mounting kit for 10U models (15kW/18kW)
B632004	Rack mounting kit for 13U models (20kW/24kW)

\* 2kW, 8kW, 10kW, 15kW, 20kW models will be available in April, 2017.



Video & Color  
Flat Panel Display  
Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



## KEY FEATURES

- Rated power : 2kW, 3kW, 4kW, 5kW, 6kW, 8kW, 10kW, 12kW, 15kW, 18kW, 20kW, 24kW
- Voltage range: 150V, 600V, 1200V
- Current range: 2,000A max. per unit
- CC, CR, CV & CP operation modes
- Up to 10 units master/slave parallel control, max. 240kW (parallel)
- Dynamic synchronous control in static and dynamic loads
- CZ mode for turn on capacitive load simulation
- Real time power supply load transient response simulation & Vpk+/- measurement
- User programmable 255 sequential front panel input status
- High precision voltage & current measurement
- Timing & discharging measurement for batteries
- Short circuit simulation
- Smart fan control
- Full protection: OC (adjustable), OT, OP (adjustable) protection & OV warning
- Standard USB, optional Ethernet/LXI & GPIB interfaces

The 63200E series have three operating voltage choices, 150V, 600V & 1,200V, with models covering power levels from 2kW to 24kW and up to 2,000A in a single unit.

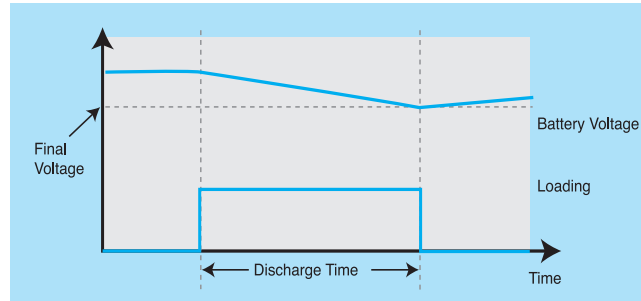
The 63200E series high power DC electronic loads are designed for testing a wide range of power conversion products including AC/DC and server power supplies, DC/DC converters, EV batteries, automotive charging stations, and other power electronics components.

Another distinct feature is the dynamic auto-frequency sweep function, which enables detecting a UUTs worst case output deviation across a wide range of current frequencies. In addition, a 255-set of data storage function has been built in for recall of the stored settings at any time. For automated testing, the save and recall functions can save a great deal of time.

The 63200E series also have overcurrent, overpower, and over temperature protections as well as over voltage and polarity reverse alarms to enhance product reliability. These DC loads are reliable products for engineering testing and automated test system's integration.

## Battery Discharge Testing

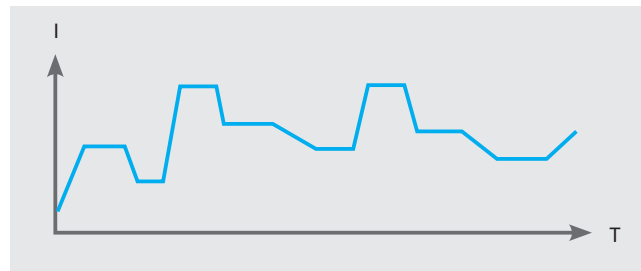
The 63200E has three discharge modes: CC, CR and CP. The electronic load can set cut off voltage and time (1~100,000 sec.) to stop loading correctly and make sure the battery is not damaged due to over discharge. In addition it can measure the battery discharge power (WH, AH) and total discharge time.



Timer function for battery discharge testing

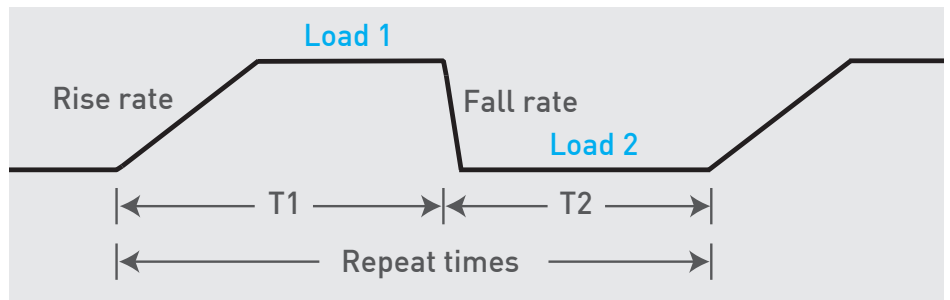
## Programmable Load Timing

The 63200E series electronic load has built in 255 programmable timings for various loading conditions simulation. Following lists the applications of common programmed timings.



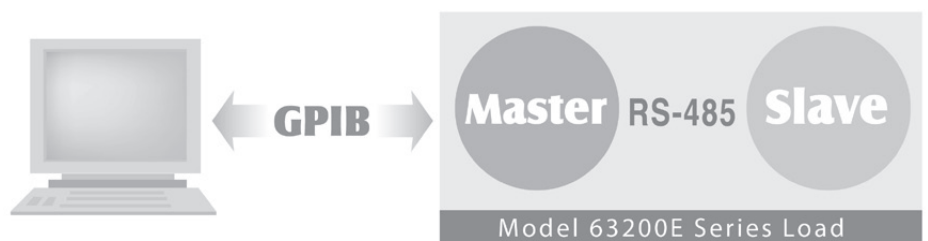
## Dynamic Load

The 63200E series offers high speed, programmable dynamic loading for testing. The figure shown below exhibits the programmable parameters such as current high/low level, T1/T2, rise/fall rate and execution times. When the load current changes continuously, the internal monitoring mechanism and line circuit can minimize the current waveform distortion. The dynamic change is up to 20kHz for model 150V.



## Master/Slave Parallel Control

When the need is for increased power, two or more loads can be run in parallel to achieve the desired load current. The 63200E provides the user with smart Master/ Slave mode controls which enables the user to program the load currents of the Master and have them automatically calculated and downloaded to the slave loads. Using several loads in parallel to emulate a single load dramatically simplifies the operation.





SPECIFICATIONS-1 (150V)									
150V Models	63202E-150-200			63203E-150-300			63204E-150-400		
Voltage*2	0~150V			0~150V			0~150V		
Current	0~20A	0~100A	0~200A	0~30A	0~150A	0~300A	0~40A	0~200A	0~400A
Power*3	0~2,000W			0~3,000W			0~4,000W		
Static Mode									
Min. Operating Voltage (DC)	1.5V @20A	1.5V @100A	1.5V @200A	1.5V @30A	1.5V @150A	1.5V @300A	0.18V @40A	0.9V @200A	1.8V @400A
Constant Current Mode									
Range	0~20A	0~100A	0~200A	0~30A	0~150A	0~300A	0~40A	0~200A	0~400A
Accuracy*4	0.1%+0.1%F.S.			0.1%+0.1%F.S.			0.1%+0.1%F.S.		
Constant Resistance Mode									
Range	0.015 Ω -150 Ω (16V/2kW) 0.06 Ω -600 Ω (80V/2kW) 1.5 Ω -3000 Ω (150V/2kW)			0.01 Ω -100 Ω (16V/3kW) 0.04 Ω -400 Ω (80V/3kW) 1 Ω -2000 Ω (150V/3kW)			0.0075 Ω -75 Ω (16V/4kW) 0.03 Ω -300 Ω (80V/4kW) 0.75 Ω -1500 Ω (150V/4kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V
Accuracy	0.05%+0.025%F.S.			0.05%+0.025%F.S.			0.05%+0.025%F.S.		
Constant Power Mode									
Range	0~200W	0~1,000W	0~2,000W	0~300W	0~1,500W	0~3,000W	0~400W	0~2,000W	0~4,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	0.2mA/μs~ 0.2A/μs	1mA/μs~ 1A/μs	2mA/μs~ 2A/μs	0.2mA/μs~ 0.3A/μs	1mA/μs~ 1.5A/μs	2mA/μs~ 3A/μs	0.4mA/μs~ 0.4A/μs	2mA/μs~ 2A/μs	4mA/μs~ 4A/μs
Resolution	0.2mA/μs	1mA/μs	2mA/μs	0.2mA/μs	1mA/μs	2mA/μs	0.5mA/μs	2mA/μs	5mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	160VA(max)			160VA(max)			200VA(max)		
Dimension (HxWxD)	132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			177 x 428 x 647 mm / 6.97 x 16.85 x 25.47 inch		
Weight	30kg / 66 lbs			30kg / 66 lbs			35kg / 77.2 lbs		

SPECIFICATIONS-2 (150V)									
150V Models	63205E-150-500			63206E-150-600			63208E-150-800		
Voltage*2	0~150V			0~150V			0~150V		
Current	0~50A	0~250A	0~500A	0~60A	0~300A	0~600A	0~80A	0~400A	0~800A
Power*3	0~5,000W			0~6,000W			0~8,000W		
Static Mode									
Min. Operating Voltage (DC)	0.15V @50A	0.75V @250A	1.5V @500A	0.18V @60A	0.9V @300A	1.8V @600A	0.18V @80A	0.9V @400A	1.8V @800A
Constant Current Mode									
Range	0~50A	0~250A	0~500A	0~60A	0~300A	0~600A	0~80A	0~400A	0~800A
Accuracy*4	0.1%+0.1%F.S.			0.1%+0.1%F.S.			0.1%+0.1%F.S.		
Constant Resistance Mode									
Range	0.005 Ω ~50 Ω (16V/5kW) 0.02 Ω ~200 Ω (80V/5kW) 0.5 Ω ~1,000 Ω (150V/5kW)			0.005 Ω ~50 Ω (16V/6kW) 0.02 Ω ~200 Ω (80V/6kW) 0.5 Ω ~1,000 Ω (150V/6kW)			0.0038 Ω ~37.5 Ω (16V/8kW) 0.015 Ω ~150 Ω (80V/8kW) 0.375 Ω ~750 Ω (150V/8kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V
Accuracy	0.05%+0.025%F.S.			0.05%+0.025%F.S.			0.05%+0.025%F.S.		
Constant Power Mode									
Range	0~500W	0~2,500W	0~5,000W	0~600W	0~3,000W	0~6,000W	0~800W	0~4,000W	0~8,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	0.5mA/μs~ 0.5A/μs	2mA/μs~ 2.5A/μs	5mA/μs~ 5A/μs	0.5mA/μs~ 0.6A/μs	2mA/μs~ 3A/μs	5mA/μs~ 6A/μs	1mA/μs~ 0.8A/μs	5mA/μs~ 4A/μs	10mA/μs~ 8A/μs
Resolution	0.5mA/μs	2mA/μs	5mA/μs	0.5mA/μs	2mA/μs	5mA/μs	1mA/μs	5mA/μs	10mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	200VA(max)			200VA(max)			400VA(max)		
Dimension (HxWxD)	177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch		
Weight	35kg / 77.2 lbs			35kg / 77.2 lbs			70kg / 154.3 lbs		

SPECIFICATIONS-3 (150V)									
150V Models	63210E-150-1000			63212E-150-1200			63215E-150-1500		
Voltage*2	0~150V			0~150V			0~150V		
Current	0~100A	0~500A	0~1,000A	0~120A	0~600A	0~1,200A	0~150A	0~750A	0~1,500A
Power*3	0~10,000W			0~12,000W			0~15,000W		
Static Mode									
Min. Operating Voltage (DC)	0.15V @100A	0.75V @500A	1.5V @1,000A	0.18V @120A	0.9V @600A	1.8V @1,200A	0.18V @150A	0.9V @750A	1.8V @1,500A
Constant Current Mode									
Range	0~100A	0~500A	0~1,000A	0~120A	0~600A	0~1,200A	0~150A	0~750A	0~1,500A
Accuracy*4	0.1%+0.1%F.S.			0.1%+0.1%F.S.			0.1%+0.1%F.S.		
Constant Resistance Mode									
Range	0.0025 Ω~25 Ω (16V/10kW) 0.01 Ω~100 Ω (80V/10kW) 0.25 Ω~500 Ω (150V/10kW)			0.0025 Ω~25 Ω (16V/12kW) 0.01 Ω~100 Ω (80V/12kW) 0.25 Ω~500 Ω (150V/12kW)			0.0017 Ω~16.6667 Ω (16V/15kW) 0.0067 Ω~66.6667 Ω (80V/15kW) 0.167 Ω~333.334 Ω (150V/15kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V
Accuracy	0.05%+0.025%F.S.			0.05%+0.025%F.S.			0.05%+0.025%F.S.		
Constant Power Mode									
Range	0~1,000W	0~5,000W	0~10,000W	0~1,200W	0~6,000W	0~12,000W	0~1,500W	0~7,500W	0~15,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	1mA/μs~1A/μs	5mA/μs~5A/μs	10mA/μs~10A/μs	1mA/μs~1.2A/μs	5mA/μs~6A/μs	10mA/μs~12A/μs	2mA/μs~1.5A/μs	10mA/μs~7.5A/μs	20mA/μs~15A/μs
Resolution	1mA/μs	5mA/μs	10mA/μs	1mA/μs	5mA/μs	10mA/μs	2mA/μs	10mA/μs	20mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	400VA(max)			400VA(max)			600VA(max)		
Dimension (HxWxD)	307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch		
Weight	70kg / 154.3 lbs			70kg / 154.3 lbs			97kg / 213.8 lbs		

SPECIFICATIONS-4 (150V)									
150V Models	63218E-150-1800			63220E-150-2000			63224E-150-2000		
Voltage*2	0~150V			0~150V			0~150V		
Current	0~180A	0~900A	0~1,800A	0~200A	0~1,000A	0~2,000A	0~200A	0~1,000A	0~2,000A
Power*3	0~18,000W			0~20,000W			0~24,000W		
Static Mode									
Min. Operating Voltage (DC)	0.18V @180A	0.9V @900A	1.8V @1,800A	0.18V @200A	0.9V @1,000A	1.8V @2,000A	0.18V @200A	0.9V @1,000A	1.8V @2,000A
Constant Current Mode									
Range	0~180A	0~900A	0~1,800A	0~200A	0~1,000A	0~2,000A	0~200A	0~1,000A	0~2,000A
Accuracy*4	0.1%+0.1%F.S.			0.1%+0.1%F.S.			0.1%+0.1%F.S.		
Constant Resistance Mode									
Range	0.0017 Ω-16.6667 Ω (16V/18kW) 0.0067 Ω-66.6667 Ω (80V/18kW) 0.167 Ω-333.334 Ω (150V/18kW)			0.0013 Ω-12.5 Ω (16V/20kW) 0.005 Ω-50 Ω (80V/20kW) 0.125 Ω-250 Ω (150V/20kW)			0.0013 Ω-12.5 Ω (16V/24kW) 0.005 Ω-50 Ω (80V/24kW) 0.125 Ω-250 Ω (150V/24kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V	0~16V	0~80V	0~150V
Accuracy	0.05%+0.025%F.S.			0.05%+0.025%F.S.			0.05%+0.025%F.S.		
Constant Power Mode									
Range	0~1,800W	0~9,000W	0~18,000W	0~2,000W	0~10,000W	0~20,000W	0~2,400W	0~12,000W	0~24,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	2mA/μs~1.8A/μs	10mA/μs~9A/μs	20mA/μs~18A/μs	2mA/μs~2A/μs	10mA/μs~10A/μs	20mA/μs~20A/μs	2mA/μs~2A/μs	10mA/μs~10A/μs	20mA/μs~20A/μs
Resolution	2mA/μs	10mA/μs	20mA/μs	2mA/μs	10mA/μs	80mA/μs	2mA/μs	10mA/μs	20mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	600VA(max)			800VA(max)			800VA(max)		
Dimension (HxWxD)	441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch		
Weight	97kg / 213.8 lbs			125kg / 275.6 lbs			125kg / 275.6 lbs		

SPECIFICATIONS-5 (600V)									
600V Models	63202E-600-140			63203E-600-210			63204E-600-280		
Voltage*2	0~600V								
Current	0~14A	0~70A	0~140A	0~21A	0~105A	0~210A	0~28A	0~140A	0~280A
Power*3	0~2,000W								
Static Mode									
Min. Operating Voltage (DC)	1.4V @14A	7V @70A	14V @140A	1.4V @21A	7V @105A	14V @210A	1.4V @28A	7V @140A	14V @280A
Constant Current Mode									
Range	0~14A	0~70A	0~140A	0~21A	0~105A	0~210A	0~28A	0~140A	0~280A
Accuracy*4	0.1%+0.1%F.S.								
Constant Resistance Mode									
Range	0.15Ω~1,500Ω (80V/2kW) 0.6Ω~6,000Ω (150V/2kW) 6Ω~12,000Ω (600V/2kW)			0.1Ω~1,000Ω (80V/3kW) 0.4Ω~4,000Ω (150V/3kW) 4Ω~8,000Ω (600V/3kW)			0.075Ω~750Ω (80V/4kW) 0.3Ω~3,000Ω (150V/4kW) 3Ω~6,000Ω (600V/4kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.								
Constant Voltage Mode									
Range	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V
Accuracy	0.05%+0.025%F.S.								
Constant Power Mode									
Range	0~200W	0~1,000W	0~2,000W	0~300W	0~1,500W	0~3,000W	0~400W	0~2,000W	0~4,000W
Accuracy *5	0.2%+0.2%F.S.								
Dynamic Mode									
Slew rate	0.2mA/μs~ 0.14A/μs	1mA/μs~ 0.7A/μs	2mA/μs~ 1.4A/μs	0.2mA/μs~ 0.21A/μs	1mA/μs~ 1.05A/μs	2mA/μs~ 2.1A/μs	0.4mA/μs~ 0.28A/μs	2mA/μs~ 1.4A/μs	4mA/μs~ 2.8A/μs
Resolution	0.2mA/μs	1mA/μs	2mA/μs	0.2mA/μs	1mA/μs	2mA/μs	0.4mA/μs	2mA/μs	4mA/μs
Accuracy	5% ± 10μs								
Others									
Power Consumption	160VA(max)			160VA(max)			200VA(max)		
Dimension (HxWxD)	132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			177 x 428 x 647 mm / 6.97 x 16.85 x 25.47 inch		
Weight	30kg / 66 lbs			30kg / 66 lbs			35kg / 77.2 lbs		

SPECIFICATIONS-6 (600V)									
600V Models	63205E-600-350			63206E-600-420			63208E-600-560		
Voltage*2	0~600V								
Current	0~35A	0~175A	0~350A	0~42A	0~210A	0~420A	0~56A	0~280A	0~560A
Power*3	0~5,000W								
Static Mode									
Min. Operating Voltage (DC)	1.4V @35A	7V @175A	14V @350A	1.4V @42A	7V @210A	14V @420A	1.4V @56A	7V @280A	14V @560A
Constant Current Mode									
Range	0~35A	0~175A	0~350A	0~42A	0~210A	0~420A	0~56A	0~280A	0~560A
Accuracy*4	0.1%+0.1%F.S.								
Constant Resistance Mode									
Range	0.05Ω~500Ω (80V/5kW) 0.2Ω~2,000Ω (150V/5kW) 2Ω~4,000Ω (600V/5kW)			0.05Ω~500Ω (80V/6kW) 0.2Ω~2,000Ω (150V/6kW) 2Ω~4,000Ω (600V/6kW)			0.038Ω~375Ω (80V/8kW) 0.15Ω~1,500Ω (150V/8kW) 1.5Ω~3,000Ω (600V/8kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.								
Constant Voltage Mode									
Range	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V
Accuracy	0.05%+0.025%F.S.								
Constant Power Mode									
Range	0~500W	0~2,500W	0~5,000W	0~600W	0~3,000W	0~6,000W	0~800W	0~4,000W	0~8,000W
Accuracy *5	0.2%+0.2%F.S.								
Dynamic Mode									
Slew rate	0.4mA/μs~ 0.35A/μs	2mA/μs~ 1.75A/μs	4mA/μs~ 3.5A/μs	0.4mA/μs~ 0.42A/μs	2mA/μs~ 2.1A/μs	4mA/μs~ 4.2A/μs	0.5mA/μs~ 0.56A/μs	2mA/μs~ 2.8A/μs	5mA/μs~ 5.6A/μs
Resolution	0.4mA/μs	2mA/μs	4mA/μs	0.4mA/μs	2mA/μs	4mA/μs	0.5mA/μs	2mA/μs	5mA/μs
Accuracy	5% ± 10μs								
Others									
Power Consumption	200VA(max)			200VA(max)			400VA(max)		
Dimension (HxWxD)	177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch		
Weight	35kg / 77.2 lbs			35kg / 77.2 lbs			70kg / 154.3 lbs		

Video & Color  
Flat Panel Display  
Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation

SPECIFICATIONS-7 (600V)									
600V Models	63210E-600-700			63212E-600-840			63215E-600-1050		
Voltage*2	0~600V			0~600V			0~600V		
Current	0~70A	0~350A	0~700A	0~84A	0~420A	0~840A	0~105A	0~525A	0~1,050A
Power*3	0~10,000W			0~12,000W			0~15,000W		
Static Mode									
Min. Operating Voltage (DC)	1.4V @70A	7V @350A	14V @700A	1.4V @84A	7V @420A	14V @840A	1.4V @105A	7V @525A	14V @1,050A
Constant Current Mode									
Range	0~70A	0~350A	0~700A	0~84A	0~420A	0~840A	0~105A	0~525A	0~1,050A
Accuracy*4	0.1%+0.1%F.S.			0.1%+0.1%F.S.			0.1%+0.1%F.S.		
Constant Resistance Mode									
Range	0.025 Ω ~250 Ω (80V/10kW) 0.1 Ω ~1,000 Ω (150V/10kW) 1 Ω ~2,000 Ω (600V/10kW)			0.025 Ω ~250 Ω (80V/12kW) 0.1 Ω ~1,000 Ω (150V/12kW) 1 Ω ~2,000 Ω (600V/12kW)			0.017 Ω ~166.667 Ω (80V/15kW) 0.067 Ω ~666.667 Ω (150V/15kW) 0.67 Ω ~1,333.34 Ω (600V/15kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V
Accuracy	0.05%+0.025%F.S.			0.05%+0.025%F.S.			0.05%+0.025%F.S.		
Constant Power Mode									
Range	0~1,000W	0~5,000W	0~10,000W	0~1,200W	0~6,000W	0~12,000W	0~1,500W	0~7,500W	0~15,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	0.5mA/μs~ 0.7A/μs	2.5mA/μs~ 3.5A/μs	5mA/μs~ 7A/μs	1mA/μs~ 0.84A/μs	5mA/μs~ 4.2A/μs	10mA/μs~ 8.4A/μs	1mA/μs~ 1.05A/μs	5mA/μs~ 5.25A/μs	10mA/μs~ 10.5A/μs
Resolution	0.5mA/μs	2.5mA/μs	5mA/μs	1mA/μs	5mA/μs	10mA/μs	1mA/μs	5mA/μs	10mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	400VA(max)			400VA(max)			600VA(max)		
Dimension (HxWxD)	307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch		
Weight	70kg / 154.3 lbs			70kg / 154.3 lbs			97kg / 213.8 lbs		

SPECIFICATIONS-8 (600V)									
600V Models	63218E-600-1260			63220E-600-1400			63224E-600-1680		
Voltage*2	0~600V			0~600V			0~600V		
Current	0~126A	0~630A	0~1,260A	0~140A	0~700A	0~1,400A	0~168A	0~840A	0~1,680A
Power*3	0~18,000W			0~20,000W			0~24,000W		
Static Mode									
Min. Operating Voltage (DC)	1.4V @126A	7V @630A	14V @1,260A	1.4V @140A	7V @700A	14V @1,400A	1.4V @168A	7V @840A	14V @1,680A
Constant Current Mode									
Range	0~126A	0~630A	0~1,260A	0~140A	0~700A	0~1,400A	0~168A	0~840A	0~1,680A
Accuracy*4	0.1%+0.1%F.S.			0.1%+0.1%F.S.			0.1%+0.1%F.S.		
Constant Resistance Mode									
Range	0.017 Ω -166.667 Ω (80V/18kW) 0.067 Ω -666.667 Ω (150V/18kW) 0.67 Ω -1,333.34 Ω (600V/18kW)			0.013 Ω -125 Ω (80V/20kW) 0.05 Ω -500 Ω (150V/20kW) 0.5 Ω -1,000 Ω (600V/20kW)			0.013 Ω -125 Ω (80V/24kW) 0.05 Ω -500 Ω (150V/24kW) 0.5 Ω -1,000 Ω (600V/24kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.			Vin/Rset*(0.2%)+0.2% I.F.S.		
Constant Voltage Mode									
Range	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V	0~80V	0~150V	0~600V
Accuracy	0.05%+0.025%F.S.			0.05%+0.025%F.S.			0.05%+0.025%F.S.		
Constant Power Mode									
Range	0~1,800W	0~9,000W	0~18,000W	0~2,000W	0~10,000W	0~20,000W	0~2,400W	0~12,000W	0~24,000W
Accuracy *5	0.2%+0.2%F.S.			0.2%+0.2%F.S.			0.2%+0.2%F.S.		
Dynamic Mode									
Slew rate	1mA/μs~ 1.26A/μs	5mA/μs~ 6.3A/μs	10mA/μs~ 12.6A/μs	2mA/μs~ 1.4A/μs	10mA/μs~ 7A/μs	20mA/μs~ 14A/μs	2mA/μs~ 1.68A/μs	10mA/μs~ 8.4A/μs	20mA/μs~ 16.8A/μs
Resolution	1mA/μs	5mA/μs	10mA/μs	2mA/μs	10mA/μs	20mA/μs	2mA/μs	10mA/μs	20mA/μs
Accuracy	5% ± 10μs			5% ± 10μs			5% ± 10μs		
Others									
Power Consumption	600VA(max)			800VA(max)			800VA(max)		
Dimension (HxWxD)	441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch		
Weight	97kg / 213.8 lbs			125kg / 275.6 lbs			125kg / 275.6 lbs		



SPECIFICATIONS-9 (1,200V)									
1,200V Models	63202E-1200-80			63203E-1200-120			63204E-1200-160		
Voltage*2	0~1,200V								
Current	0~8A	0~40A	0~80A	0~12A	0~60A	0~120A	0~16A	0~80A	0~160A
Power*3	0~2,000W								
Static Mode									
Min. Operating Voltage (DC)	2V @8A	10V @40A	20V @80A	2V @12A	10V @60A	20V @120A	2V @16A	10V @80A	20V @160A
Constant Current Mode									
Range	0~8A	0~40A	0~80A	0~12A	0~60A	0~120A	0~16A	0~80A	0~160A
Accuracy*4	0.1%+0.1%F.S.								
Constant Resistance Mode									
Range	0.3Ω-3kΩ (150V/2kW) 1.2Ω-12kΩ (600V/2kW) 30Ω-60kΩ (1,200V/2kW)			0.2Ω-2kΩ (150V/3kW) 0.8Ω-8kΩ (600V/3kW) 20Ω-40kΩ (1,200V/3kW)			0.15Ω-1.5kΩ (150V/4kW) 0.6Ω-6kΩ (600V/4kW) 15Ω-30kΩ (1,200V/4kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.								
Constant Voltage Mode									
Range	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V
Accuracy	0.05%+0.025%F.S.								
Constant Power Mode									
Range	0~200W	0~1,000W	0~2,000W	0~300W	0~1,500W	0~3,000W	0~400W	0~2,000W	0~4,000W
Accuracy *5	0.2%+0.2%F.S.								
Dynamic Mode									
Slew rate	0.1mA/μs~ 0.08A/μs	0.5mA/μs~ 0.4A/μs	1mA/μs~ 0.8A/μs	0.1mA/μs~ 0.12A/μs	0.5mA/μs~ 0.6A/μs	1mA/μs~ 1.2A/μs	0.2mA/μs~ 0.16A/μs	1mA/μs~ 0.8A/μs	2mA/μs~ 1.6A/μs
Resolution	0.1mA/μs	0.5mA/μs	1mA/μs	0.1mA/μs	0.5mA/μs	1mA/μs	0.2mA/μs	1mA/μs	2mA/μs
Accuracy	5% ± 10μs								
Others									
Power Consumption	160VA(max)			160VA(max)			200VA(max)		
Dimension (HxWxD)	132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			132.5 x 428 x 647mm / 5.22 x 16.85 x 25.47 inch			177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch		
Weight	30kg / 66 lbs			30kg / 66 lbs			35kg / 77.2 lbs		

SPECIFICATIONS-10 (1,200V)									
1,200V Models	63205E-1200-200			63206E-1200-240			63208E-1200-320		
Voltage*2	0~1,200V								
Current	0~20A	0~100A	0~200A	0~24A	0~120A	0~240A	0~32A	0~160A	0~320A
Power*3	0~5,000W								
Static Mode									
Min. Operating Voltage (DC)	2V @20A	10V @100A	20V @200A	2V @24A	10V @120A	20V @240A	2V @32A	10V @160A	20V @320A
Constant Current Mode									
Range	0~20A	0~100A	0~200A	0~24A	0~120A	0~240A	0~32A	0~160A	0~320A
Accuracy*4	0.1%+0.1%F.S.								
Constant Resistance Mode									
Range	0.1Ω-1kΩ (150V/5kW) 0.4Ω-4kΩ (600V/5kW) 10Ω-20kΩ (1200V/5kW)			0.1Ω-1kΩ (150V/6kW) 0.4Ω-4kΩ (600V/6kW) 10Ω-20kΩ (1200V/6kW)			0.075Ω-0.75kΩ (150V/8kW) 0.3Ω-3kΩ (600V/8kW) 7.5Ω-15kΩ (1200V/8kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.								
Constant Voltage Mode									
Range	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V
Accuracy	0.05%+0.025%F.S.								
Constant Power Mode									
Range	0~500W	0~2,500W	0~5,000W	0~600W	0~3,000W	0~6,000W	0~800W	0~4,000W	0~8,000W
Accuracy *5	0.2%+0.2%F.S.								
Dynamic Mode									
Slew rate	0.2mA/μs~ 0.2A/μs	1mA/μs~ 1A/μs	2mA/μs~ 2A/μs	0.2mA/μs~ 0.24A/μs	1mA/μs~ 1.2A/μs	2mA/μs~ 2.4A/μs	0.4mA/μs~ 0.32A/μs	2mA/μs~ 1.6A/μs	4mA/μs~ 3.2A/μs
Resolution	0.2mA/μs	1mA/μs	2mA/μs	0.2mA/μs	1mA/μs	2mA/μs	0.4mA/μs	2mA/μs	4mA/μs
Accuracy	5% ± 10μs								
Others									
Power Consumption	200VA(max)			200VA(max)			400VA(max)		
Dimension (HxWxD)	177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			177 x 428 x 647mm / 6.97 x 16.85 x 25.47 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch		
Weight	35kg / 77.2 lbs			35kg / 77.2 lbs			70kg / 154.3 lbs		

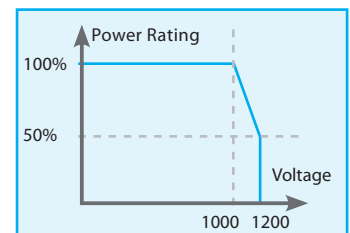
Video & Color  
Flat Panel Display  
LED/Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation

SPECIFICATIONS-11 (1,200V)									
1,200V Models	63210E-1200-400			63212E-1200-480			63215E-1200-600		
Voltage*2	0~1,200V								
Current	0~40A	0~200A	0~400A	0~48A	0~240A	0~480A	0~60A	0~300A	0~600A
Power*3	0~10,000W								
Static Mode									
Min. Operating Voltage (DC)	2V @40A	10V @200A	20V @400A	2V @48A	10V @240A	20V @480A	2V @60A	10V @300A	20V @600A
Constant Current Mode									
Range	0~40A	0~200A	0~400A	0~48A	0~240A	0~480A	0~60A	0~300A	0~600A
Accuracy*4	0.1%+0.1%F.S.								
Constant Resistance Mode									
Range	0.05Ω~0.5kΩ (150V/10kW) 0.2Ω~2kΩ (600V/10kW) 5Ω~10kΩ (1,200V/10kW)			0.05Ω~0.5kΩ (150V/12kW) 0.2Ω~2kΩ (600V/12kW) 5Ω~10kΩ (1,200V/12kW)			0.034Ω~0.333334kΩ (150V/15kW) 0.14Ω~1.33334kΩ (600V/15kW) 3.34Ω~6.66667kΩ (1,200V/15kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.								
Constant Voltage Mode									
Range	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V
Accuracy	0.05%+0.025%F.S.								
Constant Power Mode									
Range	0~1,000W	0~5,000W	0~10,000W	0~1,200W	0~6,000W	0~12,000W	0~1,500W	0~7,500W	0~15,000W
Accuracy *5	0.2%+0.2%F.S.								
Dynamic Mode									
Slew rate	0.1mA/μs~ 0.4A/μs	0.5mA/μs~ 2A/μs	1mA/μs~ 4A/μs	0.1mA/μs~ 0.48A/μs	0.5mA/μs~ 2.4A/μs	1mA/μs~ 4.8A/μs	0.2mA/μs~ 0.6A/μs	1mA/μs~ 3A/μs	2mA/μs~ 6A/μs
Resolution	0.4mA/μs	2mA/μs	4mA/μs	0.4mA/μs	2mA/μs	4mA/μs	0.5mA/μs	2mA/μs	5mA/μs
Accuracy	5% ± 10μs								
Others									
Power Consumption	400VA(max)			400VA(max)			600VA(max)		
Dimension (HxWxD)	307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			307.6 x 428 x 670.5 mm / 12.11 x 16.85 x 26.40 inch			441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch		
Weight	70kg / 154.3 lbs			70kg / 154.3 lbs			97kg / 213.8 lbs		

SPECIFICATIONS-12 (1,200V)									
1,200V Models	63218E-1200-720			63220E-1200-800			63224E-1200-960		
Voltage*2	0~1,200V								
Current	0~72A	0~360A	0~720A	0~80A	0~400A	0~800A	0~96A	0~480A	0~960A
Power*3	0~18,000W								
Static Mode									
Min. Operating Voltage (DC)	2V @72A	10V @360A	20V @720A	2V @80A	10V @400A	20V @800A	2V @96A	10V @480A	20V @960A
Constant Current Mode									
Range	0~72A	0~360A	0~720A	0~80A	0~400A	0~800A	0~96A	0~480A	0~960A
Accuracy*4	0.1%+0.1%F.S.								
Constant Resistance Mode									
Range	0.034Ω~0.333334kΩ (150V/18kW) 0.14Ω~1.33334kΩ (600V/18kW) 3.34Ω~6.66667kΩ (1,200V/18kW)			0.025Ω~0.25kΩ (150V/20kW) 0.1Ω~1kΩ (600V/20kW) 2.5Ω~5kΩ (1,200V/20kW)			0.025Ω~0.25kΩ (150V/24kW) 0.1Ω~1kΩ (600V/24kW) 2.5Ω~5kΩ (1,200V/24kW)		
Accuracy	Vin/Rset*(0.2%)+0.2% I.F.S.								
Constant Voltage Mode									
Range	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V	0~150V	0~600V	0~1,200V
Accuracy	0.05%+0.025%F.S.								
Constant Power Mode									
Range	0~1,800W	0~9,000W	0~18,000W	0~2,000W	0~10,000W	0~20,000W	0~2,400W	0~12,000W	0~24,000W
Accuracy *5	0.2%+0.2%F.S.								
Dynamic Mode									
Slew rate	0.2mA/μs~ 0.72A/μs	1mA/μs~ 3.6A/μs	2mA/μs~ 7.2A/μs	0.2mA/μs~ 0.8A/μs	1mA/μs~ 4A/μs	2mA/μs~ 8A/μs	0.4mA/μs~ 0.96A/μs	2mA/μs~ 4.8A/μs	4mA/μs~ 9.6A/μs
Resolution	0.5mA/μs	2mA/μs	5mA/μs	1mA/μs	5mA/μs	10mA/μs	1mA/μs	5mA/μs	10mA/μs
Accuracy	5% ± 10μs								
Others									
Power Consumption	600VA(max)			800VA(max)			800VA(max)		
Dimension (HxWxD)	441.1 x 428 x 670.5 mm / 17.37 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch			574.6 x 428 x 670.5 mm / 22.64 x 16.85 x 26.40 inch		
Weight	97kg / 213.8 lbs			125kg / 275.6 lbs			125kg / 275.6 lbs		

GENERAL SPECIFICATIONS			
Voltage	150V	600V	1200V
<b>Static mode</b>			
CZ			
Range		CL : 30μF~50,000μF RL : as CR Ls : 0.1μH~16μH Rs : 30mΩ~20Ω	
Resolution		CL : 1μF Ls : 0.1μH Rs : 1mΩ RL : as CR	
<b>Dynamic mode</b>			
T1 & T2		0.020~99.999ms/100ms~99,999ms	
Resolution		1μs/1ms	
Accuracy		1μs+100ppm	
Min. rise time *7	100μs (Typical)	100μs (Typical)	100μs (Typical)
<b>Measurement</b>			
<b>Voltage read back</b>			
Range *8		0 ~ rated voltage (three ranges)	
Accuracy		0.02%+0.02%F.S.	
<b>Current read back</b>			
Range		0 ~ rated current (three ranges)	
Accuracy		0.1%+0.1%F.S.	
<b>Power read back</b>			
Range		0 ~ rated power (three ranges)	
Accuracy *5		0.1%+0.1%F.S.	
<b>Battery Discharge</b>			
Range		1s~100,000s	
Resolution		1s	
<b>Monitor</b>			
<b>Voltage Monitor</b>			
Bandwidth		20kHz	
Range	0~150V	0~600V	0~1200V
Output		0~10V	
Accuracy		0.5%F.S.	
Output impedance		10kΩ	
Resolution		4mV	
<b>Current Monitor</b>			
Bandwidth		20kHz	
Range		0 ~ rated current	
Output		0~10V	
Accuracy		0.5%F.S.	
Output impedance		10kΩ	
Resolution		4mV	
<b>Protection</b>			
Over Current		Yes (Settable)	
Over Power		Yes (Settable)	
Over Temperature		Yes	
Over Voltage Alarm		Yes	
Reverse Alarm		Yes	
<b>Interface</b>			
Front USB (Host)		Standard	
Rear USB (Device)		Standard	
GPIO		Optional	
System Bus		Master/Slave	
<b>General</b>			
Input Resistance (Load Off)	800kΩ (Typical)	1MΩ (Typical)	2MΩ (Typical)
Operating Temp		0~40°C	
Storage Temp		-20~80°C	
Line Voltage		100~240 VAC / 47~63Hz	

1. The specifications are guaranteed to meet specified performance at temperature range of 25 ± 5°C.
2. If the operating voltage exceeds the rated voltage for 1.05 times, it would cause permanent damage to the device.
3. The power rating specifications at ambient temperature = 25°C.
4. If the operating current is below range 0.2%, the accuracy specification is 0.1% F.S.
5. Power F.S. = Vrange F.S.x Irang F.S.
6. The specification is valid only for loading current > 4% F.S.
7. The short circuit function simulates full power loading and thus it cannot perform mechanical short circuit.
8. Example : 63200E-1200-400, the voltage ranges are 150V, 600V, and 1,200V.



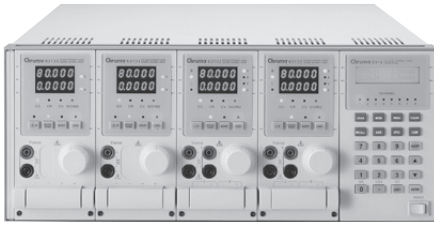
## ORDERING INFORMATION

63200E High Power DC Electronic Load					
Model	Voltage	Current	Power	Height	
63202E-150-200*	150V	200A	2kW	3U	
63203E-150-300		300A	3kW		
63204E-150-400		400A	4kW		
63205E-150-500		500A	5kW	4U	
63206E-150-600		600A	6kW		
63208E-150-800		800A	8kW	7U	
63210E-150-1000*		1000A	10kW		
63212E-150-1200		1200A	12kW		
63215E-150-1500		1500A	15kW	10U	
63218E-150-1800		1800A	18kW		
63220E-150-2000*		2000A	20kW	13U	
63224E-150-2000		2000A	24kW		
63202E-600-140*		600V	140A	2kW	3U
63203E-600-210			210A	3kW	
63204E-600-280	280A		4kW	4U	
63205E-600-350	350A		5kW		
63206E-600-420	420A		6kW		
63208E-600-560	560A		8kW	7U	
63210E-600-700*	700A		10kW		
63212E-600-840	840A		12kW	10U	
63215E-600-1050	1050A		15kW		
63218E-600-1260	1260A		18kW		
63220E-600-1400*	1400A		20kW	13U	
63224E-600-1680	1680A		24kW		
63202E-1200-80*	1200V		80A	2kW	3U
63203E-1200-120			120A	3kW	
63204E-1200-160		160A	4kW	4U	
63205E-1200-200		200A	5kW		
63206E-1200-240		240A	6kW		
63208E-1200-320		320A	8kW	7U	
63210E-1200-400*		400A	10kW		
63212E-1200-480		480A	12kW	10U	
63215E-1200-600		600A	15kW		
63218E-1200-720		720A	18kW	13U	
63220E-1200-800*		800A	20kW		
63224E-1200-960		960A	24kW		

Options	
A600009	GPIB cable (200cm)
A600010	GPIB cable (60cm)
A632000	Softpanel for 63200E Series
A632006	NI USB-6211 Bus-Powered Multifunction DAQ
A636000	GPIB interface
A636010	Ethernet interface
B632000	Handle for 3U models (2kW/3kW)
B632001	Handle for 4U models (4kW/5kW/6kW)
B632002	Rack mounting kit for 7U models (8kW/10kW/12kW)
B632003	Rack mounting kit for 10U models (15kW/18kW)
B632004	Rack mounting kit for 13U models (20kW/24kW)

\* 2kW, 8kW, 10kW, 15kW, 20kW models will be available in April, 2017.





With Synchronic parallel control capability, 6330A series loads allow users to parallel and synchronize more than one load together from an internal loading control signal. This feature provides synchronic dynamic loading test for multi-output power and high power test solution.

### KEY FEATURES

- Improve operating speeds of load for auto test system integration
- Synchronous paralleling control mode, allow Synchronous load control under static and dynamic Loading mode up to 6000W
- Up to 8 channels in one mainframe, fit for testing Multiple output SMPS.
- GPIB, RS-232 & USB Interfaces
- Max Power: 200W, 100W x 2(Dual), 30W&250W, 300W, 350W, 600W, 1200W
- Voltage Range: 0~80V/0~120V/0~500V/0~600V
- CC, CR, CV, CP operating modes
- Dynamic loading with speed up to 20kHz
- Programmable slew rate, up to 10A/μs
- Only need 0.6V to draw rated current (63323A)
- Individual panel meters
- Real time power supplies load transient response simulation and output measurement
- 16-bit precision voltage and measurement with dual-range selection
- Remote sensing capability
- Short circuit test
- Self-test at power-on
- CE marking

Chroma Model 6330A series high speed DC electronic improves CPU clock, baud rate, parser and added synchronic parallel function for fast operation, which is ideal for auto test system integration to increase your manufacturing test throughput. Plugging the user selectable load modules into the system mainframe can also provide easy system configuration and future reconfiguration configure the system.

The 6330A family offers 12 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 operating. The load can be operated in constant current, constant voltage, and constant resistance.

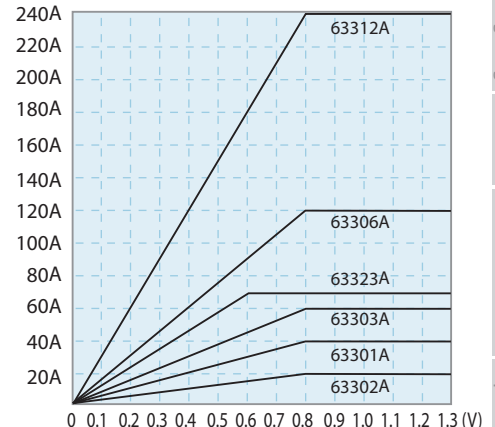
Real time measurement of voltage, current, is integrated into each 6330A load module using a 16-bit precision measurement circuit. The user can perform on line voltage measurement and adjustment, or simulate short circuit test using the simple keypad on the front panel.

The 6330A have self-diagnosis routine to maintain instrumental performance all the time. It is also protected against OP, OC, OT protection, and alarm indicating OV, reverse polarity to guarantee quality and reliability for even the most demanding engineering testing and ATE application.

The FET technology accomplishes minimum input resistance and enables the load to sink high current even at very low voltage. For example, 120V model 63303A 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. (see below)

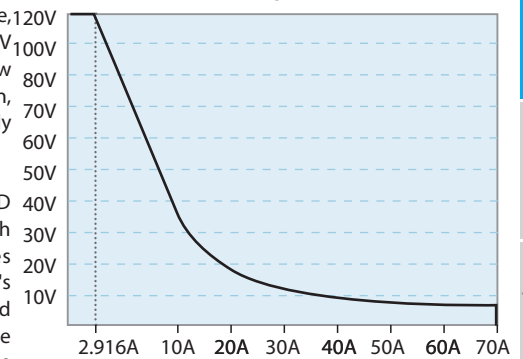
Chroma has created the industries first LED Load Simulator for simulating LED loading with our 63310A load model from our 6330A series Electronic Loads. By setting the LED power driver's output voltage, and current, the Electronic Load can simulate the LED's loading characteristics. The LED's forward voltage and operating resistance can also be set to further adjust the loading current and ripple current to better simulate LED characteristics. The 63310A design also has increased bandwidth to allow for PWM dimming testing.

**Low Voltage Characteristics (Typical)**  
Model 63301A/63302A/63303A/  
63306A/63312A/63323A

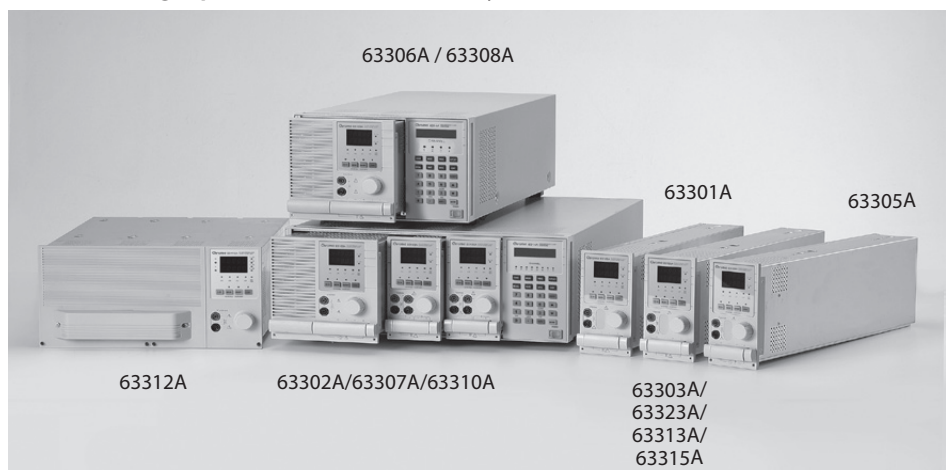


Note: All specifications are measured at load input terminals. (Ambient Temperature of 25°C)

**Model 63323A Input Characteristics**



### 6330A Series High Speed DC Electronic Load Family



SPECIFICATIONS-1						
Model	63301A		63302A (100Wx2)		63303A	
Power	20W	200W	20W	100W	30W	300W
Current	0~4A	0~40A	0~2A	0~20A	0~6A	0~60A
Voltage *3	0~80V		0~80V		0~80V	
Min. Operation Voltage (DC) *1 (Typical)	0.4V@2A 0.8V@4A	0.4V@20A 0.8V@40A	0.4V@1A 0.8V@2A	0.4V@10A 0.8V@20A	0.4V@3A 0.8V@6A	0.4V@30A 0.8V@60A
<b>Constant Current Mode</b>						
Range	0~4A	0~40A	0~2A	0~20A	0~6A	0~60A
Resolution	1mA	10mA	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.
<b>Constant Resistance Mode</b>						
Range	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)	
Resolution*5	6.667mS (200W/16V) 133μS (200W/80V)		3.333mS (100W/16V) 66.667μS (100W/80V)		10mS (300W/16V) 200μS (300W/80V)	
Accuracy	150 Ω : 0.1S + 0.2% 7.5k Ω : 0.01S + 0.1%		300 Ω : 0.1S + 0.2% 15k Ω : 0.01S + 0.1%		100 Ω : 0.1S + 0.2% 5k Ω : 0.01S + 0.1%	
<b>Constant Voltage Mode</b>						
Range	0~80V		0~80V		0~80V	
Resolution	20mV		20mV		20mV	
Accuracy	0.05% + 0.1%F.S.		0.05% + 0.1%F.S.		0.05% + 0.1%F.S.	
<b>Constant Power Mode</b>						
Range	0~20W	0~200W	0~20W	0~100W	0~30W	0~300W
Resolution	5mW	50mW	5mW	25mW	7.5mW	75mW
Accuracy	0.5% + 0.5%F.S.		0.5% + 0.5%F.S.		0.5% + 0.5%F.S.	
<b>Dynamic Mode</b>						
Dynamic Mode	C.C. Mode		C.C. Mode		C.C. Mode	
T1 & T2	0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms	
Accuracy	1μs/1ms+100ppm		1μs/1ms+100ppm		1μs/1ms+100ppm	
Slew Rate	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
Resolution	0.64mA/μs	6.4mA/μs	0.32mA/μs	3.2mA/μs	0.001A/μs	0.01A/μs
Accuracy	10% ± 20μs		10% ± 20μs		10% ± 20μs	
Min. Rise Time	10μs (Typical)		10μs (Typical)		10μs (Typical)	
Current	0~4A	0~40A	0~2A	0~20A	0~6A	0~60A
Resolution	1mA	10mA	0.5mA	5mA	1.5mA	15mA
Accuracy	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
Resolution	0.25mV	1.25mV	0.25mV	1.25mV	0.25mV	1.25mV
Accuracy	0.025% + 0.025%F.S.		0.025% + 0.025%F.S.		0.025% + 0.025%F.S.	
<b>Current Read Back</b>						
Range	0~4A	0~40A	0~2A	0~20A	0~6A	0~60A
Resolution	0.0625mA	0.625mA	0.03125mA	0.3125mA	0.09375mA	0.9375mA
Accuracy	0.05% + 0.05%F.S.		0.05% + 0.05%F.S.		0.05% + 0.05%F.S.	
<b>Power Read Back*2</b>						
Range	0~20W	0~200W	0~20W	0~100W	0~30W	0~300W
Accuracy	0.1% + 0.1%F.S.		0.1% + 0.1%F.S.		0.1% + 0.1%F.S.	
<b>Protective Section</b>						
Over Power Protection	Yes		Yes		Yes	
Over Current Protection	Yes		Yes		Yes	
Over Temperature Protection	Yes		Yes		Yes	
Over Voltage Alarm*3	Yes		Yes		Yes	
<b>General</b>						
<b>Short Circuit</b>						
Current (CC)	-	≒ 40A	-	≒ 20A	-	≒ 60A
Voltage (CV)	-	0V	-	0V	-	0V
Resistance (CR)	-	≒ 0.0375 Ω	-	≒ 0.075 Ω	-	≒ 0.025 Ω
Power (CP)	-	≒ 200W	-	≒ 100W	-	≒ 300W
<b>Input Resistance (Load Off)</b>	100k Ω (Typical)		100k Ω (Typical)		100k Ω (Typical)	
<b>Temperature Coefficient</b>	100PPM/°C (Typical)		100PPM/°C (Typical)		100PPM/°C (Typical)	
<b>Power</b>	Supply from 6334A Mainframe		Supply from 6334A Mainframe		Supply from 6334A Mainframe	
<b>Dimension (H x W x D)</b>	172x82x489.5mm / 6.8x3.2x19.3inch		172x82x489.5mm / 6.8x3.2x19.3inch		172x82x489.5mm / 6.8x3.2x19.3inch	
<b>Weight</b>	4.2 kg / 9.3 lbs		4.2 kg / 9.3 lbs		4.2 kg / 9.3 lbs	
<b>Operating Range</b>	0~40°C		0~40°C		0~40°C	
<b>EMC &amp; Safety</b>	CE		CE		CE	

SPECIFICATIONS-2				
Model	63305A		63306A	
Power	30W	300W	60W	600W
Current	0~1A	0~10A	0~12A	0~120A
Voltage*3	0~500V		0~80V	
Min. Operation Voltage (DC) *1 (Typical)	1.0V@0.5A 2.0V@1A	1.0V@5A 2.0V@10A	0.4V@6A 0.8V@12A	0.4V@60A 0.8V@120A
<b>Constant Current Mode</b>				
Range	0~1A	0~10A	0~12A	0~120A
Resolution	0.25mA	2.5mA	3mA	30mA
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.
<b>Constant Resistance Mode</b>				
Range	1.25 Ω~5k Ω (300W/125V) 50 Ω~200k Ω (300W/500V)		12.5m Ω ~ 50 Ω (600W/16V) 0.625 Ω~2.5k Ω (600W/80V)	
Resolution*5	200μS (300W/125V) 5μS (300W/500V)		20mS (600W/16V) 400μS (600W/80V)	
Accuracy	5k Ω : 20mS+ 0.2% 200k Ω :5mS+ 0.1%		50 Ω : 0.4S + 0.5% 2.5k Ω : 0.04S + 0.2%	
<b>Constant Voltage Mode</b>				
Range	0~500V		0~80V	
Resolution	125mV		20mV	
Accuracy	0.05% + 0.1%F.S.		0.05% + 0.1%F.S.	
<b>Constant Power Mode</b>				
Range	0~30W	0~300W	0~60W	0~600W
Resolution	7.5mW	75mW	15mW	150mW
Accuracy	0.5% + 0.5%F.S.		0.5% + 0.5%F.S.	
<b>Dynamic Mode</b>				
Dynamic Mode	C.C. Mode		C.C. Mode	
T1 & T2	0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms	
Accuracy	1μs/1ms+100ppm		1μs/1ms+100ppm	
Slew Rate	0.16~40mA/μs	1.6~400mA/μs	0.002~0.5A/μs	0.02~5A/μs
Resolution	0.16mA/μs	1.6mA/μs	0.002A/μs	0.02A/μs
Accuracy	10% ± 20μs		10% ± 20μs	
Min. Rise Time	24μs (Typical)		10μs (Typical)	
Current	0~1A	0~10A	0~12A	0~120A
Resolution	0.25mA	2.5mA	3mA	30mA
Accuracy	0.4%F.S.		0.4%F.S.	
<b>Measurement Section</b>				
<b>Voltage Read Back</b>				
Range	0~125V	0~500V	0~16V	0~80V
Resolution	2mV	8mV	0.25mV	1.25mV
Accuracy	0.025% + 0.025%F.S.		0.025% + 0.025%F.S.	
<b>Current Read Back</b>				
Range	0~1A	0~10A	0~12A	0~120A
Resolution	0.016mA	0.16mA	0.1875mA	1.875mA
Accuracy	0.05% + 0.05%F.S.		0.05% + 0.05%F.S.	
<b>Power Read Back*2</b>				
Range	0~30W	0~300W	0~60W	0~600W
Accuracy	0.1% + 0.1%F.S.		0.1% + 0.1%F.S.	
<b>Protective Section</b>				
Over Power Protection	Yes		Yes	
Over Current Protection	Yes		Yes	
Over Temperature Protection	Yes		Yes	
Over Voltage Alarm*3	Yes		Yes	
<b>General</b>				
<b>Short Circuit</b>				
Current (CC)	-	≒ 10A	-	≒ 120A
Voltage (CV)	-	0V	-	0V
Resistance (CR)	-	≒ 1.25 Ω	-	≒ 0.0125 Ω
Power (CP)	-	≒ 300W	-	≒ 600W
<b>Input Resistance (Load Off)</b>	100k Ω (Typical)		100k Ω (Typical)	
<b>Temperature Coefficient</b>	100PPM/°C (Typical)		100PPM/°C (Typical)	
<b>Power</b>	Supply from 6334A Mainframe		Supply from 6334A Mainframe	
<b>Dimension (HxWxD)</b>	172x82x489.5mm / 6.8x3.2x19.3inch		172x164x489.5mm / 6.8x6.5x19.3inch	
<b>Weight</b>	4.2 kg / 9.3 lbs		7.3 kg / 16.1 lbs	
<b>Operating Range</b>	0~40°C		0~40°C	
<b>EMC &amp; Safety</b>	CE		CE	

SPECIFICATIONS-3					
Model	63307A (30W & 250W)			63308A	
Power	30W	30W	250W	60W	600W
Current	0~5A	0~4A	0~40A	0~2A	0~20A
Voltage*3	0~80V			0~500V	
Min. Operation Voltage (DC) *1 (Typical)	0.4V@2.5A 0.8V@5A	0.4V@2A 0.8V@4A	0.4V@20A 0.8V@40A	1.0V@1A 2V@2A	1.0V@10A 2V@20A
<b>Constant Current Mode</b>					
Range	0~5A	0~4A	0~40A	0~2A	0~20A
Resolution	1.25mA	1mA	10mA	0.5mA	5mA
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.
<b>Constant Resistance Mode</b>					
Range	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)	
Resolution*5	833μS (30W/16V) 16.67μS (30W/80V)	6.667μS (250W/16V) 133μS (250W/80V)		400μS (600W/125V) 10μS (600W/500V)	
Accuracy	1.2kΩ: 0.1S + 0.2% 60kΩ: 0.01S + 0.1%	150Ω: 0.1S + 0.2% 7.5kΩ: 0.01S + 0.1%		25kΩ: 50mS + 0.2% 100kΩ: 5mS + 0.1%	
<b>Constant Voltage Mode</b>					
Range	0~80V			0~500V	
Resolution	20mV			125mV	
Accuracy	0.05% + 0.1%F.S.			0.05% + 0.1%F.S.	
<b>Constant Power Mode</b>					
Range	0~30W	0~30W	0~250W	0~60W	0~600W
Resolution	7.5mW	7.5mW	62.5mW	15mW	150mW
Accuracy	0.5% + 0.5%F.S.			0.5% + 0.5%F.S.	
<b>Dynamic Mode</b>					
Dynamic Mode	C.C. Mode			C.C. Mode	
T1 & T2	0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms			0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms	
Accuracy	1μs/1ms+100ppm			1μs/1ms+100ppm	
Slew Rate	0.8~200mA/μs	0.64~160mA/μs	64~1600mA/μs	0.32~80mA/μs	3.2~800mA/μs
Resolution	0.8mA/μs	0.64mA/μs	64mA/μs	0.32mA/μs	3.2mA/μs
Accuracy	10% ± 20μs			10% ± 20μs	
Min. Rise Time	10μs (Typical)			24μs (Typical)	
Current	0~5A	0~4A	0~40A	0~2A	0~20A
Resolution	1.25mA	1mA	10mA	0.5mA	5mA
Accuracy	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	0~125V
Resolution	0.25mV	1.25mV	0.25mV	1.25mV	2mV
Accuracy	0.025% + 0.025%F.S.			0.025% + 0.025%F.S.	
<b>Current Read Back</b>					
Range	0~5A	0~4A	0~40A	0~2A	0~20A
Resolution	0.078125mA	0.0625mA	0.625mA	0.03125mA	0.3125mA
Accuracy	0.05% + 0.05%F.S.			0.05% + 0.05%F.S.	
<b>Power Read Back*2</b>					
Range	0~30W	0~30W	0~250W	0~60W	0~600W
Accuracy	0.1% + 0.1%F.S.			0.1% + 0.1%F.S.	
<b>Protective Section</b>					
Over Power Protection	Yes			Yes	
Over Current Protection	Yes			Yes	
Over Temperature Protection	Yes			Yes	
Over Voltage Alarm*3	Yes			Yes	
<b>General</b>					
<b>Short Circuit</b>					
Current (CC)	-	-	≒ 40A	-	≒ 20A
Voltage (CV)	-	-	0V	-	0V
Resistance (CR)	-	-	≒ 0.0375Ω	-	≒ 0.625Ω
Power (CP)	-	-	≒ 250W	-	≒ 600W
<b>Input Resistance (Load Off)</b>	100kΩ (Typical)				
<b>Temperature Coefficient</b>	100PPM/°C (Typical)				
<b>Power</b>	Supply from 6334A Mainframe				
<b>Dimension (HxWxD)</b>	172x82x489.5mm / 6.8x3.2x19.3inch			172x164x489.5mm / 6.8x6.5x19.3inch	
<b>Weight</b>	4.5 kg / 9.9 lbs			7.3 kg / 16.1 lbs	
<b>Operating Range</b>	0~40°C				
<b>EMC &amp; Safety</b>	CE				



SPECIFICATIONS-4				
Model	63312A		63323A	
Power	120W	1200W	350W	
Current	0~24A	0~240A	0~7A	0~70A
Voltage*3	0~80V		0~120V	
Min. Operation Voltage (DC)*1 (Typical)	0.4V@12A	0.4V@120A	0.05V @ 3.5A	0.3V @ 35A
	0.8V@24A	0.8V@240A	0.1V @ 7A	0.6V @ 70A
Constant Current Mode				
Range	0~24A	0~240A	0~7A	0~70A
Resolution	6mA	60mA	0.125mA	1.25mA
Accuracy	0.1%+0.1%F.S.	0.1%+0.2%F.S.	0.1%+0.1%F.S.	0.1%+0.1%F.S.
Constant Resistance Mode				
Range	6.25mΩ~25Ω (1200W/16V) 0.3125Ω~1.25kΩ (1200W/80V)		0.015Ω~150Ω (350W/24V)*4 2Ω~2kΩ (350W/120V)	
Resolution*5	40mS (1200W/16V) 80μS (1200W/80V)		1.33mS (350W/24V)*4 10μS (350W/120V)	
Accuracy	25Ω: 0.8S+ 0.8% 1.25kΩ: 0.08S+ 0.2%		150Ω: 67mS + 0.1% 2kΩ: 5mS + 0.2%	
Constant Voltage Mode				
Range	0~80V		0~120V	
Resolution	20mV		2mV	
Accuracy	0.05% + 0.1%F.S.		0.05% + 0.1%F.S.	
Constant Power Mode				
Range	0~120W	0~1200W	0~35W	0~350W
Resolution	30mW	300mW	2.5mW	25mW
Accuracy	0.5% + 0.5%F.S.		0.5% + 0.5%F.S.	
Dynamic Mode				
Dynamic Mode	C.C. Mode		C.C. MODE	
T1 & T2	0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms~50ms/Res: 5μs 0.1ms~500ms / Res: 25μs 10ms~50s / Res: 2.5ms	
Accuracy	1μs/1ms+100ppm		1μs /1ms+100ppm	
Slew Rate	0.004~1A/μs	0.04~10A/μs	0.001~0.25A/μs	0.01~2.5A/μs
Resolution	0.004A/μs	0.04A/μs	0.001A/μs	0.01A/μs
Accuracy	10% ± 20μs		10% ± 20μs	
Min. Rise Time	10μs (Typical)		25μs (Typical) *6	
Current	0~24A	0~240A	0~7A	0~70A
Resolution	6mA	60mA	0.125mA	1.25mA
Current Accuracy	0.4%F.S.		0.1% F.S.	
Measurement Section				
Voltage Read Back				
Range	0~16V	0~80V	0~24V	0~120V
Resolution	0.25mV	1.25mV	0.4mV	2mV
Accuracy	0.025% + 0.025%F.S.		0.025%+0.015% F.S.	
Current Read Back				
Range	0~24A	0~240A	0~7A	0~70A
Resolution	0.375mA	3.75mA	0.125mA	1.25mA
Accuracy	0.075% + 0.075%F.S.		0.04%+0.04% F.S.	
Power Read Back*2				
Range	0~120W	0~1200W	0~35W	0~350W
Accuracy	0.1% + 0.1%F.S.		0.1%+0.1% F.S.	
Protective Section				
Over Power Protection	Yes		Yes	
Over Current Protection	Yes		Yes	
Over Temperature Protection	Yes		Yes	
Over Voltage Alarm*3	Yes		Yes	
General				
Short Circuit				
Current (CC)	-	≒ 240A	-	≒ 70A
Voltage (CV)	-	0V	-	0V
Resistance (CR)	-	≒ 0.00625 Ω	-	≒ 0.01 Ω
Power (CP)	-	≒ 1200W	-	≒ 350W
Input Resistance (Load Off)	100kΩ (Typical)		800kΩ (Typical)	
Temperature Coefficient	100PPM/°C (Typical)		100PPM/°C (Typical)	
Power	Supply from 6334A Mainframe		Supply from 6334A Mainframe	
Dimension (HxWxD)	172x329x495mm / 6.8x12.9x19.5inch		172x82x489.5mm / 6.8x3.2x19.3inch	
Weight	14 kg / 30.8 lbs		4.2kg / 9.3 lbs	
Operating Range	0~40°C		0~40°C	
EMC & Safety	CE		CE	

**NOTE\*1** : Low voltage operation, under 0.8 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

**NOTE\*2** : Power F.S.=Vrange F.S. x Irange F.S.

**NOTE\*3** : When the operating voltage exceeds the rated voltage for 1.02 times, a warning will occur and if it exceeds 1.1 times of the rated voltage, it would cause permanent damage to the device.

**NOTE\*4** : Please refer to user's manual for detail specifications.

**NOTE\*5** : S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.

**NOTE\*6** : The loading current should be 0.35A at least.

## ORDERING INFORMATION

**6332A**: Mainframe for 2 Load Modules  
**6334A**: Mainframe for 4 Load Modules  
**63301A**: Load Module 80V/40A/200W  
**63302A**: Load Module 80V/20A/100W x 2  
**63303A**: Load Module 80V/60A/300W  
**63305A**: Load Module 500V/10A/300W  
**63306A**: Load Module 80V/120A/600W  
**63307A**: Load Module 80V/5A & 40A/30W & 250W  
**63308A**: Load Module 500V/20A/600W  
**63312A**: Load Module 80V/240A/1200W  
**63323A**: Load Module 120V/70A/350W  
**A631000**: GPIB Interface for Model 6334A/6332A Mainframe  
**A631001**: Remote Controller  
**A631003**: USB Interface for Model 6334A/6332A Mainframe  
**A631005**: Softpanel for 6310A/6330A series  
**A631006**: Rack Mounting Kit for Model 6332A Mainframe  
**A631007**: Rack Mounting Kit for Model 6334A Mainframe  
**A632004**: Sync. Link Box for 6330A/63200 Series  
**A800042**: Test Fixture  
**LED Load Simulator for LED Driver Test**  
**63310A**: Load Module 500V/2A/100W x 2  
**63313A**: Load Module 300V/20A/300W  
**63315A**: Load Module 600V/20A/300W

SPECIFICATIONS						
Model	63310A (100Wx2)		63313A		63315A	
Power	100W		300W		300W	
Current	0~0.6A	0~2A	0~5A	0~20A	0~5A	0~20A
Voltage *1	0~500V		0~300V		0~600V	
Min. Operating Voltage	6V@2A		4V@20A		4V@20A	
<b>Constant Current Mode</b>						
Range	0~0.6A	0~2A	0~5A	0~20A	0~5A	0~20A
Resolution	12μA	40μA	100μA	400μA	100μA	400μA
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.
<b>Constant Resistance Mode</b>						
Range	CRL : 3 Ω ~1k Ω (100W/100V) CRH : 10 Ω ~10k Ω (100W/500V)		CRL @ CH : 0.2 Ω ~200 Ω (300W/60V) CRL @ CL : 0.8 Ω ~800 Ω (300W/60V) CRH @ CL : 4 Ω ~4k Ω (300W/300V)		CRL @ CH : 0.2 Ω ~200 Ω (300W/60V) CRL @ CL : 0.8 Ω ~800 Ω (300W/60V) CRH @ CL : 8 Ω ~8k Ω (300W/600V)	
Resolution*2	CRL : 62.5μS CRH : 6.25μS		CRL @ CH : 100μS CRL @ CL : 25μS CRH @ CL : 5μS		CRL @ CH : 100μS CRL @ CL : 25μS CRH @ CL : 2.5μS	
Accuracy	1k Ω : 4mS+0.2% 10k Ω : 1mS+0.1%		0.2% (setting + range)		0.2% (setting + range)	
<b>Constant Voltage Mode</b>						
Range	0~500V		0~300V		0~600V	
Resolution	20mV		6mV		12mV	
Accuracy	0.05% + 0.1%F.S.		0.05% + 0.1%F.S.		0.05% + 0.1%F.S.	
<b>LED Mode</b>						
Range	Operating Voltage: 0~100V/0~500V R <sub>d</sub> Coefficient : 0.001~1 V <sub>F</sub> : 0~100V/0~500V Current : 0~2A R <sub>d</sub> : 1 Ω ~1k Ω /10 Ω ~10k Ω		Operating Voltage : 0~60V/0~300V R <sub>d</sub> Coefficient : 0.001~1 V <sub>F</sub> : 0~60V/0~300V LEDL @ CH : 0~60V- 0~20A (R <sub>d</sub> : 0.05 Ω ~50 Ω) LEDL @ CL : 0~60V- 0~5A (R <sub>d</sub> : 0.8 Ω ~800 Ω) LEDH @ CL : 0~300V- 0~5A (R <sub>d</sub> : 4 Ω ~4k Ω)		Operating Voltage : 0~60V/0~600V R <sub>d</sub> Coefficient : 0.001~1 V <sub>F</sub> : 0~60V/0~600V LEDL @ CH : 0~60V- 0~20A (R <sub>d</sub> : 0.05 Ω ~50 Ω) LEDL @ CL : 0~60V- 0~5A (R <sub>d</sub> : 0.8 Ω ~800 Ω) LEDH @ CL : 0~600V- 0~5A (R <sub>d</sub> : 8 Ω ~8k Ω)	
Resolution *2	V <sub>o</sub> : 4mV/20mV I <sub>o</sub> : 0.1mA R <sub>d</sub> Coefficient : 0.001 R <sub>d</sub> : 62.5μS/6.25μS V <sub>F</sub> : 4mV/20mV		V <sub>o</sub> : 1.2mV/6mV I <sub>o</sub> : 100μA/400μA R <sub>d</sub> Coefficient : 0.001 R <sub>d</sub> : 400μS / 25μS / 5μS V <sub>F</sub> : 1.2mV/ 6mV		V <sub>o</sub> : 1.2mV/12mV I <sub>o</sub> : 100μA/400μA R <sub>d</sub> Coefficient : 0.001 R <sub>d</sub> : 400μS/25μS/2.5μS V <sub>F</sub> : 6mV/ 60mV	
<b>Dynamic Mode</b>						
Dynamic Mode	--		C.C. Mode		C.C. Mode	
T1 & T2	--		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms		0.025ms ~ 50ms / Res: 5μs 0.1ms ~ 500ms / Res: 25μs 10ms ~ 50s / Res: 2.5ms	
Accuracy	--		1μs/1ms+100ppm		1μs/1ms+100ppm	
Slew Rate	--		0.8~200mA/μs    3.2~800mA/μs		0.8~200mA/μs    3.2~800mA/μs	
Resolution	--		0.8mA/μs    3.2mA/μs		0.8mA/μs    3.2mA/μs	
Accuracy	--		10% ±20μs		10% ±20μs	
Min. Rise Time	--		25μs (Typical)		25μs (Typical)	
Current	--		0~5A    0~20A		0~5A    0~20A	
Resolution	--		100μA    400μA		100μA    400μA	
Accuracy	--		0.4%F.S.		0.4%F.S.	
<b>Measurement Section</b>						
Voltage Read Back						
Range	0~100V	0~500V	0~60V	0~300V	0~60V	0~600V
Resolution	2mV	10mV	1.2mV	6mV	1.2mV	12mV
Accuracy	0.025%+0.025% F.S.		0.025%+0.025% F.S.		0.025%+0.025% F.S.	
Current Read Back						
Range	0~0.6A	0~2A	0~5A	0~20A	0~5A	0~20A
Resolution	12μA	40μA	100μA	400μA	100μA	400μA
Accuracy	0.05%+0.05% F.S.		0.05%+0.05% F.S.		0.05%+0.05% F.S.	

**NOTE\*1** : If the operating voltage exceeds 1.1 times of the rated voltage, it would cause permanent damage to the device.

**NOTE\*2** : S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.

Mainframe Model	6332A	6334A
Number of slots	2	4
Operating Temperature	0~40°C	
Input Rating	1Ø 100/200Vac ± 10% V <sub>LN</sub> , 47~63Hz ; 1Ø 115/230Vac ± 10% V <sub>LN</sub> , 47~63Hz	
Dimension (HxWxD)	194x275x550mm / 7.6x10.8x21.7inch	
Weight	15 kg / 33.1 lbs	



Chroma's 63600 Series DC Electronic Loads are designed for testing multi-output AC/DC power supplies, DC/DC converters, chargers, batteries, adapters, and power electronic components. They are excellent for research, development, production, and incoming inspection applications.

### KEY FEATURES

- Max. Power : 100W x 2(Dual), 300W & 400W
- Voltage Range : up to 600V
- 5 module mainframe Max. 2000W, load modules up to 400W/ea
- Up to 10 channels in one mainframe, fit for testing multiple output SMPS
- 0.4V @ 80A (Typical) low voltage operating characteristics
- Flexible CC, CR, CV and CP operation modes
- CZ mode for turn on capacitive load simulation
- Parallel mode for high current and power application up to 2kW
- User defined waveform
- Multi Channel synchronous control
- Auto frequency sweep up to 50kHz
- Real time power supply load transient response simulation and Vpk+/- measurement
- User programmable 100 sequential front panel input status for user-friendly operating
- Precision voltage and current measurement
- Precision high speed digitizing measurement/ data capture
- Voltage, Current and Pmax measurement for OCP/OLP testing
- Timing measurement for batteries
- Short circuit simulation
- Self-test at power-on
- Full Protection : OC, OP, OT protection and OV alarm
- Ethernet, USB and GPIB interfaces

The 63600's state of the art design uses DSP technology to simulate non-linear loads using an unique CZ operation mode allowing realistic loading behavior.

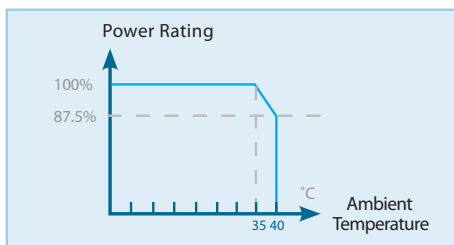
The 63600 series can draw its rated current under very low voltage (0.4V typical). This unique feature guarantees the best loading performance for modern Point-of-Load conditions and fuel cells.

The 63600 series can simulate a wide range of dynamic loading applications, with programmable load levels, slew rates, duration, and conducting voltage. The 63600 also has a dynamic sweep function to meet the test requirements of ATX power supplies. The instrument allows up to 100 sets of system operating status which can be stored in the EEPROM and recalled instantly for automated testing application.

Real time measurement of voltage and current are integrated into each 63600 load module using a 16-bit measurement circuit with three current ranges. The user can perform online voltage measurements and adjustments or simulate short circuit test using the simple keypad on the front panel.

With the VFD display and rotary knob, the 63600 loads offer versatile front panel operation. Users are able to control the 63600 family remotely via Ethernet, USB, or GPIB interface.

Also included in the 63600 are self-diagnostic routines and full protections against OP, OC, OT and alarm indicating OV, reverse polarity. This ensures the quality and reliability of the 63600 and provides protection of units under test.



### ORDERING INFORMATION

- 63600-1** : 63600 mainframe for single module
- 63600-2** : 63600 mainframe for 2 modules
- 63600-5** : 63600 mainframe for 5 modules (Max. 10 channels)
- 63601-5** : 63600 mainframe for 5 modules (Only one slot for dual channel load module, Max. 6 channels)
- 63610-80-20** : DC Load module, 80V / 20A / 100Wx2
- 63630-80-60** : DC Load module, 80V / 60A / 300W
- 63630-600-15** : DC Load module, 600V / 15A / 300W
- 63640-80-80** : DC Load module, 80V / 80A / 400W
- 63640-150-60** : DC Load Module, 150V / 60A / 400W
- A632006** : NI USB-6211 Bus-Powered Multifunction DAQ
- A636000** : GPIB interface for 63600-2 / 63600-5 / 63601-5 mainframe
- A636001** : Ethernet interface for 63600-2/63600-5 mainframe
- A636003** : External signal board (Test Pin) for 63600-2 / 63600-5 / 63601-5 mainframe
- A636005** : External signal board (BNC) for 63600-2 / 63600-5 / 63601-5 mainframe
- A636007** : Rack mounting kit for 63600-2 mainframe
- A636008** : Rack mounting kit for 63600-5/63601-5 mainframe (for Europe only)
- A636009** : Ethernet & USB interfaces for 63601-5 mainframe
- A636010** : Ethernet interface for 63601-5 mainframe



Model 63600-2



Model 63600-5

Model	63600-1 *1	63600-2	63600-5	63601-5 *2
Number of slots	1 slot	2 slots	5 slots	5 slots
Operating temperature	0~40°C	0~40°C	0~40°C	0~40°C
Input Rating	1Ø 100~115V ± 10% V <sub>LN</sub> , 1Ø 190~230V ± 10% V <sub>LN</sub> , Switchable, 47~63Hz	1Ø 100~115V ± 10% V <sub>LN</sub> , 1Ø 190~230V ± 10% V <sub>LN</sub> , Switchable, 47~63Hz	1Ø 100~115V ± 10% V <sub>LN</sub> , 1Ø 190~230V ± 10% V <sub>LN</sub> , Auto Range, 47~63Hz	1Ø 100~115V ± 10% V <sub>LN</sub> , 1Ø 190~230V ± 10% V <sub>LN</sub> , Auto Range, 47~63Hz
Mainframe dimension (HxWxD)	177x70.22x554.9mm / 7x2.76x21.8 inch	177x210x554mm / 7.0x8.27x21.8 inch	177x447x554mm / 7.0x17.6x21.8 inch (Full Rack)	177x447x554mm / 7.0x17.6x21.8 inch (Full Rack)
Weight	7.5kg / 16.53lbs	11.5kg / 23.35lbs	15.6kg / 34.39lbs	15.6kg / 34.39lbs

**Note \*1** : None digital interface option

**Note \*2** : The dual channel module 63610-80-20 can only be placed at the rightmost slot.

SPECIFICATIONS-1						
Model	63610-80-20			63630-80-60		
Configuration	100Wx2			300W		
Voltage *1 *8	0~80V			0~80V		
Current	0~0.2A	0~2A	0~20A	0~0.6A	0~6A	0~60A
Power *2	0~16W	0~30W	0~100W	0~30W	0~60W	0~300W
<b>Static Mode</b>						
Typical Min. Operating Voltage (DC)	0.5V@0.2A	0.5V@2A	0.5V@20A	0.5V@0.6A	0.5V@6A	0.5V@60A
<b>Constant Current Mode</b>						
Range	0~0.2A	0~2A	0~20A	0~0.6A	0~6A	0~60A
Resolution	0.01mA	0.1mA	1mA	0.01mA	0.1mA	1mA
Accuracy	0.1%+0.1%F.S.			0.1%+0.1%F.S.		
<b>Constant Resistance Mode</b>						
Range	CRL : 0.04~80 Ω (100W/6V) CRM: 1.44~2.9k Ω (100W/16V) CRH : 5.76~12k Ω (100W/80V)			CRL : 0.015~30 Ω (300W/6V) CRM: 0.3~600 Ω (300W/16V) CRH : 1.5~3k Ω (300W/80V)		
Resolution *9	0.3288mS			0.9864mS		
Accuracy *3	0.1%+0.075S (6V) 0.1%+0.01S (16V) 0.1%+0.00375S (80V)			0.1%+0.2S (6V) 0.1%+0.03S (16V) 0.1%+0.01S (80V)		
<b>Constant Voltage Mode</b>						
Range	0~6V	0~16V	0~80V	0~6V	0~16V	0~80V
Resolution	0.1mV	1mV	1mV	0.1mV	1mV	1mV
Accuracy	0.05%+0.1%F.S.			0.05%+0.1%F.S.		
<b>Constant Power Mode</b>						
Range	0~2W	0~10W	0~100W	0~6W	0~30W	0~300W
Resolution *9	1mW	10mW	100mW	3.2mW	32mW	320mW
Accuracy *4	0.3%+0.3%F.S.			0.3%+0.3%F.S.		
<b>Dynamic Mode - CC</b>						
Min. Operating Voltage	1.5V			1.5V		
Frequency	100Hz~50kHz/0.01Hz~1kHz			100Hz~50kHz/0.01Hz~1kHz		
Duty	1~99% (Min. Rise Time Dominated)			1~99% (Min. Rise Time Dominated)		
Accuracy	1μs/1ms+100ppm			1μs/1ms+100ppm		
Slew Rate	0.04A/ms~0.02A/μs	0.4A/ms~0.2A/μs	4A/ms~2A/μs	0.12A/ms~0.06A/μs	1.2A/ms~0.6A/μs	12A/ms~6A/μs
Resolution	0.01mA/μs	0.1mA/μs	1mA/μs	0.01mA/μs	0.1mA/μs	1mA/μs
Accuracy	10% ± 20μs			10% ± 20μs		
Min. Rise Time	10 μs			10 μs		
<b>Current</b>						
Range	0~0.2A	0~2A	0~20A	0~0.6A	0~6A	0~60A
Resolution	0.01mA	0.1mA	1mA	0.01mA	0.1mA	1mA
<b>Ext Wave Mode(20kHz) : CC</b>						
Range	0~0.2A	0~2A	0~20A	0~0.6A	0~6A	0~60A
Level	0~10V			0~10V		
Accuracy	0.5%F.S.			0.5%F.S.		
<b>Measurement</b>						
<b>Voltage Read Back</b>						
Range	0~6V	0~16V	0~80V	0~6V	0~16V	0~80V
Resolution	0.1069mV	0.2849mV	1.3537mV	0.1069mV	0.2849mV	1.3537mV
Accuracy *5	0.025%+0.01%F.S.		0.01%+0.025%F.S.	0.025%+0.01%F.S.		0.01%+0.025%F.S.
<b>Current Read Back</b>						
Range	0~0.2A	0~2A	0~20A	0~0.6A	0~6A	0~60A
Resolution	0.003349mA	0.034628mA	0.329561mA	0.009942mA	0.101748mA	1.009878mA
Accuracy *5	0.05%+0.05%F.S.			0.05%+0.05%F.S.		
<b>Power Read Back</b>						
Range	0~16W	0~30W	0~100W	0~30W	0~60W	0~300W
Accuracy *5	0.1%+0.1%F.S.			0.1%+0.1%F.S.		
<b>Voltage Monitor</b>						
Bandwidth	20 kHz			20 kHz		
Range	0~6V	0~16V	0~80V	0~6V	0~16V	0~80V
Output	0~10V			0~10V		
Accuracy	0.5%F.S.			0.5%F.S.		
<b>Current Monitor</b>						
Bandwidth	20 kHz			20 kHz		
Range	0~0.2A	0~2A	0~20A	0~0.6A	0~6A	0~60A
Output	0~10V			0~10V		
Accuracy	0.5%F.S.			0.5%F.S.		



SPECIFICATIONS-2									
Model	63630-600-15			63640-80-80			63640-150-60		
Configuration	300W			400W			400W		
Voltage *1 *8	0~600V			0~80V			0~150V		
Current	0~0.15A	0~1.5A	0~15A	0~0.8A	0~8A	0~80A	0~1A	0~6A	0~60A
Power *2	0~90W	0~300W	0~300W	0~60W	0~60W	0~400W	0~90W	0~400W	0~400W
<b>Static Mode</b>									
Typical Min. Operating Voltage (DC)	2V@0.15A	2V@1.5A	2V@15A	0.4V@0.8A	0.4V@8A	0.4V@80A	0.3V@1A	0.3V@6A	0.9V@30A 1.8V@60A
<b>Constant Current Mode</b>									
Range	0~0.15A	0~1.5A	0~15A	0~0.8A	0~8A	0~80A	0~1A	0~6A	0~60A
Resolution	0.005mA	0.05mA	0.5mA	0.01mA	0.1mA	1mA	0.02mA	0.1mA	1mA
Accuracy	0.1%+0.1%F.S.			0.1%+0.1%F.S.			0.04%+0.04%F.S.		
<b>Constant Resistance Mode</b>									
Range	CRL : 0.133~270Ω (300W/80V) CRM : 1.92~4kΩ (300W/150V) CRH : 208~200kΩ (300W/600V)			CRL : 0.01~20Ω (400W/6V) CRM : 0.36~720Ω (400W/16V) CRH : 1.45~2.9kΩ (400W/80V)			CRL : 0.03~60Ω (400W/16V) CRM : 0.64~800Ω (400W/80V) CRH : 6.25~1.5kΩ (400W/150V)		
Resolution *9	0.2435mS			1.322mS			1mS		
Accuracy *3	0.1%+0.025 (80V) 0.1%+0.0005S (150V) 0.1%+0.0003S (600V)			0.1%+0.275S (6V) 0.1%+0.036S (16V) 0.1%+0.01375S (80V)			0.1%+0.067S (16V) 0.1%+0.00625S (80V) 0.1%+0.002S (150V)		
<b>Constant Voltage Mode</b>									
Range	0~80V	0~150V	0~600V	0~6V	0~16V	0~80V	0~16V	0~80V	0~150V
Resolution	1mV	10mV	10mV	0.1mV	1mV	1mV	1mV	1mV	10mV
Accuracy	0.05%+0.1%F.S.			0.05%+0.1%F.S.			0.025%+0.025%F.S.		
<b>Constant Power Mode</b>									
Range	0~6W	0~30W	0~300W	0~8W	0~40W	0~400W	0~8W	0~40W	0~400W
Resolution *9	5.625mW	56.25mW	562.5mW	4mW	40mW	400mW	4mW	40mW	400mW
Accuracy *4	0.3%+0.3%F.S.			0.3%+0.3%F.S.			0.3%+0.3%F.S.		
<b>Dynamic Mode - CC</b>									
Min. Operating Voltage	3V			1.5V			1.8V		
Frequency	100Hz~50kHz/0.01Hz~1kHz			100Hz~50kHz/0.01Hz~1kHz			100Hz~50kHz/0.01Hz~1kHz		
Duty	1~99% (Min. Rise Time Dominated)			1~99% (Min. Rise Time Dominated)			1~99% (Min. Rise Time Dominated)		
Accuracy	1μs/1ms+100ppm			1μs/1ms+100ppm			1μs/1ms+100ppm		
Slew rate	0.03A/ms ~0.015A/μs	0.3A/ms ~0.15A/μs	3A/ms ~1.5A/μs	0.16A/ms ~0.08A/μs	1.6A/ms ~0.8A/μs	16A/ms ~8A/μs	0.2A/ms ~0.1A/μs	1.2A/ms ~0.6A/μs	12A/ms ~6A/μs
Resolution	0.005mA/μs	0.05mA/μs	0.5mA/μs	0.01mA/μs	0.1mA/μs	1mA/μs	0.02mA/μs	0.1mA/μs	1mA/μs
Accuracy	10% ± 20μs			10% ± 20μs			10% ± 20μs		
Min. Rise Time	10 μs			10 μs			10 μs		
<b>Current</b>									
Range	0~0.15A	0~1.5A	0~15A	0~0.8A	0~8A	0~80A	0~1A	0~6A	0~60A
Resolution	0.005mA	0.05mA	0.5mA	0.01mA	0.1mA	1mA	0.02mA	0.1mA	1mA
<b>Ext Wave Mode(20kHz) : CC</b>									
Range	0~0.15A	0~1.5A	0~15A	0~0.8A	0~8A	0~80A	0~1A	0~6A	0~60A
Level	0~10V			0~10V			0~10V		
Accuracy	0.5%F.S.			0.5%F.S.			0.5%F.S.		
<b>Measurement</b>									
<b>Voltage Read Back</b>									
Range	0~80V	0~150V	0~600V	0~6V	0~16V	0~80V	0~16V	0~80V	0~150V
Resolution	1.4194mV	2.661mV	10.645mV	0.1069mV	0.2849mV	1.3537mV	0.27mV	1.3mV	2.5mV
Accuracy *5	0.025%+0.01%F.S.		0.01%+ 0.025%F.S.	0.025%+0.01%F.S.		0.01%+ 0.025%F.S.	0.025%+0.01%F.S.		
<b>Current Read Back</b>									
Range	0~0.15A	0~1.5A	0~15A	0~0.8A	0~8A	0~80A	0~1A	0~6A	0~60A
Resolution	0.00275mA	0.0266mA	0.255mA	0.013695mA	0.138766mA	1.31406mA	0.02mA	0.1mA	1mA
Accuracy *5	0.05%+0.05%F.S.			0.05%+0.05%F.S.			0.04%+0.04%F.S.		
<b>Power Read Back</b>									
Range	0~90W	0~300W	0~300W	0~60W	0~60W	0~400W	0~8W	0~40W	0~400W
Accuracy *5	0.1%+0.1%F.S.			0.1%+0.1%F.S.			0.1%+0.1%F.S.		
<b>Voltage Monitor</b>									
Bandwidth	20 kHz			20 kHz			20 kHz		
Range	0~80V	0~150V	0~600V	0~6V	0~16V	0~80V	0~16V	0~80V	0~150V
Output	0~10V			0~10V			0~10V		
Accuracy	0.5%F.S.			0.5%F.S.			0.5%F.S.		
<b>Current Monitor</b>									
Bandwidth	20 kHz			20 kHz			20 kHz		
Range	0~0.15A	0~1.5A	0~15A	0~0.8A	0~8A	0~80A	0~1A	0~6A	0~60A
Output	0~10V			0~10V			0~10V		
Accuracy	0.5%F.S.			0.5%F.S.			0.5%F.S.		

Video & Color  
Flat Panel Display  
Lighting  
LED/  
Optical Devices  
Photovoltaic test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation

GENERAL SPECIFICATION					
Model	63610-80-20	63630-80-60	63630-600-15	63640-80-80	63640-150-60
Program mode					
Sequence No.	100/Program				
Dwell / SEQ	0.1ms ~ 30s (Resolution : 0.1ms)				
Load Setting	Refer to Static mode specifications				
Spec Check	Voltage/Current/Power				
Protection					
Over Power	Yes				
Over Current	Yes				
Over Voltage Alarm*8	Yes				
Over Temperature	Yes				
Reverse	Yes				
Interface					
USB	Standard				
Ethernet	Optional				
GPIB	Optional				
System BUS	Master/Slave				
Dout					
No. of bits	2 bits per mainframe				
Level - H	1.8V/3.3V/5V switchable				
Level - L	<0.6V@I <sub>sink</sub> =10mA				
Drive	Pull_up resistor = 4.7kΩ				
Din (TTL Compatible, Rising Edge)					
No. of bits	2 bits per mainframe				
External Trig. for Digitizing					
No. of bits	1 bit per mainframe				
External Trig. for Auto Sequences (TTL Compatible, Rising Edge)					
No. of bits	1 bit per mainframe				
Load ON - O/P					
Level	TTL Compatible, Level, Active High				
Short ON - O/P					
No. of channels	2 channels per 63600-1 mainframe 4 channels per 63600-2 mainframe 6 channels per 63601-5 mainframe 10 channels per 63600-5 mainframe				
Level	TTL Compatible, Level, Active High				
Short circuit					
Current *6	Set to 100% of rated current				
Input Resistance (Load Off)	700kΩ (Typical)	700kΩ (Typical)	2MΩ (Typical)	700kΩ (Typical)	700kΩ (Typical)
Dimensions (HxWxD)	142 x 86 x 514 mm / 5.6 x 3.4 x 20.2 inch				
Weight	5 kg / 11 lbs	4 kg / 8.8 lbs	5 kg / 11 lbs	4.5 kg / 9.9 lbs	4.5 kg / 9.9 lbs
Operating Temperature	0~40°C				
Storage Temperature	-20~80°C				
Power	Supply from mainframe				
EMC & Safety	CE				

**NOTE\*1** : The maximum current loading below the minimum operating voltage (0.5V) will follow a derating curve.

**NOTE\*2** : The 400W power rating of the 63640-80-80 specified at an ambient temperature of 35°C, please refer to the power rating curve on the right.

**NOTE\*3** : Does not apply to setting current < 0.25% full scale current in high range. Does not apply to setting current < 0.05% full scale current in low and middle range.

**NOTE\*4** : The full scale is V<sub>max</sub> x I<sub>max</sub>.

**NOTE\*5** : The DC level measurements are made over a period of 20ms, and does not measure any transient signals in the DC measurements.

**NOTE\*6** : Its limits are the maximum power and maximum current of the current range.

**NOTE\*7** : The 63600 is guaranteed to meet specified performance at temperature range of 25 ± 5°C.

**NOTE\*8** : If the operating voltage exceeds the rated voltage for 1.1 times, it would cause permanent damage to the device.

**NOTE\*9** : Please refer to user's manual for detail specifications, and S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.

## Softpanel



Main Operation Menu



Battery Discharge Test



User Defined Waveform



The 63800's state of the art design uses DSP technology to simulate non-linear rectified loads with its unique RLC operation mode. This mode improves stability by detecting the impedance of the UUT and dynamically adjusting the load's control bandwidth to ensure system stability.

### KEY FEATURES

- Power Rating : 1800W, 3600W, 4500W
- Voltage Range : 50Vrms ~ 350Vrms
- Current Range : Up to 18Arms, 36Arms, 45Arms
- Peak Current : Up to 54A, 108A, 135A
- Parallel / 3-Phase Function (AC mode only)
- Frequency Range : 45 ~ 440Hz, DC
- Crest Factor Range : 1.414 ~ 5.0
- Power Factor Range : 0 ~ 1 lead or lag (Rectified mode)
- CC, CR, CV, CP for DC Loading
- Constant & Rectified Load Modes for AC Loading
- Analog Voltage & Current Monitor
- Timing Measurement for Battery, UPS, Fuse and Breaker tests
- Measurement : V, I, PF, CF, P, Q, S, F, R, Ip+/- and THDv
- Short circuit simulation
- Full Protection : OC, OP, OT protection and OV alarm
- GPIB & RS-232 interfaces

Chroma's 63800 Series AC&DC Electronic Loads are designed for testing uninterruptible power supplies(UPS), Off-Grid Inverters, AC sources and other power devices such as switches, circuit breakers, fuses and connectors.

The Chroma 63800 Loads can simulate load conditions under high crest factor and varying power factors with real time compensation even when the voltage waveform is distorted. This special feature provides real world simulation capability and prevents over-stressing thereby giving reliable and unbiased test results.

Comprehensive measurements allow users to monitor the output performance of the UUT. Additionally, voltage & current signals can be routed to an oscilloscope through analog outputs. The instrument's GPIB/RS-232 interface options provide remote control & monitor for system integration. Built-in digital outputs may also be used to control external relays for short circuit (crowbar) testing.

Chroma's 63800 Loads feature fan speed control ensuring low acoustic noise. The diagnosis/protection functions include self-diagnosis routines and protection against over-power, over-current, over-temperature and alarm indicating over-voltage.

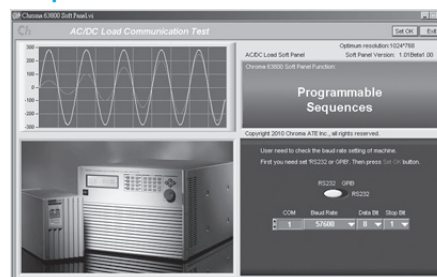
### Parallel / 3-Phase Control

The 63800 series provides parallel and 3-phase functions for high power and three phase applications. All the models within the 63800 series can be used together for both parallel and 3-phase functions as well as paralleled AC Load units in a 3-phase configuration, providing excellent flexibility and cost savings for the 63800 series AC load. Parallel and 3-phase controls are made easy by linking the AC Load units together and control of all AC load units is performed through the Master Unit.

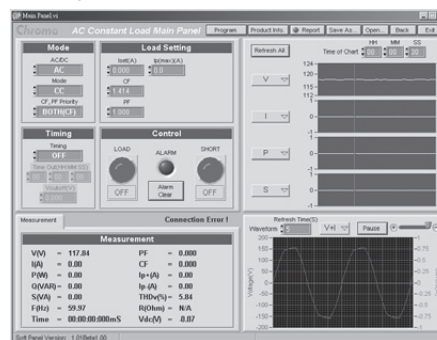


63802

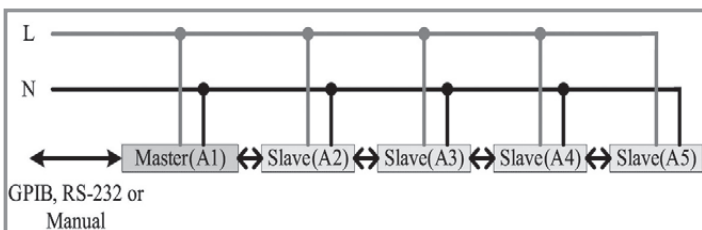
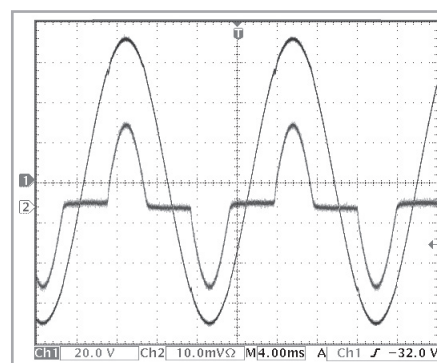
### Softpanel



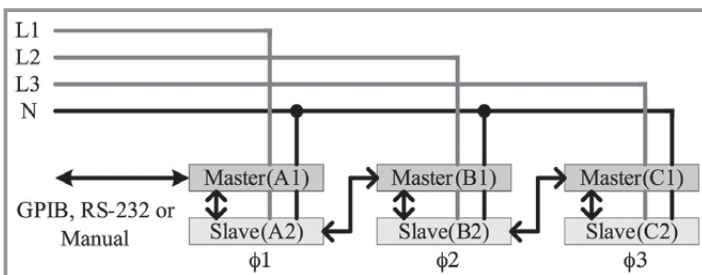
### Main Operation Menu



### AC Load



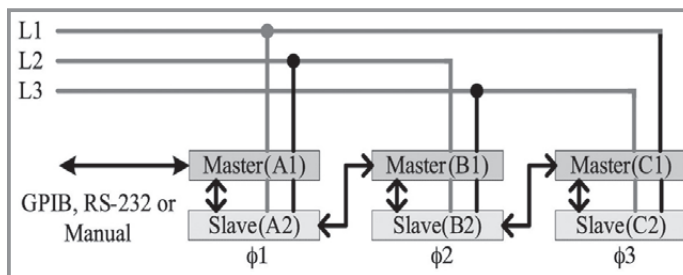
Parallel connection



Parallel/3-Phase Y connection

### ORDERING INFORMATION

- 63802** : Programmable AC & DC Electronic Load 350V/18A/1800W
- 63803** : Programmable AC & DC Electronic Load 350V/36A/3600W
- 63804** : Programmable AC & DC Electronic Load 350V/45A/4500W
- A638001** : Rack Mounting Kit for Model 63802
- A638002** : Rack Mounting Kit for Model 63803/63804



Parallel/3-Phase Delta connection

SPECIFICATIONS			
Model	63802	63803	63804
<b>Power</b>	<b>1800W</b>	<b>3600W</b>	<b>4500W</b>
<b>Current</b>	0 ~ 18Arms (54 Apeak, continue)	0 ~ 36Arms (108 Apeak, continue)	0 ~ 45Arms (135 Apeak, continue)
<b>Voltage*1</b>	50 ~ 350Vrms (500 Vpeak)	50 ~ 350Vrms (500 Vpeak)	50 ~ 350Vrms (500 Vpeak)
<b>Frequency</b>	45 ~ 440Hz, DC	45 ~ 440Hz, DC	45 ~ 440Hz, DC
<b>AC Section</b>			
<b>Constant Current Mode</b>			
<b>Range</b>	0 ~ 18Arms, Programmable	0 ~ 36Arms, Programmable	0 ~ 45Arms, Programmable
<b>Accuracy</b>	0.1% + 0.2%F.S.	0.1% + 0.2%F.S.	0.1% + 0.2%F.S.
<b>Resloution</b>	2mA	5mA	5mA
<b>Constant Resistance Mode</b>			
<b>Range</b>	2.77 Ω ~ 2.5k Ω, Programmable	1.39 Ω ~ 2.5k Ω, Programmable	1.11 Ω ~ 2.5k Ω, Programmable
<b>Accuracy</b>	0.5% + 0.5%F.S.	0.5% + 0.5%F.S.	0.5% + 0.5%F.S.
<b>Resloution*2</b>	20μS	50μS	50μS
<b>Constant Power Mode</b>			
<b>Range</b>	1800W, Programmable	3600W, Programmable	4500W, Programmable
<b>Accuracy</b>	0.5% + 0.5%F.S.	0.2% + 0.3%F.S.	0.2% + 0.3%F.S.
<b>Resloution</b>	0.375W	1.125W	1.125W
<b>Crest Factor (under CC, CP modes)</b>			
<b>Range</b>	1.414 ~ 5.0, Programmable	1.414 ~ 5.0, Programmable	1.414 ~ 5.0, Programmable
<b>Accuracy</b>	(0.5% / Irms) + 1% F.S.	(0.5% / Irms) + 1%F.S.	(0.5% / Irms) + 1%F.S.
<b>Resloution</b>	0.005	0.005	0.005
<b>Power Factor</b>			
<b>Range</b>	0 ~ 1 lead or lag, Programmable	0 ~ 1 lead or lag, Programmable	0 ~ 1 lead or lag, Programmable
<b>Accuracy</b>	1%F.S.	1%F.S.	1%F.S.
<b>Resloution</b>	0.001	0.001	0.001
<b>Rectified Load Mode</b>			
<b>Operating Frequency</b>	45Hz ~ 70Hz		
<b>RLC Mode</b>	Parameter : Ip(max), R <sub>s</sub> , L <sub>s</sub> , C, R <sub>L</sub>		
<b>Constant Power Mode</b>	Parameter : Ip(max), Power setting=200W ~ 1800W, PF=0.4 ~ 0.75	Parameter : Ip(max), Power setting=200W ~ 3600W, PF=0.4 ~ 0.75	Parameter : Ip(max), Power setting=200W ~ 4500W, PF=0.4 ~ 0.75
<b>Inrush Current Mode</b>	Parameter : Ip(max), R <sub>s</sub> , L <sub>s</sub> , C, R <sub>L</sub> , Phase		
	80A (peak current)	160A (peak current)	200A (peak current)
<b>R<sub>s</sub> Range</b>	0 ~ 9.999 Ω	0 ~ 9.999 Ω	0 ~ 9.999 Ω
<b>L<sub>s</sub> Range</b>	0 ~ 9999μH	0 ~ 9999μH	0 ~ 9999μH
<b>C Range</b>	100 ~ 9999μF	100 ~ 9999μF	100 ~ 9999μF
<b>R<sub>L</sub> Range</b>	2.77 ~ 9999.99 Ω	1.39 ~ 9999.99 Ω	1.11 ~ 9999.99 Ω
<b>DC Section</b>			
<b>Voltage Range</b>	7.5V ~ 500V	7.5V ~ 500V	7.5V ~ 500V
<b>Current Range</b>	0A ~ 18A	0A ~ 36A	0A ~ 45A
<b>Min. operating voltage</b>	7.5V	7.5V	7.5V
<b>Rise time</b>	75μs	75μs	75μs
<b>Operating Mode</b>	CC, CV, CR, CP, DC Rectified		
<b>Short Circuit Simulation</b>	Use the CR mode loading under max. power rating		
<b>Measurement Section</b>			
<b>DVM Range</b>	350V <sub>rms</sub> (500V <sub>peak</sub> )	350V <sub>rms</sub> (500V <sub>peak</sub> )	350V <sub>rms</sub> (500V <sub>peak</sub> )
<b>DVM Accuracy</b>	0.1% + 0.1%F.S.	0.1% + 0.1%F.S.	0.1% + 0.1%F.S.
<b>DVM Resloution</b>	10mV	10mV	10mV
<b>DAM Range</b>	18A <sub>rms</sub> (80A <sub>peak</sub> )	36A <sub>rms</sub> (160A <sub>peak</sub> )	45A <sub>rms</sub> (200A <sub>peak</sub> )
<b>DAM Accuracy(&lt;70Hz)</b>	0.1% + 0.2%F.S.	0.1% + 0.2%F.S.	0.1% + 0.2%F.S.
<b>DAM Accuracy(&gt;70Hz)</b>	0.1% (1+CF <sup>2</sup> x kHz)+0.2% F.S.	0.1% (1+CF <sup>2</sup> x kHz)+0.2% F.S.	0.1% (1+CF <sup>2</sup> x kHz)+0.2% F.S.
<b>DAM Resloution</b>	1.0mA	1.0mA	1.0mA
<b>Other Parameter</b>	P(W), S(VA), Q(VAR), CF, PF, Freq, R, Ip-, Ip+, THDv		
<b>Others</b>			
<b>Vmonitor</b>	± 500V / ± 10V (Isolated)	± 500V / ± 10V (Isolated)	± 500V / ± 10V (Isolated)
<b>Imonitor</b>	± 80A / ± 10V (Isolated)	± 200A / ± 10V (Isolated)	± 200A / ± 10V (Isolated)
<b>Protection</b>	OCP : 19.2Arms ; OV alarm: 360Vrms (DC : 510VDC) OPP : 1920W ; OTP	OCP : 38.4Arms ; OV alarm: 360Vrms (DC : 510VDC) OPP : 3840W ; OTP	OCP : 48Arms ; OV alarm: 360Vrms (DC : 510VDC) OPP : 4800W ; OTP
<b>Remote Interface</b>	GPIB, RS-232		
<b>Input Rating</b>	1Ø 100~115Vac ± 10% V <sub>LN</sub> , 47~63Hz ; 1Ø 200~230Vac ± 10% V <sub>LN</sub> , 47~63Hz		
<b>Dimension (H x W x D)</b>	177 x 440 x 595 mm / 7.0 x 17.32 x 23.42 inch	310 x 440 x 595 mm / 12.2 x 17.32 x 23.42 inch	310 x 440 x 595 mm / 12.2 x 17.32 x 23.42 inch
<b>Weight</b>	37kg / 81.57 lbs	66 kg / 145.5 lbs	66 kg / 145.5 lbs

**NOTE\*1** : If the operating voltage exceeds the rated voltage for 1.1 times, it would cause permanent damage to the device.

**NOTE\*2** : S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.





## 500VA~90kVA

### KEY FEATURES

- Compact size and weight attributable to advance PWM technology
- AC+DC output mode for voltage DC offset simulation
- Programmable output impedance for IEC 61000-3-3
- IEC 61000-4-11, IEC 61000-4-14, IEC 61000-4-28 voltage dips and frequency variation simulation
- Harmonics, interharmonics waveform synthesizer for IEC 61000-4-13 testing
- Power line disturbance simulation capability
- Programmable voltage and current limit settings
- Comprehensive measurement capability, including current harmonics
- High output current crest factor, ideal for inrush current testing
- Turn on, turn off phase angle control
- TTL signal which indicates output transient
- Optional analog programmable interface
- 2 units combined in series for high Voltage source (Model 61501~61505)
- 3 units combined to 3-phase power output (Model 61501~61505)
- Optional GPIB and RS-232 interface (Model 61501~61505)
- Easy use graphic user interface: softpanel (Option)
- Softpanel for IEC regulation test
- Capable of delivering power output up to 90KVA by implementing Master-slave parallel operation



The 61500 series AC power source defines new standard for high performance AC power source. It equips with all the powerful features. Such as power line disturbance simulation, programmable output impedance, comprehensive measurement function, wave-shape synthesis and regulation test software. Chroma also provides software for aerospace testing, including MIL-STD-704F, RTCA DO-160D, ABD100. These features make Chroma 61500 ideal for commercial, power electronics, avionics, marine, military and regulation test applications from bench-top testing to mass productions.

The 61500 series line up range from 500VA up to 90kVA, with one or three phase output. This allows user to have maximum choices from R/D design verification, quality assurance, to production testing.

Using the state-of-the-art PWM technology, the Chroma 61500 AC source is capable of delivering up to 6 times of peak current (Model 61501~61505) versus to its maximum rated current which makes it ideal for inrush current testing.

By using advanced DSP technology, 61500 AC power source offers precision and high speed power and harmonics measurements such as RMS voltage, RMS current, true power, power factor, current crest factor and up to 40 orders of current harmonics components.

The 61500 AC power source allows users to compose different harmonic components to synthesize your own harmonic distorted wave-shapes. The AC+DC and DC mode also extend the applications to simulate the natural waveform, Chroma 61500 also provides an external analog input, to amplify the analog signal from arbitrary signal generator. Thus, it is capable to simulate the unique waveform observed in the field.

With the versatile programmable output impedance and regulation test software, the 61500 AC power source allows users to perform Pre-compliance test against IEC 61000-4-11 and compliance test against IEC 61000-4-13/-4-14/-4-28 immunity test regulations and IEC 61000-3-2/-3-3 emission test regulations by incorporating a flicker meter.



Model 61501~61504



Model 61505



Model 61509



Model 61511, 61512



A615103 Parallelable Power stage Unit 18KVA

### ORDERING INFORMATION

**61501** : Programmable AC Source 0~300V, 15~1kHz / 500VA, 1Ø

**61502** : Programmable AC Source 0~300V, 15~1kHz / 1kVA, 1Ø

**61503** : Programmable AC Source 0~300V, 15~1kHz / 1.5kVA, 1Ø

**61504** : Programmable AC Source 0~300V, 15~1kHz / 2kVA, 1Ø

**61505** : Programmable AC Source 0~300V, 15~2kHz / 6kVA, 1Ø

\* **61509** : Programmable AC Source 0~350V, 15~1kHz / 4kVA, 1 or 3Ø

**61511** : Programmable AC Source 0~300V, 15~1.5kHz / 12kVA, 1 or 3Ø

**61512** : Programmable AC Source 0~300V, 15~1.5kHz / 18kVA, 1 or 3Ø

**A615001** : Remote Interface for 61501~61505 and 61601~61605 (External V Input, RS-232 Interface, GPIB Interface)

**A615002** : Remote interface board (LAN and USB) for Model 61500/61600/61700 Series

**A615003** : AC voltage transform unit for Model 61500/61600 Series

**A615007** : Softpanel for Model 61500/61600 Series

**A615008** : DC Noise Filter (Max. 16A)

\* **A615010** : Aerospace softpanel for RTCA DO-160G standard

**A615011** : Aerospace softpanel for MIL-STD-704F standard

**A615103** : Parallelable power stage unit 18kVA, 1 or 3Ø, for 61511/61512/61611/61612

**A615104** : Input/Output terminals for parallel connecting 2 units of 61511/61512/61611/61612/ A615103

**A615105** : Input/Output terminals for parallel connecting 3 units of 61511/61512/61611/61612/ A615103

**A615106** : Reverse Current Protection unit for 61511/61512/61611/61612

\* Call for availability

Option for 277V/480V (5Wires) AC input voltage are available with 61511/61512/ 61611/61612/ A615103 models, please contact Chroma sales representative for detailed information.

Support higher than 300V output voltage capability, please contact Chroma sales representative for detailed information.

- Video & Color
- Flat Panel Display
- LED/ Lighting
- Optical Devices
- Photovoltaic test & Automation
- Automated Optical Inspection
- Power Electronics
- Battery Test & Automation
- Passive Component
- Electrical Safety
- Semiconductor/ IC
- PXI Test & Measurement
- General Purpose
- Intelligent Manufacturing System
- Turnkey Test & Automation

SPECIFICATIONS-1			
Model	61501	61502	61503
Output Phase	1	1	1
<b>Output Rating -AC</b>			
Power	500VA	1000VA	1500VA
<b>Voltage</b>			
Range/Phase	150V/300V/Auto	150V/300V/Auto	150V/300V/Auto
Accuracy	0.2%+0.2%F.S.	0.2%+0.2%F.S.	0.2%+0.2%F.S.
Resolution	0.1V	0.1V	0.1V
Distortion*1	0.3% @ 50/60Hz 1% @ 15-1kHz	0.3% @ 50/60Hz 1% @ 15-1kHz	0.3% @ 50/60Hz 1% @ 15-1kHz
Line Regulation	0.1%	0.1%	0.1%
Load Regulation*2	0.2%	0.2%	0.2%
<b>Max. Current</b>			
RMS	4A/2A (150V/300V)	8A/4A (150V/300V)	12A/6A (150V/300V)
Peak	24A/12A (150V/300V)	48A/24A (150V/300V)	72A/36A (150V/300V)
<b>Frequency</b>			
Range	DC, 15 ~ 1kHz	DC, 15 ~ 1kHz	DC, 15 ~ 1kHz
Accuracy	0.15%	0.15%	0.15%
Resolution	0.01 Hz	0.01 Hz	0.01 Hz
<b>Output Rating-DC</b>			
Power	250W	500W	750W
Voltage	212V/424V	212V/424V	212V/424V
Current	2A/1A (212V/424V)	4A/2A (212V/424V)	6A/3A (212V/424V)
<b>Programmable Output Impedance</b>			
Range	0 Ω +200μH ~ 1 Ω +1mH		
<b>Harmonics &amp; Interharmonics Simulation</b>			
Bandwidth	2400Hz	2400Hz	2400Hz
<b>Input Rating</b>			
Voltage Operating Range	1Ø 100~240V ± 10%V <sub>LN</sub>	1Ø 100~240V ± 10%V <sub>LN</sub>	1Ø 100~240V ± 10%V <sub>LN</sub>
Frequency Range	47~63Hz	47~63Hz	47~63Hz
Current (per phase)	10A Max. @ 90V	18A Max. @ 90V	22A Max. @ 90V
Power Factor*4	0.97 Min.	0.97 Min.	0.98 Min.
<b>Measurement</b>			
<b>Voltage</b>			
Range	150V/300V	150V/300V	150V/300V
Accuracy	0.2%+0.2%F.S.	0.2%+0.2%F.S.	0.2%+0.2%F.S.
Resolution	0.1V	0.1V	0.1V
<b>Current</b>			
Range (peak)	24A	48A	72A
Accuracy (RMS)	0.4%+0.3%F.S.	0.4%+0.3%F.S.	0.4%+0.3%F.S.
Accuracy (peak)	0.4%+0.6%F.S.	0.4%+0.6%F.S.	0.4%+0.6%F.S.
<b>Power</b>			
Accuracy	0.4%+0.4%F.S.	0.4%+0.4%F.S.	0.4%+0.4%F.S.
Resolution	0.1W	0.1W	0.1W
<b>Harmonics</b>			
Range	2~40 orders	2~40 orders	2~40 orders
<b>Others</b>			
Interface	GPIB, RS-232 (Optional)		
<b>Temperature</b>			
Operating	0 ~ 40°C	0 ~ 40°C	0 ~ 40°C
Storage	-40 ~ +85°C	-40 ~ +85°C	-40 ~ +85°C
<b>Safety &amp; EMC</b>			
CE ( include EMC & LVD )			
Dimension (HxWxD)	133.35 x 482.6 x 569.5 mm / 5.25 x 19 x 22.42 inch	133.35 x 482.6 x 569.5 mm / 5.25 x 19 x 22.42 inch	133.35 x 482.6 x 569.5 mm / 5.25 x 19 x 22.42 inch
Weight	20 kg / 44.05 lbs	20 kg / 44.05 lbs	20 kg / 44.05 lbs

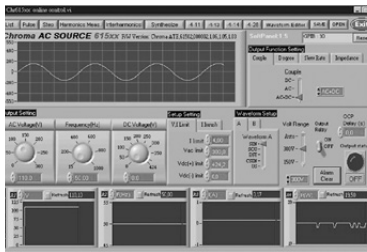
**Note\*1** : Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

**Note\*2** : Load regulation is tested with sine wave and remote sense.

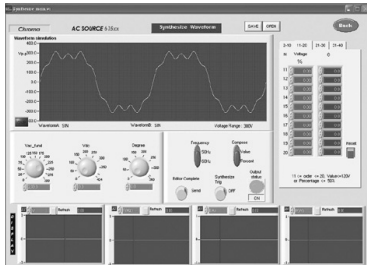
**Note\*3** : Model 61505 can also use single-phase connecting method of input AC power, the maximum input current is 28A @ 190V.

**Note\*4** : Input power factor is tested on input 220V, full load condition.

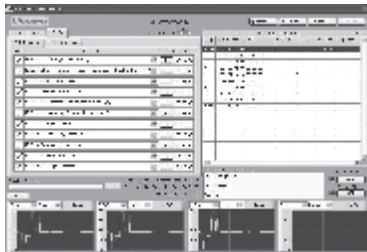
## Softpanel



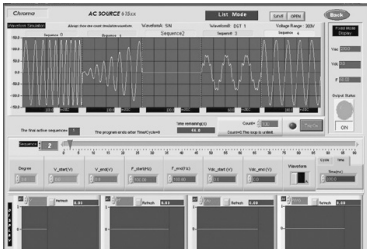
Main Operation Menu



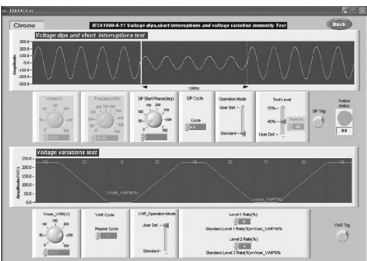
Distorted Waveform Editor



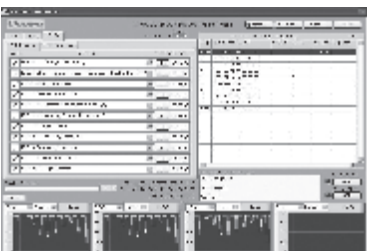
Aerospace Testing : MIL-STD-704F



Transient Voltage Programming



Voltage Dip, Short, Variation Regulation Test



Aerospace Testing : RTCA DO-160G

## SPECIFICATIONS-2

Model	61504	61505
<b>Output Phase</b>	1	1
<b>Output Rating -AC</b>		
Power	2000VA	4000VA
<b>Voltage</b>		
Range/Phase	150V/300V/Auto	150V/300V/Auto
Accuracy	0.2%+0.2%F.S.	0.2%+0.2%F.S.
Resolution	0.1V	0.1V
Distortion*1	0.3% @ 50/60Hz 1% @ 15-1kHz	0.3% @ 50/60Hz 1% @ 15-1kHz
Line Regulation	0.1%	0.1%
Load Regulation*2	0.2%	0.2%
<b>Max. Current</b>		
RMS	16A/8A (150V/300V)	32A/20A (150V/300V)
Peak	96A/48A (150V/300V)	192A/96A (150V/300V)
<b>Frequency</b>		
Range	DC, 15 ~ 1kHz	DC, 15 ~ 1kHz
Accuracy	0.15%	0.15%
Resolution	0.01 Hz	0.01 Hz
<b>Output Rating-DC</b>		
Power	1000W	2000W
Voltage	212V/424V	212V/424V
Current	8A/4A (212V/424V)	16A/8A (212V/424V)
<b>Programmable Output Impedance</b>	0 Ω +200μH ~ 1 Ω +1mH	
<b>Harmonics &amp; Interharmonics Simulation</b>		
Bandwidth	2400Hz	2400Hz
<b>Input Rating</b>		
Voltage Operating Range	1Ø 100~240V ± 10%V <sub>LN</sub>	3Ø 200~240V ± 10%V <sub>LN</sub> *3
Frequency Range	47~63Hz	47~63Hz
Current (per phase)	28A Max. @ 90V	14A Max. @ 190V
Power Factor*4	0.98 Min.	0.98 Min.
<b>Measurement</b>		
<b>Voltage</b>		
Range	150V/300V	150V/300V
Accuracy	0.2%+0.2%F.S.	0.2%+0.2%F.S.
Resolution	0.1V	0.1V
<b>Current</b>		
Range (peak)	96A	192A
Accuracy (RMS)	0.4%+0.3%F.S.	0.4%+0.3%F.S.
Accuracy (peak)	0.4%+0.6%F.S.	0.4%+0.6%F.S.
<b>Power</b>		
Accuracy	0.4%+0.4%F.S.	0.4%+0.4%F.S.
Resolution	0.1W	0.1W
<b>Harmonics</b>		
Range	2~40 orders	2~40 orders
<b>Others</b>		
<b>Interface</b>	GPIB, RS-232 (Optional)	
<b>Temperature</b>		
Operating	0 ~ 40°C	0 ~ 40°C
Storage	-40 ~ +85°C	-40 ~ +85°C
<b>Safety &amp; EMC</b>	CE ( include EMC & LVD )	
<b>Dimension (HxWxD)</b>	133.35 x 482.6 x 569.5 mm / 5.25 x 19 x 22.42 inch	266.7 x 482.6 x 569.5 mm / 10.5 x 19 x 22.42 inch
<b>Weight</b>	20 kg / 44.05 lbs	41 kg / 90.31 lbs

**Note\*1** : Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

**Note\*2** : Load regulation is tested with sine wave and remote sense.

**Note\*3** : Model 61505 can also use single-phase connecting method of input AC power, the maximum input current is 28A @ 190V.

**Note\*4** : Input power factor is tested on input 220V, full load condition.

Video & Color  
Flat Panel Display  
LED/Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Manufacturing System  
Intelligent  
Turnkey Test & Automation

SPECIFICATIONS-3					
Model	61509 *7	61511	61512	61511+A615103	61512+A615103
Output Phase	1 or 3 selectable				
<b>Output Rating-AC</b>					
Power	6kVA	12kVA	18kVA	30kVA	36kVA
Each phase	2kVA	4kVA	6 kVA	10kVA	12kVA
<b>Voltage</b>					
Range	0~175V/0~350V/Auto		0~150V/0~300V		
Accuracy	0.1%+0.2%F.S. *1		0.1%+0.2%F.S.		
Resolution	0.1 V				
Distortion *2	0.3% @50/60Hz, 1% @15Hz~1kHz, above 1 kHz, add 0.2%/kHz to 1%		0.3% @50/60Hz, 1%@15~1kHz, 1.5%>1kHz		
Line regulation	0.10%				
Load regulation *3	0.20%				
Temp. coefficient	0.02% per degree from 25°C				
<b>Max Current (1-phase mode)</b>					
RMS	60A/30A	96A / 48A	144A / 72A	240A / 120A	288A / 144A
Peak (CF=4)	240A / 120A	384A / 192A	576A / 288A	960A / 480A	1152A / 576A
<b>Max Current (each phase in 3-phase mode)</b>					
RMS	20A/10A	32A / 16A	48A / 24A	80A / 40A	96A / 48A
Peak (CF=4)	80A/40A	128A / 64A	192A / 96A	320A / 160A	384A / 192A
<b>Frequency</b>					
Range	15Hz ~ 2000Hz, 15Hz ~ 5kHz (HF option)		DC, 15-1.5kHz		
Accuracy	0.005%				
Resolution	0.01Hz (15Hz ~ 999Hz), 0.1Hz (1000Hz ~ 5000Hz)		0.01 Hz		
<b>Phase</b>					
Range	0 ~ 359.9°				
Resolution	0.1°		0.3°		
Accuracy	± 1°, 15Hz ~ 1kHz plus ± 1°/ kHz above 1 kHz		<0.8°@50/60Hz		
<b>DC Output (1-phase mode)</b>					
Power	4.5kW	6kW	9kW	15kW	18kW
Voltage	247.5V/495V	212V / 424V	212V / 424V	212V / 424V	212V / 424V
Current	45A/22.5A	48A / 24A	72A / 36A	120A / 60A	144A / 72A
<b>DC Output (3-phase mode)</b>					
Power	4.5kW	2kW	3kW	5kW	6kW
Voltage	247.5V/495V	212V / 424V	212V / 424V	212V / 424V	212V / 424V
Current	15A/7.5A	16A / 8A	24A / 12A	40A / 20A	48A / 24A
<b>Input AC Power (each phase)</b>					
AC type	3-phase, Delta or Y connecting				
Voltage Operating Range*4	3Ø 200~240V ± 10%V <sub>LN</sub> (Delta: L-L, Y: L-N)				
Frequency Range	47-63 Hz				
Max. Current	23A Max./Phase	Delta: 80A Y: 70A	Delta: 120A Y: 90A	Delta: 200A Y: 160A	Delta: 240A Y: 180A
<b>Measurement</b>					
<b>Voltage</b>					
Range	0~175V/0~350V/Auto		150V / 300V		
Accuracy	0.1%RD+0.2%F.S. *1		0.1%+0.2%F.S.		
Resolution	0.1 V				
<b>Current</b>					
Range	120A/60A	128/32/8 A peak	192/48/12 A peak	320/80/20 A peak	384/96/24 A peak
Accuracy (RMS)	0.2% + 0.2% F.S *1		0.4% + 0.3% F.S.		
Accuracy (peak)	0.2% + 0.4% F.S *1		0.4% + 0.6% F.S.		
Resolution	0.1 A				
<b>Power</b>					
Accuracy	0.2%+0.4%F.S *1		0.4%+0.4% F.S		
Resolution	0.1 W				
<b>Others</b>					
Waveform Synthesis	50 orders @ 50/60Hz				
Harmonic Measurement	Voltage / Current 50 orders @ 50/60Hz				
Programmable Impedance	0Ω+200μH~1Ω+2mH		0Ω+200μH~1Ω+1mH		
Efficiency*5	>80%(Typical)		0.75 (Typical)		
<b>Protect</b>					
UVP, OCP, OPP, OTP, FAN					
<b>Interface</b>					
GPIB, RS-232, USB host, USB, Ethernet (standard)			GPIB, RS-232, USB, Ethernet (standard)		
<b>Temperature</b>					
Operating	0°C ~40°C				
Storage	-40°C~85°C				
Humidity	30%~90%				
<b>Safety &amp; EMC</b>					
CE ( include EMC & LVD )					
Dimension (H x W x D)	221.5 x 425 x 680 mm / 8.72 x 16.73 x 26.77 inch		1163 x 546 x 700 mm / 45.78 x 21.5 x 27.56 inch*6		1163 x 546 x 700 mm / 45.78 x 21.5 x 27.56 inch x 2 units*6
Weight	60kg / 132 lbs		229.4 kg / 505.29 lbs	242.4 kg / 533.92 lbs	480 kg / 1057.27 lbs   495 kg / 1090.31 lbs

**Note\*1** : Add 0.2%/kHz to FS when above 1 kHz

**Note\*2** : Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

**Note\*3** : Load regulation is tested with sine wave and remote sense.

**Note\*4** : Models with 277V<sub>LN</sub>/480V<sub>LL</sub>(5 Wires) AC input voltage are available upon request.

**Note\*5** : Efficiency is tested on input voltage 230V.

**Note\*6** : Dimensions (HxWxD) with wheel sets : 1246 x 546 x 700mm / 49.05 x 21.5 x 27.56 inch.

**Note\*7** : Preliminary specifications





500VA~90kVA

### KEY FEATURES

- Built-in PFC, provide input power factor over 0.98 (full load)
- AC+DC output mode for voltage DC offset simulation
- Programmable voltage and current limit setting
- Comprehensive measurement capability, V, Hz, Irms, Ipk, linrush, P, VAR, VA, PF, CF of current and etc.
- High output current crest factor, ideal for inrush current testing
- Turn on, turn off phase angle control
- One-key recall for 9 different voltage and frequency
- Programmable slew rate setting for changing voltage and frequency
- Analog input for power amplifier
- Optional Analog programming interface
- Optional GPIB and RS-232 interface (Model 61601~61605)
- Full protection: OP, OC, OV and OT protection
- Easy use graphic user interface: softpanel (option)
- Capable of delivering power output up to 90KVA by implementing Master-Slave operation

The Chroma Model 61600 series Programmable AC Power Source delivers pure, instrument grade AC and DC power at very low cost. The 61600 AC power source offers output voltage



from 0 to 300VAC, and frequency from 15 to 1.5kHz. A easy-use software can let users edit an auto-run profile and record the measuring data during the test. It is suitable for commercial, avionics, marine, and military applications from bench-top testing to mass productions.

The 61600 AC power source generates very clean AC output with typical distortion less than 0.3%. With power factor correction circuit, the 61600 AC power source yields higher efficiency and deliver more output power.

Using the state-of-the-art PWM technology, the Chroma 61600 AC source is capable of delivering up to 6 times of peak current versus to its maximum rated current which makes it ideal for inrush current testing.

By using advanced DSP technology, 61600 AC power source offers precision and high speed measurements such as RMS voltage, RMS current, true power, power factor, and current crest factor.

The AC+DC and DC mode extend the applications when users need DC voltage component. The 61600 AC power source also provides an external analog input, to amplify the analog signal from arbitrary signal generator. Thus, it is capable to simulate the unique waveform which observed in the field.

With the LCD display and rotary knob, the Chroma 61600 AC power source offers versatile front panel operation. Users may also control the 61600 remotely via GPIB, RS-232 or APG (Analog Programming) interface.

The self-diagnosis routine and the full protections against OPP, OCP, OVP and OTP ensure the quality and reliability for even the most demanding engineering testing and ATE application.

### ORDERING INFORMATION

- 61601** : Programmable AC Source 0~300V, 15~1kHz / 500VA, 1Ø
  - 61602** : Programmable AC Source 0~300V, 15~1kHz / 1kVA, 1Ø
  - 61603** : Programmable AC Source 0~300V, 15~1kHz / 1.5kVA, 1Ø
  - 61604** : Programmable AC Source 0~300V, 15~1kHz / 2kVA, 1Ø
  - 61605** : Programmable AC Source 0~300V, 15~1kHz / 4kVA, 1Ø
  - \* **61609** : Programmable AC Source 0~350V, 15~1kHz / 4kVA, 1 or 3Ø
  - 61611** : Programmable AC Source 0~300V, 15~1.5kHz / 12kVA, 1 or 3Ø
  - 61612** : Programmable AC Source 0~300V, 15~1.5kHz / 18kVA, 1 or 3Ø
  - A615001** : Remote Interface for 61501~61505 and 61601~61605 (External V Input, RS-232 Interface, GPIB Interface)
  - A615002** : Remote interface board (LAN and USB) for Model 61500/61600/61700 Series
  - A615003** : AC voltage transform unit for Model 61500/61600 Series
  - A615007** : Softpanel for Model 61500/61600 Series
  - A615008** : DC Noise Filter (Max. 16A)
  - A615103** : Parallelable power stage unit 18kVA, 1 or 3Ø, for 61511/61512/61611/61612
  - A615104** : Input/Output terminals for parallel connecting 2 units of 61511/61512/61611/61612/ A615103
  - A615105** : Input/Output terminals for parallel connecting 3 units of 61511/61512/61611/61612/ A615103
  - A615106** : Reverse Current Protection unit for 61511/61512/61611/61612
- \* Call for availability

Support higher than 300V output voltage capability, please contact Chroma sales representative for detailed information.



Model 61605~61604      Model 61605      Model 61609      Model 61611, 61612      A615103 Parallelable Power stage Unit 18KVA

SPECIFICATIONS-1			
Model	61601	61602	61603
Output phase	1	1	1
<b>Output Rating - AC</b>			
Power/Phase	500VA	1000VA	1500VA
<b>Voltage</b>			
Range/Phase	150V/300V/Auto	150V/300V/Auto	150V/300V/Auto
Accuracy	0.2%+0.2%F.S.	0.2%+0.2%F.S.	0.2%+0.2%F.S.
Resolution	0.1V	0.1V	0.1V
Distortion *1	0.3% @ 50/60Hz 1% @ 15~1kHz	0.3% @ 50/60Hz 1% @ 15~1kHz	0.3% @ 50/60Hz 1% @ 15~1kHz
Line Regulation	0.1%	0.1%	0.1%
Load Regulation *2	0.2%	0.2%	0.2%
<b>Max. Current/Phase</b>			
RMS	4A/2A (150V/300V)	8A/4A (150V/300V)	12A/6A (150V/300V)
peak	24A/12A (150V/300V)	48A/24A (150V/300V)	72A/36A (150V/300V)
<b>Frequency</b>			
Range	DC, 15~1kHz	DC, 15~1kHz	DC, 15~1kHz
Accuracy	0.15%	0.15%	0.15%
Resolution	0.01 Hz	0.01 Hz	0.01 Hz
<b>Output Rating - DC</b>			
Power	250W	500W	750W
Voltage	212V/424V	212V/424V	212V/424V
Current	2A/1A (212V/424V)	4A/2A (212V/424V)	6A/3A (212V/424V)
<b>Input Rating</b>			
Voltage Operating Range	1Ø 100~240V ± 10%V <sub>LN</sub>	1Ø 100~240V ± 10%V <sub>LN</sub>	1Ø 100~240V ± 10%V <sub>LN</sub>
Frequency Range	47~63Hz	47~63Hz	47~63Hz
Current	10A Max. @ 90V	18A Max. @ 90V	22A Max. @ 90V
Power Factor *4	0.97 Min.	0.97 Min.	0.98 Min.
<b>Measurement</b>			
<b>Voltage</b>			
Range/Phase	150V/300V	150V/300V	150V/300V
Accuracy	0.2%+0.2%F.S.	0.2%+0.2%F.S.	0.2%+0.2%F.S.
Resolution	0.1V	0.1V	0.1V
<b>Current</b>			
Range (peak)	24A	48A	72A
Accuracy (RMS)	0.4%+0.3%F.S.	0.4%+0.3%F.S.	0.4%+0.3%F.S.
Accuracy (peak)	0.4%+0.6%F.S.	0.4%+0.6%F.S.	0.4%+0.6%F.S.
<b>Power</b>			
Accuracy	0.4%+0.4%F.S.	0.4%+0.4%F.S.	0.4%+0.4%F.S.
Resolution	0.1W	0.1W	0.1W
<b>Others</b>			
Interface	GPIB, RS-232 (Optional)		
<b>Temperature</b>			
Operating	0~40°C	0~40°C	0~40°C
Storage	-40 ~ +85°C	-40 ~ +85°C	-40 ~ +85°C
<b>Safety &amp; EMC</b>			
CE ( include EMC & LVD )			
Dimension (H x W x D)	133.35 x 482.6 x 569.5 mm / 5.25 x 19 x 22.42 inch	133.35 x 482.6 x 569.5 mm / 5.25 x 19 x 22.42 inch	133.35 x 482.6 x 569.5 mm / 5.25 x 19 x 22.42 inch
Weight	20 kg / 44.05 lbs	20 kg / 44.05 lbs	20 kg / 44.05 lbs

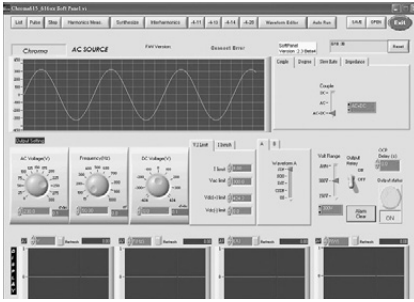
**Note\*1** : Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

**Note\*2** : Load regulation is tested with sinewave and remote sense.

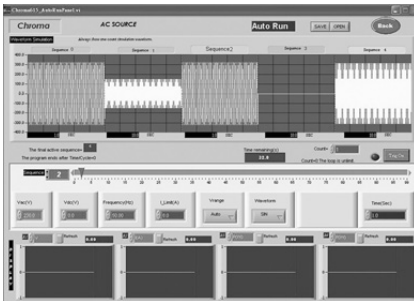
**Note\*3** : Model 61605 can also use single-phase connecting method of input AC power, the maximum input current is 28A @ 190V.

**Note\*4** : Input power factor is tested on input 220V, full load condition.

## Softpanel



Main Operation Menu



Auto Run (for ON/OFF Burn in test)

## SPECIFICATIONS-2

Model	61604	61605
<b>Output phase</b>	1	1
<b>Output Rating - AC</b>		
Power/Phase	2000VA	4000VA
<b>Voltage</b>		
Range/Phase	150V/300V/Auto	150V/300V/Auto
Accuracy	0.2%+0.2%F.S.	0.2%+0.2%F.S.
Resolution	0.1V	0.1V
Distortion *1	0.3% @ 50/60Hz 1% @ 15~1kHz	0.3% @ 50/60Hz 1% @ 15~1kHz
Line Regulation	0.1%	0.1%
Load Regulation *2	0.2%	0.2%
<b>Max. Current/Phase</b>		
RMS	16A/8A (150V/300V)	32A/20A (150V/300V)
peak	96A/48A (150V/300V)	192A/96A (150V/300V)
<b>Frequency</b>		
Range	DC, 15~1kHz	DC, 15~1kHz
Accuracy	0.15%	0.15%
Resolution	0.01 Hz	0.01 Hz
<b>Output Rating - DC</b>		
Power	1000W	2000W
Voltage	212V/424V	212V/424V
Current	8A/4A (212V/424V)	16A/8A (212V/424V)
<b>Input Rating</b>		
Voltage Operating Range	1Ø 100~240V ± 10%V <sub>LN</sub>	3Ø 200~240V ± 10%V <sub>LN</sub> *3
Frequency Range	47~63Hz	47~63Hz
Current	28A Max. @ 90V	14A Max. @ 190V
Power Factor *4	0.98 Min.	0.98 Min.
<b>Measurement</b>		
<b>Voltage</b>		
Range/Phase	150V/300V	150V/300V
Accuracy	0.2%+0.2%F.S.	0.2%+0.2%F.S.
Resolution	0.1V	0.1V
<b>Current</b>		
Range (peak)	96A	192A
Accuracy (RMS)	0.4%+0.3%F.S.	0.4%+0.3%F.S.
Accuracy (peak)	0.4%+0.6%F.S.	0.4%+0.6%F.S.
<b>Power</b>		
Accuracy	0.4%+0.4%F.S.	0.4%+0.4%F.S.
Resolution	0.1W	0.1W
<b>Others</b>		
<b>Interface</b>	GPIB, RS-232 (Optional)	
<b>Temperature</b>		
Operating	0~40°C	0~40°C
Storage	-40 ~ +85°C	-40 ~ +85°C
<b>Safety &amp; EMC</b>		
CE ( include EMC & LVD )		
<b>Dimension (H x W x D)</b>	133.35 x 482.6 x 569.5 mm / 5.25 x 19 x 22.42 inch	266.7 x 482.6 x 569.5 mm / 10.5 x 19 x 22.42 inch
<b>Weight</b>	20 kg / 44.05 lbs	41 kg / 90.31 lbs

**Note\*1** : Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

**Note\*2** : Load regulation is tested with sinewave and remote sense.

**Note\*3** : Model 61605 can also use single-phase connecting method of input AC power, the maximum input current is 28A @ 190V.

**Note\*4** : Input power factor is tested on input 220V, full load condition.

SPECIFICATIONS-3					
Model	61609*7	61611	61612	61611+A615103	61612+A615103
<b>Output Phase</b>	1 or 3 selectable				
<b>Output Rating-AC</b>					
Power	6kVA	12kVA	18kVA	30kVA	36kVA
Each phase	2kVA	4kVA	6kVA	10kVA	12kVA
<b>Voltage</b>					
Range	0~175V/0~350V/Auto		0~150V/0~300V		
Accuracy	0.1%+0.2%F.S. *1		0.1%+0.2%F.S.		
Resolution	0.1 V				
Distortion *2	0.3% @50/60Hz, 1% @15Hz~1kHz, above 1 kHz, add 0.2%/kHz to 1%		0.3% @50/60Hz, 1%@15~1kHz, 1.5%>1kHz		
Line regulation	0.1%				
Load regulation *3	0.2%				
Temp. coefficient	0.02% per degree from 25°C				
<b>Max. Current (1-phase mode)</b>					
RMS	60A/30A	96A / 48A	144A / 72A	240A / 120A	288A / 144A
Peak (CF=4)	240A / 120A	384A / 192A	576A / 288A	960A / 480A	1152A / 576A
<b>Max. Current (each phase in 3-phase mode)</b>					
RMS	20A/10A	32A / 16A	48A / 24A	80A / 40A	96A / 48A
Peak (CF=4)	80A/40A	128A / 64A	192A / 96A	320A / 160A	384A / 192A
<b>Frequency</b>					
Range	15Hz ~ 2000Hz, 15Hz ~ 5kHz (HF option)		DC, 15-1.5kHz		
Accuracy	0.005%				
Resolution	0.01Hz (15Hz ~ 999Hz), 0.1Hz (1000Hz ~ 5000Hz)		0.01 Hz		
<b>Phase</b>					
Range	0 ~ 360°				
Resolution	0.1°		0.3°		
Accuracy	± 1°, 15Hz ~1kHz plus ± 1°/ kHz above 1 kHz		<0.8°@50/60Hz		
<b>DC Output (1-phase mode)</b>					
Power	4.5kW	6kW	9kW	15kW	18kW
Voltage	247.5V/495V	212V / 424V	212V / 424V	212V / 424V	212V / 424V
Current	45A/22.5A	48A / 24A	72A / 36A	120A / 60A	144A / 72A
<b>DC Output (3-phase mode)</b>					
Power	4.5kW	2kW	3kW	5kW	6kW
Voltage	247.5V/495V	212V / 424V	212V / 424V	212V / 424V	212V / 424V
Current	15A/7.5A	16A / 8A	24A / 12A	40A / 20A	48A / 24A
<b>Input AC Power (each phase)</b>					
AC type	3-phase, Delta or Y connecting				
Voltage Operating Range *4	3Ø, 200~240V ± 10%V <sub>LN</sub> (Delta: L-L, Y: L-N)				
Frequency Range	47-63 Hz				
Max. Current	23A Max./Phase	Delta: 80A Y: 70A	Delta: 120A Y: 90A	Delta: 200A Y: 160A	Delta: 240A Y: 180A
<b>Measurement</b>					
<b>Voltage</b>					
Range	0~175V/0~350V/Auto		150V / 300V		
Accuracy	0.1%RD+0.2%F.S. *1		0.1%+0.2%F.S.		
Resolution	0.1 V				
<b>Current</b>					
Range	120A/60A	128/32/8 A peak	192/48/12 A peak	320/80/20 A peak	384/96/24 A peak
Accuracy (RMS)	0.2% + 0.2% F.S *1		0.4%+0.3%F.S.		
Accuracy (peak)	0.2% + 0.4% F.S *1		0.4%+0.6%F.S.		
Resolution	0.1 A				
<b>Power</b>					
Accuracy	0.2%+0.4%F.S *1		0.4%+0.4% F.S		
Resolution	0.1 W				
<b>Efficiency *5</b>	>80%(Typical)		0.75 (Typical)		
<b>Protect</b>	UVP, OCP, OPP, OTP, FAN				
<b>Interface</b>	GPIB, RS-232, USB host, USB, Ethernet (standard)		GPIB, RS-232, USB, Ethernet (Standard)		
<b>Temperature</b>					
Operating	0°C~40°C				
Storage	-40°C~85°C				
Humidity	30%~90%				
<b>Safety &amp; EMC</b>					
CE ( include EMC & LVD )					
<b>Dimension (H x W x D)</b>	221.5 x 425 x 680 mm / 8.72 x 16.73 x 26.77 inch	1163 x 546 x 700 mm / 45.78 x 21.5 x 27.56 inch*5		1163 x 546 x 700 mm / 45.78 x 21.5 x 27.56 inch x 2 units*6	
<b>Weight</b>	60kg / 132 lbs	229.4 kg / 505.29 lbs	242.4 kg / 533.92 lbs	480 kg / 1057.27 lbs	495 kg / 1090.31 lbs

**Note\*1** : Add 0.2%/kHz to FS when above 1 kHz

**Note\*2** : Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

**Note\*3** : Load regulation is tested with sine wave and remote sense.

**Note\*4** : Models with 277V<sub>LN</sub>/480V<sub>LL</sub>(5 Wires) AC input voltage are available upon request.

**Note\*5** : Efficiency is tested on input voltage 230V.

**Note\*6** : Dimensions (HxWxD) with wheel sets : 1246 x 546 x 700mm / 49.05 x 21.5 x 27.56 inch.

**Note\*7** : Preliminary specifications





## 1.5kVA~12kVA

### KEY FEATURES

- Output Rating: Power: 1.5kVA, 3Ø (61701); 3kVA, 3Ø (61702); 4.5kVA, 3Ø (61703); 6kVA, 3Ø (61704); 12kVA, 3Ø (61705)  
Voltage: 0-150V/0-300V
- Frequency: 15~1.2kHz
- Phase angle: 0~360° Programmable
- Built-in PFC, provides input power factor of over 0.98
- AC+DC output mode
- Comprehensive measurement capability, V, Irms, Ipk, linrush, P, PF, CF of current etc.
- Programmable r.m.s. current limit
- Turn on, turn off phase angle control
- Full protection: OP, OC, OV and OT protection
- Optional GPIB and RS-232 interface
- Advanced PWM technology delivers high power density in a compact rack-mountable package
- User-definable power-on status
- Built-in output isolation relays
- Easy use graphic user interface: softpanel (Option)
- Optional function for transient voltage output, including LIST, PULSE, STEP and INTERHARMONICS mode

The Chroma Programmable AC Power Source model 61700 series delivers pure, 5-wire, 3-phase AC power. Unlike the traditional 3-phase AC power source, it includes low power rating models at very low cost. Users can program voltage and frequency, measure the critical characteristics of the output on its LCD display. It delivers the right solution to simulate all kinds of input condition of UUT to be utilized in R&D and QA. It is also suitable for commercial applications from laboratory testing to mass productions.

The 61700 supplies the output voltage from 0 to 300VAC and it can be set individually for each phase. Users also can set the phase angle from 0° to 360°. These kinds of function make the 61700 series can simulate unbalance 3-phase power. Because of the wide output frequency from 15 to 1200Hz, it is suitable for avionics, marine and military application. The AC+DC mode extends the output function to simulate abnormal situation when power line contains DC offset.



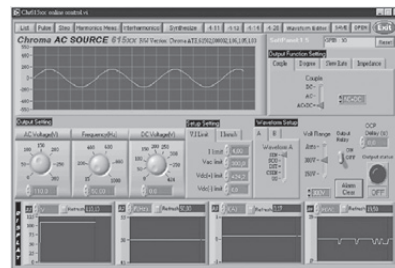
The 61700 series uses the state-of-the-art PWM technology, so it is capable to generate very clean AC output with typical distortion less than 0.3%. With power factor correction circuit, the 61700 series yields higher efficiency and deliver more output power.

By using advanced DSP technology, the 61700 series offers precision and high speed measurements such as RMS voltage, RMS current, true power, power factor, and current crest factor, etc.

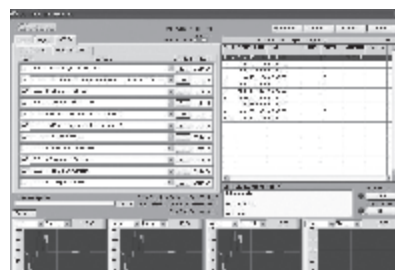
The 61700 series offers an optional function to output transient voltage. The function includes LIST, PULSE, STEP and INTERHARMONICS mode. Users can easily program variant waveform for immunity test. The 61700 series can also be controlled by a powerful and user friendly softpanel through GPIB or RS-232 interface. Besides that, the softpanel includes a waveform editor that can edit up to 40th order harmonic components. By this way, the 61700 series get the ability to output distorted waveform as users like.

The self-diagnosis routine and protections against over power, over current, over voltage, over temperature and fan fail, the 61700 series ensure the quality and reliability for even the most demanding engineering testing and production line application.

### Softpanel



Softpanel of 61700 Series : Main page



Aerospace Testing : MIL-STD-704F

### ORDERING INFORMATION

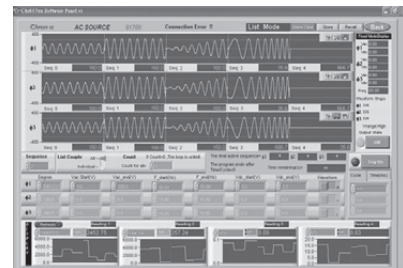
- 61701** : Programmable AC Source 0~300V/DC, 15~1.2kHz, 3Ø 1.5kVA
- 61702** : Programmable AC Source 0~300V/DC, 15~1.2kHz, 3Ø 3kVA
- 61703** : Programmable AC Source 0~300V/DC, 15~1.2kHz, 3Ø 4.5kVA
- 61704** : Programmable AC Source 0~300V/DC, 15~1.2kHz, 3Ø 6kVA
- 61705** : Programmable AC Source 0~300V, 15~1.2kHz, 3Ø 12kVA
- A615001** : Remote Interface Board for 61500/61600/61700 Series (RS-232 Interface, GPIB Interface)
- A615002** : Remote interface board (LAN and USB) for Model 61500/61600/61700 Series
- \* **A615010** : Aerospace softpanel for RTCA DO-160G standard
- \* **A615011** : Aerospace softpanel for MIL-STD-704F standard
- A617001** : Softpanel for Model 61700 Series
- A617002** : Transient voltage output function, including WAVEFORM, LIST, PULSE, STEP and INTERHARMONICS mode

\* Call for availability

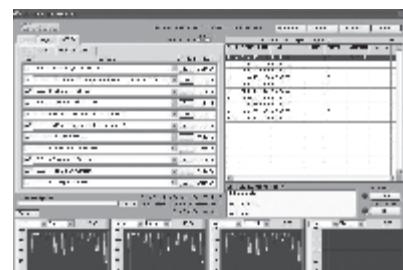
Support higher than 300V output voltage capability, please contact Chroma sales representative for detailed information.



Model 61705



Optional Function : LIST Mode Voltage Transient Output



Aerospace Testing : RTCA DO-160G

SPECIFICATIONS					
Model	61701	61702	61703	61704	61705
<b>AC Output Rating</b>					
Max. Power	1500VA	3000VA	4500VA	6000VA	12000VA
Per Phase	500VA	1000VA	1500VA	2000VA	4000VA
<b>Voltage (per phase)</b>					
Range	150V/ 300V	150V/ 300V	150V/ 300V	150V/ 300V	150V/ 300V
Accuracy	0.2%+0.2%F.S.	0.2%+0.2%F.S.	0.2%+0.2%F.S.	0.2%+0.2%F.S.	0.2%+0.2%F.S.
Resolution	0.1V	0.1V	0.1V	0.1V	0.1V
Distortion *1	0.3%@50/60Hz 1.5% @ 15~1.2kHz	0.3%@50/60Hz 1.5% @ 15~1.2kHz	0.3%@50/60Hz 1.5% @ 15~1.2kHz	0.3%@50/60Hz 1.5% @ 15~1.2kHz	0.3%@50/60Hz 1.5% @ 15~1.2kHz
Line regulation	0.1%	0.1%	0.1%	0.1%	0.1%
Load regulation *2	0.2%	0.2%	0.2%	0.2%	0.2%
Temp. coefficient	0.02% per degree from 25°C				
<b>Max. Current (per phase)</b>					
RMS	4A/2A	8A/4A	12A/6A	16A/8A	32A/20A
peak	24A/12A	48A/24A	72A/36A	96A/48A	192A/96A
<b>Frequency</b>					
Range	DC, 15~1.2kHz	DC, 15~1.2kHz	DC, 15~1.2kHz	DC, 15~1.2kHz	DC, 15~1.2kHz
Accuracy	0.15%	0.15%	0.15%	0.15%	0.15%
<b>Phase Angle</b>					
Range	0~360°	0~360°	0~360°	0~360°	0~360°
Resolution	0.3°	0.3°	0.3°	0.3°	0.3°
Accuracy	< 0.8°@50/60Hz	< 0.8°@50/60Hz	< 0.8°@50/60Hz	< 0.8°@50/60Hz	< 0.8°@50/60Hz
<b>DC Output Rating (per phase)</b>					
Power	250W	500W	750W	1kW	2kW
Voltage	212V/424V	212V/424V	212V/424V	212V/424V	212V/424V
Current	2A/1A	4A/2A	6A/3A	8A/4A	16A/8A
<b>Input 3-Phase Power (per phase)</b>					
Voltage Operating Range	3Ø 100~240V ± 10%V <sub>LN</sub>		3Ø 200~240V ± 10%V <sub>LN</sub>		
Frequency range	47~63Hz	47~63Hz	47~63Hz	47~63Hz	47~63Hz
Current	9A Max.	16A Max.	10A Max.	14A Max.	28A Max.
Power factor *3	0.97 Min.	0.98 Min.	0.98 Min.	0.98 Min.	0.98 Min.
<b>Measurement</b>					
<b>Voltage (Line-Neutral)</b>					
Range	150V/300V	150V/300V	150V/300V	150V/300V	150V/300V
Accuracy	0.2%+0.2%F.S.	0.2%+0.2%F.S.	0.2%+0.2%F.S.	0.2%+0.2%F.S.	0.2%+0.2%F.S.
Resolution	0.1V	0.1V	0.1V	0.1V	0.1V
<b>Current (per phase)</b>					
Range (peak)	24A	48A	72A	96A	192A
Accuracy (RMS)	0.4%+0.3%F.S.	0.4%+0.3%F.S.	0.4%+0.3%F.S.	0.4%+0.3%F.S.	0.4%+0.3%F.S.
Accuracy (peak)	0.4%+0.6%F.S.	0.4%+0.6%F.S.	0.4%+0.6%F.S.	0.4%+0.6%F.S.	0.4%+0.6%F.S.
Resolution	0.01A	0.01A	0.01A	0.01A	0.01A
<b>Power (per phase)</b>					
Accuracy	0.4%+0.4% F.S.	0.4%+0.4% F.S.	0.4%+0.4% F.S.	0.4%+0.4% F.S.	0.4%+0.4% F.S.
Resolution	0.1W	0.1W	0.1W	0.1W	0.1W
<b>Others</b>					
Efficiency *4	68 %	77 %	81 %	82%	82%
Protection	UVP, OCP, OPP, OTP, FAN				
<b>Temperature Range</b>					
Operating	0°C~40°C				
Storage	-40°C~85°C				
Humidity	30 %~90 %				
<b>Safety &amp; EMC</b>					
CE					
Dimension (H x W x D)	400 x 482.6 x 600.5 mm / 15.75 x 19 x 23.64 inch	400 x 482.6 x 600.5 mm / 15.75 x 19 x 23.64 inch	400 x 482.6 x 600.5 mm / 15.75 x 19 x 23.64 inch	400 x 482.6 x 600.5 mm / 15.75 x 19 x 23.64 inch	896.4 x 546 x 699.9 mm / 35.28 x 21.5 x 27.56 inch*5
Weight	75 kg / 165.2 lbs	75 kg / 165.2 lbs	75 kg / 165.2 lbs	75 kg / 165.2 lbs	150 kg / 330.4 lbs

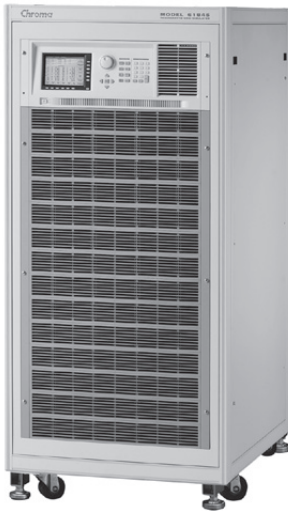
**Note\*1** : Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

**Note\*2** : Load regulation is tested with sinewave and remote sense.

**Note\*3** : Input power factor is tested on input 220V, full load condition

**Note\*4** : Efficiency is tested on input voltage 110V for 61701 and 61702, 220V for 61703, 61704 and 61705.

**Note\*5** : For dimension including the wheel set, please add 80mm to overall height.



conditions. Supported variations include frequency, phase angle, voltage amplitude, voltage drops in either single or three phase modes. Unbalanced three phase conditions can easily be simulated. And most importantly, the regenerative feature of the 61800 grid simulator provides an effective energy saving method since energy generated by unit under test is fed back to the grid instead of dissipated as heat during operation.

The 61800 grid simulator could also meet test requirements with smart grid and EV related test applications, such as Vehicle to Grid (V2G) and Energy Storage System (ESS) testing. The 61800 is also capable of meeting IEC regulatory standards' (such as IEC 61000-3-2/-3-3/-3-11/-3-12) requirement for AC supply.

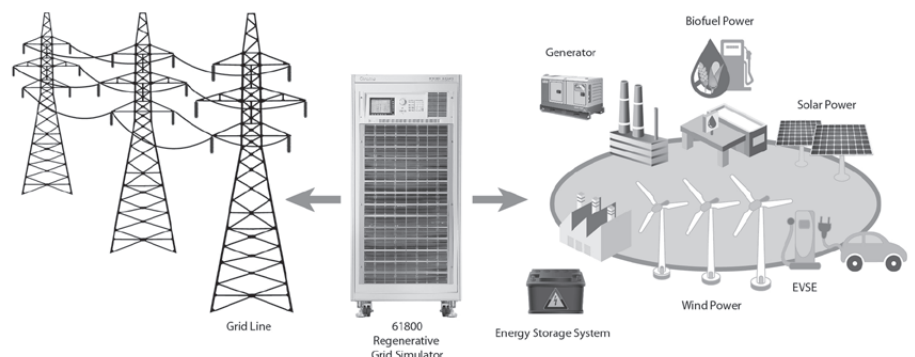
The 61800 regenerative grid simulator is not only limited to product development during R&D. Its extensive features are also valuable during design and quality verification as well as throughout various production stages. Using state-of-the-art digital control technology the 61800 can deliver up to 300VAC at output frequencies ranging from 30Hz to 100Hz. The AC+DC feature allows for applications which require a DC offset bias.

The 61800 series is also able to provide precision measurements such as RMS voltage, RMS current, true power, power factor, current crest factor and many others. By applying advanced DSP technology, the 61800 can easily simulate power line disturbance (PLD) using LIST, PULSE and STEP modes. Additional features such as the waveform synthesis function allows users to program various distorted harmonic waveforms which are required by some regulatory standards. GPIB (IEEE488.2), RS-232, USB and Ethernet interface are available to control the 61800 grid simulator remotely.

**60kVA x 5 = 300kVA**



### Implement for Micro Grid Testing



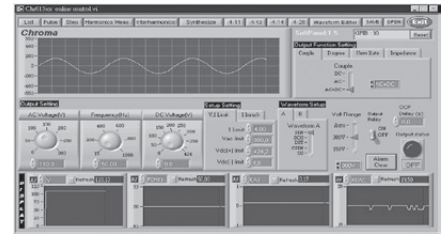
### KEY FEATURES

- Power rating  
61830 : 30kVA  
61845: 45kVA  
61860: 60kVA
- Voltage range: 0-300V
- Frequency: DC, 30Hz-100Hz
- Full regenerative capability based on 100% of output current rating
- Specifically designed for PV inverter, Smart Grid and EV related test applications
- Single phase or three-phase output selectable
- Programmable slow rate setting for changing voltage and frequency
- Programmable voltage and current limit
- Turn on, turn off phase angle control
- TTL signal which indicates Output transient
- LIST, PULSE, STEP mode functions for testing Power Line Disturbance (PLD) simulation
- Voltage dips, short interruption and voltage variation simulation
- Harmonics, inter-harmonics waveform synthesizer
- Comprehensive measurement capability, including current harmonics
- Analog programmable interfaces
- Remote interface: GPIB, RS-232, USB and Ethernet
- Provide parallel feature for meeting high power test applications (Three phase only)

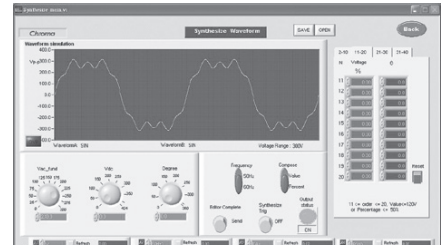
Market demand for Distributed Resource (DR) products such as PV inverters and wind energy systems is steadily growing as the world strives for clean renewable energy sources. This demand has created a need for rigorous regulation testing to standards such IEEE 1547 / IEC 61000-3-15 / IEC 62116 ensuring proper and safe operation of on-grid products. It has become critical to manufacturers to conduct these tests to prove compliance and to relieve product liability concerns. Chroma's new 61800 family of Grid Simulators has been designed to fulfill these test requirements by providing a full 4 quadrant, fully regenerative, grid simulator with advanced features for compliance, safety and product verification testing.

The 61800 regenerative grid simulator allows users to vary relevant parameters in order to simulate real world grid environments and

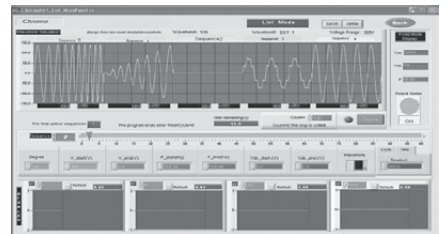
### Softpanel



Main Operation Menu



Distorted Waveform Editor



Transient Voltage Programming

### ORDERING INFORMATION

- 61830** : Regenerative Grid Simulator 30kVA
- 61845** : Regenerative Grid Simulator 45kVA
- 61860** : Regenerative Grid Simulator 60kVA
- A618001** : Softpanel for 61800 Series
- A618002** : Terminals for parallel connecting
- B618001** : 400 V<sub>LN</sub> HV option

The 61800 series is capable to deliver output voltage up to 800V<sub>LN</sub> based on customized modification, please contact Chroma sales representative for detailed information.

SPECIFICATIONS			
Model	61830	61845	61860
<b>AC Output Rating</b>			
Output Phase	1 or 3 selectable	1 or 3 selectable	1 or 3 selectable
Max. Power	30kVA	45kVA	60kVA
Per Phase	10kVA	15kVA	20kVA
<b>Voltage</b>			
Range	0~300V <sub>LN</sub> /0~520V <sub>LL</sub>	0~300V <sub>LN</sub> /0~520V <sub>LL</sub>	0~300V <sub>LN</sub> /0~520V <sub>LL</sub>
Accuracy	0.1%+0.2%F.S.	0.1%+0.2%F.S.	0.1%+0.2%F.S.
Resolution	0.1V	0.1V	0.1V
Distortion *1	< 0.5% @ 50/60Hz < 0.8% @ 30Hz~100Hz	< 0.5% @ 50/60Hz < 0.8% @ 30Hz~100Hz	< 0.5% @ 50/60Hz < 0.8% @ 30Hz~100Hz
Line regulation	0.10%	0.10%	0.10%
Load regulation	0.20%	0.20%	0.20%
<b>Max. Current (1-Phase Mode)</b>			
RMS	150A	225A	300A
Peak	450A	675A	900A
<b>Max. Current (each phase in 3-Phase Mode)</b>			
RMS	50A	75A	100A
Peak	150A	225A	300A
<b>Frequency</b>			
Range	30Hz ~ 100Hz	30Hz ~ 100Hz	30Hz ~ 100Hz
Accuracy	0.01%	0.01%	0.01%
<b>DC Output (1-Phase Mode) *2</b>			
Power	15kW	22.5kW	30kW
Voltage	424V	424V	424V
Current	75A	112.5A	150A
<b>DC Output (3-Phase Mode)</b>			
Power	5kW	7.5kW	10kW
Voltage	424V	424V	424V
Current	25A	37.5A	50A
<b>Harmonics Synthesis Function</b>			
Harmonics range	up to 50 harmonics order @ 50/60Hz fundamental frequency		
<b>Input Rating</b>			
Voltage Operating Range *3	3Ø 200~220V ± 10%V <sub>LL</sub> , 47~63Hz 3Ø 380~400V ± 10%V <sub>LL</sub> , 47~63Hz 3Ø 440~480V ± 10%V <sub>LL</sub> , 47~63Hz	3Ø 200~220V ± 10%V <sub>LL</sub> , 47~63Hz 3Ø 380~400V ± 10%V <sub>LL</sub> , 47~63Hz 3Ø 440~480V ± 10%V <sub>LL</sub> , 47~63Hz	3Ø 200~220V ± 10%V <sub>LL</sub> , 47~63Hz 3Ø 380~400V ± 10%V <sub>LL</sub> , 47~63Hz 3Ø 440~480V ± 10%V <sub>LL</sub> , 47~63Hz
Current	125A Max./Phase (3Ø 200~220V ± 10%V <sub>LL</sub> ) 65A Max./Phase (3Ø 380~400V ± 10%V <sub>LL</sub> ) 58A Max./Phase (3Ø 440~480V ± 10%V <sub>LL</sub> )	190A Max./Phase (3Ø 200~220V ± 10%V <sub>LL</sub> ) 100A Max./Phase (3Ø 380~400V ± 10%V <sub>LL</sub> ) 87A Max./Phase (3Ø 440~480V ± 10%V <sub>LL</sub> )	250A Max./Phase (3Ø 200~220V ± 10%V <sub>LL</sub> ) 130A Max./Phase (3Ø 380~400V ± 10%V <sub>LL</sub> ) 115A Max./Phase (3Ø 440~480V ± 10%V <sub>LL</sub> )
Power factor	0.99 (Typical)		
<b>Measurement</b>			
<b>Voltage</b>			
Range	0~300V	0~300V	0~300V
Accuracy	0.1%+0.2%F.S.	0.1%+0.2%F.S.	0.1%+0.2%F.S.
<b>Current</b>			
Range (peak)	150A	225A	300A
Accuracy (RMS)	0.4%+0.3%F.S.	0.4%+0.3%F.S.	0.4%+0.3%F.S.
Accuracy (peak)	0.4%+0.6%F.S.	0.4%+0.6%F.S.	0.4%+0.6%F.S.
<b>Power</b>			
Accuracy	0.4%+0.4% F.S.	0.4%+0.4% F.S.	0.4%+0.4% F.S.
<b>Others</b>			
Efficiency	80% (Typical)		
Protection	OVP, OCP, OPP, OTP, FAN		
Safety & EMC	CE (include EMC & LVD)		
Dimension (H x W x D)	1740 x 780 x 1000 mm (include wheel set)	1740 x 780 x 1000 mm (include wheel set)	1740 x 780 x 1000 mm (include wheel set)
Weight	850kg	850kg	870kg

**Note\*1** : Maximum distortion is tested on output 250V with maximum current to linear load

**Note\*2** : The DC function is mainly intended as DC offset for AC+DC output voltage function

**Note\*3** : Must be specified at time of order. All inputs are L-L, 3Ø, 3 wire+GND





## 1500~9000VA

### KEY FEATURES

- Output distortion less than 0.3%, and peak repetitive current over 2.5 times of the rms current
- High accuracy measurement of RMS voltage, RMS current, true power, frequency, power factor, and current crest factor
- Built-in power factor correction circuit provides input power factor of over 0.98 to meet IEC regulations
- Programmable current limit
- Built-in output isolation relays
- EEPROM storage of user defined voltage & frequency combination for instant recall at anytime
- Optional GPIB, RS-232, Analog Programming interface
- Over-voltage, under-voltage, over-power, over-current, over-temperature, and short circuit protection
- Temperature controlled fan speed
- Self-test at power-on
- User-definable power-on state
- Easy use graphic user interface: softpanel (Option)

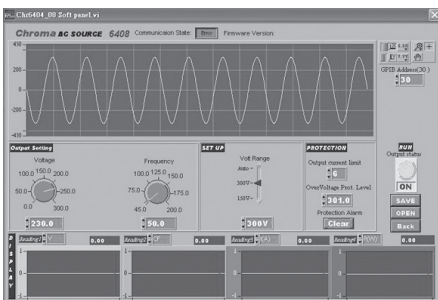
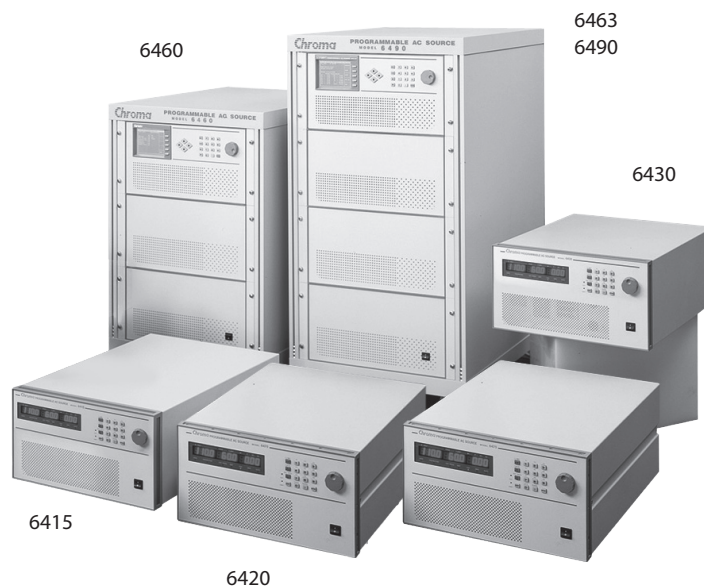
The Chroma 6400 series Programmable AC Power Source uses state of the art PWM technology to deliver pure, instrument grade AC power at very low cost never achieved before. The 6400 AC power source offers maximum rated power for any output voltage from 0 to 300VAC, at any frequency from 45 to 1kHz. It is not only suitable for commercial applications(47-63Hz), but also for avionics, marine, military applications at 400Hz.

All models generate very clean output with typical distortion less than 0.3%. Incorporating power factor correction circuit, the 6400 AC power source yields higher efficiency and delivers more output power than competitive instruments. Furthermore, it is capable of high peak repetitive current needed to drive most electronic products with high crest factor input design.

The 6400 AC power source uses advanced circuit to offer precision and high speed measurement of true RMS voltage, true RMS current, true power, frequency, power factor, and current crest factor. The 6400 AC power source is very easy to operate from the front panel keypad, or from the remote controller via GPIB, RS-232 or APG (Analog Programming) interface. The optional interface is designed as a plug-in card to change the unit in seconds into a computer controlled system power source.

Designed with self diagnostic routine and protected against over-voltage, under-voltage, over-power, over-current, over-temperature and fan fail, the instrument offers quality and reliability for even the most demanding applications in production testing, R&D design characterization, and QA verification.

### 6400 Series Programmable AC Source Family



Softpanel of 6400 Series

### ORDERING INFORMATION

- 6415** : Programmable AC Source 0~300V/45-1000Hz (1500VA)
- 6420** : Programmable AC Source 0~300V/45-1000Hz (2000VA)
- 6430** : Programmable AC Source 0~300V/45-1000Hz (3000VA)
- 6460-2** : Programmable AC Source 0~300V/45-1000Hz (6000VA), output 1Ø, input 3Ø 220V
- 6460-3** : Programmable AC Source 0~300V/45-1000Hz (6000VA), output 1Ø, input 3Ø 380V
- 6463-2** : Programmable AC Source 0~300V/45-1000Hz (6000VA), output 1Ø or 3Ø Selectable, input 3Ø 220V
- 6463-3** : Programmable AC Source 0~300V/45-1000Hz (6000VA), output 1Ø or 3Ø Selectable, input 3Ø 380V
- 6490-2** : Programmable AC Source 0-300V/45-1000Hz (9000VA), output 1Ø or 3Ø Selectable, input 3Ø 220V
- 6490-3** : Programmable AC Source 0-300V/45-1000Hz (9000VA), output 1Ø or 3Ø Selectable, input 3Ø 380V
- A650001** : Remote Interface for Model 6415/6420/6430/6500 Series (External V Input, RS-232 Interface,GPIB Interface)
- A640004** : Softpanel for Model 6400 Series
- A610004** : Universal Socket Center for Model 6415/6420/ 6430 Series



SPECIFICATIONS						
Model	6415	6420	6430	6460	6463	6490
<b>Output / Phase</b>	1	1	1	1 (parallel or series)	1 or 3 selectable	1 or 3 selectable
<b>Output Ratings</b>						
Power / Phase	1500VA	2000VA	3000VA	6000VA	2000VA	3000VA
<b>Voltage</b>						
Range / Phase	150V/300V/Auto	150V/300V/Auto	150V/300V/Auto	150V/300V(parallel), 300V/500V(series)	150V/300V	150V/300V
Accuracy	0.2% + 0.2% of F.S.	0.2% + 0.2% of F.S.	0.2% + 0.2% of F.S.	0.2% + 0.2% of F.S.	0.2% + 0.2% of F.S.	0.2% + 0.2% of F.S.
Resolution	0.1V	0.1V	0.1V	0.1V	0.1V	0.1V
Distortion	0.5% for (45-500Hz), 1% for (> 500-1KHz)	0.5% for (45-500Hz), 1% for (> 500-1KHz)	0.5% for (45-500Hz), 1% for (> 500-1KHz)	1%	1%	1%
Line Regulation	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Load Regulation	0.1%	0.1%	0.1%	0.2%(series), 0.8% (parallel)	0.2%(3 phases), 0.8% (1 phase)	0.2%(3 phases), 0.8% (1 phase)
Temp. Coefficient	0.02% per °C	0.02% per °C	0.02% per °C	0.02% per °C	0.02% per °C	0.02% per °C
<b>Max. current</b>						
RMS/Phase	15A/7.5A	20A/10A	30A/15A	60A/30A/15A (150V/300V/500V)	20A/10A (150V/300V)	30A/15A ( 150V/300V)
Peak Current/ phase-crest-factor	45A/22.5A ≤ 100Hz (45-100Hz) 37.5A/18.75A (>100-1kHz)	60A/30A (45-100Hz) 50A/25A (>100- 1kHz)	3(45-100Hz), 2.5(>100-1kHz)	180A/90A/45A (45- 100Hz), 150A/75A/38A (>100- 1kHz)	60A/30A (45-100Hz), 50A/25A (>100- 1kHz)	90A/45A (45-100Hz), 75A/38A (>100- 1kHz)
<b>Frequency</b>						
Range	45-1000Hz	45-1000Hz	45-1000Hz	45-1000Hz	45-1000Hz	45-1000Hz
Accuracy	0.1%	0.1%	0.1%	0.15%	0.15%	0.15%
Resolution	0.1Hz	0.1Hz	0.1Hz	0.01Hz (45-99.9Hz), 0.1Hz (100-999.9Hz)		
<b>Input Ratings</b>						
Voltage Operating Range	1Ø 200~240V ± 10%V <sub>LN</sub>	1Ø 200~240V ± 10%V <sub>LN</sub>	1Ø 200~240V ± 10%V <sub>LN</sub>	3Ø 200~240V ± 10%V <sub>LN</sub>		
Frequency Range	47-63Hz	47-63Hz	47-63Hz	47-63Hz	47-63Hz	47-63Hz
Current	12A max.	15A max.	23A max.	23A max./phase	15A max./phase	23A max./phase
Power Factor	0.95 min.	0.97 min.	0.98 min.	0.98 min. under full load	0.97 min. under full load	0.98 min. under full load
<b>Measurement</b>						
<b>Voltage / Phase</b>						
Range	0-150V/0-300V	0-150V/0-300V	0-150V/0-300V	0-150V/0-300V	0-150V/0-300V	0-150V/0-300V
Accuracy (RMS)	0.25% + 0.1% F.S.	0.25% + 0.1% F.S.	0.25% + 0.1% F.S.	0.25% + 0.1% F.S.	0.25% + 0.1% F.S.	0.25% + 0.1% F.S.
Resolution	0.1V	0.1V	0.1V	0.1V	0.1V	0.1V
<b>Current / Phase</b>						
Range (peak)	0-70A	0-100A	0-140A	0-280A	0-100A	0-140A
Accuracy (RMS)	0.4% + 0.2% F.S.	0.4% + 0.15% F.S.	0.4% + 0.1% F.S.	0.4% + 0.1% F.S.	0.4% + 0.15% F.S.	0.4% + 0.1% F.S.
Resolution	0.01A	0.01A	0.01A	0.01A	0.01A	0.01A
<b>Power / Phase</b>						
Range	0-1500W	0-2000W	0-3000W	0-3000W	0-2000W	0-3000W
Accuracy	1% F.S. (CF<6)	1% F.S. (CF<6)	1% F.S. (CF<6)	1% F.S. (CF<6)	1% F.S. (CF<6)	1% F.S. (CF<6)
Resolution	0.1 W for P<1000W, 1W for P>1000W		0.1 W for P<1000W, 1W for P>1000W	0.01 W	0.01 W	0.01 W
<b>Frequency</b>						
Range	45-1000Hz	45-1000Hz	45-1000Hz	45-1000Hz	45-1000Hz	45-1000Hz
Accuracy	0.02%	0.02%	0.02%	0.01%+2 count	0.01%+2 count	0.01%+2 count
Resolution	0.1Hz	0.1Hz	0.1Hz	0.01Hz	0.01Hz	0.01Hz
<b>Others</b>						
<b>Efficiency</b>	80% typical	80% typical	80% typical	80% typical	80% typical	80% typical
<b>Protection</b>	UVP, OVP, OCP, OPP, OTP, Short	UVP, OVP, OCP, OPP, OTP, Short	UVP, OVP, OCP, OPP, OTP, Short	OPP, OLP, OTP, FAN Fail		
<b>Safety &amp; EMC</b>	Compliance with EMC directive 2014/30/EU and LVD directive 2014/35/EU					
<b>Dimension (H x W x D)</b>	221.5 x 425 x 567 mm / 8.72 x 16.73 x 22.32 inch			765.94x546x700 mm / 30.16x21.5x27.56 inch*1	990 x 546 x 700 mm / 38.98 x 21.5 x 27.56 inch*1	
<b>Weight</b>	23 kg / 50.66 lbs	27 kg / 59.47 lbs	27 kg / 59.47 lbs	107 kg / 235.68 lbs	156 kg / 343.61 lbs	156 kg / 343.61 lbs

**Note\*1** : For dimension including the wheel set, please add 80mm to overall height.



## 1200VA~9000VA

### KEY FEATURES

- Direct Digital Synthesis (DDS) waveform generation
- Programmable Sine, Square, or Clipped Sine waveform output
- Programmable voltage, current limit, frequency, phase, and distortion
- Power line disturbances simulation capability
- 30 factory installed harmonic waveforms in the waveform library
- User programmable harmonic waveforms
- User programmable sequential output waveforms for auto-execution
- Powerful measurement of Vrms, Irms, Ipk+, Ipk-, power, frequency, crest factor, power factor, inrush current, VA, VAR, etc.
- Built-in power factor correction circuit provides input power factor of over 0.98 to meet the IEC regulations
- Advanced PWM technology to deliver high power output in a light and compact rackmountable package
- Built-in output isolation relays
- User-definable power-on state
- TTL output to signal any output transition for ATE application
- Analog Programming Interface for external amplitude control
- Optional GPIB, RS-232 interface
- List mode transient power line disturbances simulation for Voltage Dip & Variation to meet IEC 61000-4-11
- Easy use graphic user interface: softpanel (Option)

The global AC power testing requirements demand more sophisticated AC Power Source that is capable of simulating a wide variety of AC line conditions, harmonic waveforms, accurate power measurement and analysis. The Chroma 6500 series Programmable AC Power Source delivers the right solution to simulate all kinds of normal/abnormal input conditions and measure the critical characteristics of the product under test. It can be used for R&D design characterization, production testing, and QA verification of commercial, industrial and aerospace electronic products.

The 6500 series delivers maximum rated power for any output voltage up to 300 Vac, and at any frequency between 15Hz to 2000Hz. It is suitable for commercial applications (47-63Hz); for avionics, marine, military applications at 400Hz or higher frequency; or for electrical motor, air-conditioner test applications at 20Hz. All models generate very clean sine or square waveforms output with typical distortion less than 0.5%.



The 6500 series has built-in Direct Digital Synthesis (DDS) Waveform Generator to provide user programmable high precision waveform. For testing products under AC line distortion conditions, clipped sine wave can be generated with 0% to 43% distortion and amplitude from 0% to 100%. It also can simulate all kinds of power line disturbances such as cycle dropout, transient spike, brown out, phase angle, voltage and frequency ramp up (ramp down), etc.. Up to 30 harmonic waveforms are factory installed, and testing for compliance to AC line harmonic immunity standards can be easily achieved in the field.

The 6500 series has built-in 16-bit precision measurement circuit to offer precision and high speed measurement of Vrms, Irms, Ipk+, Ipk-, power, frequency, crest factor, power factor,

inrush current, VA, VAR, etc. It is designed as an integral part of the PMS Power Measurement System. By adding the 6630 Power Analyzer it becomes an ATE for testing IEC 61000-3-2 harmonic and IEC 61000-3-3 flicker measurement.

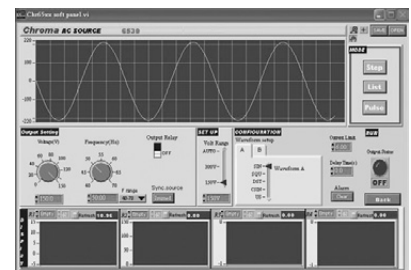
The 6500 series is very easy to operate from the front panel keypad, or from a remote controller via GPIB, RS-232 BUS or APG (Analog Programming) interface. Instrument drivers are available to integrate the AC source into any ATE application operating under Labview control.

Designed with self diagnostic routine and protected against over load, over power, over temperature, over current and fan fail, the instrument offers quality and reliability for even the most demanding production line applications.

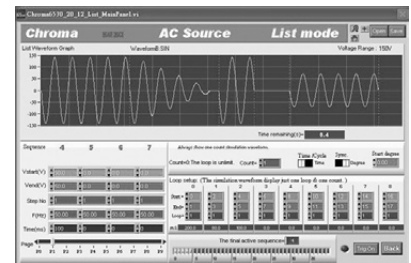
### ORDERING INFORMATION

- 6512** : Programmable AC Source  
0~300V/15~2kHz / 1.2kVA
- 6520** : Programmable AC Source  
0~300V/15~2kHz / 2kVA
- 6530** : Programmable AC Source  
0~300V/15~2kHz / 3kVA
- 6560-2** : Programmable AC Source  
0~500V/45~1kHz / 6kVA I/P 3Ø 220V
- 6560-3** : Programmable AC Source  
0~500V/45~1kHz / 6kVA I/P 3Ø 380V
- 6590-2** : Programmable AC Source  
0~300V/45~1kHz / 9kVA 1Ø or 3Ø, 3000VA per phase, I/P 3Ø 220V
- 6590-3** : AC Power Source  
0~300V/45~1kHz / 9kVA 1Ø or 3Ø, 3000VA per phase, I/P 3Ø 380V
- A650001** : Remote Interface for Model 6500 Series  
(External V Reference, RS-232 interface, Printer Interface, GPIB Interface, Special I/O Port , System I/O Port)
- A650002** : 19" Rack Mounting Kit for Model 6512/6520/6530
- A650003** : Softpanel for Model 6500 Series
- A610004** : Universal Socket Center for Model 6512/6520/6530/ 6560 Series

### Softpanel



Main operation menu



List Mode: Transient voltage programming

### 6500 Series Programmable AC Source Family



Video & Color  
Flat Panel Display  
LED/Lighting  
Optical Devices  
Photovoltaic test & Automation  
Optical Inspection  
Automated  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation

SPECIFICATIONS					
Model	6512	6520	6530	6560	6590
Output Phase	1	1	1	1 (parallel or series)	1 or 3 selectable
<b>Output Ratings</b>					
Power	1200VA	2000VA	3000VA	6000VA	3000VA per phase, 9000VA total
<b>Voltage</b>					
Range/phase	150V / 300V / Auto	150V / 300V / Auto	150V / 300V / Auto	150V / 300V (parallel) 300V / 500V (series)	150V / 300V
Accuracy	0.2% +0.2%of F.S.	0.2% +0.2%of F.S.	0.2% +0.2%of F.S.	0.2% +0.2%of F.S.	0.2% +0.2%of F.S.
Resolution	0.1V	0.1V	0.1V	0.1V	0.1V
Distortion *1	1% (15~45Hz) 0.5% (> 45~500Hz) 1% (> 500~1kHz) 2% (> 1K~2kHz)	1% (15~45Hz) 0.5% (> 45~500Hz) 1% (> 500~1kHz) 2% (> 1K~2kHz)	1% (15~45Hz) 0.5% (> 45~500Hz) 1% (> 500~1kHz) 2% (> 1K~2kHz)	1% (45~1kHz)	1% (45~1kHz)
Line Regulation	0.1%	0.1%	0.1%	0.1%	0.1%
Load Regulation *2	0.1%	0.1%	0.1%	0.2% (series), 0.8% (parallel)	0.2%
Temp. Coefficient	0.02% per°C	0.02% per°C	0.02% per°C	0.02% per°C	0.02% per°C
<b>Max. Current/Phase</b>					
RMS	12A/6A (150V / 300V)	20A/10A (150V / 300V)	30A/15A (150V / 300V)	60/30/15A (150/300/500V)	30A/15A (150V / 300V) 90A/45A total
peak	36A/18A (15~100Hz) 30A/15A (>100~1KHz) 24A/12A (>1K~2KHz)	60A/30A (15~100Hz) 50A/25A (>100~1KHz) 40A/20A (>1K~2KHz)	90A/45A (15~100Hz) 75A/38A (>100~1KHz) 60A/30A (>1K~2KHz)	180/90/45A (45~100Hz) 150/75/38A (>100~1KHz)	90A/45A (45~100Hz) 75A/38A (>100~1KHz)
<b>Frequency</b>					
Range	15 ~ 2kHz	15 ~ 2kHz	15 ~ 2kHz	45 ~ 1kHz	45 ~ 1kHz
Accuracy	0.15%	0.15%	0.15%	0.15%	0.15%
Resolution	0.01Hz (15 ~ 99.9Hz) 0.1Hz (100 ~ 999.9Hz) 0.2Hz (1k ~ 2kHz)	0.01Hz (15 ~ 99.9Hz) 0.1Hz (100 ~ 999.9Hz) 0.2Hz (1k ~ 2kHz)	0.01Hz (15 ~ 99.9Hz) 0.1Hz (100 ~ 999.9Hz) 0.2Hz (1k ~ 2kHz)	0.01Hz (45 ~ 99.9Hz) 0.1Hz (100 ~ 999.9Hz)	0.01Hz (45 ~ 99.9Hz) 0.1Hz (100 ~ 999.9Hz)
<b>Input Ratings</b>					
Voltage Operating Range	1Ø 200~240V ± 10%V <sub>LN</sub>			3Ø 200~240V ± 10%V <sub>LN</sub>	
Frequency Range	47 ~ 63Hz	47 ~ 63Hz	47 ~ 63Hz	47 ~ 63Hz	47 ~ 63Hz
Current	10A max.	15A max.	23A max.	23A max./phase	23A max./phase
Power Factor	0.95 min. under full load	0.97 min. under full load	0.98 min. under full load	0.98 min. under full load	0.98 min. under full load
<b>Measurement</b>					
<b>Voltage/Phase</b>					
Range	0 ~ 150V / 0 ~ 300V	0 ~ 150V / 0 ~ 300V	0 ~ 150V / 0 ~ 300V	0 ~ 150V / 0 ~ 300V	0 ~ 150V / 0 ~ 300V
Accuracy (RMS)	0.25% + 0.1% F.S.	0.25% + 0.1% F.S.	0.25% + 0.1% F.S.	0.25% + 0.1% F.S.	0.25% + 0.1% F.S.
Resolution	0.1V	0.1V	0.1V	0.1V	0.1V
<b>Current/Phase</b>					
Range (peak)	0 ~ 60A	0 ~ 100A	0 ~ 140A	0 ~ 280A	0 ~ 140A
Accuracy (RMS)	0.4% + 0.25%F.S.	0.4% + 0.15%F.S.	0.4% + 0.1%F.S.	0.4% + 0.1%F.S.	0.4% + 0.1%F.S.
Accuracy (peak)	0.4% + 0.5%F.S.	0.4% + 0.3% F.S.	0.4% + 0.2% F.S.	0.4% + 0.2% F.S.	0.4% + 0.2% F.S.
Resolution	0.01A	0.01A	0.01A	0.01A	0.01A
<b>Power/Phase</b>					
Accuracy	1% F.S. ( CF<6)	1% F.S. ( CF<6)	1% F.S. ( CF<6)	1% F.S. ( CF<6)	1% F.S. ( CF<6)
Resolution	0.01W	0.01W	0.01W	0.01W	0.01W
<b>Frequency</b>					
Range	15 ~ 2kHz	15 ~ 2kHz	15 ~ 2kHz	45 ~1kHz	45 ~1kHz
Accuracy	0.01% +2 count	0.01% +2 count	0.01% +2 count	0.01% +2 count	0.01% +2 count
Resolution	0.01Hz	0.01Hz	0.01Hz	0.01Hz	0.01Hz
<b>Others</b>					
Efficiency	80% typical	80% typical	80% typical	80% typical	80% typical
Protection	OPP, OLP, OTP, FAN Fail				
<b>Temperature</b>					
Operating	0 ~ 40°C	0 ~ 40°C	0 ~ 40°C	0 ~ 40°C	0 ~ 40°C
Storage	-40 ~ +85°C	-40 ~ +85°C	-40 ~ +85°C	-40 ~ +85°C	-40 ~ +85°C
<b>Safety &amp; EMC</b>					
CE (Include LVD and EMC Requirement)					
Dimension (H x W x D)	221.5 x 425 x 567 mm / 8.72 x 16.73 x 22.32 inch	221.5 x 425 x 567 mm / 8.72 x 16.73 x 22.32 inch	221.5 x 425 x 567 mm / 8.72 x 16.73 x 22.32 inch	765.94 x 546 x 700 mm / 30.16 x 21.5 x 27.56 inch*3	888.5 x 546 x 700 mm / 34.98 x 21.5 x 27.56 inch*3
Weight	26.4 kg / 58.15 lbs	26.4 kg / 58.15 lbs	26.4 kg / 58.15 lbs	107 kg / 235.68 lbs	156 kg / 343.61 lbs

**Note\*1** : Test under output voltage from half to full range.

**Note\*2** : Test with sinewave & with remote sense.

**Note\*3** : For dimension including the wheel set, please add 80mm to overall height.



66205

### KEY FEATURES

- Embedded high speed DSP, 16 bits Analog/Digital converters
- 5mA minimum current range(66203/66204) and 0.1mW power resolution
- Meets ENERGY STAR / IEC 62301 / ErP ecodesign / SPEC POWER measurement requirement
- Meets IEC 61000-4-7 standard requirement for harmonics measurement (66205)
- Accumulated energy methods for unstable power measurement
- User-define criteria for automatic PASS/FAIL judgment
- Half rack width and small 2U height, suitable for system integration
- Dual shunts for current range selection providing high accuracy over a wide current range (66202)
- THD and user-specify orders distortion measurement (66202)
- Inrush current and Energy measurement (66202)
- Optional remote interface: USB or GPIB+USB
- Voltage/current harmonics measurement up to 50 orders
- Capable of displaying input waveform DC component measurement reading
- Half rack width and suitable for system integration, 2U height (66201/66202,66205)
- 3U height, 4 input modules design (66203/66204)
- Support different wiring configuration power measurement (1P2W/1P3W/3P3W/3P4W) (66203/66204)
- Support external shunt and CT for higher current measurement application (66204)
- SMART Range function provides seamless power measurement capability (66205)
- Capable of extending current measurement range up to 30A (66205)
- USB (Host) interface provides data logging functionality (66205)
- Optional remote interface: USB or GPIB+USB
- Support GPIB, USB, RS232, Ethernet (LXI) interface (66205)



66203/66204



66201/66202

All specifications are subject to change without notice.



Chroma Digital Power Meter 66200 series provide both single and multiple phase power measurement solution designed for measurement of AC or AC+DC power signals and related parameters common to most electronic products. Instead of traditional analog measurement circuits, the Power Meter 66200 uses state-of-the-art DSP digitizing technology. The internal 16 bits analog/digital converters with sampling rates of up to 250kHz provide both high speed and high accuracy measurements. The instrument provides excellent function and stability compared to other power meters of same class currently available on the market. It includes a front panel 4 display area with 5 digits, 7-segment LED readouts as well as optional remote control using USB or GPIB interfaces.

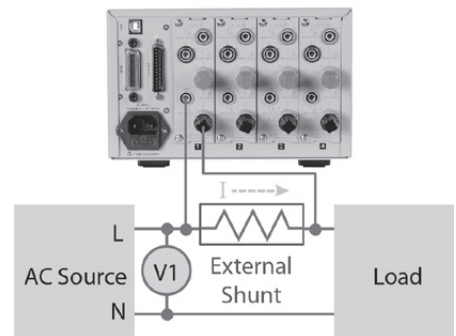
The 66200 series Power Meter is also designed to meet ENERGY STAR/IEC 62301/ErP ecodesign/SPEC POWER measurement requirements. The instrument provides 5mA (66203/66204) minimum current range and 0.1mW power resolution providing less than 2% uncertainty for No-Load mode power measurement. Included are not only traditional averaging methods but also accumulated energy approach method used to calculate active power data. In this way, users can achieve accurate readings even if power consumption levels are not stable or operating on in non-linear modes (i.e. hiccup modes). The Model 66202 can even measure Total-Harmonic-Distortion (THD) and to user-specify distortion orders. Thus, the instrument can easily measure distortion values up to and including the 13th harmonic as required by ENERGY STAR requirements. The 66200 Power Meter also includes limit test GO/NG functions. This feature allows users to set pass/fail limits to automatically display PASS/FAIL according to these user-define criteria.

The 66201 includes simple measurement functions designed for testing at low power levels (maximum current 4A). Examples of these devices are AC adapters, battery chargers, LCD monitors and similar devices. Included measurement data is Voltage (Vrms, Vpeak+, Vpeak-), Current (Irms, Ipeak+, Ipeak-), Power (W, Power Factor, Apparent Power VA, Reactive Power VAR), Current Crest Factor and Frequency. The Model 66201 Power meter is competitively priced to be suitable for bench-top testing and automated production line testing.

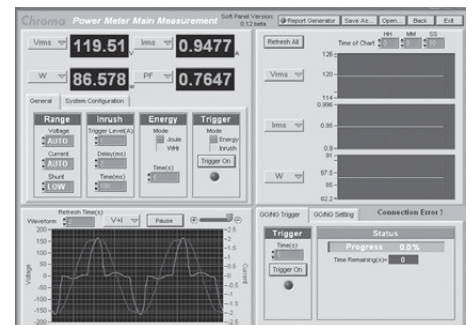
The 66202 includes a 2-shunt design to get 66202 highly accurate for both low and high current measurements. Besides the parameters measured on Model 66201, it also provides Inrush Current, Total Harmonic Distortion of V/I and Energy measurement. With these practical functions, The Model 66202 is suitable for meeting the demanding tasks of R&D and quality control departments.

The 66203/66204 are packaged in a 3U high, half rack enclosure suitable for bench top or system integration. The power meters are capable of supporting external shunts and CT for higher current application. The 4 channel 66204 is suitable for input and output parameter measurement and efficiency of 3 phase PV inverters can be calculated with measurement of the DC voltage/current at the input side of the inverter.

The 66203/66204 power meters include a 2-shunt design to provide high accurate readings for both low and high current measurements. The power meters also support features such as Inrush current, Total Harmonic Distortion of V/I, and Energy measurements. With these practical functions, the 66203/66204 power meters are suitable for meeting the demanding tasks of R&D, production and quality control departments.



66203/66204 Power Meters support external shunt function for high current (>20A) measurement application.



Softpanel for Model 66200 Series



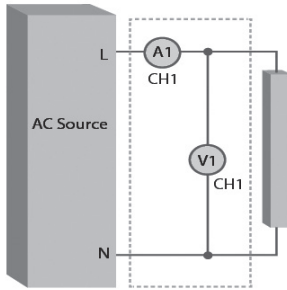
Power Efficiency Test Softpanel



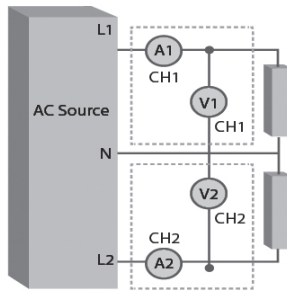
The multi-channel of 66203/66204 Power Meters are capable of supporting different wiring modes. As shown the instruments can be configured for single and 3 phase configurations by selection preset modes.

Each channel of 66203/66204 has the ability to provide independent measurements; hence the meters are suitable for multi-point measurement applications such as PV inverter testing. Instruments are designed for measuring DC input parameters as well as three phase AC readings on the output side. The overall efficiency for the PV inverter can easily be obtained by built-in functions. In order to meet high voltage applications (up to 1200Vrms) Chroma offers an HV option kit.

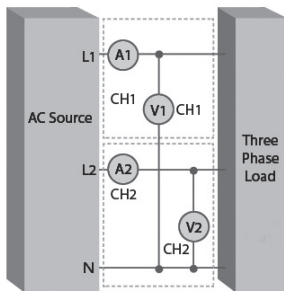
User could also implement 3P3W (Three Phase Three Wire) wiring mode for three phase power measurement application. Such as Power Supplies.



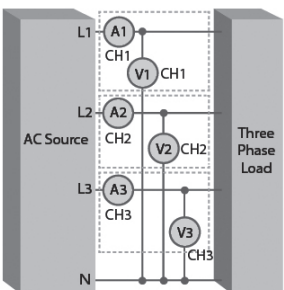
1P2W (Single Phase Two Wire)



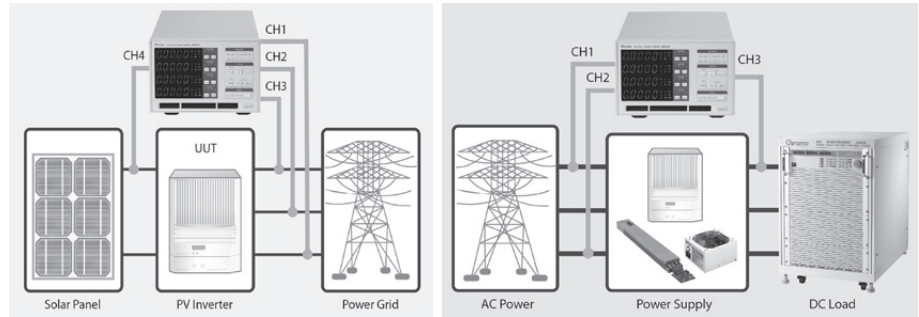
1P3W (Single Phase Three Wire)



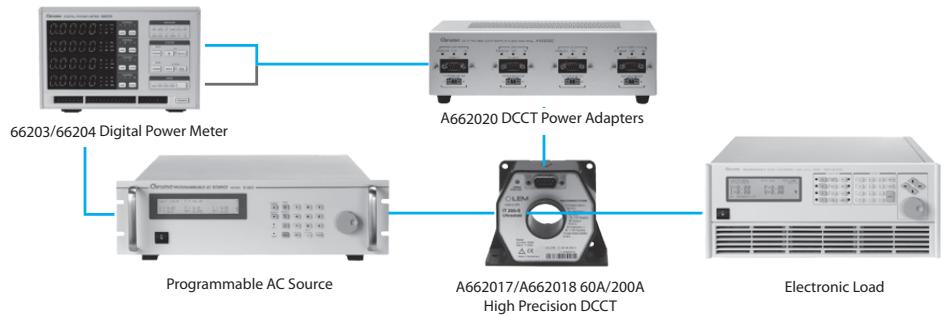
3P3W (Three Phase Three Wire)



3P4W (Three Phase Four Wire)



Support Ultra High Precision DCCT 60A/200A Optional Kit for High Current Measurement Application



## ORDERING INFORMATION

- 66201** : Digital Power Meter
- 66202** : Digital Power Meter
- 66203** : Digital Power Meter (3ch)
- 66204** : Digital Power Meter (4ch)
- \* **66205** : Digital Power Meter (1ch)
- A662001** : USB Remote Interface Board for Model 66201/66202
- A662002** : GPIB+USB Remote Interface Board for Model 66201/66202
- A662003** : Measurement Test Fixture (250V/10A) for Model 66201/66202
- A662004** : Rack Mounting Kit for Model 66201/66202
- A662005** : USB Cable (180cm)
- A662006** : External CT 50 Arms for Model 66202
- A662007** : External CT 100 Arms for Model 66202
- A662008** : Power Efficiency Test Softpanel
- A662009** : Softpanel for Model 66200 Series
- A662010** : Rack Mount Kit for Model 66203/66204
- A662012** : 1200V HV option kit for Model 66203/66204
- A662013** : External CT 50Arms for Model 66203/66204
- A662014** : External CT 100Arms for Model 66203/66204
- A662015** : Voltage and current measurement cables for Model 66204
- A662016** : Voltage and current measurement cables for Model 66203
- A662017** : Ultra High Precision DCCT 60A
- A662018** : Ultra High Precision DCCT 200A
- A662019** : DCCT Power Adapter for single channel
- A662020** : DCCT Power Adapter for multi- channels



A662003



A662019



A662020

\* Call for availability

SPECIFICATIONS-1		
Model	66201	66202
Channel	1	1
Parameters	V, Vpk, I, Ipk, W, VA, VAR, PF, CF_I, F	V, Vpk, I, Ipk, Is, W, VA, VAR, PF, CF_I, F, THD_V, THD_I, Energy
<b>Voltage</b>		
Range	150/300/500Vrms (CF = 1.6)	150/300/500Vrms (CF = 1.6)
Accuracy	DC, 15Hz - 1kHz: 0.1% of rdg + 0.08% of rng 1kHz - 10kHz: (0.1+0.05*KHz)% of rdg + 0.08% of rng	DC, 15Hz - 1kHz: 0.1% of rdg + 0.08% of rng 1kHz - 10kHz: (0.1+0.05*KHz)% of rdg + 0.08% of rng
Harmonics Accuracy	--	15Hz - 1kHz: 0.1% of rdg + 0.08% of rng 1kHz - 10kHz: (0.1+0.05*KHz)% of rdg + 0.08% of rng
Input Resistance	1MΩ	1MΩ
<b>Current</b>		
Range	0.01/0.1/0.4/2 Arms (CF=4) *1	SHUNT H : 0.2/2/8/20Arms (CF=2@0.2/2/8A, CF = 4@ 20A) SHUNT L : 0.01/0.1/0.4/2Arms (CF=4)
Accuracy *2	0.01A Range: DC, 15Hz - 1kHz: 0.1% of rdg + 0.25% of rng 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.25% of rng  0.1A/0.4A/2A Range: DC, 15Hz - 1kHz: 0.1% of rdg + 0.1% of rng 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.1% of rng	SHUNT H: 0.2A Range: DC, 15Hz - 1kHz: 0.1% of rdg + 0.12% of rng 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.12% of rng 2A/8A/20A Range: DC, 15Hz - 1kHz: 0.1% of rdg + 0.1% of rng 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.1% of rng  SHUNT L: 0.01A Range: DC, 15Hz - 1kHz: 0.1% of rdg + 0.25% of rng 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.25% of rng 0.1A/0.4A/2A Range: DC, 15Hz - 1kHz: 0.1% of rdg + 0.1% of rng 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.1% of rng
Harmonics Accuracy	--	SHUNT H: 0.2A Range: DC, 15Hz - 1kHz: 0.1% of rdg + 0.12% of rng 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.12% of rng 2A/8A/20A Range: DC, 15Hz - 1kHz: 0.1% of rdg + 0.1% of rng 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.1% of rng  SHUNT L: 0.01A Range: DC, 15Hz - 1kHz: 0.1% of rdg + 0.25% of rng 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.25% of rng 0.1A/0.4A/2A Range: DC, 15Hz - 1kHz: 0.1% of rdg + 0.1% of rng 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.1% of rng
<b>Power</b>		
Range	1.5W ~ 1000W, 12 ranges	1.5W ~ 10kW, 24 ranges
Accuracy	47Hz~63Hz : 0.1% of rdg + 0.1% of rng 15Hz~1kHz : (0.1+ 0.2/PF x kHz)% of rdg+0.18% of rng	47Hz~63Hz : 0.1% of rdg + 0.1% of rng 15Hz~1kHz : (0.1+ 0.2/PF x kHz)% of rdg+0.18% of rng
Power Factor accuracy *3	0.006+(0.003/PF) x kHz	0.006+(0.003/PF) x kHz
<b>Frequency</b>		
Range	DC, 15Hz ~ 10kHz	DC, 15Hz ~ 10kHz
Measuring Condition	Voltage (10 ~ 100% of the voltage range)	Voltage (10 ~ 100% of the voltage range)
<b>Others</b>		
Display Resolution	5 Digits	
Display update rate	0.25~2 sec	
Input Voltage	90V ~ 130V /180V ~ 250V, 50Hz/ 60Hz, 30VA	
Interface	Option: USB or GPIB+USB	
Operating Temperature	0°C ~ 40°C	
Storage	-40°C ~ 85°C	
<b>Safety &amp; EMC</b>	CE (include EMC & LVD)	
<b>Dimension (H x W x D)</b>	88 x 212 x 348.1 mm / 3.46 x 8.35 x 13.7 inch (excluding projections)	
<b>Weight</b>	Approx. 3.8 kg / 8.37 lbs	

The specifications are valid only after the power meter is turned on more than one hour in a thermally stable environment.

**Note\*1** : The maximum measurable current of 66201 is 4 Arms.

**Note\*2** : The current accuracy applies temperature range  $23 \pm 1^\circ\text{C}$  for 0.01A & 0.2A(CF=2). For all the other current ranges, the spec. applied under  $23 \pm 5^\circ\text{C}$ .

**Note\*3** : The PF spec. applies only when the signals are higher than 50% of the selected voltage and current ranges.

SPECIFICATIONS-2			
Model	66203	66204	66205 *1
Channel	3	4	1
Parameters	V, Vpk, I, Ipk, Is, W, VA, VAR, PF, Cfi, F, THD V, THD I, Energy		
<b>Voltage</b>			
Range	15V/30V/60V/150V/300V/600Vrms (CF=2), 6 range HV option up to 1200Vrms		15V/30V/60V/150V/300V/600Vrms (CF=2), 6 range
Accuracy	DC, 10Hz to 1kHz: 0.1% RD + 0.08% RNG 1kHz to 10kHz: (0.1+0.05*kHz)% RD + 0.08% RNG		DC, 10Hz to 850Hz: 0.1% rdg+0.05% rng 850Hz to 10kHz: (0.1+0.05xkHz)% rdg+0.08% rng
Harmonics Accuracy	10Hz to 1kHz: 0.1% RD + 0.08% RNG 1kHz to 10kHz: (0.1+0.05*kHz)% RD + 0.08% RNG		DC, 10Hz to 850Hz: 0.1% rdg+0.05% rng 850Hz to 10kHz: (0.1+0.05xkHz)% rdg+0.08% rng
Input Resistance	2MΩ		
<b>Current</b>			
Range	5mA/20mA/50mA/200mA/500mA/2A/5A/20Arms (CF=4)		Low Shunt: 5mA/20mA/50mA/200mA/300mA (CF=4) High Shunt: 500mA/2A/5A/20Arms/30Arms (CF=4)
Accuracy	DC, 10Hz to 1kHz: 0.1% RD + 0.1% RNG 1kHz to 10kHz: (0.1+0.05 x kHz)% RD + 0.1% RNG		DC, 10Hz to 850Hz: 0.1% rdg+0.05% rng 850Hz to 10kHz: (0.1+0.05xkHz)% rdg+0.1% rng
Harmonics Accuracy	10Hz to 1kHz: 0.1% RD + 0.1% RNG 1kHz to 10kHz: (0.1+0.05 x kHz)% RD + 0.1% RNG		DC, 10Hz to 850Hz: 0.1% rdg+0.05% rng 850Hz to 10kHz: (0.1+0.05xkHz)% rdg+0.1% rng
<b>Power</b>			
Range	75mW ~ 12kW (48 ranges)		75mW ~ 18kW (60 ranges)
Accuracy	DC, 47Hz ~ 63Hz: 0.1% RD + 0.1% RNG 10Hz ~ 1KHz: 0.1% RD + 0.18% RNG 1KHz ~ 10KHz: (0.1+0.1 x kHz)% RD + 0.18% RNG		DC, 10Hz to 850Hz: 0.1% rdg+0.05% rng 850Hz to 10kHz: (0.1+0.07xkHz)% rdg+0.15% rng
Power Factor accuracy	0.001+(15ppm/PF) x Hz		
<b>Frequency</b>			
Range	DC, 10Hz ~ 10kHz		
Measuring Condition	Voltage (10 ~ 100% of the voltage range)		
<b>Others</b>			
Display Resolution	5 Digits		
Display Update Rate	0.25sec/0.5sec/1sec/2sec		50ms/100ms/250ms/500ms/1s/2s/5s
Input Voltage	100~240V ± 10%, 50/60Hz		
Interface	USB+GPIB (Standard)		USB+GPIB+USB (Host)+ RS232+Ethernet (LXI) *1
Operation Temperature	0°C ~ 40°C		
Storage	-40°C ~ 85°C		
Safety & EMC	CE (include EMC & LVD)		
Dimension (H x W x D)	133 x 212 x 420 mm / 5.25 x 8.25 x 16.3 inch		88 x 212 x 348mm / 3.46 x 8.35 x 13.7 inch
Weight	7.5 kg / 16.5 lbs	8.5 kg / 18.7 lbs	Approx. 4kg / 8.8 lbs

**Note\*1** : Call for availability

The specifications are valid only after the power meter is turned on more than one hour in a thermally stable environment.



**600W, 1200W, 2400W, 5000W**

### KEY FEATURES

- Wide range of voltage & current combinations with constant power
- Voltage range: 0 ~ 600V  
Current range: 0 ~ 120A  
Power range: 600W, 1200W, 2400W, 5000W
- Digital encoder knobs, keypad and function keys
- Power Factor Correction (0.95)
- High-speed Programming
- Precision V&I Measurements
- Current sharing for parallel operation with Master/Slave Control
- Voltage Ramp function : Time Range (5ms~99 hours)
- Auto Sequencing Programming : 10 Programs /100 Sequences / 8 bit TTL
- Voltage & Current Slew Rate Control
- OVP, Current Limit, Thermal protection
- Remote sense, 5V line loss compensation
- APG (Analog Programmable Interface) with Isolated Analog Interface Card
- Optional GPIB control with SCPI
- Optional Ethernet/LXI interface
- Standard RS-232 & USB interface
- LabView and Labwindows
- CE Certified

Chroma's new 62000P Series of programmable DC power supplies offer many unique advantages for ATE integration and testing. These advantage include a constant power operating envelope, precision readback of output current and voltage, output trigger signals as well as the ability to create complex DC transients waveforms to test device behavior to spikes, drops, and other voltage deviations. Designed for automated testing DC-DC converters and similar products, the 62000P sets a new standard for high accuracy programmable DC supplies.

The 62000P Series includes 12 different models ranging from 600W to 5000W, up to 120A and up to 600V. Due to their constant power operating envelope a single instrument can provide both high voltage/low current AND low voltage/ high current thereby reducing the number of supplies needed in typical ATE applications.

The 62000P also includes 16 bit readback capability for accurate voltage and current readings. This means systems no longer need complex shunt/multiplexers to make accurate readings of the UUT's input parameters. The instruments also include I/O ports providing 8 bit TTLs, DC-ON, fault output signal and remote inhibit as well as a output trigger signal for system timing measurements.



Another unique capability of the 62000P supplies is their ability to create complex DC transient waveforms. This capability allows devices to be tested to DC voltage dropouts, spikes and other voltage variations making them an ideal choice for airborne device testing, inverter testing and other devices which will experience voltage interrupts. Applications include DC/DC Converter & Inverter voltage drop test, engine start-up simulation, battery automated charging, electronic product life cycle test, and etc.

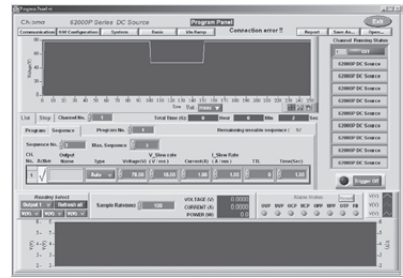
### Master/Slave Parallel & Serial Control

When high power is required, it is common to connect two or more power supplies in parallel or series. The 62000P Series supplies have a smart Master / Slave control mode making series/parallel operation fast and simple. In this mode the master scales values and downloads data to slave units so programming is simple and current sharing automatic.

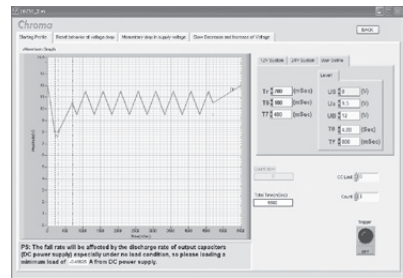


Model 62050P-100-100

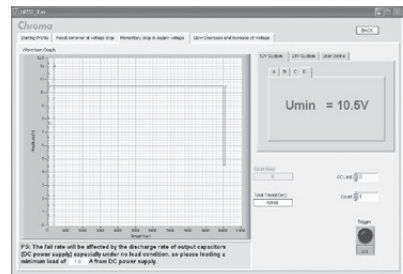
### Soft Panel



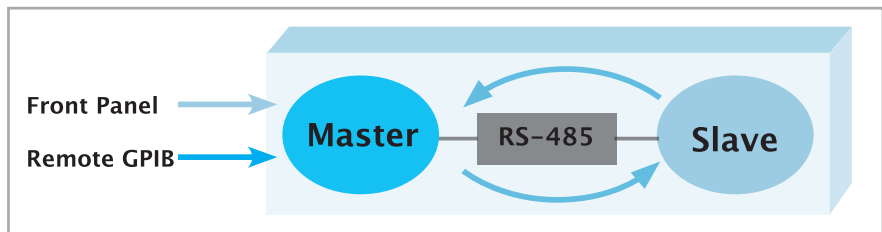
Transient Voltage Programming



ISO 16750-2 4.5.3 Starting Profile



ISO 16750-2 4.5.1 Momentary Drop In Supply Voltage



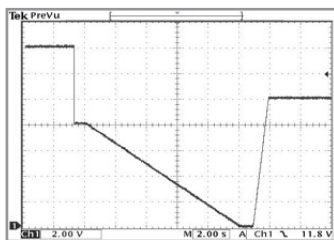
Master/Slave Parallel & Serial Control

### ORDERING INFORMATION

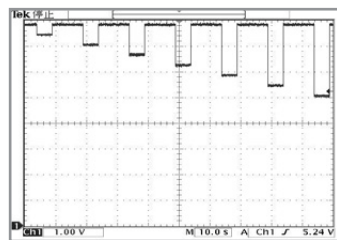
- 62006P-30-80** : Programmable DC Power Supply 30V/80A/600W
- 62006P-100-25** : Programmable DC Power Supply 100V/25A/600W
- 62006P-300-8** : Programmable DC Power Supply 300V/8A/600W
- 62012P-40-120** : Programmable DC Power Supply 40V/120A/1200W
- 62012P-80-60** : Programmable DC Power Supply 80V/60A/1200W
- 62012P-100-50** : Programmable DC Power Supply 100V/50A/1200W
- 62012P-600-8** : Programmable DC Power Supply 600V/8A/1200W
- 62024P-40-120** : Programmable DC Power Supply 40V/120A/2400W
- 62024P-80-60** : Programmable DC Power Supply 80V/60A/2400W
- 62024P-100-50** : Programmable DC Power Supply 100V/50A/2400W
- 62024P-600-8** : Programmable DC Power Supply 600V/8A/2400W
- 62050P-100-100** : Programmable DC Power Supply 100V/100A/5000W
- A620004** : GPIB Interface for Model 62000P Series
- A620006** : Rack mounting kit for Model 62000P Series (2U model)
- A620009** : Softpanel for 62000P Series
- A620015** : Rack mounting kit for Model 62050P-100-100
- A620023** : Ethernet/LXI Interface for Model 62000P Series



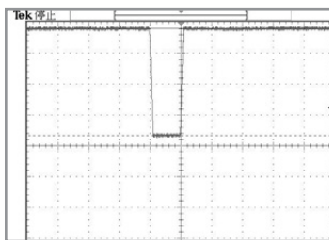
ELECTRICAL SPECIFICATIONS-1						
Model	62006P-30-80	62006P-100-25	62006P-300-8	62012P-40-120	62012P-80-60	62012P-100-50
<b>Output Ratings</b>						
Output Voltage	0~30V	0~100V	0~300V	0-40V	0~80V	0~100V
Output Current	0~80A	0~25A	0~8A	0-120A	0~60A	0~50A
Output Power	600W	600W	600W	1200W	1200W	1200W
<b>Line Regulation</b>						
Voltage	0.01%+2mV	0.01%+6mV	0.01%+18mV	0.01%+2mV	0.01%+8mV	0.01%+10mV
Current	0.01%+25mA	0.01%+5mA	0.03%+20mA	0.01%+25mA	0.01%+10mA	0.01%+12mA
<b>Load Regulation</b>						
Voltage	0.01%+3mV	0.01%+10mV	0.01%+50mV	0.01%+3mV	0.01%+12mV	0.01%+18mV
Current	0.01%+10mA	0.01%+5mA	0.03%+40mA	0.01%+10mA	0.01%+20mA	0.01%+28mA
<b>Voltage Measurement</b>						
Range	6V/30V	20V/100V	60V/300V	8V/40V	16V/80V	20V/100V
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.	0.05% + 0.05%F.S.	0.05% + 0.05%F.S.
<b>Current Measurement</b>						
Range	16A/80A	5A/25A	1.6A/8A	24A / 120A	12A/60A	10A/50A
Accuracy	0.1% + 0.2%F.S.	0.1% + 0.2%F.S.	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>Output Noise (0 ~ 20MHz)</b>						
Voltage Ripple (P-P)	60 mV	85 mV	180 mV	90 mV	100 mV	100 mV
Voltage Ripple (rms)	8 mV	10 mV	90 mV	10 mV	10 mV	15 mV
Current Ripple (rms)	60 mA	10 mA	60 mA	120 mA	30 mA	20 mA
<b>OVP Adjustment Range</b>	110% of Vset to 110% of Vmax	110% of Vset to 110% of Vmax	110% of Vset to 110% of Vmax	110% of Vset to 110% of Vmax	110% of Vset to 110% of Vmax	110% of Vset to 110% of Vmax
<b>Slew Rate Range</b>						
Voltage	0.001V - 5V/ms	0.001V - 10V/ms	0.01V - 10V/ms	0.001V - 5V/ms	0.001V - 10V/ms	0.001V - 10V/ms
Current	0.001A - 1A/ms	0.001A - 1A/ms	0.001A - 1A/ms	0.001A - 1A/ms	0.001A - 1A/ms	0.001A - 1A/ms
<b>Programming Response Time (Typical)</b>						
<b>Rise Time (Full &amp; No Load)</b>	6 ms	10 ms	30 ms	8 ms	8 ms	10 ms
Fall Time	350ms(max)	300 ms(max)	2.5 s(max)	460 ms(max)	240 ms(max)	300 ms(max)
<b>Efficiency</b>	0.75	0.75	0.75	0.8	0.8	0.8
<b>Drift (8 hours)</b>						
Voltage	0.02% of Vmax	0.02% of Vmax	0.02% of Vmax	0.02% of Vmax	0.02% of Vmax	0.02% of Vmax
Current	0.04% of Imax	0.04% of Imax	0.04% of Imax	0.04% of Imax	0.04% of Imax	0.04% of Imax
<b>Temperature Coefficient</b>						
Voltage	0.02% of Vmax/°C	0.02% of Vmax/°C	0.02% of Vmax/°C	0.02% of Vmax/°C	0.02% of Vmax/°C	0.02% of Vmax/°C
Current	0.04% of Imax/°C	0.04% of Imax/°C	0.04% of Imax/°C	0.04% of Imax/°C	0.04% of Imax/°C	0.04% of Imax/°C
<b>Transient Response Time</b>						
3 mS	3 mS	3 mS	3 mS	3 mS	3 mS	3 mS
10 % step change	150 mV	180 mV	600 mV	150 mV	250 mV	250 mV
<b>Voltage limit @ Series Mode</b>						
	150V	500V	800V	200V	400V	500V
<b>AC Input Operating Voltage Ranges</b>						
	1Ø 100~240Vac ± 10% V <sub>LN</sub> , 47~63 Hz					
<b>Operating Temperature</b>						
	0~40°C	0~40°C	0~40°C	0~40°C	0~40°C	0~40°C
<b>Dimension ( H x W x D)</b>						
	89 x 430 x 425 mm / 3.5 x 16.93 x 16.73 inch					
<b>Weight</b>						
	12kg / 26.43 lbs	12.1 kg / 26.65 lbs	11.2 kg / 24.67 lbs	12kg / 26.43 lbs	13 kg / 28.63 lbs	12.1 kg / 26.65 lbs



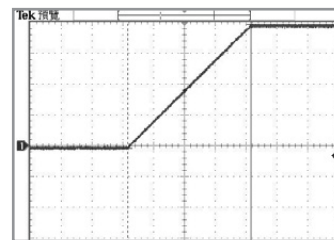
Battery Voltage Dropout



Reset Behavior at Voltage Drop of ISO 16750-2



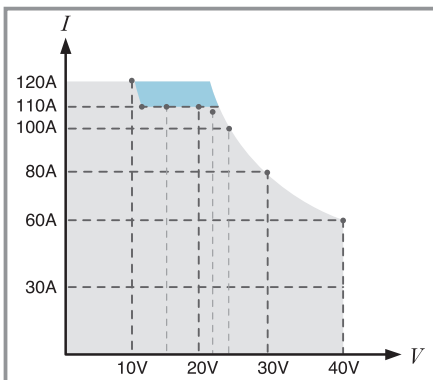
Telecom Converter Sag Testing



Output Voltage Slew Rate Control

ELECTRICAL SPECIFICATIONS-2						
Model	62012P-600-8	62024P-40-120	62024P-80-60	62024P-100-50	62024P-600-8	62050P-100-100
<b>Output Ratings</b>						
Output Voltage	0~600V	0~40V	0~80V	0~100V	0~600V	0~100V
Output Current	0~8A	0~120A*1	0~60A	0~50A	0~8A	0~100A
Output Power	1200W	2400W*1	2400W	2400W	2400W	5000W
<b>Line Regulation</b>						
Voltage	0.01%+18mV	0.01%+2mV	0.01%+8mV	0.01%+10mV	0.01%+18mV	0.01%+8mV
Current	0.03%+20mA	0.01%+25mA	0.01%+10mA	0.01%+12mA	0.03%+20mA	0.01%+24mA
<b>Load Regulation</b>						
Voltage	0.01%+50mV	0.01%+3mV	0.01%+12mV	0.01%+18mV	0.01%+50mV	0.01%+12mV
Current	0.03%+40mA	0.01%+10mA	0.01%+20mA	0.01%+28mA	0.03%+40mA	0.01%+56mA
<b>Voltage Measurement</b>						
Range	120V/600V	8V / 40V	16V/80V	20V/100V	120V / 600V	20V/100V
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.	0.05% + 0.05%F.S.	0.05% + 0.05%F.S.
<b>Current Measurement</b>						
Range	1.6A/8A	24A / 120A	12A/60A	10A/50A	1.6A / 8A	20A/100A
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.	0.1% + 0.1%F.S.	0.1% + 0.1%F.S.
<b>Output Noise (0 ~ 20MHz)</b>						
Voltage Ripple (P-P)	180 mV	90 mV	100 mV	100 mV	200 mV	50 mV
Voltage Ripple (rms)	90 mV	10 mV	10 mV	15 mV	180 mV	15 mV
Current Ripple (rms)	60 mA	120 mA	30 mA	20 mA	120 mA	40 mA
<b>OVP Adjustment Range</b>						
	110% of Vset to 110% of Vmax	110% of Vset to 110% of Vmax	110% of Vset to 110% of Vmax	110% of Vset to 110% of Vmax	110% of Vset to 110% of Vmax	110% of Vset to 110% of Vmax
<b>Slew Rate Range</b>						
Voltage	0.01V - 10V/ms	0.001V - 5V/ms	0.001V - 10V/ms	0.001V - 10V/ms	0.01V - 10V/ms	0.001V - 10V/ms
Current	0.001A - 1A/ms	0.001A - 1A/ms	0.001A - 1A/ms	0.001A - 1A/ms	0.001A - 1A/ms	0.001A - 2A/ms
<b>Programming Response Time (Typical)</b>						
Rise Time (Full & No Load)	60 ms	8 ms	8 ms	10 ms	60 ms	10 ms
Fall Time	5 s(max)	460ms(max)	240 ms(max)	300 ms(max)	5 s(max)	850 ms(max)
<b>Efficiency</b>						
	0.8	0.8	0.85	0.85	0.8	0.85
<b>Drift (8 hours)</b>						
Voltage	0.02% of Vmax	0.02% of Vmax	0.02% of Vmax	0.02% of Vmax	0.02% of Vmax	0.02% of Vmax
Current	0.04% of Imax	0.04% of Imax	0.04% of Imax	0.04% of Imax	0.04% of Imax	0.04% of Imax
<b>Temperature Coefficient</b>						
Voltage	0.02% of Vmax/°C	0.02% of Vmax/°C	0.02% of Vmax/°C	0.02% of Vmax/°C	0.02% of Vmax/°C	0.02% of Vmax/°C
Current	0.04% of Imax/°C	0.04% of Imax/°C	0.04% of Imax/°C	0.04% of Imax/°C	0.04% of Imax/°C	0.04% of Imax/°C
<b>Transient Response Time</b>						
10 % step change	3mS	3mS	3mS	3mS	3mS	3mS
<b>Voltage limit @ Series Mode</b>						
	800V	200V	400V	500V	800V	500V
<b>AC Input Operating Voltage Ranges</b>						
	1Ø 100~240Vac ± 10% V <sub>LN</sub> , 47~63 Hz	1Ø 200~240Vac ± 10% V <sub>LN</sub> , 47~63 Hz				3Ø 200~240Vac ± 10% V <sub>LL</sub> , or 3Ø 380~400Vac ± 10% V <sub>LL</sub> , 47~63 Hz
<b>Operating Temperature</b>						
	0~40°C	0~40°C	0~40°C	0~40°C	0~40°C	0~40°C
<b>Dimension ( H x W x D )</b>						
	89 x 430 x 425 mm / 3.5 x 16.93 x 16.73 inch					176 x 428 x 566 mm / 6.93 x 16.85 x 22.28 inch
<b>Weight</b>						
	11.2 kg / 24.67lbs	13 kg / 28.63 lbs	12.2 kg / 26.87 lbs	13 kg / 28.63 lbs	13 kg / 28.63 lbs	28 kg / 61.67 lbs

**Note \*1 :** The Max. power limit of 2400W is under output 22V~40V , and see the diagram below for operating power envelope.



The blue area is over specification due to low voltage (<22V) & high current output(>110A).  
 The following is operation power envelope :  
 (10V/120A), (11V/110A), (15V/110A), (20V/110A), (22V/109A), (24V/100A), (30V/80A), (40V/60A).

<b>GENERAL SPECIFICATIONS</b>	
<b>Programming &amp; Measurement Resolution</b>	
Voltage (Front Panel)	10 mV
Current (Front Panel)	10 mA
Voltage (Remote Interface)	0.003% of Vmax
Current (Remote Interface)	0.002% of Imax
Voltage (Analog Programming Interface)	0.04% of Imax
Current (Analog Programming Interface)	0.04% of Imax
<b>Programming Accuracy</b>	
Voltage Programming (Front Panel and Remote Interface)	0.1% of Vmax
Voltage Programming (Analog Programming Interface)	0.2% of Vmax
Current Programming (Front Panel and Remote Interface)	0.3% of Imax
Current Programming (Analog Programming Interface)	0.3% of Imax
<b>Programming Response Time</b>	
Rise Time: For a programmed 5% to 95% step in output voltage. (Full & NoLoad)	See Electrical Specification
Fall Time: For a programmed 95% to 5% step in output voltage. (The fall time will be affected by the external loading from UUT.)	See Electrical Specification
Vout setting (USB send command to DC Power Supply receiver)	10ms
Measure Voltage, Current (under USB command using Fetch)	10ms
Measure Voltage, Current (under USB command using Measure)	70ms
<b>Analog Programming Interface</b>	
Voltage and Current Programming inputs	0~10Vdc or 0~5Vdc of F.S.
Voltage and Current monitor	0~10Vdc or 0~5Vdc of F.S.
Isolation: Maximum working voltage of any analog programming signal with respect to chassis potential	70Vdc
<b>Auxiliary Power Supply</b>	
Output Voltage	12Vdc
Maximum current source capability	10mA
<b>Remote Inhibit Function (I/O)</b>	
Use to disable the output of DC Power Supply; Active Low	TTL
<b>DC-ON Output Signal</b>	
Indicate the output status, Active High	TTL
<b>Fault Output Signal</b>	
Indicate if there is a fault/protection occurred, Active Low	TTL
<b>Series &amp; Parallel operation function with Master / Slave control</b>	
Voltage limit @ Series Mode	See Electrical Specification
Number of DC Power Supplies allowed @ master / slave control mode	5
<b>Auto Sequencing Programmable Function</b>	
Number of program	10
Number of sequence	100
Time Range	5ms ~ 15000S
TTL signal out	8 bits
TTL source capability	7 mA
<b>Auto Sequencing Programmable Function (Step Mode)</b>	
Start Voltage Range	0 ~ full scale
End Voltage Range	0 ~ full scale
Total Run Time Range (hh:mm:ss.sss)	10ms ~ 99 hours
<b>Slew Rate Control Function</b>	
Voltage slew rate range (The fall rate will be affected by the discharge rate of the output capacitors especially under no load condition.)	See Electrical Specification
Current slew rate range of current	See Electrical Specification
Minimum transition time	0.5 ms
<b>Remote Sense</b>	
Line loss compensation	5V



### KEY FEATURES

- Power range: 5KW / 10KW / 15KW
- Voltage range: 0 ~ 1000V / 2000V (series)
- Current range: 0 ~ 375A
- High power density (15KW in 3U)
- Easy Master / Slave parallel & series operation up to 150KW
- Precision V&I Measurements
- High-speed programming
- Voltage & Current Slew Rate Control
- Digital encoder knobs, keypad and function keys
- Current sharing operation
- Voltage ramp function (time range: 5 ms ~ 99 hours)
- Auto Sequencing Programming: 10 Programs / 100 Sequences
- OVP, Current Limit, Thermal protection
- Standard Analog Programming interface
- Standard USB / RS-232 / RS485 interface
- Optional GPIB / Ethernet interface
- Remote output ON / OFF (I / P)
- Remote sense line drop compensation
- LabView and Labwindows
- CE Certified

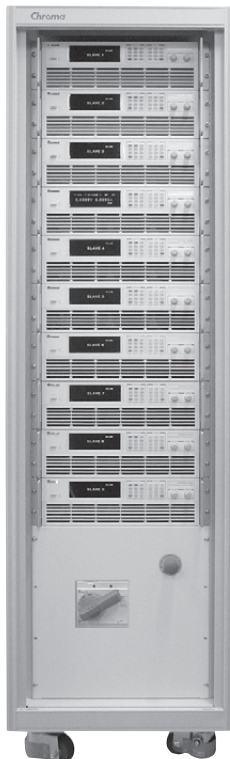
Chroma's new 62000H Series of programmable DC power supplies offer many unique advantages for telecom, automated test system & integration, industrial, battery charge & simulation for hybrid cars and solar panel simulation. These advantages include high power density of 15KW in 3U, precision readback of output current and voltage, output trigger signals as well as the ability to create complex DC transients waveforms to test device behavior to spikes, drops, and other voltage deviations.

The 62000H series DC power supply are very easy to operate either from the front panel keypad or from the remote controller via USB / RS-232 / RS485 / APG (Standard) and GPIB & Ethernet (optional). Its compact size with 3U only can be stacked on a bench in a standard rack without any difficulties.

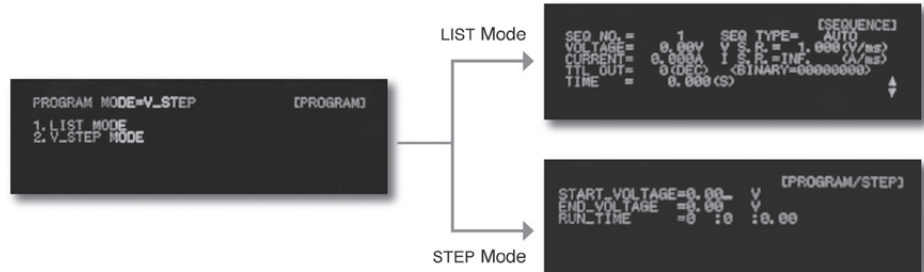
Another unique capability of the 62000H supplies is their ability to create complex DC transient waveforms. This capability allows devices to be tested to DC voltage dropouts, spikes and other voltage variations making them an ideal choice for aerospace device testing, inverter testing and other devices which will experience voltage interrupts. Applications include DC/DC Converter & Inverter voltage drop test, engine start-up simulation, battery automated charging, electronic product life cycle test, etc.

The 62000H Series includes different models ranging from 5KW to 15KW, with current ranges up to 375A and voltage ranges up to 1000V. The 62000H can easily parallel up to ten units capable of 150KW with current sharing for bulk power applications, for example, battery bank simulation of 450V/150A/67.5KW for electric vehicle and military use.

There are 100 user programmable input status on the front panel for automated test application and life cycle ON/OFF test. In addition, the 62000H has a 16 bit digital control with bright vacuum fluorescent display readout.



Master/Slave Parallel Operation - 150KW



### ORDERING INFORMATION

Power Rating	62000H Series Programmable DC Power Supply
5KW	62050H-40 : Programmable DC Power Supply 40V/125A/5KW
	62050H-450 : Programmable DC Power Supply 450V/11.5A/5KW
	62050H-600 : Programmable DC Power Supply 600V/8.5A/5KW
10KW	62075H-30 : Programmable DC Power Supply 30V/250A/7.5KW
	62100H-30 : Programmable DC Power Supply 30V/375A/11KW
	62100H-40 : Programmable DC Power Supply 40V/250A/10KW
	62100H-100P *1 : Programmable DC Power Supply 100V/250A/10KW
	62100H-450 : Programmable DC Power Supply 450V/23A/10KW
	62100H-600 : Programmable DC Power Supply 600V/17A/10KW
	62100H-1000 : Programmable DC Power Supply 1000V/10A/10KW
15KW	62150H-40 : Programmable DC Power Supply 40V/375A/15KW
	62150H-100P *1 : Programmable DC Power Supply 100V/375A/15KW
	62150H-450 : Programmable DC Power Supply 450V/34A/15KW
	62150H-600 : Programmable DC Power Supply 600V/25A/15KW
	62150H-1000 *5 : Programmable DC Power Supply 1000V/15A/15KW
Options	A620024 : GPIB Interface for 62000H series (Factory installed)
	A620025 : Ethernet Interface for 62000H series (Factory installed)
	A620026 : Rack Mounting kit for 62000H series

**Note \*1 :** Model 62000H-100P (input 380Vac) will be available in May, 2016

**Note \*2 :** Please specify GPIB or Ethernet Interface (alternative) at time of order.

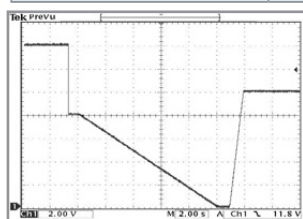
**Note \*3 :** All models output power are available for 200/220Vac, 380/400Vac and 440/480Vac (600V/1000V models) line voltage.

**Note \*4 :** Call for availability. (30V/40V/450V for 200/220 Vac and 440/480 Vac line voltage)

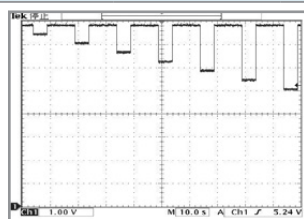
**Note \*5 :** Customized output voltage up to 2000V



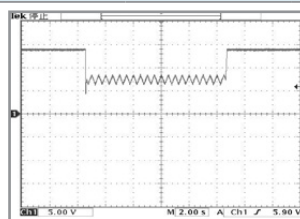
ELECTRICAL SPECIFICATIONS -1							
Model	62075H-30	62050H-40	62050H-450	62050H-600	62100H-30	62100H-40	62100H-100P*1
<b>Output Ratings</b>							
Output Voltage	0-30V	0-40V	0-450V	0-600V	0-30V	0-40V	0-100V
Output Current	0-250A	0-125A	0-11.5A	0-8.5A	0-375A	0-250A	0-250A
Output Power	7500W	5000W	5000W	5000W	11250W	10000W	10000W
<b>Line Regulation</b>							
Voltage	± 0.01% F.S.						
Current	± 0.05% F.S.						
<b>Load Regulation</b>							
Voltage	± 0.02% F.S.						
Current	± 0.1% F.S.						
<b>Voltage Measurement</b>							
Range	6V / 30V	8V / 40V	90V / 450V	120V / 600V	6V / 30V	8V / 40V	20V/100V
Accuracy	0.05% + 0.05% F.S.						
<b>Current Measurement</b>							
Range	50A / 250A	25A / 125A	2.3A / 11.5A	1.7A / 8.5A	75A / 375A	50A / 250A	50A / 250A
Accuracy	0.1% + 0.1% F.S.						
<b>Output Noise &amp; Ripple</b>							
Voltage Noise (P-P)	60mV	60mV	300mV	350mV	60mV	60mV	150mV
Voltage Ripple (rms)	15mV	15mV	450mV	600mV	15mV	15mV	25mV
Current Ripple (rms)	100mA	50mA	20mA	15mA	150mA	100mA	150mA
<b>OVP Adjustment Range</b>							
Range	0-110% programmable from front panel, remote digital inputs						
Accuracy	± 1% of full-scale output						
<b>Programming Response Time</b>							
Rise Time: Full Load	6ms	8ms	60ms	60ms	6ms	8ms	10ms
Rise Time: No Load	6ms	8ms	60ms	60ms	6ms	8ms	10ms
Fall Time: Full Load	6ms	8ms	60ms	60ms	6ms	8ms	10ms
Fall Time: 10% Load	100ms	100ms	250ms	250ms	100ms	100ms	625ms
Fall Time: No Load	1s	1s	2.5s	2.5s	1s	1s	2.5s
<b>Slew Rate Control</b>							
Voltage slew rate range	0.001V/ms ~ 5V/ms	0.001V/ms ~ 5V/ms	0.001V/ms ~ 7.5V/ms	0.001V/ms ~ 10V/ms	0.001V/ms ~ 5V/ms	0.001V/ms ~ 5V/ms	0.001V/ms ~ 10V/ms
Current slew rate range	0.001A~1A/ms, or INF						
Min. transition time	0.5ms						
<b>Transient Response Time</b>							
	Recovers within 1ms to +/- 0.75% of steady-state output for a 50% to 100% or 100% to 50% load change(1A/μs)						
Efficiency (Typical)	0.87	0.87	0.87	0.87	0.87	0.87	0.92
<b>Drift (30 minutes)</b>							
Voltage	0.04% of Vmax						
Current	0.06% of Imax						
<b>Drift (8 hours)</b>							
Voltage	0.02% of Vmax						
Current	0.04% of Imax						
<b>Temperature Coefficient</b>							
Voltage	0.04% of Vmax/°C						
Current	0.06% of Imax/°C						



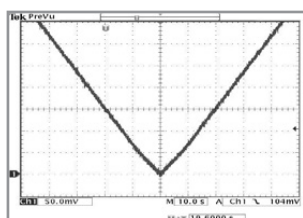
Battery Voltage Dropout



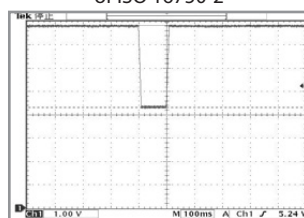
Reset Behavior at Voltage Drop of ISO 16750-2



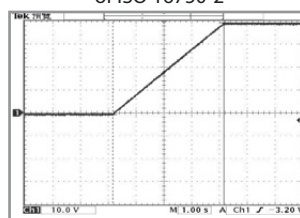
Engine Starting Profile of ISO 16750-2



Battery Voltage Slow Decrease & Decrease profile



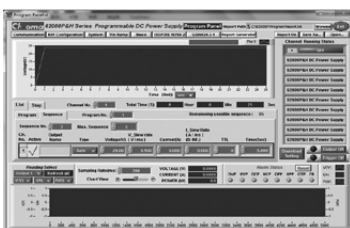
Telecom Converter Sag Testing



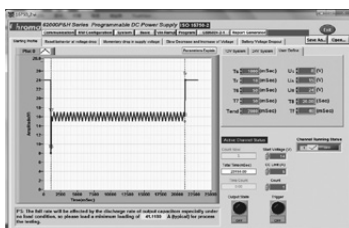
Output Voltage Slew Rate Control

ELECTRICAL SPECIFICATIONS -2								
Model	62100H-450	62100H-600	62100H-1000	62150H-40	62150H-100P*1	62150H-450	62150H-600	62150H-1000
<b>Output Ratings</b>								
Output Voltage	0-450V	0-600V	0-1000V	0-40V	0-100V	0-450V	0-600V	0-1000V
Output Current	0-23A	0-17A	0-10A	0-375A	0-375A	0-34A	0-25A	0-15A
Output Power	10000W	10000W	10000W	15000W	15000W	15000W	15000W	15000W
<b>Line Regulation</b>								
Voltage	± 0.01% F.S.							
Current	± 0.05% F.S.							
<b>Load Regulation</b>								
Voltage	± 0.02% F.S.	± 0.02% F.S.	± 0.05% F.S.	± 0.02% F.S.	± 0.02% F.S.	± 0.02% F.S.	± 0.02% F.S.	± 0.05% F.S.
Current	± 0.1% F.S.							
<b>Current Measurement</b>								
Range	90V/450V	120V/600V	200V/1000V	8V/40V	20V/100V	90V/450V	120V/600V	200V/1000V
Accuracy	0.05% + 0.05%F.S.							
<b>Current Measurement</b>								
Range	4.6A/23A	3.2A/17A	4A/10A	75A/375A	75A/375A	6.8A/34A	5A/25A	6A/15A
Accuracy	0.1% + 0.1%F.S.							
<b>Output Noise &amp; Ripple</b>								
Voltage Noise(P-P)	300mV	350mV	2550mV	60mV	150mV	300mV	350mV	2550mV
Voltage Ripple(rms)	450mV	600mV	1500mV	15mV	25mV	450mV	600mV	1500mV
Current Ripple(rms)	40mA	30mA	180mA	150mA	150mA	60mA	45mA	270mA
<b>OVP Adjustment Range</b>								
Range	0-110% programmable from front panel, remote digital inputs							
Accuracy	± 1% of full-scale output							
<b>Programming Response Time</b>								
Rise Time:Full Load	60ms	60ms	25ms (30% F.S. CC Load)	8ms	10ms	60ms	60ms	25ms(50% F.S. CC Load)
Rise Time:No Load	60ms	60ms	25ms	8ms	10ms	60ms	60ms	25ms
Fall Time: Full Load	60ms	60ms	25ms (50% F.S. CC Load)	8ms	10ms	60ms	60ms	25ms(50% F.S. CC Load)
Fall Time: 10% Load	250ms	250ms	120ms (10% F.S. CC Load)	100ms	625ms	250ms	250ms	80ms(10% F.S. CC Load)
Fall Time: No Load	2.5s	2.5s	3s	1s	2.5s	2.5s	2.5s	3s
<b>Slew Rate Control</b>								
Voltage slew rate range	0.001V/ms ~7.5V/ms	0.001V/ms ~10V/ms	0.001Vms~ 40V/ms	0.001V/ms ~5V/ms	0.001V/ms ~10V/ms	0.001V/ms ~7.5V/ms	0.001V/ms ~10V/ms	0.001V/ms ~40V/ms
Current slew rate range	0.001A~0.1A/ms, or INF							
Min. transition time	0.5ms							
<b>Transient Response Time</b>								
	Recovers within 1ms to +/- 0.75% of steady-state output for a 50% to 100% or 100% to 50% load change(1A/μs)							
Efficiency (Typical)	0.87	0.87	0.85	0.87	0.92	0.87	0.87	0.87
<b>Drift (30 minutes)</b>								
Voltage	0.04% of Vmax							
Current	0.06% of Imax							
<b>Drift (8 hours)</b>								
Voltage	0.02% of Vmax							
Current	0.04% of Imax							
<b>Temperature Coefficient</b>								
Voltage	0.04% of Vmax/°C							
Current	0.06% of Imax/°C							

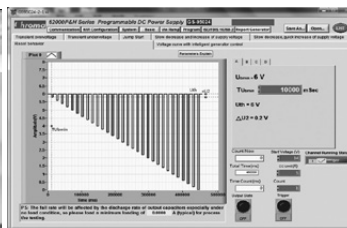
## Soft Panel



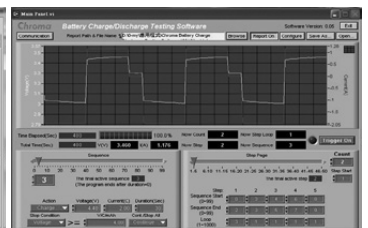
Program Sequences Function



ISO 16750-2 Standard for Voltage Transient Test



GS-95024 Standard for Voltage Transient Test



Battery Charge Test

GENERAL SPECIFICATIONS				
<b>Programming &amp; Measurement Resolution</b>				
Voltage (Front Panel )	0.1mV / 1mV / 10mV / 100mV (Vo < 10V / 100V / 600V / 1000V)			
Current (Front Panel)	0.1mA / 1mA / 10 mA (Io < 10A / 100A / 1000A)			
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			
<b>Remote Interface</b>				
Analog programming	Standard			
USB	Standard			
RS-232	Standard			
RS485	Standard			
GPIO	Optional			
Ethernet	Optional			
System BUS(CAN)	Standard for master/slave control			
<b>Programming Accuracy</b>				
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			
<b>GPIO Command Response Time</b>				
Vout setting	GPIO send command to DC source receiver <20ms			
Measure V & I	Under GPIO command using Measure <25ms			
<b>Analog Interface (I/O)</b>				
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			
<b>Series &amp; Parallel Operation</b>	Master / Slave control via CAN for 10 units up to 150KW. (Series: two units / Parallel: ten units )			
<b>Auto Sequencing(List Mode)</b>				
Number of program	10			
Number of sequence	100			
Dwell time Range	5ms - 15000S			
Trig. Source	Manual / Auto / External			
<b>Auto Sequencing (Step Mode)</b>				
Start voltage	0 to Full scale			
End voltage	0 to Full scale			
Run time	10ms - 99hours			
<b>Input Specification</b>				
AC input voltage 3phase , 3 wire + ground	3Ø 200~220Vac ± 10% VLL 3Ø 380~400Vac ± 10% VLL 3Ø 440~480Vac ± 10% VLL			
AC frequency range	47-63 Hz			
Max Current (each phase)	200/220 Vac	5KW Model : 39A	10KW Model : 69A	15KW Model : 93A
	380/400 Vac	5KW Model : 22A	10KW Model : 37A	15KW Model : 50A
	440/480 Vac	5KW Model : 19A	10KW Model : 32A	15KW Model : 44A
<b>General Specification</b>				
Maximum Remote Sense Line Drop Compensation	<100V model: 5% of full scale voltage per line(10% total) >100V model :2% of full scale voltage per line (4% total)			
Operating Temperature Range	0°C ~ 50°C *2			
Storage Temperature Range	-40°C ~ +85°C			
Dimension (HxWxD)	132.8 x 428 x 610 mm / 5.23 x 16.85 x 24.02 inch			
Weight	5KW Model : Approx. 23 kg / 50.66 lbs 10KW Model : Approx. 29 kg / 63.88 lbs *3 15KW Model : Approx. 35 kg / 77.09 lbs			

**Note\*1** : Preliminary specification for Model 62000H-100P

**Note\*2** : The operating temperature range is 0°C ~ 40°C for Model 62100H-1000/62150H-1000

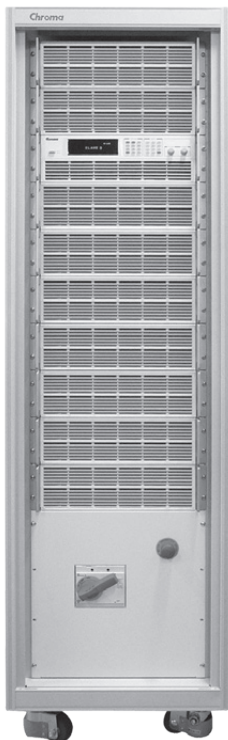
**Note\*3** : The weight is approx. 35kg/77.09 lbs for Model 62100H-1000



## Solar Array Simulator

### KEY FEATURES

- Voltage range : 0 ~150V/600V/1000V/1800V
- 3U/15kW high power density module with easy master/slave parallel operation up to 1.5MW
- 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 (4096 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
- 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
- Support up to ten-channel SAS control for multi-MPPT testing
- Build-in dynamic MPPT test profile of EN50530, Sandia, CGC/GF004, CGC/GF035, NB/T 32004



Master/Slave Parallel Operation - 150kW

All specifications are subject to change without notice.



The latest programmable solar array simulator power supply 62000H-S Series released by Chroma provide simulation of Voc (open circuit voltage) up to 1000V and Isc (short circuit current) up to 25A. 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%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 62000H-S Series 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-S 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.

### ORDERING INFORMATION

Power Rating	62000H-S Series Programmable DC Power Supply
2kW	<b>62020H-150S</b> : Programmable DC Power Supply 150V/40A/2kW with Solar Array Simulation
5kW	<b>62050H-600S</b> : Programmable DC Power Supply 600V/8.5A/5kW with Solar Array Simulation
10kW	<b>62100H-600S</b> : Programmable DC Power Supply 600V/17A/10kW with Solar Array Simulation
15kW	<b>62150H-600S</b> : Programmable DC Power Supply 600V/25A/15kW with Solar Array Simulation
	<b>62150H-1000S *4</b> : Programmable DC Power Supply 1000V/15A/15kW with Solar Array Simulation
Options	<b>A620024</b> : GPIB Interface for 62000H series (Factory installed)
	<b>A620025</b> : Ethernet Interface for 62000H series (Factory installed)
	<b>A620026</b> : 19" Rack Mounting kit for 62000H series
	<b>A620027</b> : Parallelable Power Stage 15kW for 62150H-600S
	<b>A620028</b> : Parallelable Power Stage 15kW for 62150H-1000S
	<b>A620029</b> : Control and Supervisor Unit for 150kW~1.5MW
	<b>A620030</b> : 19" Rack (41U) for 62000H-S series (380Vac input)
	<b>B620000</b> : 19" Rack Mounting Kit for 62020H-150S (2U)

**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~1.5MW.

**Note \*3** : All models output power are available for 200/220Vac, 380/400Vac and 440/480Vac line voltage.

**Note \*4** : Customized output voltage up to 1800V



Model 62020H-150S



Parallelable Power Stage  
A620027/A620028

• Continued on next page →

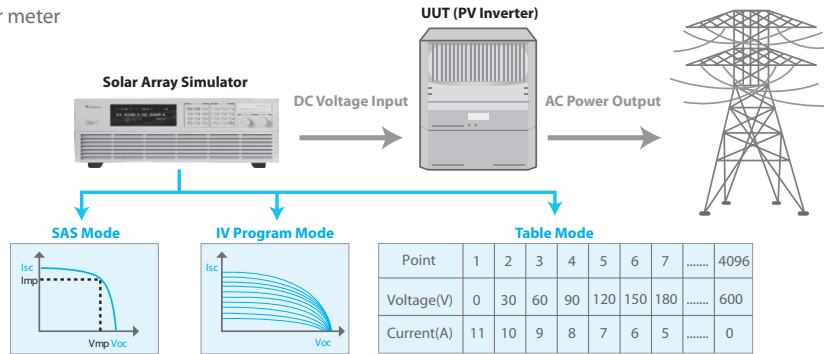


## Solar Array I-V Curve Simulation Power Supply

The Model 62000H-S Series has a built in EN50530/Sandia 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 testing:

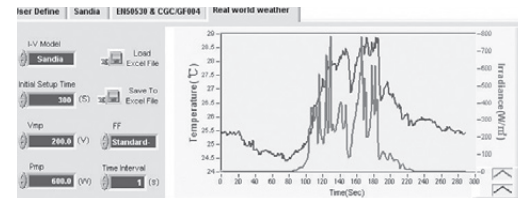
- Design and verify the maximum power tracking circuit and algorithm of the PV inverter
- Verify the high/low limit of operating input voltage allowed for the PV inverter.
- Verify the high/low limit of operating input voltage allowed for the inverter's maximum power point
- Verify the static maximum 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, CGC/GF004, CGC/GF035, and NB/T 32004)
- 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

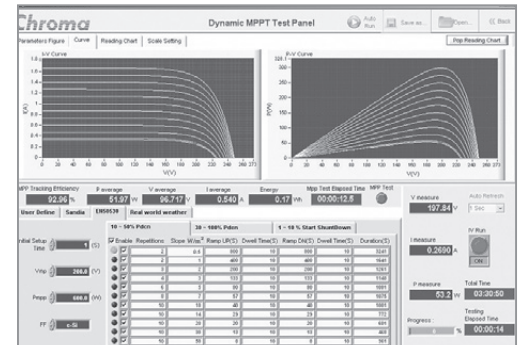
The real world weather simulation function allows the user to import real conditions of irradiation and temperature profiles of a whole day from excel file to Softpanel, in order to simulate the irradiation intensity and temperature level from early morning to nightfall. It can also set the interval 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 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 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.



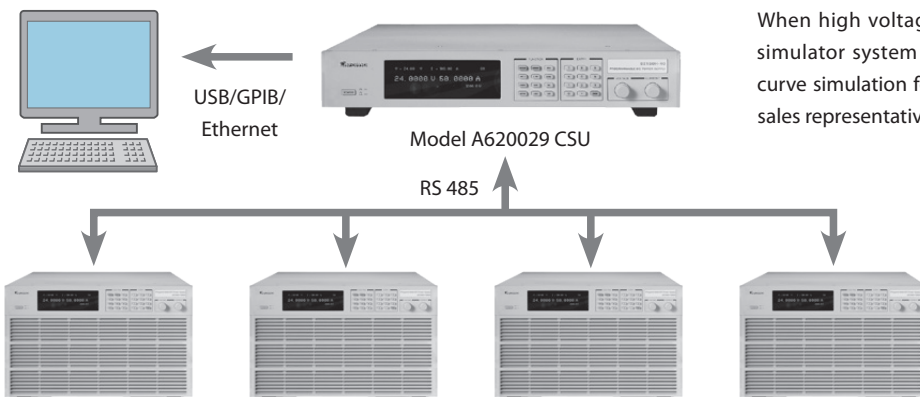
Solar Array Simulation SoftPanel

## 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 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.

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

## Customization solar array simulator 1800V/60A/108kW



### Note :

When high voltage 1800V is required, the customized solar array simulator system of 1800V/60A/108kW which can provide the I-V curve simulation for PV Inverter testing, please contact with Chroma sales representative for detailed information.

ELECTRICAL SPECIFICATIONS-WITH SOLAR ARRAY SIMULATION					
MODEL	62020H-150S	62050H-600S	62100H-600S	62150H-600S	62150H-1000S
<b>Output Ratings</b>					
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
<b>Line Regulation</b>					
Voltage	+/- 0.01% F.S.				
Current	+/- 0.05% F.S.				
<b>Load Regulation</b>					
Voltage	+/- 0.05% F.S.				
Current	+/- 0.1% F.S.				
<b>Voltage Measurement</b>					
Range	60V / 150V	120V / 600V	120V / 600V	120V / 600V	200V / 1000V
Accuracy	0.05% + 0.05%F.S.				
<b>Current Measurement</b>					
Range	16A / 40A	3.4A / 8.5A	6.8A / 17A	10A / 25A	6A / 15A
Accuracy	0.1% + 0.1%F.S.				
<b>Output Noise&amp;Ripple</b>					
Voltage Noise(P-P)	450 mV	1500 mV	1500 mV	1500 mV	2550 mV
Voltage Ripple(rms)	65 mV	650 mV	650 mV	650 mV	1950 mV
Current Ripple(rms)	80 mA	150 mA	300 mA	450 mA	270mA
<b>OVP Adjustment Range</b>					
Range	0-110% programmable from front panel, remote digital inputs.				
Accuracy	+/- 1% of full-scale output				
<b>Programming Response Time</b>					
Rise Time: 50%F.S. CC Load	10ms (6.66A loading)	30ms	30ms	30ms	25ms
Rise Time: No Load	10ms	30ms	30ms	30ms	25ms
Fall Time: 50%F.S. CC Load	10ms (6.66A loading)	30ms	30ms	30ms	25ms
Fall Time: 10%F.S. CC Load	83ms (1.33A loading)	100ms	100ms	100ms	80ms
Fall Time: No Load	300ms	1.2s	1.2s	1.2s	3s
<b>Slew Rate Control</b>					
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	Recovers within 1ms to +/- 0.75% of steady-state output for a 50% to 100% or 100% to 50% load change(1A/us)				
Efficiency	0.77 (Typical)	0.87 (Typical)			
<b>Programming &amp; Measurement Resolution</b>					
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				
<b>Programming Accuracy</b>					
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				
<b>Parallel Operation*1</b> Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )					
<b>Auto Sequencing (I-V program)</b>					
Number of program	10				
Number of sequence	100				
Dwell time Range	1s - 15,000S				
Trig. Source	Manual / Auto				

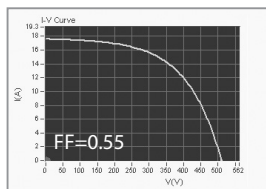
**Note\*1** : Max. Power is 20kW for 62020H-150S

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

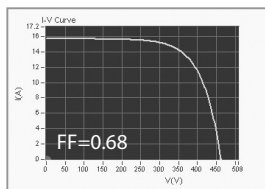
**Note\*3** : None APG interface for A620027/A620028

GENERAL SPECIFICATIONS						
MODEL	62020H-150S	62050H-600S	62100H-600S	62150H-600S	62150H-1000S	
<b>Remote Interface</b>						
Analog programming					Standard	
USB					Standard	
RS232					Standard	
RS485					Standard	
GPIB					Optional	
Ethernet					Optional	
System bus(CAN)					Standard for master/slave control	
<b> GPIB Command Response Time</b>						
Vout setting					GPIB send command to DC source receiver <20ms	
Measure V&I					Under GPIB command using Measure <25ms	
<b>Analog Interface (I/O) *3</b>						
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	
<b>Auto Sequencing(List Mode)</b>						
Number of program					10	
Number of sequence					100	
Dwell time Range					5ms - 15000S	
Trig. Source					Manual / Auto / External	
<b>Auto Sequencing (Step Mode)</b>						
Start voltage					0 to Full scale	
End voltage					0 to Full scale	
Run time					10ms - 99hours	
<b>Input Specification</b>						
AC Input Volatage 3Phase, 3Wire+Ground	1Ø 200~220Vac ± 10% V <sub>LN</sub>				3Ø 200~220Vac ± 10% V <sub>LL</sub> 3Ø 380~400Vac ± 10% V <sub>LL</sub> 3Ø 440~480Vac ± 10% V <sub>LL</sub>	
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
<b>General Specification</b>						
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. 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	
Approval	CE	CE	CE	CE	CE	

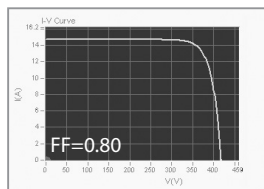
**Note\*3** : None APG interface for A620027/A620028



Thin-Film



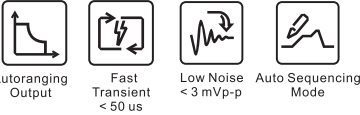
Standard Crystalline Array



High-efficiency Crystalline



Model 62010L-36-7



### KEY FEATURES

- Voltage range: 0 ~ 60V
- Current range: 0 ~ 7A
- Power range: 0 ~ 150W
- Wide range of voltage & current combinations
- Clean and stable power with programmability at an affordable price
- Low noise: < 3mVp-p
- High transient response time: < 50us
- High-speed programming
- Precision V&I measurements
- Standard GPIB/USB interface
- Remote sense (Model 62010L-36-7 only)
- Master-slave parallel and serial control (Model 62010L-36-7 only)
- 8 steps for auto sequencing programming
- 16 storage locations for user-defined operating states
- OVP, Current limit, Thermal protection
- CE Certified

### APPLICATIONS

- Laboratory and system integration
- Automotive electronic components
- University and 3C products
- Mobile, IC driving power, wireless and communication power
- Low noise for aircraft application



Model 62015L-60-6

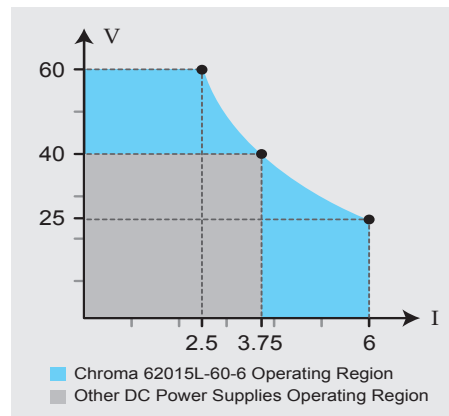
The Chroma 62000L Series Programmable DC power supplies have low noise linear performance and fast transient response. The units have many unique functions that are targeted for overall automated test system integration, automotive power electronics MCU/ECU, power semiconductors, wireless communications, etc. and are configured with both GPIB and USB as standard interfaces.

The 62000L Series is a high quality yet cost effective programmable DC Source, designed to meet the stringent requirements of the next generation of power electronics.

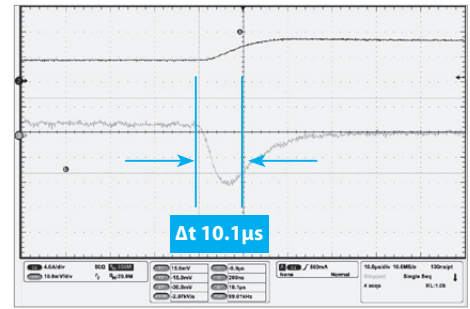
The GPIB and USB control interfaces are built into the 62000L Series, no additional purchase required. The 62000L Series can be easily remote controlled via either of these two interfaces. The 62000L weighs less than 2.5 kg, and its case measures W214.6xH88.6xD280.7mm. Its light weight and compact size makes it easy to handle and stack the device safely.

Auto-ranging allows you to freely adjust voltage and current. This feature eliminates the need to manually select the optimum range allowing all of the power to be available across all of the voltage and current settings.

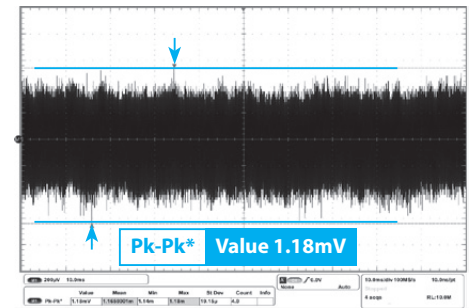
If you have applications that need voltages and currents greater than the rated maximum outputs, you can achieve this using multiple power supplies. The power supply can output an extended range of voltages or currents by connecting more units. Up to 7 units can be connected at the same time, using a series-parallel connection to achieve greater voltage (up to 252V) and current (up to 49A) output.



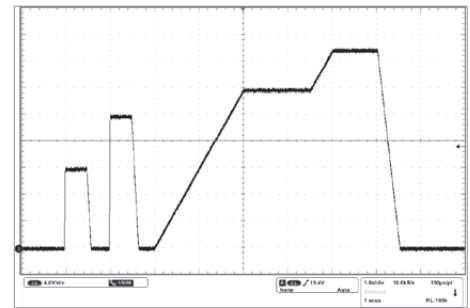
Auto Ranging Output



Fast Transient



Low Noise



Auto Sequencing Mode

### ORDERING INFORMATION

- 62010L-36-7** : Programmable DC Power Supply 36V/7A/108W with GPIB & USB Interface
- 62015L-60-6** : Programmable DC Power Supply 60V/6A/150W with GPIB & USB Interface
- B620001** : 62000L Series (2U model x 1)



<b>ELECTRICAL SPECIFICATIONS</b>		
<b>Model</b>	<b>62010L-36-7</b>	<b>62015L-60-6</b>
<b>Output Ratings</b>		
Output Voltage	0~36V	0~60V
Output Current	0~7A	0~6A
Output Power	108W	150W
<b>Line Regulation</b>		
Voltage	0.01%+2mV	0.01%+2mV
Current	0.01%+250uA	0.01%+250uA
<b>Load Regulation</b>		
Voltage	< 0.01%+2mV	< 0.01%+2mV
Current	< 0.01%+250uA	< 0.01%+250uA
<b>Output Noise &amp; Ripple</b>		
Voltage Noise (p-p)	< 2mVp-p	< 3mVp-p
Voltage Ripple (rms)	< 0.35mVrms	< 0.5mVrms
Current Ripple (rms)	< 2mArms	< 2mArms
<b>Transient Response Time</b>		
100% to 50% load change	< 30usec	< 50usec
<b>Temperature Coefficient</b>		
Voltage	0.01%+3mV	0.01%+10mV
Current	0.02%+3mA	0.02%+3mA
<b>Drift</b>		
Voltage	0.02%+1mV	0.05%+10mV
Current	0.1%+1mA	0.15%+2mA
<b>Programming &amp; Measurement Resolution</b>		
Voltage (Front Panel)	1mV	10mV
Current (Front Panel)	0.1mA	1mA
Voltage (Remote Interface)	1mV	1mV
Current (Remote Interface)	0.1mA	0.21mA
Voltage (Analog Programming Interface)	1mV	1mV
Current (Analog Programming Interface)	0.21mA	1mA
<b>Programming Accuracy</b>		
Voltage (Front Panel & Remote Interface)	0.05%+5mV	0.05%+5mV
Current (Front Panel & Remote Interface)	0.15%+5mA	0.15%+5mA
Voltage (Analog Programming Interface)	0.05%+10mV	0.05%+10mV
Current (Analog Programming Interface)	0.2%+10mA	0.2%+10mA
<b>Programming Response Time</b>		
Rise Time (Full Load)	< 40ms	< 100ms
Rise Time (No Load)	< 20ms	< 35ms
Fall Time (Full Load)	< 40ms	< 50ms
Fall Time (No Load)	< 400ms	< 500ms
Measure Voltage, Current (under GPIB command using Measure)	< 20ms	< 20ms
AC Input Operating Voltage Range	100~240Vac, 47~63 Hz	
Interfaces	USB & GPIB standard	
Dimension (H x W x D)	88.6 x 214.6 x 280.7 mm / 3.49 x 8.45 x 11.05 inch	
Weight	< 2.5 kg / 5.5 lbs	



For continuous operation applications the modular hot-swap design allows engineers to replace the failure unit on-site without shutting down the entire system.



### KEY FEATURES

- Voltage range: 1 ~ 150V
- Current range: 0 ~ 2000A (System)
- Power range: 1.5kW per module up to 120kW per system
- N+1 Redundancy
- High Power Density  
(464 mW / cm<sup>3</sup> = 7.13 W/In<sup>3</sup>)
- Hot-swappable
- Remote Sense
- Remote ON / OFF
- CAN BUS Control
- DC OK Signal Output

Chroma's new 62000B series of Modular DC Power Supplies offer many unique features for Burn-in and plating applications. The features include a N+1 redundancy, high power densities, hot-swappable maintenance, remote ON/OFF and programmable control via the CAN BUS.

The 62000B family offers 5 types of power module with ranging from 1V to 150V, current from 10A to 90A, and offers two mainframe type of six and three position. The six position mainframe can envelop in up to six power modules paralleled operation for 9KW power output. The 62000B can easily parallel up to fourteen mainframe to 120KW with current sharing and CAN BUS control for bulk power applications.

The Modular DC Power Supplies of 62000B are very cost effective with high power density and low current ripple. These instruments have been designed for burn-in applications such as DC-DC converters, power inverters, telecom powers, battery chargers and many other types of electronic devices.

Modern power factor correction circuitry is incorporated in 62000B providing an input power factor above 0.98 to meet the IEC requirements. This PFC correction circuitry not only reduces the input current but also raises the operating efficiency to over 80% Optional graphic SoftPanels and CAN BUS control allow for control and monitoring of the power system using an easy to use graphical interface.

### Hot-swap Operation

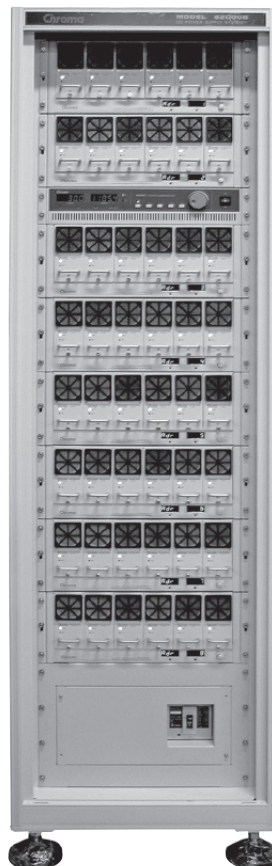
Equipped with the functionality of N+1 redundancy and hot-swap, the 62000B Series of modular DC power supplies are most applicable for 24 hours non-stop applications such as the SMD plating production lines, as well as product life burn-in test for IT products like DC converters, inverters, fans, motors, switch components, and routers.

### High Power Applications with CSU

The 62000B modular power supplies are capable of providing high power output up to 120KW/2000A with minimum specification degradation via CSU(Control & Supervisor Unit). Each chassis is designed to accommodate a maximum of 9KW and include current sharing capability to ensure system stability. In addition, for convenient control of even large power systems, a Control & Supervisor unit is provided to set and display output and protection circuits via a standard CAN BUS communication protocol.



Control & Supervisor Unit



Customized Power Solution

### ORDERING INFORMATION

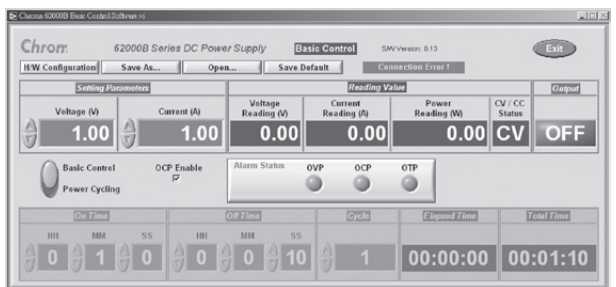
- 62000B-3-1** : Three Position 62000B Mainframe
- 62000B-6-1** : Six Position 62000B Mainframe
- 62015B-15-90** : DC Power Supply Module, 15V/90A/1350W
- 62015B-30-50** : DC Power Supply Module, 30V/50A/1500W
- 62015B-60-25** : DC Power Supply Module, 60V/25A/1500W
- 62015B-80-18** : DC Power Supply Module, 80V/18A/1440W
- 62015B-150-10** : DC Power Supply Module, 150V/10A/1500W
- A620007** : Control & Supervisor Unit
- A620008** : CAN BUS Interface for mainframe
- A620010** : Rack Mounting Kit for mainframe
- A620011** : Ethernet Interface for CSU
- A620012** : AD-Link PCI 7841 CAN BUS Card
- A620013** : 19" Rack (23U) for 62000B Series
- A620014** : 19" Rack (41U) for 62000B Series
- A620016** : Rack Mounting Kit for CSU
- A620017** : Softpanel for 62000B Series
- A620018** : NI USB-8473 high-speed USB to CAN interface
- A620019** : USB Interface Control Box for mainframe & CSU
- A620020** : GPIB Interface Control Box for mainframe & CSU
- A620021** : Analog Interface Control Box for mainframe
- A620022** : RS-485 Interface Control Box for mainframe & CSU

### AVAILABLE POWER RATINGS

Current Rating Voltage Rating	Power Rating	9KW	18KW	27KW	36KW	45KW
		15V	540A	1080A	1620A	2160A
30V	300A	600A	900A	1200A	1500A	
60V	150A	300A	450A	600A	750A	
80V	108A	216A	324A	432A	540A	
150V	60A	120A	180A	240A	300A	

Paralleled unit of mainframe

Note : Call for more information on customization of high power system (>2000A)



Softpanel for Model 62000B Series

Video & Color  
Flat Panel Display  
Lighting  
LED/  
Optical Devices  
Photovoltaic test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation

SPECIFICATIONS					
Model	62015B-15-90	62015B-30-50	62015B-60-25	62015B-80-18	62015B-150-10
<b>Electrical Specifications</b>					
<b>Output Ratings</b>					
Output Power	1350W	1500W	1500W	1440W	1500W
Output Voltage	1~15V	1~30V	1~60V	1~80V	1~150V
Output Current	1~90A	1~50A	1~25A	1~18A	1~10A
<b>Line Regulation</b>	0.1% F.S.				
<b>Load Regulation *1</b>	1% F.S.				
<b>Programming Accuracy</b>	1% F.S.				
<b>Measurement Accuracy</b>	1% F.S.				
<b>Output Noise (20MHz)</b>					
Voltage Noise (P-P)	100mV	100mV	200mV	200mV	400mV
Voltage Ripple (rms)	30mV	30mV	50mV	50mV	100mV
Current Ripple (rms)	0.9A	0.5A	0.25A	0.18A	0.1A
<b>Efficiency</b>	> 87% @ full load	> 88% @ full load			
<b>Turn on over shoot voltage *2</b>	5% of nominal output				
<b>Transient Response Time *3</b>	< 5 ms				
<b>AC Input Voltage</b>					
Six Position Mainframe	3Ø 200~240Vac ± 10% V <sub>LL</sub> or 3Ø 380~400Vac ± 10% V <sub>LL</sub> , 47~63 Hz				
Three Position Mainframe	1Ø 200~240Vac ± 10% V <sub>LN</sub> , 47~63 Hz				
Input Power Factor	> 0.98@ full load				
<b>Protection Function</b>					
OVP	Automatically shuts down at 115% of set value				
Adjustment Range	1~16V	1~31V	1~65V	1~83V	1~155V
OCP	Current limit (0 ~ 100%) / OCP Shutdown at 115% of F.S.				
OTP	Automatically shuts down if internal limit is reached				
<b>I/O Signal</b>					
Remote ON/OFF (I/P)	Dry contact (closed = enabled), vice versa				
AUX Voltage	4 ~ 24V / 0.5A at mainframe (by trimmer adjust voltage)				
DC OK Signal Type (O/P)	Dry contact (closed = enabled) (Error : OVP / OCP / OTP / AC Fault)				
<b>Programming Response Time *4 (Typical)</b>					
Rise Time (Full Load)	For a programmed 5% to 95% step in output voltage : 100ms				
Rise Time (No Load)	For a programmed 5% to 95% step in output voltage : 100ms				
Fall Time (Full Load)	For a programmed 95% to 5% step in output voltage : 40ms				
Fall Time (No Load)	For a programmed 95% to 5% step in output voltage : 5s				
Vout Setting	CAN BUS send command to DC module receiver : 1s				
Measurement V & I	Under CAN command using fetch : 100ms				
Delay Time	For output ON/OFF enable and disable (under CAN command) : 5s(Single Mainframe)				
<b>General Specifications</b>					
<b>Remote Sensing</b>	3V max. line loss compensation				
<b>Parallel Operation</b>	Current Sharing (± 5%)				
<b>Operating Temperature</b>	0 ~ 50°C				
<b>Humidity Range</b>	0 ~ 90% RH. Non-condensing				
<b>Remote Interface</b>	CAN BUS (optional)				
<b>Safety &amp; EMC</b>	CE				
<b>Dimension (H x W x D)</b>	Mainframe : 175.6 x 443.9 x 466.2 mm / 6.91 x 17.48 x 18.35 inch (62000B-6-1) Mainframe : 175.6 x 239.9 x 466.2 mm / 6.91 x 9.44 x 18.35 inch (62000B-3-1) Module : 138.5 x 67.5 x 377.5 mm / 5.45 x 2.66 x 14.86 inch				
<b>Weight</b>	Mainframe : 14 Kg / 30.8 lbs (62000B-6-1) Mainframe : 8 Kg / 17.6 lbs (62000B-3-1) Module : 4 Kg / 8.8 lbs				

**Note\*1** : For 50% step load variation with remote sense at maximum output voltage

**Note\*2** : based on rise time of 100ms

**Note\*3** : Time for the output voltage to recover within 1% of its rated for a load changed of 25%

**Note\*4** : Six Position Mainframe through CAN



## KEY FEATURES

- Open architecture software platform
  - Support instrument with GPIB / RS-232 or RS-485 / I<sup>2</sup>C / CAN BUS interfaces
  - User editable test item
  - User editable test program
  - User editable report format
  - Statistical report
  - On-line control function
  - User authority control
  - Release control
  - Activity log
  - Master / Slave control mode
  - Multi-UUT test capability for single-output PSU
  - Support bar code reader
  - Support Shop-floor control
  - Remote monitoring via internet
- Test command optimizer helps to improve test speed
- Capable of coding for any power supply testing applications
- Comprehensive hardware modules provide high accuracy and repetitive measurements
- High test throughput by system default test items
- Cost effective
- Other hardware expandable upon request
- Windows 98/NT/2000/XP/7 based software

This auto test system uses the unique test command optimization technology to prevent the repeating control commands from sending to the system hardware devices. This improves the system test speed dramatically and makes Chroma 8000, which uses open software architecture, highly efficient as a close or optimized auto test system.

To meet the power supply test requirements, Chroma Power Supply Auto Test System model 8000 has built in 56 ready-made test items. Users may create new test items based on new test requirements using the test item editing function, which gives users the capability to expand the test items unlimitedly.

All specifications are subject to change without notice.

With the powerful report, statistic and management functions, Chroma Power Supply Auto Test System model 8000 is able to provide complete tools to generate various test documents and perform system administration. Because the test and statistical reports are equally important nowadays for R/D evaluation, QA verification and mass production tests. So these save users a great deal of time for paper work.

Working under Windows 98/NT/2000/XP/7 operation system, Chroma 8000 Power Supply Auto Test System is able to get all the resources provided by Windows; thus, it can easily export the test results to network or to your web-page for remote manufacturing monitoring.

## COMPREHENSIVE TEST ITEMS OUTPUT PERFORMANCES

1. DC output voltage
2. DC output current
3. Peak-Peak noise
4. RMS noise
5. Current ripple\*
6. Efficiency
7. In-test adjustment
8. Power good signal
9. Power fail signal
10. P / S ON signal
11. Extended measure
12. Waveform capture
13. Overshoot voltage

## INPUT CHARACTERISTICS

14. Input Inrush current
15. Input RMS current
16. Input peak current
17. Input power
18. Current harmonics against regulations
19. Input power factor
20. Input voltage ramp
21. Input freq. ramp
22. AC cycle drop out
23. PLD simulation

## REGULATION TESTS

24. Current regulation
25. Voltage regulation
26. Total regulation

## TIMING AND TRANSIENT

27. Power up sequence
28. Power down sequence
29. Transient response time
30. Transient spike
31. Turn ON time
32. Rise time
33. Fall time
34. Hold-up time
35. Extra timing
36. Tracking

## PROTECTION TESTS

37. Short circuit
38. OV protection
39. UV protection
40. OL protection
41. OP protection

## SPECIAL TESTS

42. Fan speed
43. Correlation test
44. UUT measurement verification test

## SPECIAL FEATURE

45. Can BUS read/ write
46. I<sup>2</sup>C read/ write\*
47. GPIB read/ write
48. RS-232 read/ write
49. RS-485 read/ write\*
50. TTL signal control
51. Relay control
52. Bar code scan\*
53. DMM measure

\* These test items need to be created by users by using test item editor due to the variety of the UUTs, and unlimited customized or user defined test items are allowed.

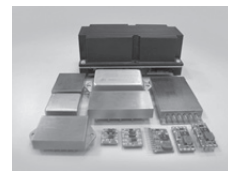
## DC to DC Converter Testing

**Software:** Special Design Test Items (Load Fault Power Dissipation Test, Switching Frequency Test, Synchnization Frequency Test)

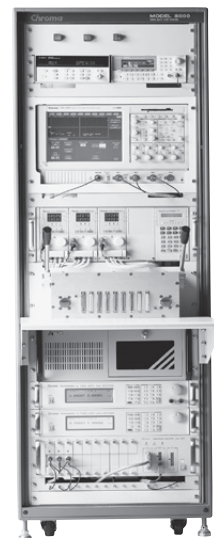
**Hardware:** Create Standard Test Fixture platform (Receiver)



DC to DC Converter Test Fixture



DC to DC Converter



DC to DC Converter ATS



## PV Inverter Testing

The Chroma 8000 ATS is equipped with optimized standard test items for PV inverters (the Unit Under Test). It meets IEEE1547, 1547.1, UL1741, GB/T 19939, CGC/GF004 preliminary test requirements. The user is only required to define the test conditions and specifications for the standard test items to perform the test.

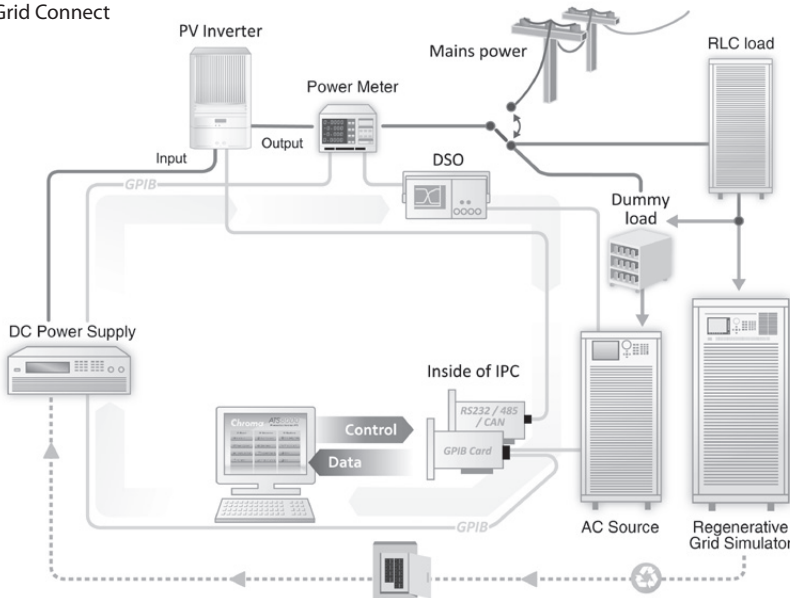


PV Inverter ATS

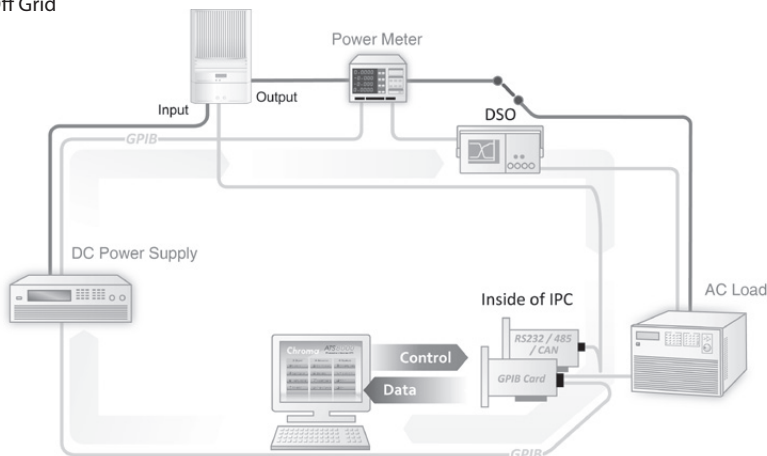
Micro Inverter ATS  
(Rapid 4 DUTs Parallel Test)

## Grid Connected PV Inverter Test Block Diagram

Grid Connect



Off Grid



## Optimized Equipment & Test Items

The optimized test item covers 5 types of power supply test requirements. The OUTPUT PERFORMANCE test verifies the output characteristics of the UUT. The INPUT CHARACTERISTIC test checks the UUT input parameters. TIMING & TRANSIENT tests the timing and transient states during protection. The PROTECTION TESTS trigger and test the protection circuit, the SPECIAL TEST provides means to test the most sophisticated UUT when unique test routines are needed.

## Output Performances

1. Output Voltage
2. Output Current
3. Output Power
4. Output Power Factor
5. EFF (CEC/European/Conversion/Max)
6. DC injection Current
7. THD
8. Current Harmonic Test
9. Night Time Power Consumption

## Input Characteristics

10. Input Voltage
11. Input MPPT Voltage
12. Input Current
13. Input Power
14. Input MPPT Power

## Timing & Transient

15. OVP/UVF Trip Time
16. OFP/UFV Trip Time
17. Anti-Islanding Trip Time \*
18. Re On-Grid Time

## Protection Tests

19. OV/UV Protection
20. OF/UF Protection
21. Anti-Islanding \*

## Special Tests

22. MPPT Efficiency
23. MPPT Time
24. MPPT Record
25. RS232/485/CAN communication

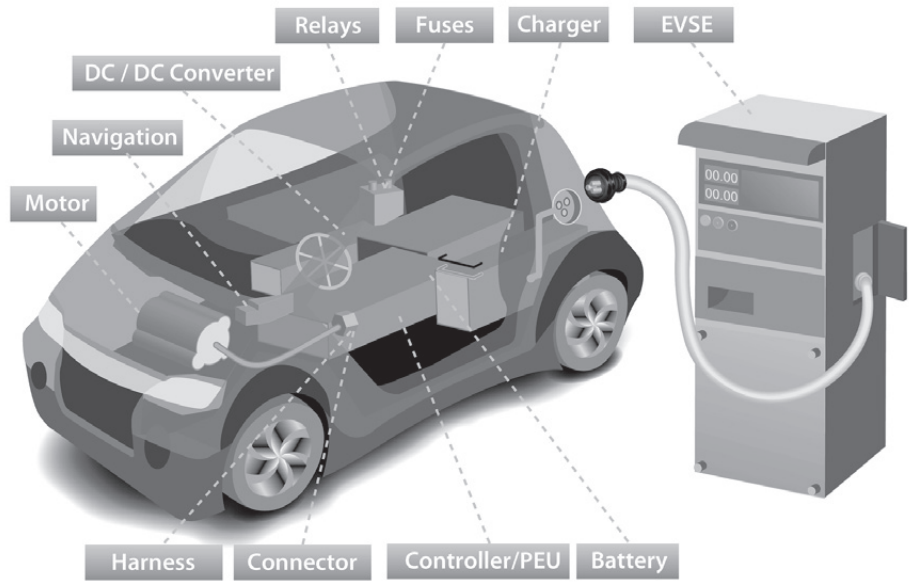
\* The A800067 RLC load is required. This system can test automatically and meet regulations of multiple anti-islanding protection test conditions to save test time. It not only fits R&D and QC, but also very suitable for production line.

## EV Power Electronics Test Solutions

The power conversion section of the EV/HEV is composed of several power electronic units, which include the AC or DC EVSE (EV Supply Equipment), on-board charger, DC/DC converter, motor driver, etc. The Chroma 8000 addresses the specialized requirements involved in testing the power electronics during not only the development phase, but also the production phase.

The following pictures of the Chroma ATS show some applications for EV/HEV. The system will not only perform the tests and report it to an isolated PC, but it will also network to the shop-floor (MES) system for production line for data log-in, analysis and monitoring.

## Power Electronics Devices in Electric Vehicle



## Motor Driver ATS

For EV Motor driver & PCBA testing

- For Motor driver PCBA components voltage/temperature/signal/communication/protection function testing
- For Motor driver over voltage/over current/over temperature protection/ load regulation/ power testing



Motor Driver ATS

## EVSE ATS

It is a customized system based on Chroma 8000 ATS specializing in verification of EV Supply Equipment (EVSE) and complying with SAE-J1772 in programming the test items for operation.

- Meets SAE-J1772, CNS15511, GB/T18487, GB/T27930, GB/T20234, NB/T 33008.1, NB/T 33008.2 standards
- Simulates various AC grid situation and EV charging mode

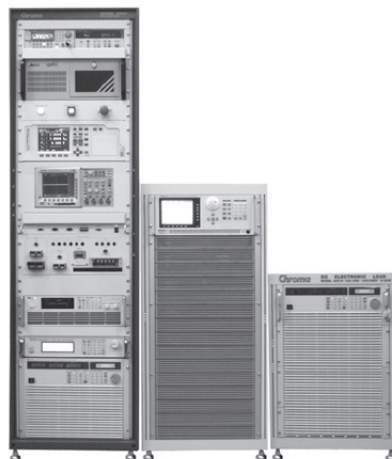


EVSE ATS

## EV OBC & DC-DC Converter ATS

The automated test equipment are customized for EV OBC and DC to DC converter

- Meets all test requirements of EV on-board charger (OBC) and DC to DC converter
- Integrated connecting panels
- Exclusive test items
- Fully complies with QC/T 895 and GB/T 24347 test requirements



OBC & DC-DC Converter ATS

## EV AC/DC Charging Compatibility ATS

- To simulate various states of EVSE to make sure AC/DC charging compatibility before electric vehicle delivery
- Based on the requirements of different regulations to simulate EVSE for testing if electric vehicle can do accurate action or response appropriately when the signal contains error
- Testing response action of electric vehicle for EVSE transmission signal limit value in regulation to make sure the compatibility of miscellaneous EVSE

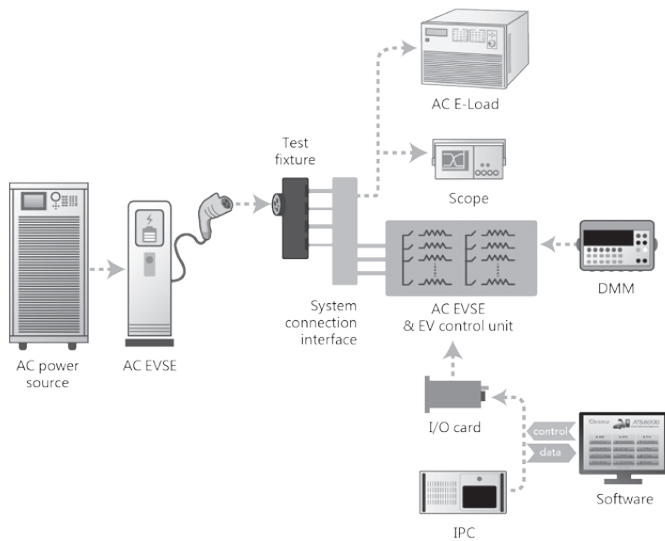


EV AC/DC Charging Compatibility ATS

## Electric Vehicle Supply Equipment testing Structure

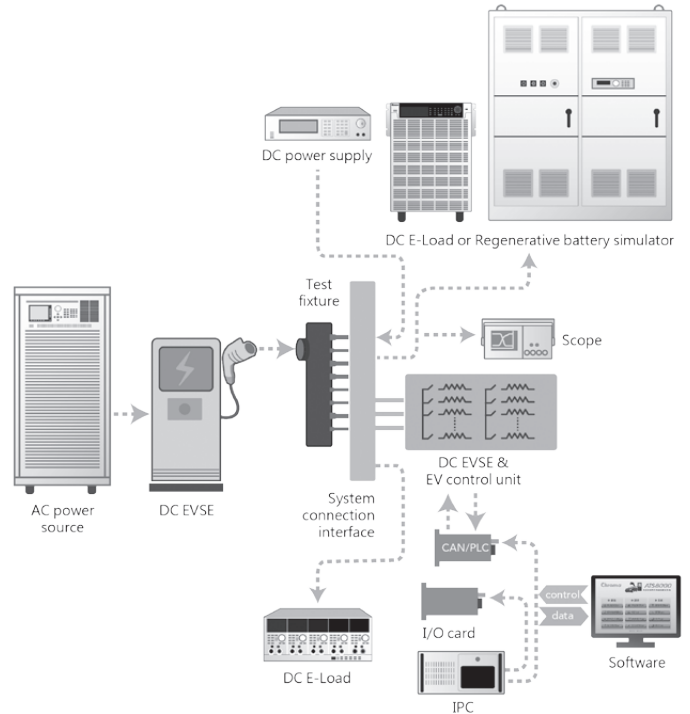
### AC output - AC charging station

AC charging station which delivers AC with lower power rating to the OBC (on board charger) of Electric Vehicle for AC to DC power conversion and the DC power is implemented for charging the Electric Vehicle battery pack.



### DC output - DC charging station

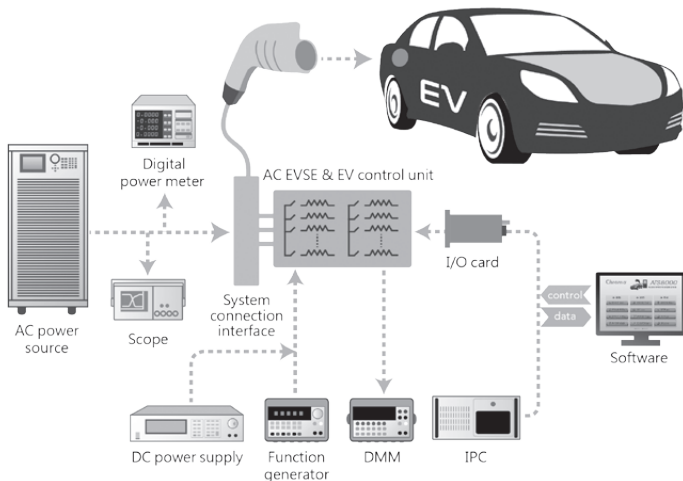
DC charging station which delivers DC in higher power rating with fast charging capability to the Electric Vehicle battery pack directly.



## Electric Vehicle and Charging Station Interoperability Test

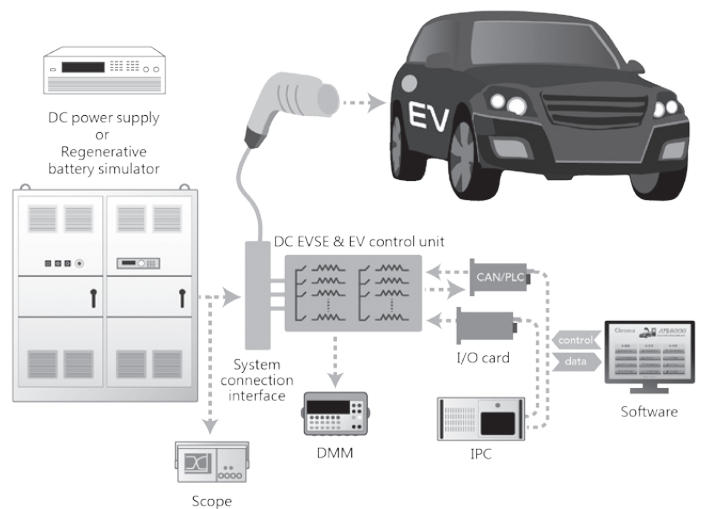
### AC input -

AC charging station simulation for electric vehicle AC charging function testing.



### DC input -

DC charging station simulation for Electric Vehicle DC charging function testing.



## SPECIFICATIONS-1

Accurate and highly reliable hardware devices:

Power Meter				
Model	66201	66202	66203	66204
Measurement Channel	1	1	3	4
Power measurement range	12 ranges	24 ranges	48 ranges	48 ranges
Voltage measurement range	3 ranges	3 ranges	6 ranges	6 ranges
Current measurement range	4 ranges	8 ranges	8 ranges	8 ranges
Front panel display	Yes	Yes	Yes	Yes
Front panel editable	Yes	Yes	Yes	Yes
Harmonics measurement	No	Yes	Yes	Yes

\* Please refer to respective product catalogs for detail specifications.

Electronic Load				
Model	6310A series	6330A series	63200A series	63600 series
Load mode	CC/CR/CV	CC/CR/CV	CC/CR/CV/CP	CC/CR/CV/CP/CZ
Power rating	30-1200W	30-1200W	2000-24000W	100-400W
Voltage range	1-500V	1-500V	1-1200V	1-600V
Current range	Up to 240A	Up to 240A	Up to 2000A	Up to 80A
Slew rate	Up to 10A/μs	Up to 10A/μs	Up to 80A/μs	Up to 8A/μs
Measurements	Voltage/Current/Power	Voltage/Current/Power	Voltage/Current/Power	Voltage/Current/Power
Monitoring output	No	No	Voltage/Current	Voltage/Current
Current share measurement	No	No	No	No
Noise measurement	No	No	No	No
Voltage sense input	Yes	Yes	Yes	Yes
Sync dynamic	No	Yes	Yes	Yes

\* Please refer to respective product catalogs for detail specifications.

AC Source						
Model	6400 series	6500 series	61500 series	61600 series	61700 series	61800 series
Power rating	1500-9000VA	1200-9000VA	500-18000VA	500-18000VA	1500-12000VA	30-60KVA
Voltage range	0-100V/600V	0-300V	0-300V	0-300V	0-300V	0-300V
Output phase	1 or 3 phase	1 or 3 phase	1 or 3 phase	1 or 3 phase	3 phase	3 phase
DC output	No	No	Yes	Yes	Yes	Yes
Output measurement	Yes	Yes	Yes	Yes	Yes	Yes
Harmonic measurement	No	No	Yes	No	No	Yes
Waveform simulation	No	Yes	Yes	No	Yes	Yes
Programmable impedance	No	No	Yes	No	No	No
Harmonic synthesis	No	Yes	Yes	No	Yes	Yes
Inter-harmonic synthesis	No	No	Yes	No	Yes	Yes

\* Please refer to respective product catalogs for detail specifications.

DC Source		
Model	62000P series	62000H series
Power rating	600,1200,2400,5000W	10KW,15KW
Voltage range	0-100V/600V	0-600V/1000V
Programmable current limit	Yes	Yes
Programmable OV point	Yes	Yes
Analog programming	Yes	Yes
Remote sensing	Yes	Yes
Line-drop compensation	5V	10%/4%

\* Please refer to respective product catalogs for detail specifications.

Digital Measurement Card	
Model	A800068
Input DC Voltage Range	6V/30V/120V/500V
Noise Measurement range	500mV/5V/25V
Resolution	10 bit
Bandwidth	100MHz
Filter	HPF : 6Hz, 2KHz LPF : 2k, 10k, 100k, 500k, 1M, 4M, 10M, 20M, 100M Hz
Input Impedance	50 ohm / 0.95M ohm (DC)
AC mode AC Voltage range	20V/150V/300V (rms)
Resolution / Sampling Rate	16 bit / 1MS/s

### Other hardware devices :

- Digital Multimeter (Agilent-34401A / Keithley 2000), other types or brands of DMM supported upon request
- Digital Storage Oscilloscope (Tektronix TDS-1000/2000/3000/5000/7000 series ,DPO-2000/3000/4000/5000/7000 series), other types or brands of DSO supported upon request



## SPECIFICATIONS-2

System Controller	
Model	PC/IPC
CPU	Pentium III 600 or faster
SRAM	256KB
DRAM	512MB or higher
Hard drive	8.3GB or higher
CD-ROM	40X or faster
Monitor	15"
Keyboard	101 keys
I/O	Mouse/Print port
System Interface	GPIO/RS-232
System I/O	DIO Card
GPIO board	NI-PCI GPIO Card

Timing/Noise Analyzer		
Model	80611	80614
NO. of input module	Up to 10	Up to 4
Noise measurement range	2V/0.4V	2V/0.4V
Low Pass Filter	Up to 20MHz	Up to 20MHz
Input circuit	Differential input	Differential input
Timing range	0-64 second	0-64 second
NO. of trigger input	6 sets	6 sets
NO. of comparator	4 Input module	4 Input module
Controllable TTL bits	16 output / 16 input	No
Controllable floating relay	8	6
NO. of multiplex input	10	No
NO. of multiplex output	1 for DMM	No

ON/OFF Controller	
Model	80613
Input	AC/DC
ON/OFF range - AC	0-360 deg
Voltage range - AC	277V
Current range - AC	30A
Voltage range - DC	200V
Current range - DC	60A
Measurement Capability	Internal
Control Interface	RS 485

Short Circuit/OVP Tester	
Model	80612
NO. of input terminal	Up to 6
Short circuit impedance	< 0.05 ohm
Short current measurement	Yes
Sync. Signal for short circuit	6 relay signal
OVP/UVP testing	Internal / External
Internal impedance range	100-1M ohm
External OVP/UVP source	DC source
Measurement Capability	Internal
Control Interface	RS 485

USB PD Tester	
Model	80617
No. of input module	Up to 8
Module Type-C voltage range	5V~20V
Module Type-C current range	0~5A ( for P model)
Dual role Swap capability	Yes ( D model only)
Control interface	USB

## ORDERING INFORMATION

**8000** : Switching Power Supply Auto Test System  
**80611/80614** : Timing/Noise Analyzer  
**80611N** : Timing/Noise module  
**80612** : Short Circuit/OVP Tester  
**80613** : ON/OFF Controller  
**80617** : USB PD Tester  
**80617P** : USB PD Emulator  
**5004ATM** : System Controller  
**A800003** : 8000 software Package

**A800004** : 19" Rack for Model 8000  
**A800005** : PCI BUS GPIO Card (National Instrument)  
**A800027** : Test Fixture for Model 8000  
**A800068** : Digital Measurement Card  
**A806105** : 1200V Attenuator  
**DC Load Module** : 6310A, 63200A, 6330A, 63600 Series  
**Digital Power Meter** : Model 66200 Series  
**AC Source** : Model 6400, 6500, 61500, 61600, 61700, 61800 Series  
**DC Source** : Model 62000H, 62000P Series



### GENERAL TEST ITEMS

1. DC output voltage
2. DC output current
3. Voltage regulation
4. Current regulation
5. Turn ON time
6. Hold-up time
7. Power good signal
8. P/S ON signal
9. Efficiency
10. Input RMS current
11. Input peak current
12. Input power
13. Input power factor
14. Short circuit test
15. Short circuit current
16. OV protection
17. OL protection
18. OP protection
19. In-test adjustment

### LED DRIVER TEST ITEMS

1. LED & Current Harmonics Test
2. LED & Discharge Load Test
3. LED & Hold On Adjust Test
4. LED & Input / Output Test
5. LED & Inrush Current Test
6. LED & Open Voltage Test
7. LED & OVP Test
8. LED & Power Saving Mode Test
9. LED & Regulation Test
10. LED & Short Circuit Test
11. LED & Static Test
12. LED & System Setup

### KEY FEATURES

- User editable test program
- User editable report format
- User authority control
- Release control
- Activity log
- Comprehensive hardware modules provide high accuracy repetitive and measurements
- High test throughput by system default test items
- Cost effective
- Windows 98/NT/2000/XP/7 based software

Chroma Power Supply Auto Test System model 8200 provides complete solution for PC ATX power supply, adapter and battery charger testing. The application oriented system structure makes it the most cost effective test equipment for initial test in power supply production line.

To meet the power supply test requirements, Chroma Power Supply Auto Test System model 8200 has built in 20 ready-made test items. Users can simply enter the test conditions and test the power supply features while proceeding.

With the report and management functions, Chroma Power Supply Auto Test System model 8200 is able to provide versatile tools to establish test documents and perform system administration.

Meanwhile, Chroma Power Supply Auto Test System model 8200 can be upgraded to Chroma model 8000, the ultimate power supply auto test system, to fit the future test needs by changing system software and adding new hardware devices.

### ORDERING INFORMATION

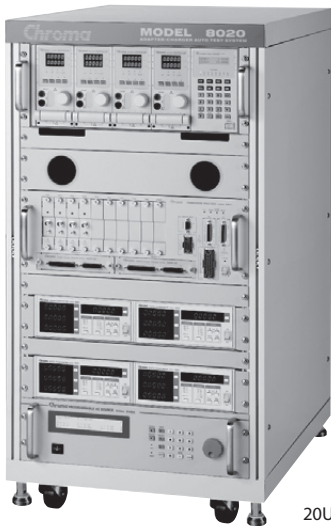
- 8200** : Switching Power Supply Auto Test System  
**A820001** : PCI BUS AD Card  
**A800004** : 19" Rack for Model 8200  
**A800005** : PCI BUS GPIB Card (National Instrument)  
**A820002** : 8200 software Package  
**A800027** : Test Fixture for Model 8200  
**A600013** : Adapter for A600011/A600012 Test Fixture (PC Standard)  
**A600014** : Adapter for A600011/A600012 Test Fixture (Terminal Block)  
**DC Load Module** : Refer to Model 6310A, 6330A, 63600 Series  
**AC Source** : Refer to Model 6400, 6500, 61500, 61600, 61800 Series

\* Please refer to Model 8000's specifications for detail instruments

### SPECIFICATIONS

AC Source	6500 series	61500 series	61600 series
<b>Model</b>			
<b>Power rating</b>	1200-9000VA	500-18000VA	500-18000VA
<b>Voltage range</b>	0-300V	0-300V	0-300V
<b>Output phase</b>	1 or 3 phase	1 or 3 phase	1 or 3 phase
<b>DC output</b>	No	Yes	Yes
<b>Output measurement</b>	Yes	Yes	Yes
<b>Harmonic measurement</b>	No	Yes	No
<b>Waveform simulation</b>	Yes	Yes	No
<b>Programmable impedance</b>	No	Yes	No
<b>Harmonic synthesis</b>	Yes	Yes	No
<b>Inter-harmonic synthesis</b>	No	Yes	No

\* Please refer to respective product catalogs for detail specifications.



20U

## KEY FEATURES

- Be able to test multiple UUTs concurrently that improve productivity significantly
- Equipped with both of the test performance of 6000 ATS and the flexible hardware architecture of 8000 ATS
- Provide optimized standard test items for the Unit Under Test (adapter/charger) to deliver excellent test performance
- Easy-to-use software function specially designed to meet the production line needs
- Flexible software platform with the following functions
  - Test Program editor
  - Test Report format editor
  - Test Report Generator
  - Statistics Analysis Report editor
  - User level setting
  - Release control
  - Activity log
  - Supporting bar code reader
- New test items and extended hardware are able to expand to fulfill the new requirements for adapter/charger industry
  - Average efficiency test that complies with Energy Star
- Rack specially designed more meet to the production line
- Windows 98/2000/NT/XP/7 based software

Chroma 8020 Adapter/Charger ATS is the best test system for testing Adapter and Charger in the production line. 8020 is able to test multiple UUTs concurrently that improve productivity significantly, the hardware architecture is also as flexible as Chroma 8000 ATS. There are many hardware devices available for selection such as AC Power Supply, Electronic Load, Timing/Noise Analyzer and Power Meter.

Chroma 8020 has standard test items specially customized and optimized for the features of Adapter and Charger that provides excellent test performance to meet the requirements of mass production. Meanwhile, the software equipped is very friendly and easy to operate that is suitable for production line use.



New test items and extended hardware are expanded to Chroma 8020 ATS for the new test requirements in the Adapter/Charger industry, such as average efficiency to comply with Energy Star requirement, and etc.

Chroma 8020 ATS runs under the easy-to-learn Windows 98/2000/NT/XP/7 environment with a specialized power test system for test engineers so that they can utilize the Windows resources easily.

## OPTIMIZED TEST ITEMS

### OUTPUT PERFORMANCES

1. DC output voltage
2. DC output current
3. DC output power
4. Peak-to-peak noise
5. RMS noise
6. Efficiency
7. In-test adjustment
8. Overshoot voltage

### INPUT CHARACTERISTICS

9. Input inrush current
10. Input RMS current
11. Input power
12. Input power factor
13. AC cycle drop out
14. Input voltage ramp

### REGULATION TESTS

15. Line regulation
16. Load regulation
17. Combine regulation
18. Dynamic load regulation
19. Sync. dynamic load regulation

### TIMING AND TRANSIENT

20. Power up sequence
21. Rise time
22. Fall time
23. Power off time

### PROTECTION TESTS

24. Short circuit
25. Over load protection
26. Over voltage protection

### SPECIAL TESTS

27. Average efficiency test
28. ID Pin Singnal measurement
29. Quick Charge 2.0 Charger test
30. Pump Express Charger test
31. Type C USB PD test

### SPECIAL FEATURE

32. TTL signal control
33. Relay control

## ORDERING INFORMATION

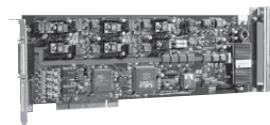
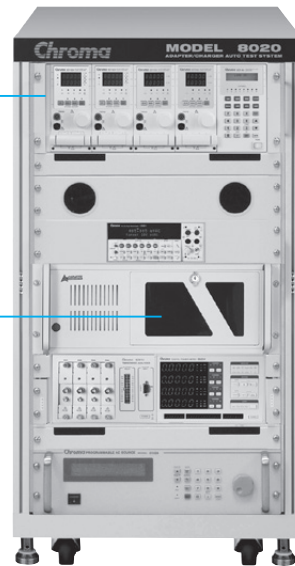
- 8020** : Adapter / Charger ATS
- 80611/80614** : Timing/Noise Analyzer
- 80611N** : Timing/Noise Module
- 80617** : USB PD Tester
- 80617P** : USB PD Emulator
- 84903** : Control Card
- 84904** : DMM Card
- 5004ATM** : System Controller
- A800004** : 19" Rack for Model 8020
- A800068** : Digital Measurement Card
- A802001** : 4+4 Multi-UUT Test Fixture
- A806101/A806103** : 100 MHz HF MUX Module
- A806102/A806104** : Digital Output Module
- DC Load Module** : Refer to Model 6330A, 63600 Series
- Digital Power Meter** : Refer to Model 66200 Series
- AC Source** : Refer to Model 6500, 61500, 61600 Series
- I/O Card** : ADLink 7230

\* Please refer to Model 8000's specifications for detail instruments



**A802001** : 4+4 Multi-UUT Test Fixture

The 63600 High Speed DC Electronic Load is applied to verify PUMP Express Charger.



The 84903 Control Card is applied to verify Quick Charge 2.0 charger.



The 84904 DMM Card is applied to measure the voltage of charger ID pin.



### KEY FEATURES

- For LED Power Driver testing
- Capable to test Multi-UUT/Multi-output concurrently that improve productivity
- Provide optimized standard test items for the Unit Under Test (LED Power Driver) to deliver excellent test performance
- Open architecture software
  - Expandable hardware support
  - Support instrument with GPIB/RS-232/RS-485/I<sup>2</sup>C interface
  - User editable test library
  - User editable test programs
  - User editable reports
  - Statistical report
  - On-line Softpanel
  - User authority control
  - Release control
  - Activity log
  - Support bar code reader
- Windows 98/2000/NT/XP/7 based software

Chroma 8491 LED Power Driver ATS is the ultimate test system for LED Power Driver. It is able to test Multi-UUT/Multi-output concurrently improving productivity significantly. The hardware devices available for selection include AC/DC Power Supply, Power Meter, PCI interface function card, Transducer Unit and the industries first LED Load simulator for simulating LED loading with 6330A series Electronic Loads.

The PCI interface function card - LED Power Driver Measurement Card & Control Card, they measure Dimming Current / Frequency / Duty & provide BL control signal(DC level, PWM, SM BUS), and Enable ON/OFF signal. Furthermore the Timing / Noise Card is using in Ripple Current measurement at 20MHz bandwidth.



The Chroma 8491 ATS is equipped with optimized standard test items for LED power driver testing. The user is only required to define the test conditions and specifications for the standard test items to perform the test.

Chroma 8491 ATS software runs under the user friendly Windows 98/2000/NT/XP/7 operating environment, providing the test engineer a dedicated LED Power Driver testing system with easy access to Windows resources.

### OPTIMIZED TEST ITEMS

#### OUTPUT PERFORMANCES

1. Output Voltage
2. Output Current
3. Ripple Current (RMS & p-p)
4. Dimming Current
5. Dimming Frequency
6. Dimming Duty
7. Efficiency
8. In-test adjustment
9. Turn ON Overshoot Current

#### INPUT CHARACTERISTICS

10. Input Inrush Current
11. Input RMS Current
12. Input Peak Current
13. Input Power
14. Current Harmonics
15. Input Power Factor
16. Input Voltage Ramp
17. Input Freq. Ramp
18. AC Cycle Drop Out
19. PLD Simulation

#### REGULATION TESTS

20. Current Regulation
21. Voltage Regulation
22. Total Regulation

#### TIMING & TRANSIENT

23. Turn ON Time
24. Hold Up Time
25. Rise Time
26. Fall Time

#### PROTECTION TESTS

27. Short Circuit
28. OV Protection
29. OL Protection \*
30. OP Protection \*

#### SPECIAL TESTS

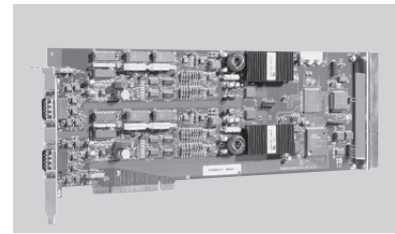
31. GPIB Read/Write
32. RS-232 Read/Write

\* If UUT is constant voltage output

### ORDERING INFORMATION

- 8491** : LED Power Driver ATS
- A800068** : Digital Measurement Card
- A849008** : Control Unit
- 84911** : LED Power Driver Measurement Card
- 84903** : Control Card
- A849101** : Transducer Unit
- A849102** : Transducer Module 400mA/500V
- A849103** : Transducer Module 1600mA/500V
- A849104** : Transducer Module 20A/500V
- 80611 / 80614** : Timing / Noise Analyzer
- 80611N** : Timing / Noise Module
- 80612** : Short Circuit/OVP Tester
- 80613** : ON / OFF Controller
- DC Load Module** : Refer to Model 6310A, 6330A, 63600 Series
- Digital Power Meter** : Refer to Model 66200 Series
- AC Source** : Refer to Model 6500, 61500, 61600 Series
- DC Source** : Refer to Model 62000P Series

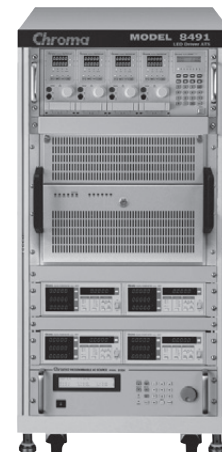
\* Please refer to Model 8000's specifications for detail instruments



**84911** : LED Power Driver Measurement Card



**A849101** : Transducer Unit



**8491** : LED Power Driver ATS



## SPECIFICATIONS-1

Transducer Unit		A849101
No. of slot		8
Input Voltage Range		95~240 Vac @ 50 / 60Hz
Dimension (HxWxD)		221.5 x 450 x 500 mm / 8.72 x 17.72 x 19.69 inch

Transducer Module 400mA/500V		A849102
<b>Input</b>		
Vrms	Range	0~80V / 0~500V
	Bandwidth	200 KHz @ -3dB
	Accuracy	0.3%+0.2%F.S.
Irms	Range	0~100mA / 0~200mA / 0~400mA
	Bandwidth	200KHz @ -3dB
	Accuracy	0.5%+0.5%F.S.
Ripple Current(rms & p-p)	Range	0~50mAp-p / 0~100mAp-p / 0~150mAp-p
	Bandwidth	20MHz @ -3dB
	Accuracy	0.5%+0.5%F.S.
Voltage Ripple/Noise (rms & p-p)	Range	2.5Vp-p / 20Vp-p
	Bandwidth	20MHz @ -3dB
	Accuracy	1% F.S.
<b>-3dB Tolerance</b>		± 1dB
<b>Output</b>		
9 Pin D-sub(to 84911 M card)	Range	4Vpk
BNC(to 80611N card)	Range	2Vp-p

Transducer Module 1600mA/500V		A849103
<b>Input</b>		
Vrms	Range	0~80V / 0~500V
	Bandwidth	200KHz @ -3dB
	Accuracy	0.3%+0.2%F.S.
Irms	Range	0~400mA / 0~800mA / 0~1600mA
	Bandwidth	200KHz @ -3dB
	Accuracy	0.5%+0.5%F.S.
Ripple Current (rms & p-p)	Range	0~100mAp-p / 0~400mAp-p / 0~800mAp-p
	Bandwidth	20MHz @ -3dB
	Accuracy	0.5%+0.5%F.S.
Voltage Ripple/Noise (rms & p-p)	Range	2.5Vp-p / 20Vp-p
	Bandwidth	20MHz @ -3dB
	Accuracy	1% F.S.
<b>-3dB Tolerance</b>		± 1dB
<b>Output</b>		
9 Pin D-sub(to 84911 M card)	Range	4Vpk
BNC(to 80611N card)	Range	2Vp-p

A849104 Transducer Module 20A/500V		A849104
<b>Input</b>		
Vrms	Range	0~80V / 0~500V
	Bandwidth	200KHz @ -3dB
	Accuracy	0.3%+0.2%F.S.
Irms	Range	0~5A / 0~10A / 0~20A
	Bandwidth	200KHz @ -3dB
	Accuracy	0.5%+0.5%F.S.
Ripple Current(rms & p-p)	Range	0~1.25Ap-p / 0~5Ap-p / 0~10Ap-p
	Bandwidth	20MHz @ -3dB
	Accuracy	0.5%+30mA@5A, 0.5%+60mA@10A/20A
Voltage Ripple/Noise(rms & p-p)	Range	2.5Vp-p / 20Vp-p
	Bandwidth	20MHz @ -3dB
	Accuracy	1%F.S.
<b>-3dB Tolerance</b>		± 1dB
<b>Output</b>		
9 Pin D-sub(to 84911 M card)	Range	4Vpk
BNC(to 80611N card)	Range	2Vp-p

## SPECIFICATIONS-2

LED Driver Measurement Card	84911
<b>Vac measurement</b>	
Input Voltage	4Vpk max.
<b>Vpk+ / Vpk- / Vpp measurement</b>	
Range	4Vpk
Bandwidth	10k-200kHz
Resolution	14bits
Accuracy	0.5%+0.5%F.S.(100-100kHz) 1%+0.5%F.S.(100K-200kHz)
<b>Vrms measurement</b>	
Range	4Vrms~2Vrms / 2Vrms~1Vrms / 1Vrms~0.5Vrms
Bandwidth	10k-200kHz
Resolution	14bits
Accuracy	1%+0.2%F.S.(100-100kHz) 1.5%+0.2%F.S.(100K-200kHz)
<b>Iac measurement</b>	
Input Voltage	4Vpk max.
<b>Ipk+ / Ipk- / Ipp measurement</b>	
Range	4Vpk
Bandwidth	10k-200kHz
Resolution	14bits
Accuracy	0.5%+0.5%F.S.(100-100kHz) 1%+0.5%F.S.(100K-200kHz)
<b>Irms measurement</b>	
Range	4Vrms~2Vrms / 2Vrms~1Vrms / 1Vrms~0.5Vrms 0.5Vrms~0.25Vrms / 0.25Vrms~0.125Vrms / 0.125Vrms~0.06Vrms
Bandwidth	10K-200KHz
Resolution	14bits
Accuracy	1%+0.2%F.S.(10K-100kHz) 1.5%+0.2%F.S.(100K-200kHz)
<b>Pac measurement</b>	
Range	V range x I range
Bandwidth	10K-200KHz
Resolution	14bit
Accuracy	1%+0.2%F.S.(10K-100kHz) 2%+0.3%F.S.(100K-200kHz)
<b>Frequency measurement</b>	
Range	10Hz-35KHz
Resolution	1Hz
Accuracy	0.1%reading
Input	Via voltage/current input
<b>Timing measurement</b>	
Trigger input	External x1(AC ON/Enable, A849101) and Vmeasurement input and Imeasurement input
<b>Trigger level</b>	
Range	5% ~ 95%F.S.
Resolution	2mV for voltage / 2mV for current
Accuracy	1%setting
<b>Timing measure</b>	
Resolution	0.01uS / 0.1mS
Accuracy	0.1uS / 1mS
Timing range	65uS / 650msec
<b>Burst Mode measurement</b>	
<b>Frequency</b>	
Range	10Hz-35KHz
Resolution	0.1Hz
Accuracy	0.1%reading
<b>Duty(Ton)</b>	
Range	3us-90ms
Resolution	1us
Accuracy	Error Max : 1us
<b>Measurement speed</b>	
<10mS	
<b>Interface</b>	
PCI	
<b>Dimension</b>	
1 Slot width	

Control Card	84903
<b>BL control</b>	
<b>DC level control</b>	
Program level	0 ~ 10V
Resolution	11 bits
Level Accuracy	0.5 % setting + 0.1 % F.S.
Sourcing current	20mA
<b>PWM control</b>	
Program level	0 ~ 10V
Resolution	7 bits
Accuracy	2 % + 1 % F.S (No Load) / 5.5% +1% F.S. (20mA output)
Sourcing current	20mA
Frequency	20Hz ~ 10kHz / 10kHz ~ 100kHz
Freq. Resolution	1Hz
Freq. Accuracy	0.1% (10kHz) / 1% (100kHz)
Duty	0 % ~ 100 % (10kHz) / 5% ~ 95% (100kHz)
Duty Resolution	1 %
Duty Accuracy	Error Max : 100nS
<b>SMBUS control</b>	
DC Output	5V
SM DATA	Bidirectional
SM CLK	Bidirectional
<b>BLI measurement (DC)</b>	
Range	0 ~ 20mA
Resolution	15 bits
Accuracy	0.1% reading + 1% F.S.
<b>Analog output (Enable V and Vsave 1, 2)</b>	
<b>Channel</b>	
No. of channel	1 for Enable 2 for Vsave
<b>DC level output</b>	
Program level	0 ~ 10V
Resolution	11 bits
Level Accuracy	0.5 % setting + 0.1 % F.S.
Sourcing current	20mA
<b>Analog I measurement (Idc)</b>	
Range	0 ~ 20mA
Resolution	15 bits
Accuracy	0.1% reading + 1% F.S.
<b>Digital I/O</b>	
No. of channel	12 bits For Output 4 bits For Input
Output type	Open collector
<b>Measurement speed</b>	
< 30mS	
<b>Interface</b>	
PCI	
<b>Dimension</b>	
1 Slot width	

<b>Battery Cell Test and Formation System</b>	<b>11-1</b>
<b>Battery Cell Charge &amp; Discharge Test System</b>	<b>11-3</b>
<b>Regenerative Battery Pack Test System</b>	<b>11-5</b>
<b>Battery Pack ATS</b>	<b>11-17</b>



**Battery Cell Formation System**



**OCV/ACR Test Equipment**

**Barcode Binding Equipment**

**Rework Sorter**

**Grouping Equipment**

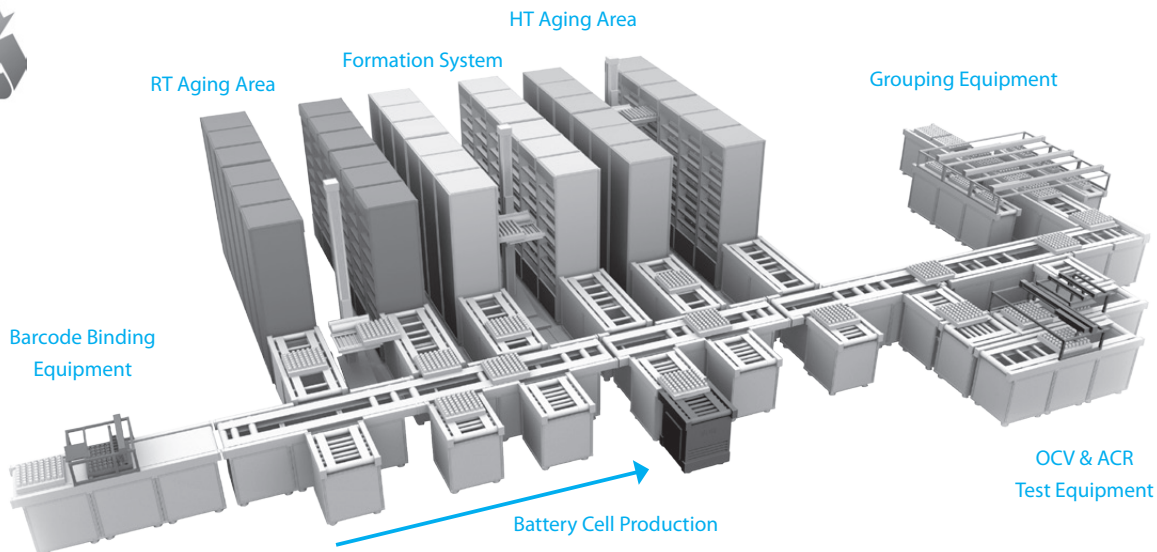


**Battery Cell Charge & Discharge Test System**

**Regenerative Battery Pack Test System**

**Battery Pack ATS**





## KEY FEATURES

- **System Advantages**
  - Reliable test accuracy
  - High yield rate of the device
  - Energy recycling
  - Safety
  - Management and maintenance convenience
  - Providing turnkey solutions (auto/semi-auto)
- **Performance Design**
  - Production temperature control
  - Vacuum Formation
  - Probe / terminal clamp technique
  - Compatible device change for different size battery
  - Abnormality detection
  - Fireproof / Extinguishing fire design
  - Modular design
- **Automation Features**
  - high-speed AGV (anti-collision, anti-spark, antistatic and low noise)
  - Highly efficient process line planning
- **MES**
  - Technology management to streamline manpower
  - Human factors and errors prevention
  - Clear manufacturing traceability
  - Favorable for data analysis and process improvement

The battery cell formation turnkey solution is an overall planning and service provided by Chroma for battery cell production line. Based on the process technology, the most appropriate equipment or systematic planning can be made starting from formation to grouping. It includes the configuration of equipment, logistics planning and production management systems that can provide diverse customization features to tailor a highly efficient production line.

To fit the capacity and production mode requirement, the battery cell formation turnkey solution has auto and semi-auto production lines for selection. It uses tray to place the battery cells and flow them to each process station for testing. The main process stations include formation charge/discharge system, barcode binding

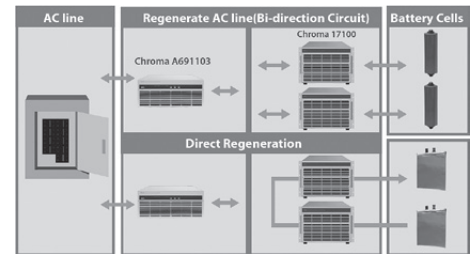
equipment, OCV/ACR/ DCIR test equipment, rework sorter, grading equipment and aging automated storage & retrieval Systems.

The auto production line integrates instruments, automated mechanical logistics and manufacturing execution system to link all process stations in series to a big system. Through the hi-tech management, the operator only needs to set the menu on the screen to achieve the demand of unattended operation on site. It is suitable for mass and uniformity production to save the manpower, improve the efficiency and stabilize the capacity.

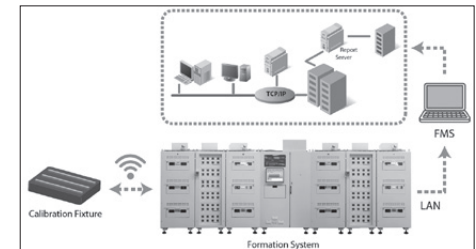
## Battery Cell Formation System 17000

This is a charge/discharge system especially designed for li-ion battery formation and grouping. Trays are used for production and the system is divided into charge only system and charge/discharge system. The system has high accuracy and energy saving features.

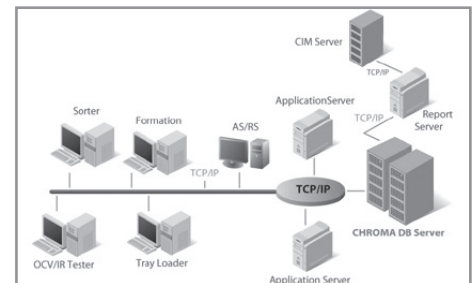
The system is controlled by PC with the main structure composed of instrument cabinets and battery clamping cabinets. The battery clamping cabinet can automatically perform battery electrode contact testing when the tray is placed. The professional rack design improves the production stability effectively. There are open-shelf type and temperature control cabinet type for battery rack cabinets that are working separately with fire proof design to avoid spreading fire during abnormality.



High Energy Efficiency



Automatic Calibration Design



Manufacturing Execution System (MES)



Battery Cell Formation System 17000

## OCV/ACR/DCIR Test Equipment 17800

The 17800 is a test equipment to measure the Open Circuit Voltage (OCV), AC Resistance (ACR) and DC Resistance (DCIR). It can work with trays to perform batch testing or one by one test on conveyor line to meet inspection requirements. The automated machine provides stable and fast electrode connection that enables the battery contact to be uniformed. The battery holder can be customer designed according to the tray size or battery size/quantity.

## Barcode Binding Equipment 17910

The 17910 is a barcode binding equipment that can connect the battery serial number with tray number, and create data file to upload to the system. Later on, only tray number is required to get the battery data when it is used as the unit for production. Such method advantages the production with high efficiency and low cost.

## Rework Sorter 17920

The 17920 is a rework sorter to pick out the batteries that are identified as defects during the production process, and then the manufacturing execution system can determine what to do with the defect batteries. The advantage of it is to prevent any quality issues caused by human errors and manage the battery manufacturing traceability with all data well recorded.

## Grouping Equipment 17930

The 17930 is a grouping equipment that can group the fabricated batteries by specific classification rules. The user can define the grouping rules, levels and quantity to program the categorization using the battery manufacturing traceability, and the batteries of the same group will be pick out to place in a new tray.

## Automated Warehousing System

Before or after formation process, there is inventory queuing procedure. According to the production process, there are room temperature and high temperature storages. As the longer queuing time leads to huge storage, a system is often used to substitute human for management; and the strengths of using it are high utilization of space, less human errors, reduction of process differences, detailed control logs and efficiency improvement.

## ORDERING INFORMATION

**17000** : Battery Cell Formation System

**17800** : OCV/ACR/DCIR Test Equipment

**17910** : Barcode Binding Equipment

**17920** : Rework Sorter

**17930** : Grouping Equipment

**Automated Warehousing System**

**Intelligent Battery Process System (IBPS)**

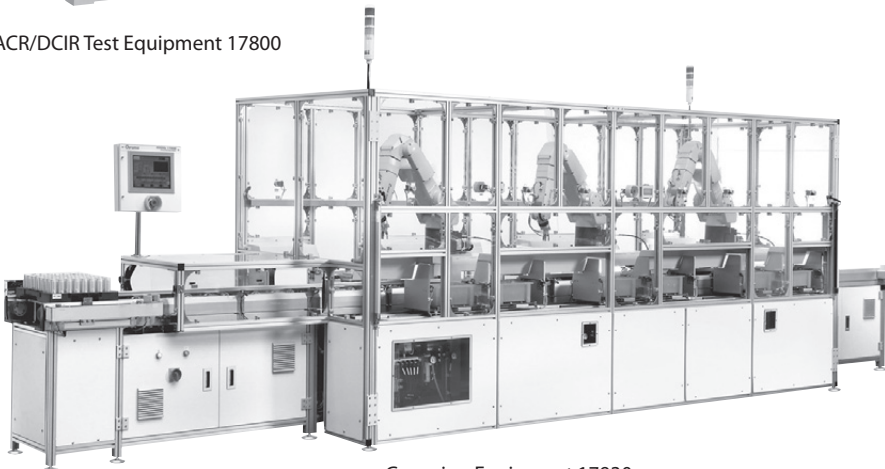


Barcode Binding Equipment 17910

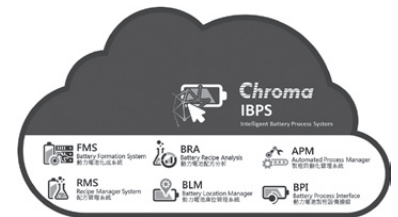


Rework Sorter 17920

OCV/ACR/DCIR Test Equipment 17800



Grouping Equipment 17930



Intelligent Battery Process System (IBPS)



Automated Warehousing System



## KEY FEATURES

- High precision output and measurement up to 0.02%F.S.
- High sampling rate up to 10ms
- Channel parallel output function with maximum 1200A output
- Operating modes: CC/CC-CV/CP/CR
- Dynamic working condition simulation (current/power)
- Flexible sampling recording (t, V, I, Q, W)
- Low ripple current
- Real time external circuit resistance monitoring function
- Equipped with redundant DC power supply to avoid affecting the cycle life test due to power failure factor (linear circuit series)
- Energy recycling during discharge (AC/DC bi-directional regenerative series)
- Integrating ACIR test fixture, temperature/ data logger and humidity chamber

## FUNCTIONS

- LIB charge/discharge test Capacity, ACIR and DCIR tests
- EDLC charge/discharge test Capacitance, ACIR, DCR and LC tests
- LIC charge/discharge test Capacitance, ACIR, DCR and LC tests

## APPLICATIONS

- Characteristics analysis
- Product life test
- Material test
- Production test
- Voltage adjustment application
- Quality assurance for incoming/shipping inspection

The Chroma 17011 Battery Cell Charge and Discharge Test System is a high precision system designed specifically for testing lithium-ion batteries (LIB), electrical double layer capacitors (EDLC), and lithium-ion capacitors (LIC). It is suitable for product characteristics screening, cycle life testing, incoming and shipping inspection, material experiment, and balancing battery voltage.

Based on the test characteristics and size of battery current, the Chroma 17011 test system has AC/DC bi-directional regenerative series and linear circuit series with precision output and measurement traceability to guarantee product specifications. Small errors among channels and relatively reliable test data are suitable for analyzing the characteristics differences and detecting changes in detail. The system is equipped with energy-saving design and thermal management capable of running stably for long periods and providing reliable real-life testing data. The modular design allows the system to be configured based on test requirements, and each

channel can run tests independently with parallel output supported. The test system has high product compatibility and testing flexibility.

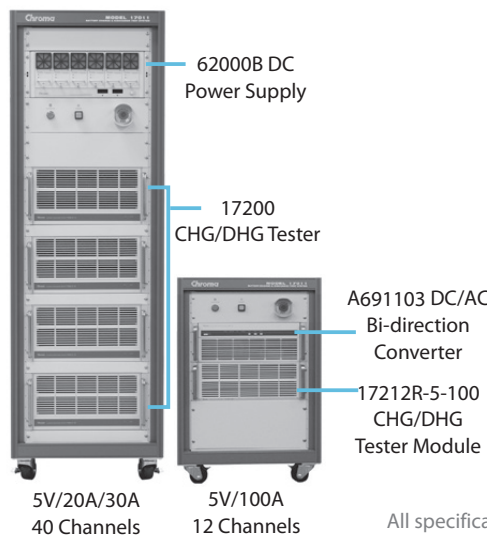
In view of energy issues, the fabrication of green products should be in line with production methods that are environmentally friendly. The Chroma 17011 AC/DC bi-directional regenerative test system has an energy recycling function that can convert the discharged energy to the charging channel improving power efficiency when in use. The excess power will feed back to grid if the energy recovered is more than the system requires. In addition to decreasing electricity costs, the regenerative power function reduces system heat significantly by lowering air conditioning demands and operation costs. It not only improves system stability, extends service life, but also creates a low carbon emission environment for production.

For small current testing and material development, the Chroma 17011 linear circuit series features low noise and precision outputs, with redundant DC power supplies which are more stable and reliable when compared to general switching power supplies. When a power module fails, it will shut down automatically, and the rest of the modules can be paralleled in order to output sufficient power, maintaining a stable power supply. In addition, it supports a hot swap function that allows the malfunctioning module to be switched without shutting down the system to make sure no interruptions occur during testing.

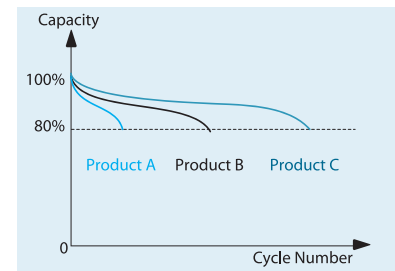
Four current range models are available for material research and development. The standalone device can easily be placed on the lab desk. This device is suitable for precision and leakage current testing with an automatic current shift resolution up to 0.1uA. With data refresh rate up to 1ms in pulse mode, it can perform rapid pulse current charge/discharge tests on various material samples for characteristics verification.

The lithium ion battery cell tests include life and characteristics tests such as ACIR, DCIR and HPPC, etc. The Chroma 17011 includes built-in test steps in line with regulations that can provide test results fast and accurately without requiring conversion afterwards. It provides easy operation with low chances of human error, and can draw battery characteristic curves via software for specification comparison or application parameter analysis.

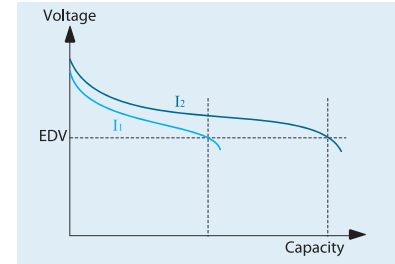
For EDLC and lithium capacitors, capacitance, DCIR and leakage current tests are included. The test steps built into the Chroma 17011 comply with the standards which get the capacitance and DCIR test results with one step. It also measures the leakage current directly.



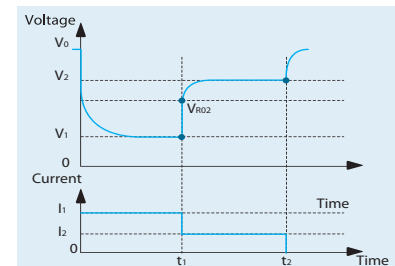
## Lithium-ion secondary battery testing



Battery capacity curve

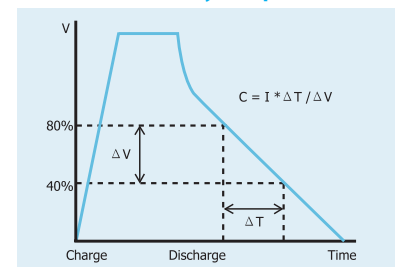


Cycle life testing curve

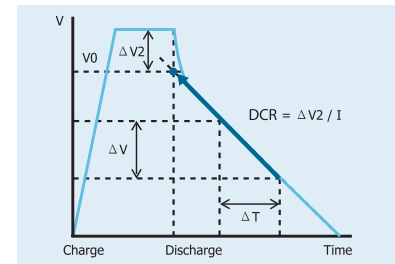


DCIR test

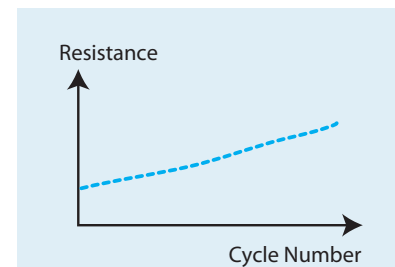
## Electrical Double Layer Capacitor Test



Capacitance test



DCR test



ACR test curve (1kHz)



SPECIFICATIONS									
Module	17202-5-20		17202-5-30		17212R-5-100		17216M-10-6		
Maximum Voltage/Current	5V/20A		5V/30A		5V/100A		10V/6A		
Maximum Channel	2 ch/module, 10 ch/frame		2 ch/module, 10 ch/frame		12 ch/set (fixed)		16 ch/set (fixed)		
Parallelable Current	40A, 100A, 200A		60A, 150A, 300A		200A, 300A, 400A, 600A, 1200A		6A to 96A		
Voltage									
Setting Range	0 mV ~ 5000 mV, resolution 1mV		0 mV ~ 5000 mV, resolution 1mV		0mV~5000mV*1, resolution 1mV		0V~10V or -5V~5V, resolution 1mV		
Reading Range	0.0 mV ~ +5199.9 mV, resolution 0.1mV		0.0 mV ~ +5199.9 mV, resolution 0.1mV		0.0 mV ~ +5199.9 mV, resolution 0.1mV		0V~10.4V or -5V~5.04V, resolution 0.2mV		
Accuracy	± (0.02% rdg.+0.02% F.S.)		± (0.02% rdg.+0.02% F.S.)		± (0.02% rdg.+0.02% F.S.)		± (0.02% F.S.)		
Current									
Setting Range	3A	1mA ~ 3,000mA, resolution 1mA	4A	1mA ~ 4,000mA, resolution 1mA	100A	0.01A ~ 100.00A, resolution 0.01A	200μA	0.1μA ~ 200μA, resolution 0.1μA	
		6mA		1μA ~ 6mA, resolution 1μA					
	20A	0.01A ~ 20.00A, resolution 0.01A	30A	0.01A ~ 30.00A, resolution 0.01A			200mA	0.1mA ~ 200mA, resolution 0.1mA	
		6A		1mA ~ 6A, resolution 1mA					
Reading Range	3A	0.0mA ~ 3,150.0mA, resolution 0.1mA	4A	0.0mA ~ 4,200.0mA, resolution 0.1mA	100A	0.000A ~ 105.000A, resolution 0.001A	200μA	0A ~ 210μA, resolution 0.01μA	
		6mA		0A ~ 6.3mA, resolution 0.2μA					
	20A	0.000A ~ 21.000A, resolution 0.001A	30A	0.000A ~ 31.500A, resolution 0.001A			200mA	0A ~ 210mA, resolution 0.01mA	
		6A		0A ~ 6.3A, resolution 0.2mA					
Accuracy	3A	± (0.02% rdg.+0.02% rng.)	4A	± (0.05% rdg.+0.05% rng.)	100A	± (0.05% rdg.+0.05% F.S.)	200μA	± (0.02% rng.)	
		6mA							
	20A	± (0.03% rdg.+0.03% rng.)	30A	± (0.05% rdg.+0.05% rng.)			200mA		
		6A							
Power									
Setting Range	15W	10 mW~15,000 mW, resolution 1 mW	20W	10 mW~20,000 mW, resolution 1 mW	500W	0.05W~500.00W, resolution 0.01W	2mW	1μW~2mW, resolution 1μW	
		60mW		10μW~60mW, resolution 10μW					
	100W	0.05 W~100.00 W, resolution 0.01 W	150W	0.05 W~150.00 W, resolution 0.01 W			2W	1mW~2W, resolution 1mW	
		60W		10mW~60W, resolution 10mW					
Reading Range	15W	0.0 mW~15,600.0 mW, resolution 0.1 mW	20W	0.0 mW~21,000.0 mW, resolution 0.1 mW	500W	0.000 W~520.000 W, resolution 0.001W	2mW	0W~2.1mW, resolution 0.1μW	
		60mW		0W~63mW, resolution 2μW					
	100W	0.000 W~104.000 W, resolution 0.001 W	150W	0.000 W~160.000 W, resolution 0.001 W			2W	0~2.1W, resolution 0.1mW	
		60W		0~63W, resolution 2mW					
Accuracy	15W	± (0.04% rdg.+0.04% rng.)	20W	± (0.07% rdg.+0.07% rng.)	500W	± (0.07% rdg.+0.07% F.S.)	2mW	± (0.04% rng.)	
		60mW							
	100W	± (0.05% rdg.+0.05% rng.)	150W	± (0.07% rdg.+0.07% rng.)			2W		
		60W							
Flow Edit Capability	Max. step number in one flow: 500 steps; Max. cycle number in one step: 999999 steps								
Data Storage	10ms~60min *2								
Power Supply	Built in 62015B-24-62 DC Power Supply Module				A691103、A691104 DC/AC Bi-direction Converter			Built in	
AC Input Voltage	1Φ, 220V 3Φ 4 wire, Δ connection, 220V / 380V				3Φ 4 wire, Δ connection, 220V / 380V			1Φ, 220V	

**Note \*1:** The maximum discharge current will derate at low voltage range between 1V to 0V.

**Note \*2:** The model 17202-5-20 and 17202-5-30 of 10ms sampling time, the current and power accuracy specification is a bit lower than 100ms.

### Chroma 51101 Thermal/Multi-function Data Logger

- Optional temperature channel (8ch/card) available
- Test 64 temperature channels maximum



### ORDERING INFORMATION

- 17011** : Battery Cell Charge & Discharge Test System
- 17200-5-10** : Programmable Charge/Discharge Tester Frame for 5 modules
- 17202-5-20** : Programmable Charge/Discharge Tester Module 5V/20A, 2 channels
- 17202-5-30** : Programmable Charge/Discharge Tester Module 5V/30A, 2 channels
- 17212R-5-100** : Programmable Charge/Discharge Tester Module 5V/100A, 12 channels
- 17216M-10-6** : Programmable Charge/Discharge Tester Module 10V/6A, 16 channels
- 51101-64** : Thermal Multi-function Data Logger 64 channel (option)
- 62000B-3-1** : 62000B Series Mainframe for 3 Modules
- 62000B-6-1** : 62000B Series Mainframe for 6 Modules
- 62015B-24-62** : Modular DC Power Supply 24V/62.5A/1500W
- A172010** : ACR test switch fixture, for 5V/20A/30A, 10 channels
- A172011** : ACR test switch fixture, for 5V/100A, 12 channels
- A691103** : DC/AC Bi-direction Converter, AC 220V to DC 45V
- A691104** : DC/AC Bi-direction Converter, AC 380V to DC 45V





Chroma's 17020 is a high precision system specifically designed for secondary battery module and pack tests. Highly accurate sources and measurements ensure that the test quality is suitable for performing repetitive and reliable tests crucial for battery modules/packs, incoming, and outgoing inspections as well as capacity, performance, production, and qualification testing.

The system architecture of the Chroma 17020 offers regenerative discharge capabilities designed to recycle the electric energy sourced by the battery module either back to the channels in the system performing a charging function or to the utility mains in the most energy efficient manner. This feature saves electricity, reduces the facilities thermal foot print, and provides a green solution.

The Chroma 17020 system is equipped with multiple independent channels to support dedicated charge/discharge tests on multiple battery modules/packs, each with discrete test characteristics. Channels can easily be paralleled to support higher current requirements. This feature provides the ultimate in flexibility between high channel count and high current testing.

The Chroma 17020 system has flexible programming functions and may be operated with Chroma's powerful "Battery Pro" software. With the Battery Pro software, cycling tests from basic charge or discharge to complex drive cycle testing can be created and utilized for each channel or channel groups. A thermal chamber control can be integrated into a profile and triggered by time or test results yielding a dynamic profile. Battery Pro's features allow quick and intuitive test development, eliminating the need of tedious scripting or programming by a software engineer.

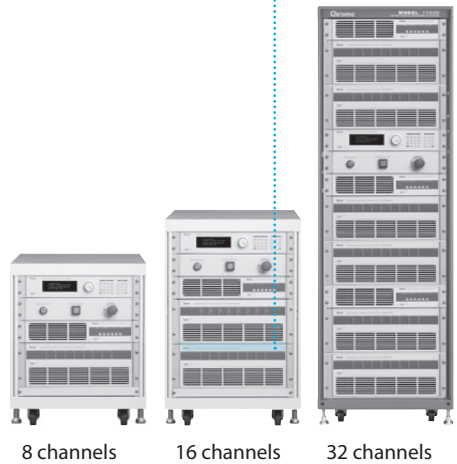
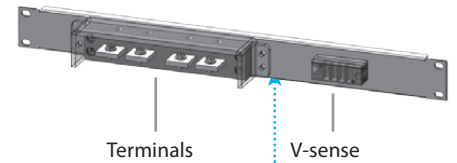
17020's Regenerative Module / Battery Pack Test System uses bi-directional AC-DC converter and bi-directional DC-DC tester with a battery charge/discharge controller that is composed of the three standalone units.

### KEY FEATURES

- Regenerative battery energy discharge
  - Energy saving
  - Environment protection
  - Low heat generate
- Channels paralleled for higher currents
- Charge / discharge mode (CC, CV, CP)
  - Constant current
  - Constant voltage
  - Constant power
- Driving cycle simulation
- High precision measurement
- Fast current conversion
- Smooth current without over shoot
- Test data analysis function
- Data recovery protection (after power failure)
- Independent protection of multi-channel
- BMS data recording
- Thermal chamber control integration

### APPLICATIONS

- EV battery module
- Electric scooter
- Electric bike
- UPS
- Energy storage battery
- Power tools
- Car battery
- Lead-acid battery



### Flexible System Configuration

17020 Regenerative Battery Pack Test System can be configured to specified requirements and expandable to 60 channels.

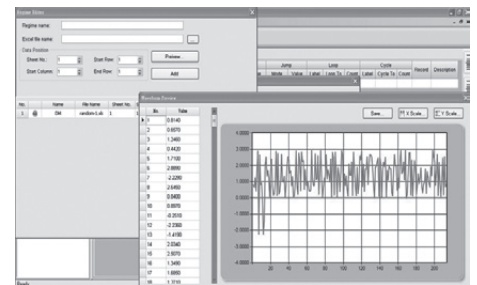
The driving cable can connect the front panel or rear outlet, users can choose their own.

### Operating Mode

- Constant current (CC) mode
- Constant voltage (CV) mode
- Constant power (CP) mode
- Constant voltage-limit current mode (CC-CV)
- Waveform current mode
- DCIR mode
- Rest

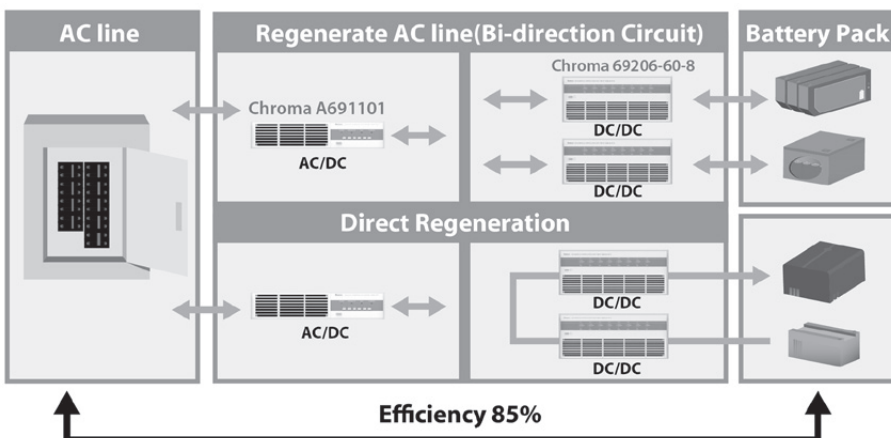
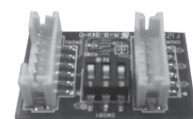
### Driving Cycle Simulation

The battery pack always is used at quick and unregular current condition. The system simulates the real condition on battery pack by working condition simulator.

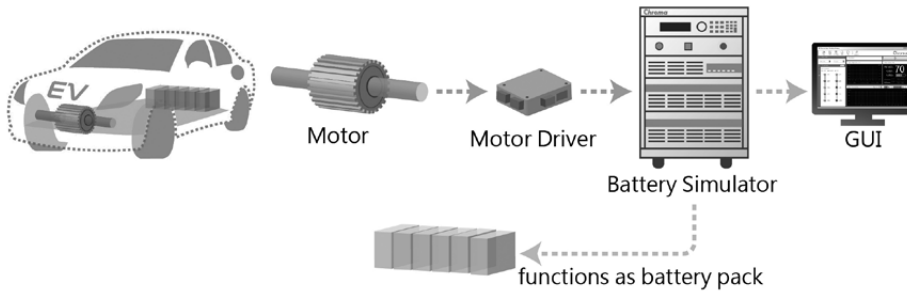


### Temperature Measurement

- Temperature measured for each channel within the range of 0~90°C±2°C
- 4 sets of measurements (Max) per channel to measure the battery surface temperature



## Motor Driver Testing for Vehicle 48V Start-stop System



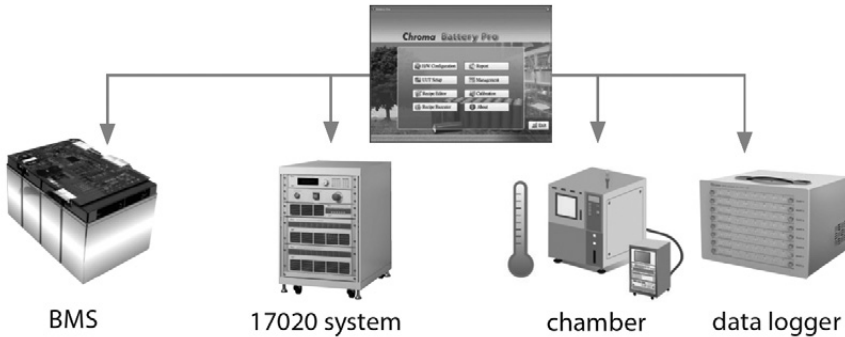
## BMS Communication Unit

- Communication interface : CANBus, SMBus, RS485
- Sampling Rate : 100ms/ch



## Software Integration

- BMS communication interface : Collect the BMS data to controls the charge/ discharge profile and protection setting
- Data logger : Collect the data logger to controls the charge/ discharge profile and protection setting
- Thermal Chambers : It synchronize temperature control with charge/discharge profile (See Model 51101-64 page)

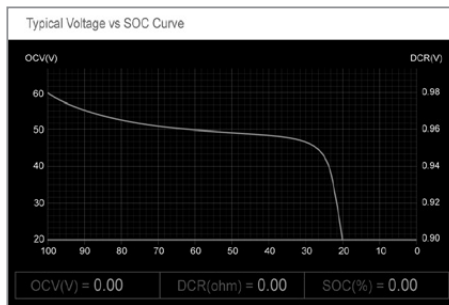


## Battery simulator Soft-panel (Option)

The soft-panel can simulate the battery capacity and DC impedance of battery cell. And it includes voltage-SOC curve simulation. The output voltage of battery simulator follows the user-defined curve. The function is suitable for testing chargers, inverters and motor drives.



Battery simulator main window



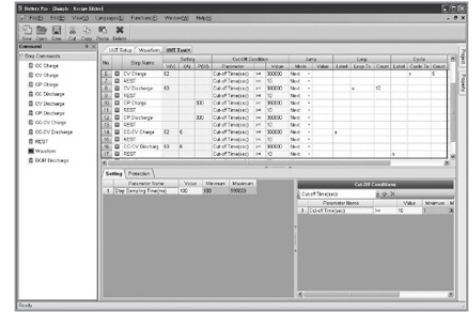
Battery characteristics V-SOC curve setting screen

## Graphic User Interface - Battery Pro

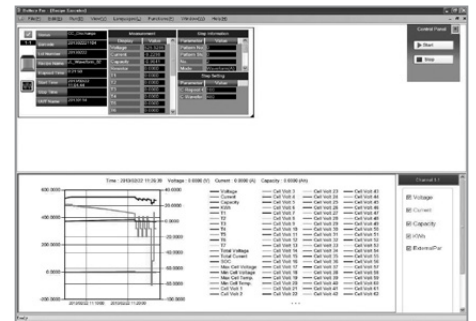
BatteryPro is specifically designed to meet the various requirements for testing secondary battery packs with high safety and stability. Charge and discharge protection aborts tests when abnormal conditions are detected. Data loss, storage and recovery are protected against power failure.



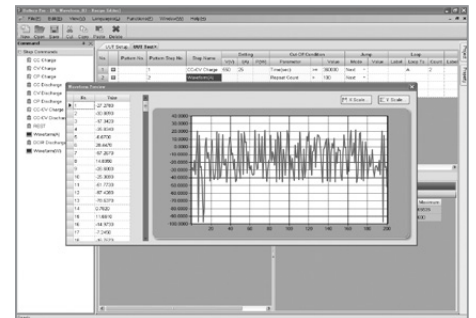
Battery Pro



Recipe editor



Recipe executor



Waveform simulator editor

SPECIFICATIONS							
Model	17020						
Voltage	20V	60V	60V	60V	100V	200V	500V
Current	65A	13A	62.5A	62.5A	50A	30A	13A
Power	1.25kW	600W	1.25kW	2.5kW	2.5kW	2.5kW	2.5kW
Channels	4~40	8~56	4~40	4~24	4~24	4~24	4~24
Max. Power (Parallelable)	50kW	33.6kW	50kW	60kW	60kW	60kW	60kW
Max. Current (Parallelable)	2600A	728A	2500A	1500A	1200A	720A	312A
Battery Cycler							
Charge / Discharge Mode per channel							
Voltage Range*1	0~20V	0~60V.	0~60V	0~60V	0~100V	0~200V	0~500V *3
Voltage Accuracy	0.1% stg.+ 0.05% F.S.	0.1% stg.+ 0.05% F.S.	0.1% stg. + 0.05% F.S.	0.1% stg. + 0.05% F.S.	0.1% stg. + 0.05%F.S.	0.1% stg. + 0.05%F.S.	0.1% stg. + 0.05%F.S.
Voltage Resolution	0.5mV	1mV	1mV	1mV	3mV	5mV	10mV
Current*2	65A	13A	62.5A	62.5A	50A	30A	13A
Current Accuracy	0.1% stg.+ 0.05% F.S.	0.1% stg. + 0.05% F.S.	0.1% stg. + 0.05% F.S.	0.1% stg. + 0.05% F.S.	0.1% stg. + 0.05%F.S.	0.1% stg. + 0.05%F.S.	0.1% stg.+ 0.05% F.S.
Current Resolution	5mA	1mA	5mA	5mA	5mA	5mA	1mA
Power	1.25kW	600W	1.25kW	2.5kW	2.5kW	2.5kW	2.5kW
Power Accuracy	0.2% stg.+ 0.1% F.S.	0.2% stg. + 0.1% F.S.	0.2% stg. + 0.1% F.S.	0.2% stg. + 0.1% F.S.	0.2% stg. + 0.1%F.S.	0.2% stg. + 0.1%F.S.	0.2% stg.+ 0.1% F.S.
Power Resolution	0.1W	0.1W	0.3W	0.3W	0.5W	0.5W	0.5W
Measurement per channel							
Voltage Range	0~20V	0~60V	0~60V	0~60V	0~100V	0~200V	0~500V
Voltage Accuracy	0.02% rdg. + 0.02% F.S.	0.02% rdg. + 0.02% F.S.	0.02% rdg. + 0.02% F.S.	0.02% rdg. + 0.02% F.S.	0.02% rdg. + 0.02% F.S.	0.02% rdg. + 0.02% F.S.	0.02% rdg. + 0.02% F.S.
Voltage Resolution	0.5mV	1mV	1mV	1mV	3mV	5mV	10mV
Current Range	24A/65A	4.8A/13A	24A/62.5A	24A/62.5A	20A/50A	12A/30A	4.8A/13A
Current Accuracy	0.1% rdg. + 0.05% rng.	0.05% rdg. + 0.05% rng.	0.1% rdg. + 0.05% rng.	0.1% rdg. + 0.05% rng.	0.1% rdg. + 0.05% rng.	0.1% rdg. + 0.05% rng.	0.1% rdg. + 0.05% rng.
Current Resolution	5mA	1mA	5mA	5mA	5mA	5mA	1mA
Power Range	1.25kW	600W	1.25kW	2.5kW	2.5kW	2.5kW	2.5kW
Power Accuracy	0.12% rdg. + 0.07% rng.	0.12% rdg. + 0.07% rng.	0.12% rdg. + 0.07% rng.	0.12% rdg. + 0.07% rng.	0.12% rdg. + 0.07% rng.	0.12% rdg. + 0.07% rng.	0.12% rdg. + 0.07% rng.
Power Resolution	0.1W	0.1W	0.3W	0.3W	0.5W	0.5W	0.5W

Battery Simulator	
Internal resistance setting	10mΩ~1Ω
Output Noise (0~20MHz)	
Voltage Ripple(P-P)	0.5% F.S.
Voltage Ripple(rms)	0.1% F.S.
Transient Response Time *4	10 ms
Bi-directional Transient Response Time *5	20 ms
Road Regulation	< 0.1% F.S.
Program time *6	< 1s

Others - 17020 Power / Channels							
Voltage	20V	20V	20V	20V	60V	60V	60V
Current	130A	260A	520A	2600A	125A	125A	250A
Power	2.5KW	5KW	10KW	50KW	2.5KW	5KW	10KW
Channels	2 - 20	1 - 10	1 - 5	1	2 - 20	2 - 12	1 - 6
Model	17020						
Voltage	60V	60V	60V	100V	100V	100V	100V
Current	500A	750A	1500A	100A	200A	400A	600A
Power	20KW	30KW	60KW	5KW	10KW	20KW	30KW
Channels	1 - 3	1 - 2	1	2 - 12	1 - 6	1 - 3	1 - 2
Model	17020						
Voltage	200V	200V	200V	500V	500V	500V	500V
Current	60A	120A	60A	26A	52A	156A	312A
Power	5KW	10KW	30KW	5KW	10KW	30KW	60KW
Channels	2 - 12	1 - 6	1 - 2	2 - 12	1 - 6	1 - 2	1

GENERAL SPECIFICATIONS	
<b>Measurement by A692003 Thermal Sensor</b>	
Temperature Range	0~90°C
Temperature Accuracy	±2°C
Temperature Resolution	0.1°C
<b>Temperature Coefficient</b>	
Voltage / Current	50ppm/°C
<b>AC Power</b>	
Voltage Range	1Ø 200~240V ± 10% 3Ø 200~220Vac ± 10% V <sub>LL</sub> 3Ø 380~400Vac ± 10% V <sub>LL</sub> 47~63Hz for input AC power
Current THD	< 5% at rated power
Power Factor	> 0.9 at rated power
<b>Controller to PC</b>	
Data Acquisition Rate to PC *7	Minimum 40ms@ 4CH independent Minimum 10ms@ 4CH parallel Minimum 600ms@ 60CH independent Minimum 100ms@ 60CH parallel
<b>Others</b>	
Protection	UVP, OCP, OPP, OTP, FAN, FAN, Short
Efficiency (Typical)	85~90% at 20% rated power
Operating Temperature	0°C ~ 40°C
Storage Temperature	-40°C ~ 85°C
Operating Humidity	10 ~ 90% RH, non-condensing
Safety & EMC	CE
<b>Dimension (H x W x D)</b>	
5kW ~ 20kW	120cm x 60cm x 90cm
20kW ~ 30kW	170cm x 60cm x 90cm
40kW ~ 60kW	170cm x 60cm x 90cm x 2 racks

Note \*1 : The output range of voltage is referred by the cabling.

Note \*2 : The connection between the device and battery is 3 meters long as standard accessory. The maximum discharge current will derate at low voltage range, please refer the detail V-I curve.

Note \*3 : The voltage range of the battery simulator and the constant voltage mode is 45V to 500V.

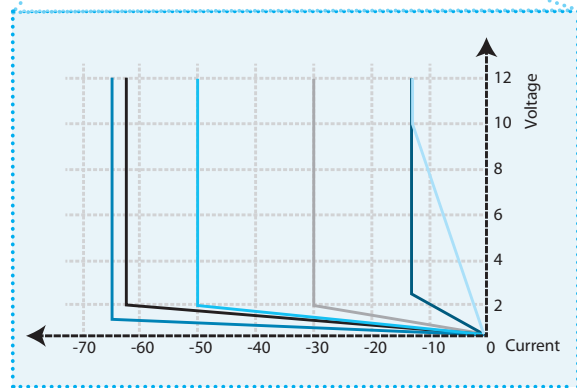
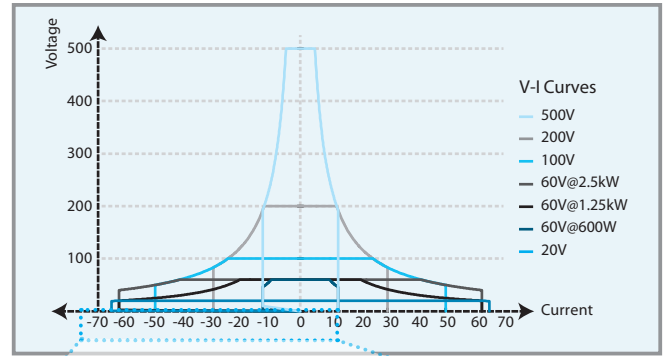
Note \*4 : When the rated load change from 10% to 90%, the item is stability time of voltage.

Note \*5 : When the bi-directional rated load change from -90% to 90%, the item is stability time of voltage.

Note \*6 : The spending time from zero to the maximum voltage is at no-load condition.

Note \*7 : 20µs sampling rate for calculating battery capacity and energy.

V-I curve of operating



Low Voltage Discharge

## ORDERING INFORMATION

Regenerative Battery Pack Test System Model 17020			
Power Range	Voltage	Current	Channel
600W	60V	13A	8~56
1.25kW	20V / 60V	65A / 62.5A	4~40
2.5kW	20V / 60V / 60V / 100V / 200V / 500V	130A / 125A / 62.5A / 50A / 30A / 13A	4~20
5kW	20V / 60V / 60V / 100V / 200V / 500V	260A / 250A / 125A / 100A / 60A / 26A	2~10
10kW	20V / 60V / 60V / 100V / 200V / 500V	520A / 500A / 250A / 200A / 120A / 52A	1~5
20kW	20V / 60V / 60V / 100V / 200V / 500V	1040A / 1000A / 500A / 400A / 240A / 104A	1~3
50kW	20V / 60V / 60V / 100V / 200V / 500V	2600A / 2500A / 1250A / 1000A / 600A / 260A	1
60kW	60V / 100V / 200V / 500V	1500A / 1200A / 720A / 312A	1

Others and Options	
51101-64	Thermal/Multi-function Data logger 64 channels
HIOKI 8423/8948	Data logger measurement unit
HIOKI 9683	Connection cable caption for HIOKI 8423
A170201	IPC for battery test system
A692003	Thermal sensor with cable
A692000	BMS data communication unit 4 Channels
A692001	BMS data communication unit 8 Channels



A692001 (8CH)





Chroma's 17030 system include a driving cycle simulation function. Since automotive battery packs are used at quick and irregular intervals, the 17030 includes the capability to create seamless transitions between maximum charge and maximum discharge (or maximum discharge and maximum charge) with a rapid 50 ms conversion. This feature allows for charge/discharge mode simulations of real world driving scenarios. The system simulates the real conditions on the battery pack in its working condition.

Chroma's 17030 system has flexible programming functions and includes Chroma's powerful Battery Pro software. Battery Pro is a user friendly software environment allowing for the creation of a wide range of test scenarios from basic charge and discharge to complex drive cycle testing. Battery Pro's features allows quick and intuitive test development to eliminate the need for tedious scripting or programming by a software developer.

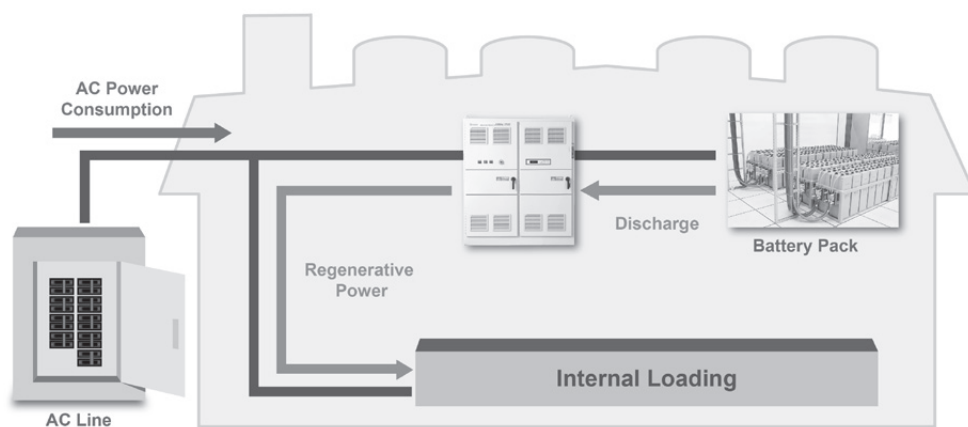
There are multiple safety features built into the 17030 including battery polarity checks, overvoltage protection, overcurrent protection and over temperature protection. In the unlikely event of a power or computer communication loss, the data is securely stored within the system in non-volatile memory thereby protecting against potential data loss and allowing for continuous flow after restart.

### KEY FEATURES

- Supports high power battery certification: IEC, SAE, GB, and etc.
- Regenerative battery discharge, Saves energy, environment-friendly and provides low heat dissipation
- Driving cycle simulator
- Industry Leading Accuracy
- 10ms Data acquisition
- Charge / discharge mode
  - Constant Current
  - Constant Voltage
  - Constant Power
- Customized rating power
  - Voltage range : 10~1200V
  - Current range : 0~1000A
  - Power range : 90~500kW (Parallel up to 2 units)
- System Integration:
  - Chamber Control
  - Multi-channels voltage/ temperature measurement (Max 256CH)
  - BMS Communication

### Regenerative Energy

- Regenerate power to grid, Low heat dissipation, reduce air-conditioner loads and facility power consumption
- THD under 5% at rated power
- The PF over 0.9 at rated power
- Efficiency above 85% when operated above 20% of rated power



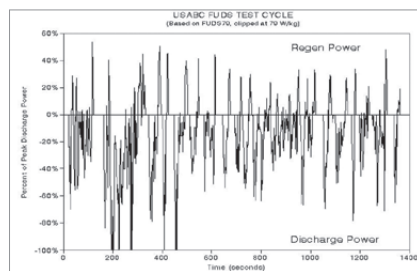
Chroma's 17030 is an automated regenerative test system specifically designed for high power battery pack tests. Accurate power sources and measurements ensure test quality suitable for repetitive and reliable testing of crucial battery packs. Applications include incoming inspections capacity validation, production and certification testing.

Chroma's 17030 system architecture offers regenerative discharging designed to recycle the electric energy sourced by the battery pack. This feature saves electricity, reduces the facilities costs, reduces the thermal foot print and provides a green solution by reducing the environmental impact to the planet.

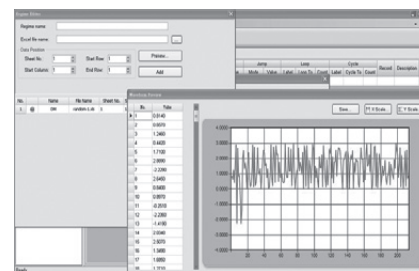
### Driving Cycle Simulation (Power/ Current Waveform mode)

Simulate real automotive working conditions by defining quick and irregular charging and discharging conditions.

- Import dynamic charge/discharge waveforms to simulate the DRIVE CYCLE or other actual applications via .xls file formats
- Supports 720,000 points within driving profile memory for saving profiles of each channel
- Minimum transition time ( $\Delta t$ ) = 10ms



Support FUDS test



Loading FUDS waveform current

## Software Function - Battery Pro

The 17030 Test system is specifically designed to meet the various requirements for testing secondary battery packs with high safety and stability. Charge and discharge protection aborts tests when abnormal conditions are detected. Data loss, storage and recovery are protected against power failure.

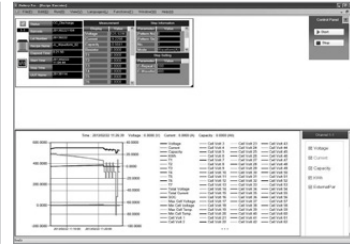
- Real-time battery pack status browse
- Icon Manager: Test status of each channel is managed through different icons, easy to read and understand
- Authority management: Allows for multiple user authority
- Fault record tracking: Records abnormal states of each channel independently

### Recipe editor

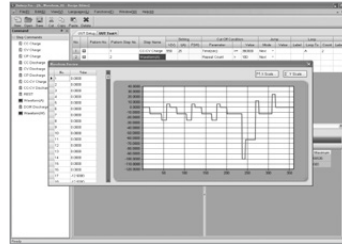
- 255 charge/discharge conditions
- Sets dual layer loops (cycle & loop) with 9999 loops per layer
- Ability to edit dynamic charge/discharge waveform
- 10ms current switching speed in waveform current mode
- Testing modes: CV/CC/CP/CC-CV/Waveform current/DCIR
- Cut-off conditions (time, current, capacity, cut-off voltage, cut-off current, etc.)



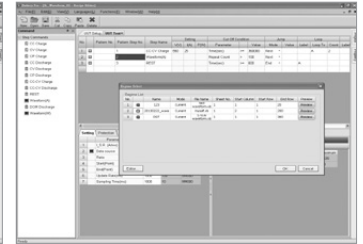
Battery Pro Main Page



Status browser



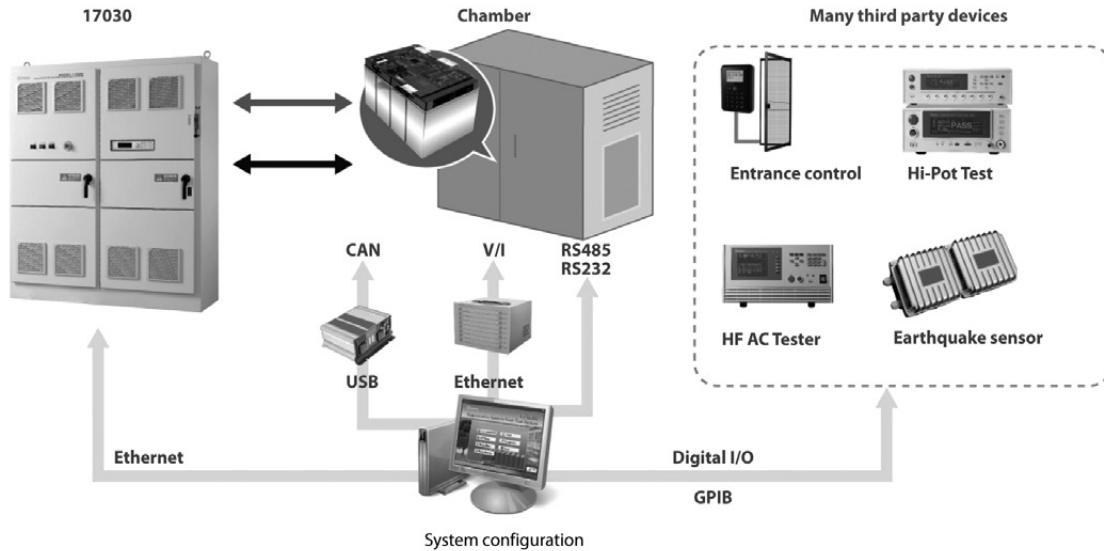
DST waveform current



Loading multi-waveform

## Software Integration

- Battery Pro can communicate to most thermal chambers for life and temperature testing .
- Many third party devices can be integrated into the 17030 via standard interface protocols (discrete I/O interface, GPIB, etc).



## ORDERING INFORMATION

Model 17030 Regenerative Battery Pack Test System			
Power Range	Voltage	Current	Channel
90kW	450V	200A	1
180kW	450V	200A	2
	700V	300A	1
210kW	900V	500A	1
250kW	700V	500A	1
	900V	500A	1
280kW	700V	200A	2
300kW	700V	1000A	1
500kW	1200V	700A	1
Others and Options			
<b>51101-64</b>	Thermal/Multi-function Data logger 64 channel (option)		
<b>A170201</b>	IPC for battery test system		
<b>A692003</b>	Thermal sensor (0~90°C) and cable (30cm)		

SPECIFICATIONS-1						
Model	17030 *					
Channel	1	2	1	1	1	
Max Power *1	90kW	180kW	180kW	250kW	210kW	
Max Power / Per channel	90kW	90kW	180kW	250kW	210kW	
Max Voltage	450V	450V	700V	700V	900V	
Max Current / Per channel	200A	200A	300A	500A	500A	
<b>Constant Voltage Mode</b>						
Voltage Range *2	15-450Vdc	15-450Vdc	15-700Vdc	15-700Vdc	19-900 Vdc	
Voltage accuracy	0.1%F.S.	0.1%F.S.	0.1%F.S.	0.1%F.S.	0.1%F.S.	
Voltage resolution	10mV	10mV	15mV	15mV	20mV	
<b>Constant Current Mode</b>						
Maximum Current	200A	200A	300A	500A	500A	
Current accuracy	0.1%F.S.	0.1%F.S.	0.1%F.S.	0.1%F.S.	0.1%F.S.	
Current resolution	10mA	10mA	15mA	20mA	20mA	
<b>Constant Power Mode</b>						
Max Power / Per channel	90kW	90kW	180kW	250kW	210kW	
Power accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.	0.2%F.S.	0.2%F.S.	
Power resolution	5W	5W	10W	20W	20W	
Current Rising Time (10% to 90% Load)	10ms with 0.2Ω Resistive load	10ms with 0.2Ω Resistive load	10ms with 0.2Ω Resistive load	10ms with 0.2Ω Resistive load	10ms with 0.2Ω Resistive load	
Ripple Noise (DC Current)	<1%F.S.	<1%F.S.	<1%F.S.	<1%F.S.	<1%F.S.	
Overshoot	<1%F.S.	<1%F.S.	<1%F.S.	<1%F.S.	<1%F.S.	
<b>Measurement *3</b>						
<b>Voltage Read Back</b>						
range	0~450V	0~450V	0~700V	0~700V	0~900V	
accuracy	0.05% rdg.+0.05% F.S.	0.05% rdg.+0.05% F.S.	0.05% rdg.+0.05% F.S.	0.05% rdg.+0.05% F.S.	0.05% rdg.+0.05% F.S.	
resolution	10mV	10mV	15mV	15mV	20mV	
<b>Current Read Back</b>						
High range	0~200A	0~200A	0~300A	0~500A	0~500A	
accuracy	0.1%F.S.	0.1%F.S.	0.1%F.S.	0.1%F.S.	0.1%F.S.	
Low range	0~50A	0~50A	0~75A	0~125A	0~125A	
accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.	0.2%F.S.	0.2%F.S.	
resolution	10mA	10mA	15mA	20mA	20mA	
<b>Power Read Back</b>						
Power range	90kW	90kW	180kW	250kW	250kW	
Power accuracy	0.2% F.S.	0.2% F.S.	0.2% F.S.	0.2% F.S.	0.2% F.S.	
Power resolution	5W	5W	10W	20W	20W	
<b>Thermal Sensor</b>						
range	0°C ~90°C	0°C ~90°C	0°C ~90°C	0°C ~90°C	0°C ~90°C	
accuracy	±0.2°C	±0.2°C	±0.2°C	±0.2°C	±0.2°C	
resolution	0.1°C	0.1°C	0.1°C	0.1°C	0.1°C	
<b>AC Input</b>						
Line voltage / Frequency *4	3Ø 200V/220V/380V/440V/480V ± 5%, 47~63Hz					
<b>Others</b>						
Audible noise level (in 1m distance)	Under 80dB					
Efficiency (Typical)	85%					
Interface *5	Ethernet					
Operation Temperature	0°C ~ 40°C					
Dimension (H x W x D) *6	Transformer	1111 x 813 x 686mm / 43.75 x 32 x 27 inch	1257 x 1041 x 813mm / 49.5 x 41 x 32 inch	1257 x 1041 x 813mm / 49.5 x 41 x 32 inch	1257 x 1041 x 813mm / 49.5 x 41 x 32 inch	1257 x 1041 x 813mm / 49.5 x 41 x 32 inch
	Power Enclosure	1982 x 1982 x 915mm / 78 x 78 x 36 inch	1982 x 1982 x 915mm / 78 x 78 x 36 inch	1982 x 1982 x 915mm / 78 x 78 x 36 inch	1982 x 1982 x 915mm / 78 x 78 x 36 inch	1982 x 1982 x 915mm / 78 x 78 x 36 inch
Weight *7	Transformer	approx. 465 kg / approx. 1025 lbs	approx. 710 kg / approx. 1560 lbs	approx. 640 kg / approx. 1400 lbs	approx. 710 kg / approx. 1560 lbs	approx. 710 kg / approx. 1560 lbs
	Power Enclosure	approx. 1140 kg / approx. 2500 lbs	approx. 1600 kg / approx. 3500 lbs	approx. 1140 kg / approx. 2500 lbs	approx. 1140 kg / approx. 2500 lbs	approx. 1270 kg / approx. 2800 lbs

SPECIFICATIONS-2					
Model		17030 *			
Channel		1	2	1	1
Max Power *1		250kW	280kW	300kW	500kW
Max Power / Per channel		250kW	140kW	300kW	500kW
Max Voltage		900V	700V	700V	1200V
Max Current / Per channel		500A	200A	1000A	700A
<b>Constant Voltage Mode</b>					
Voltage Range *2		19-900 Vdc	15-700Vdc	15-700Vdc	30-1200Vdc
Voltage accuracy		0.1%F.S.	0.1%F.S.	0.1%F.S.	0.1%F.S.
Voltage resolution		20mV	15mV	15mV	30mV
<b>Constant Current Mode</b>					
Maximum Current		500A	200A	1000A	700A
Current accuracy		0.1%F.S.	0.1%F.S.	0.1%F.S.	0.1%F.S.
Current resolution		20mA	10mA	40mA	30mA
<b>Constant Power Mode</b>					
Max Power / Per channel		250kW	140kW	300kW	500kW
Current accuracy		0.2%F.S.	0.2%F.S.	0.2%F.S.	0.2%F.S.
Power resolution		20W	10W	20W	40W
Current Rising Time (10% to 90% Load)		10ms with 0.2Ω Resistive load	10ms with 0.2Ω Resistive load	10ms with 0.2Ω Resistive load	10ms with 0.2Ω Resistive load
Ripple Noise (DC Current)		<1%F.S.	<1%F.S.	<1%F.S.	<1%F.S.
Overshoot		<1%F.S.	<1%F.S.	<1%F.S.	<1%F.S.
<b>Measurement *3</b>					
Voltage Read Back					
Range		0~900V	0~700V	0~700V	0~1200V
Accuracy		0.05% rdg.+0.05% F.S.	0.05% rdg.+0.05% F.S.	0.05% rdg.+0.05% F.S.	0.05% rdg.+0.05% F.S.
Resolution		20mV	15mV	15mV	30mV
Current Read Back					
High range		0~500A	0~200A	0~1000A	0~700A
Accuracy		0.1% F.S.	0.1%F.S.	0.1%F.S.	0.1%F.S.
Low range		0~125A	0~50A	0~250A	0~175A
Accuracy		0.2% F.S.	0.2%F.S.	0.2%F.S.	0.2%F.S.
Resolution		20mA	10mA	40mA	30mA
Power Read Back					
Power range		250kW	140kW	300kW	500kW
Power accuracy		0.2% F.S.	0.2% F.S.	0.2% F.S.	0.2% F.S.
Power resolution		20W	10W	20W	40W
Thermal Sensor					
Range		0°C ~90°C	0°C ~90°C	0°C ~90°C	0°C ~90°C
Accuracy		±0.2°C	±0.2°C	±0.2°C	±0.2°C
Resolution		0.1°C	0.1°C	0.1°C	0.1°C
AC Input					
Line voltage / Frequency *4		3Ø 200V/220V/380V/440V/480V ± 5%, 47~63Hz			
<b>Others</b>					
Audible noise level (in distance)		Under 80dB			
Efficiency (Typical)		85%			
Interface *5		Ethernet			
Operation Temperature		0°C ~ 40°C			
Dimension (H x W x D) *6	Transformer	1257 x 1041 x 813mm / 49.5 x 41 x 32 inch	1257 x 1041 x 813mm / 49.5 x 41 x 32 inch	1257 x 1041 x 813mm / 49.5 x 41 x 32 inch	1257 x 1041 x 813mm / 49.5 x 41 x 32 inch
	Power Enclosure	1982 x 1982 x 915mm / 78 x 78 x 36 inch	1982 x 1982 x 915mm / 78 x 78 x 36 inch	1982 x 1982 x 915mm / 78 x 78 x 36 inch	2286 x 5030 x 609mm / 90 x 198 x 24 inch
Weight *7	Transformer	approx. 710 kg / approx. 1560 lbs	approx. 710 kg / approx. 1560 lbs	approx. 710 kg / approx. 1560 lbs	approx. 1420 kg / approx. 3120 lbs
	Power Enclosure	approx. 1270 kg / approx. 2800 lbs	approx. 1270 kg / approx. 2800 lbs	approx. 1650 kg / approx. 3640 lbs	approx. 2270 kg / approx. 5000 lbs

**Note\*1 :** Customized rated power : Voltage 10~1200V; max Current 1000A ; Power 90~500kW

**Note\*2 :** The output range of voltage is referred by the cabling. The connection between the device and battery is 3 meters long as standard accessory.

**Note\*3 :** 20us sampling rate for calculating battery capacity and energy

**Note\*4 :** The transformer is for isolation and to accommodate various facility voltages

**Note\*5 :** The interface from PC to 17030 is through Ethernet

**Note\*6 :** The dimension is for reference. The dimensions are subject to change base on real condition

**Note\*7 :** The weight is for reference. The weight are subject to change base on real condition





The Chroma 17040 Regenerative Battery Pack Test System is a high precision system specifically designed for secondary battery module and pack tests. It has an energy regenerative function to greatly reduce power consumption during discharge, and ensure a stable power grid without generating harmonic pollution on other devices - even in dynamic charge and discharge conditions. It is capable of recycling the electric energy discharged by the battery module back to the grid reducing wasted energy that is discharged by traditional equipment in the form of heat, thus reducing the HVAC requirements.

The Chroma 17040 system has built in parallel channels and dynamic profile simulation functions. The parallel capability increases the charge and discharge current and power to its maximum, thus increasing the efficiency and flexibility of device usage. The dynamic profile simulation allows the user to load a battery waveform of a given drive profile in either current or power mode to meet the NEDC/FUDS requirements. Its bi-directional architecture ensures that the current will not be interrupted during the charge and discharge transient state so that the driving conditions can be accurately simulated to be in line with the ISO, IEC, UL and GB/T international testing standards.

Equipped with Chroma's powerful "Battery Pro" software, the 17040 system has flexible test editing functions to perform independent channel tests, and conforms to the diversified requirements for testing secondary battery packs with high safety and stability. It also supports power failure recovery functions that ensure test data is not interrupted.

The test system has multiple safety features including Over Voltage Protection, Over Current Protection Check, Over Temperature Protection, and external parameter detection to ensure protected charge/discharge testing on the batteries. Furthermore data loss, storage and recovery are protected against power failure.

## KEY FEATURES

- Conforms to international standards for battery testing: IEC, ISO, UL, and GB/T, etc.
- Regenerative battery energy discharge (Eff. >90%, PF >0.95, I\_THD <5%)
- 4 voltage and current ranges for auto ranging function to provide optimum resolution
- High accuracy current/voltage measurement ( $\pm 0.05\%FS/\pm 0.02\%FS$ )
- 2ms current slew rate and 1ms data acquisition
- Dynamic (current/power) driving profile simulation tests for NEDC, FUDS, HPPC
- Test channel parallel function
- Test data analysis function
- Data recovery protection (after power failure)
- Automatic protection for error condition
- Battery simulator (option)
- High power testing equipment
  - Voltage range : 10~1000V
  - Current range : 0~1500A
  - Power range : 0~600kW
- Customized integration functions
  - Integrated temperature chamber
  - BMS data analysis
  - Multi-channel voltage/temperature recording

## FIELDS OF APPLICATION

- Power battery module
- Energy storage system
- Motor driver
- Power control system

Security



Efficiency



Precision



## Regenerative Battery Pack Test System



## SYSTEM FEATURES

### Security - Reinforce Risk Management

- Able to load test, cut-off, and protection criteria to a charging/discharging device directly for execution to achieve multi-layer protection through internal software and hardware
- Able to integrate external hardware to get real-time monitoring parameters from BMS, Data Logger, Chamber, and I/O signals to execute warning/cut-off/power off protection
- Able to monitor various voltage and temperature values of battery packs through readings from BMS and measurements on Data Logger; also able to perform instant judgment and protection based on set values
- Built-in multiple warning and protection modes : OVP, UVP, OTP, WIR\_LOSS, CAL\_ERR, POW\_ERR, RMT\_RVS

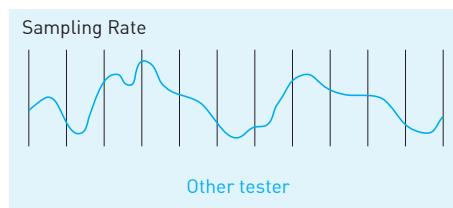
### Precision - Improve Product Quality

- High frequency sampling measurement technology: Max. sampling rate 50kHz to ensure dynamic measurement accuracy
- Voltage accuracy:  $\pm (0.02\% \text{ of rdg. } \pm 0.02\% \text{ of r.n.g.})$
- Current accuracy:  $\pm (0.05\% \text{ of rdg. } \pm 0.05\% \text{ of r.n.g.})$
- Quick response test technology: 2ms (-90% to 90%) current slew rate applicable for various test applications
- Auto voltage/current range switch function: 4 ranges are varied with current change that will be automatically adjusted to optimize the measurement accuracy
- Support dynamic driving profile simulation (waveform), which simulates the current and power state of real driving conditions to comply with the NEDC, FUDS and HPPC standards

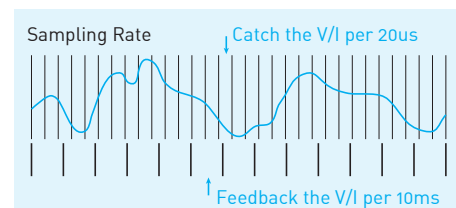
### High frequency sampling measurement technology

Generally, battery chargers/dischargers use software to read current values for power computing; however, limited data sampling speed could result in large errors when calculating the dynamic current capacity. By increasing the V/I sampling rate and double integrating method, Chroma is able to provide capacity calculation with much higher accuracy. When the current changes, the data is not lost and the transmission speed is not affected.

- V/I sampling rate: 50KHz (per 20  $\mu$ s)
- Integrate calculus: I for capacity; VxI for energy



General charger/discharger sampling rate

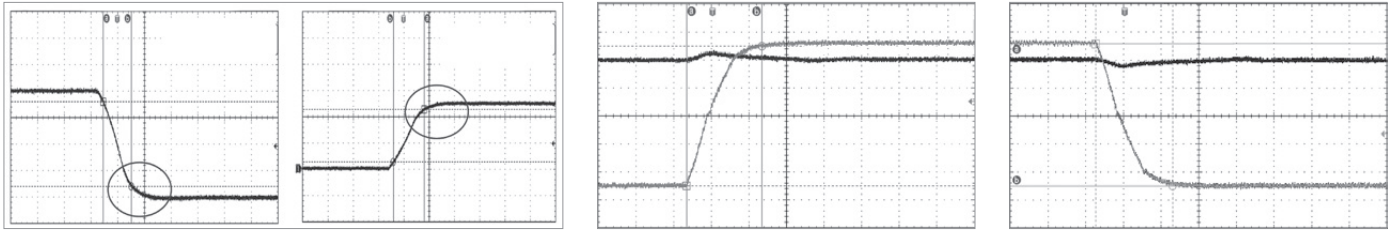


Chroma charger/discharger sampling rate

## Quick response test technology

In quick response mode, the current is smooth without overshoot to avoid damaging the battery

- Current ripple noise <0.5%, Overshoot <1%



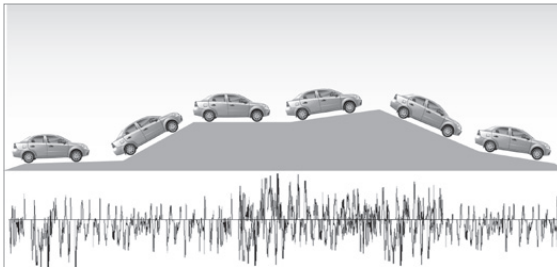
Overshoot <1%

Current slew rate 2ms (-90% to 90%)

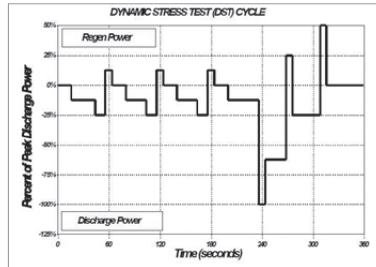
## Dynamic driving profile simulation

Battery packs are used under quick and irregular current conditions. The 17040 system simulates real conditions on the battery pack via the working condition simulator

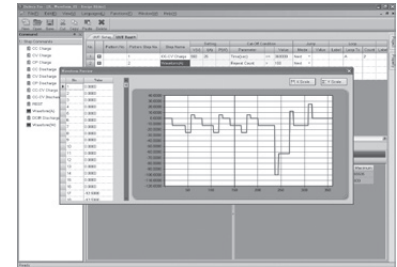
- Dynamic charge/discharge power or current waveforms simulate the drive cycle or any real world application. In the dynamic current mode (waveform), the current transition time for maximum discharge and charge requires only 2ms
- Test steps can specify an Excel file from which to read the stored current/power waveform
- 720,000 points of driving profile memory available to save the waveform profile in each channel
- Interval for profile condition changes: 1ms~10sec.



Driving profile simulation



Regulatory compliance testing standards



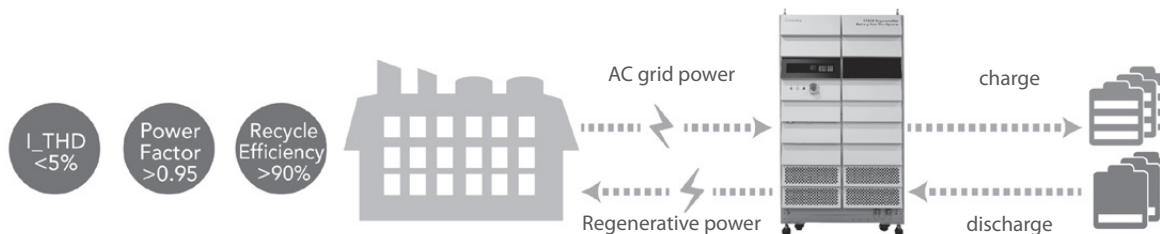
Profile simulation data loading equipment

## Efficiency - Reduce Operating Costs

- Software and hardware integration and customization capabilities including BMS, Data logger, Chamber, external signals, and HIL (HIL, Hardware in the Loop)
- Provides various signal interfaces for a variety of external devices (CANbus, Ethernet, Analog I/O) to support HIL
- Parallel function within the system up to a maximum of 600kW, 1500A
- Equipped with battery charger/discharger and simulator functions
- Embedded with high efficiency discharge energy regeneration technology

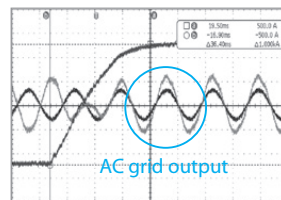
## Discharge energy recycling technology

- Bidirectional circuit architecture to accurately control reverse current change
- Regenerative battery energy discharge (efficiency > 90%)
- Static regenerative energy: In compliance with regenerative grid standards for solar energy, current THD < 5%, PF > 0.95
- Dynamic regenerative energy: Real-time transient current phase transitions avoid contaminating the grid

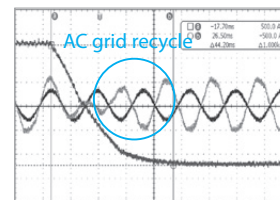


- I<sub>THD</sub> <5%
- Power Factor >0.95
- Recycle Efficiency >90%

- Smooth AC current waveform and real-time phase transition when energy is regenerated to the grid. This prevents other equipment from being affected by false test results or a contaminated grid



Discharge state changes to charge state



Charge state changes to discharge state

規格表										
Model	17040									
Max. Power	60kW			120kW			180kW			
Max. Voltage	500V	750V	1000V	500V	750V	1000V	500V	750V	1000V	
Max. Current	150A	150A	150A	300A	300A	300A	450A	450A	450A	
Channel	1			1			1			
Constant Voltage Mode										
Voltage Range	10~500V	15~750V	30~1000V	10~500V	15~750V	30~1000V	10~500V	15~750V	30~1000V	
Voltage Accuracy	±0.1%FS			±0.1%FS			±0.1%FS			
Voltage Resolution	10mV	15mV	20mV	10mV	15mV	20mV	10mV	15mV	20mV	
Constant Current Mode										
Current Accuracy	±0.1%FS			±0.1%FS			±0.1%FS			
Current Resolution	10mA			20mA			30mA			
Constant Power Mode										
Power Accuracy	±0.2%FS			±0.2%FS			±0.2%FS			
Power Resolution	100mW			100mW			100mW			
Battery Simulator Mode										
Voltage Range	10~500V	15~750V	30~1000V	10~500V	15~750V	30~1000V	10~500V	15~750V	30~1000V	
Voltage Accuracy	±0.1%FS			±0.1%FS			±0.1%FS			
Voltage Ripple (rms)	< 1%FS			< 1%FS			< 1%FS			
Measurement										
Voltage Range (4 Scales as F.S.)	1	500V	750V	1000V	500V	750V	1000V	500V	750V	1000V
	2	350V	500V	700V	350V	500V	700V	350V	500V	700V
	3	150V	350V	450V	150V	350V	450V	150V	350V	450V
	4	60V	100V	120V	60V	100V	120V	60V	100V	120V
Voltage Accuracy	±(0.02% rdg + 0.02% FS)			±(0.02% rdg + 0.02% FS)			±(0.02% rdg + 0.02% FS)			
Voltage Resolution	10mV	15mV	20mV	10mV	15mV	20mV	10mV	15mV	20mV	
Current Range (4 Scales as F.S.)	1	150A	150A	150A	300A	300A	300A	450A	450A	450A
	2	75A	75A	75A	150A	150A	150A	225A	225A	225A
	3	30A	30A	30A	60A	60A	60A	90A	90A	90A
	4	10A	10A	10A	20A	20A	20A	30A	30A	30A
Current Accuracy	±(0.05% rdg + 0.05% FS)			±(0.05% rdg + 0.05% FS)			±(0.05% rdg + 0.05% FS)			
Current Resolution	0.1mA @ 10A Current Scale			0.2mA @ 20A Current Scale			0.3mA @ 30A Current Scale			
Power Accuracy	±0.15% FS			±0.15% FS			±0.15% FS			
Power Resolution	1mW			1mW			1mW			
Model	17040									
Max. Power	250kW			300kW			300kW			
Max. Voltage	500V	750V	1000V	500V	750V	1000V	500V	750V	1000V	
Max. Current	600A	600A	600A	750A	750A	750A	750A	750A	750A	
Channel	1			1			1			
Constant Voltage Mode										
Voltage Range	10~500V	15~750V	30~1000V	10~500V	15~750V	30~1000V	10~500V	15~750V	30~1000V	
Voltage Accuracy	±0.1%FS			±0.1%FS			±0.1%FS			
Voltage Resolution	10mV	15mV	20mV	10mV	15mV	20mV	10mV	15mV	20mV	
Constant Current Mode										
Current Accuracy	±0.1%FS			±0.1%FS			±0.1%FS			
Current Resolution	40mA			50mA			50mA			
Constant Power Mode										
Power Accuracy	±0.2%FS			±0.2%FS			±0.2%FS			
Power Resolution	1W			1W			1W			
Battery Simulator Mode										
Voltage Range	10~500V	15~750V	30~1000V	10~500V	15~750V	30~1000V	10~500V	15~750V	30~1000V	
Voltage Accuracy	±0.1%FS			±0.1%FS			±0.1%FS			
Voltage Ripple (rms)	< 1%FS			< 1%FS			< 1%FS			
Measurement										
Voltage Range (4 Scales as F.S.)	1	500V	750V	1000V	500V	750V	1000V	500V	750V	1000V
	2	350V	500V	700V	350V	500V	700V	350V	500V	700V
	3	150V	350V	450V	150V	350V	450V	150V	350V	450V
	4	60V	100V	120V	60V	100V	120V	60V	100V	120V
Voltage Accuracy	±(0.02%rdg+0.02% FS)			±(0.02%rdg+0.02% FS)			±(0.02%rdg+0.02% FS)			
Voltage Resolution	10mV	15mV	20mV	10mV	15mV	20mV	10mV	15mV	20mV	
Current Range (4 Scales as F.S.)	1	600A	600A	600A	750A	750A	750A	750A	750A	
	2	300A	300A	300A	375A	375A	375A	375A	375A	
	3	120A	120A	120A	150A	150A	150A	150A	150A	
	4	40A	40A	40A	50A	50A	50A	50A	50A	
Current Accuracy	±(0.05% rdg + 0.05% FS)			±(0.05% rdg + 0.05% FS)			±(0.05% rdg + 0.05% FS)			
Current Resolution	0.4mA @ 40A Current Scale			0.5mA @ 50A Current Scale			0.5mA @ 50A Current Scale			
Power Accuracy	±0.15% FS			±0.15% FS			±0.15% FS			
Power Resolution	10mW			10mW			10mW			

GENERAL SPECIFICATIONS		
Battery Charge & Discharge Test System		
Operating Mode	Charge	CC, CV, CP, CC-CV, Waveform Power, Waveform Current, DCIR
	Discharge	CC, CV, CP, CR, CP-CV, Waveform Power, Waveform Current, DCIR
Current Rising/Falling Time with 0.2Ω Resistive load		2ms (-90% to 90%)
Current Ripple Noise		<0.5%F.S.
Overshoot		<1%F.S.
Temperature Coefficient (Voltage/Current)		<50 ppm/°C
AC Input		
Line Voltage / Frequency (3 phase, 4 wire with earth ground)		Input 200~220V <sub>ac</sub> ± 10% V <sub>LL</sub> , 47-63Hz Input 380~400V <sub>ac</sub> ± 10% V <sub>LL</sub> , 47-63Hz Input 440~480V <sub>ac</sub> ± 10% V <sub>LL</sub> , 47-63Hz
Power Factor		> 0.95 (at rated power)
I_T.H.D		< 5% (at rated power)
Others		
Efficiency		>90% (at rated power)
PC Interface		Ethernet
Operating Temperature		0°C~40°C
Protection		UVP, OCP, OPP, OTP, FAN, Short
Safety & EMC		CE
Noise Level		<70dB
Interface		Standard : Ethernet, I/O control Option : GPIB, HIL(Ethernet, CAN, Analog), BMS read/write
Dimension (H x W x D) / Weight		
60kW		190cm x 100cm x 50cm / 900 kg
120kW		190cm x 100cm x 100cm / 1800 kg
180kW		190cm x 150cm x 100cm / 2700 kg
250kW		190cm x 200cm x 100cm / 3600 kg
300kW		190cm x 250cm x 100cm / 4500 kg

## SPECIFICATIONS OF 5110164 THERMAL/MULTIFUNCTION DATA LOGGER

Model	51101-64
Temperature Reading	
Number of Inputs (option)	8, 16, 24, 32, 40, 48, 56, 64
Temperature Sensor Type	Thermocouple : B, E, J, K, N, R, S, T
Temperature Resolution	± 0.01 °C
Temperature Accuracy	± (0.01% of reading + 0.3) °C
CJC Error	± 0.3°C
Maximum Sample Rate	5 sample/sec.
Channel to Channel Isolation	1000VDC/750 Vrms

Voltage Reading	
Voltage Input Type	VA-10 Voltage Adaptor
Voltage Resolution	100uV
Voltage Input Range	± 10VDC
Voltage Input Accuracy	± (0.05% of reading + 500uV)
Input Resistance	300 KΩ

## ORDERING INFORMATION

Regenerative Battery Pack Test System Model 17040			
Power Range	Voltage	Current	Channels
60kW	1000V	150A	1
	750V	150A	
	500V	150A	
120kW *	1000V	300A	1
	750V	300A	
	500V	300A	
180kW *	1000V	450A	1
	750V	450A	
	500V	450A	
250kW *	1000V	600A	1
	750V	600A	
	500V	600A	
300kW *	1000V	750A	1
	750V	750A	
	500V	750A	

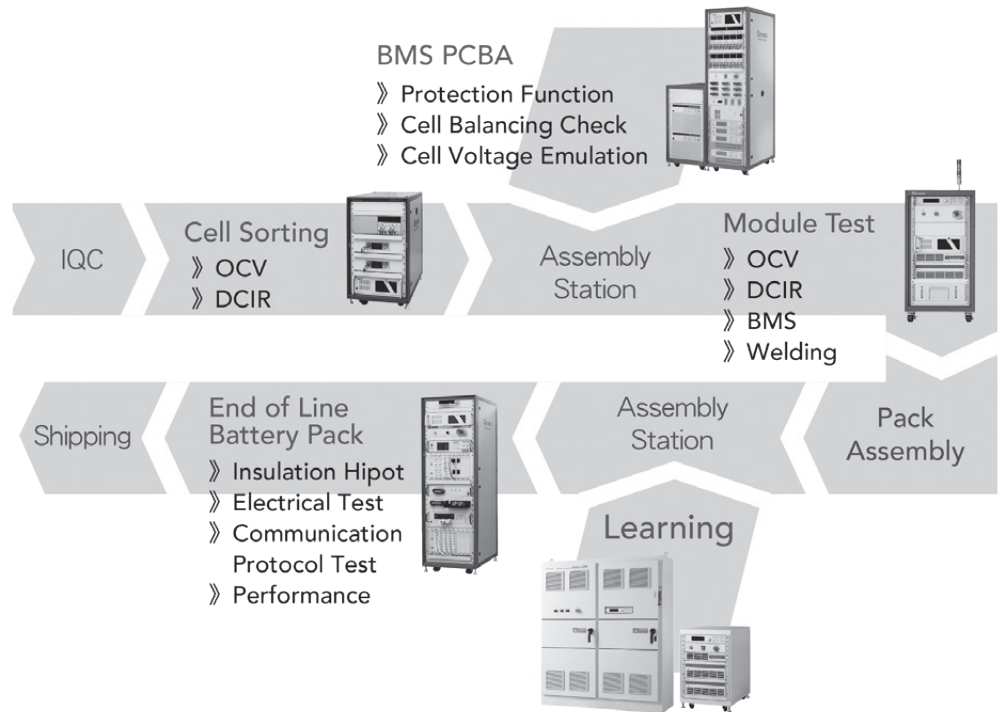
Others and Options	
51101-64	Thermal/Multi-Function Data Logger, 8~64 CH
A170201	IPC for battery test system
A692004	AC input cable (5m)
A692005	DC output cable and sensor (3m)

\* 120kW model will be available in Q2, 2017, 180kW/250kW/300kW models will be available in Q3, 2017.





## Battery Pack Production Flow Chart



### KEY FEATURES

- Specifically designed for battery production line, or battery development testing
- The application range of this system includes battery modules for electric vehicles, motor vehicles, and power storage systems
- Increases QA efficiency by up to 80%
- Inspection of BMS functions, connector withstand voltage, consistency, and performance of battery module
- Charge/discharge power range : 5kW~500kW  
Charge/discharge voltage range : 0V~1200V  
Charge/discharge current range : 0A~2600A
- Standard test items include insulation resistance, electrical tests, software/communication, and battery performance testing
- Able to create test fixture to connect the customized battery module with the automated switch control
- The control system is an easy to use open software platform that supports shop floor control integration with Manufacturing Execution System (MES)

### Battery Cell/ Module/Pack Test Solutions

In order to increase testing coverage and the efficiency of the power storage battery industry, Chroma ATE has developed an automated inspection system that can be applied to the EOL (End Of Line) of battery pack production for testing assembly defects, Battery Management System (BMS) communication, internal power switches, battery balancing circuits/consistency, and temperature distribution, etc. before battery packs are shipped out of the factory.

The comprehensive PASS/FAIL tests can be used in production lines, in a development phase nearing completion and used during battery pack acceptance inspection for EV or energy storage station.

### BMS PCBA Automated Test System

- 2~72 series cell voltage simulation
- Support active and passive balance test
- Flexible hardware architecture that can select a variety of hardware devices
- The test items can be expanded to meet the demands for inspecting tests.
- Support dual-output of battery module
- Resistor measurement (ID pin/NTC)
- BMS IC Firmware program & Parameter download BMS data compare
- Support BMS interface: CANBus/RS485/RS232
- Support BMS power consumption measurement
- BMS IC V/I/T calibration
- Over voltage protection test
- Under voltage protection test
- Over charge current protection test
- Over discharge current protection test
- Over temperature protection test



BMS PCBA ATS

## Battery Cell Automated Test System

- Pass/fail validation for battery cell production
- OCV, ACIR and DCIR measurement for multi-channels
- Charge/discharge power range : 100W~400W
- Charge/discharge voltage/current range: 0V~80V/0A~80A



Battery Cell ATS

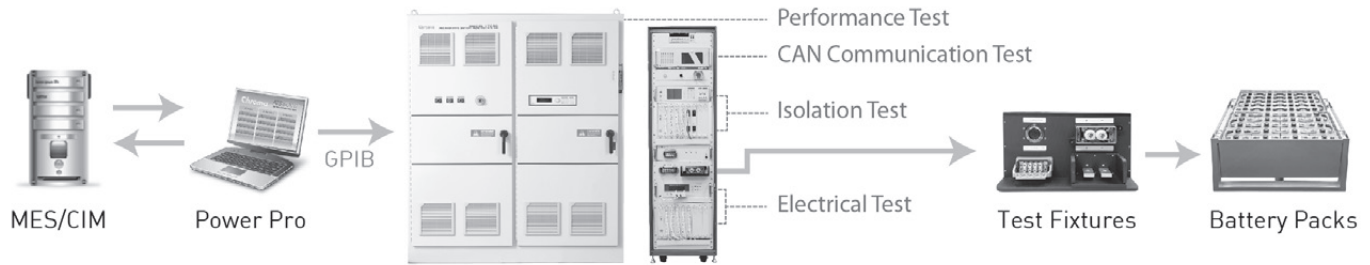
## Battery Module Automated Test System

- Pass/Fail validation for battery module production
- Inspection of BMS functions for voltage/temperature measurement accuracy as well as the distribution consistency of voltage/DC resistance/temperature for each serial cell of battery pack
- Charge/discharge power range: 2.5kW~50kW
- Charge/discharge voltage/current range: 0V~200V/0A~2600A

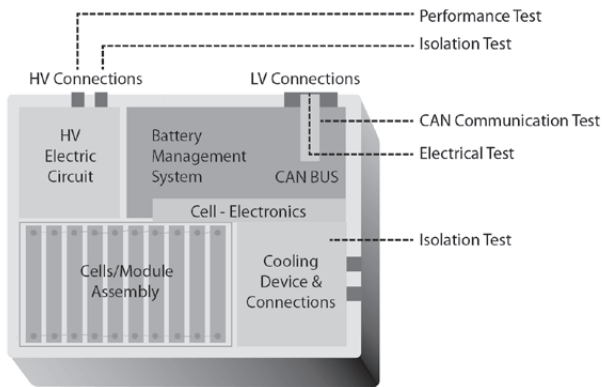


Battery Module ATS

## Architecture of Battery Pack Automated Test System



## Standard Function Test Items



### Performance Test

- Standard charge/discharge capacity test
- Drive profile cycle test
- DCIR / OCV test

### Isolation Test

- Terminal(HV+, HV-) insulation resistance
- Ground isolation
- Shield impedance
- Hi-Pot test

### Electrical Test

- HV interlock function test
- Max. and Min Voltage/Temperature range test

### CAN Communication Test

- Cell and Pack voltage/Temperature
- Contactor characterization
- Diagnostic trouble and fault mode test

## ORDERING INFORMATION

- 8700** : Battery Pack ATS
- AC Source** : Model 6400, 6500, 61500, 61600, 61700, 61800 Series
- DC Source** : Model 62000H, 62000P Series
- DC Load Module** : 6310A, 63200A, 6330A, 63600 Series
- Digital Power Meter** : Model 66200 Series
- Electrical Safety Analyzer 500VA** : Model 19032-P
- EOL LV Isolation Box**
- EOL HV Switch Box**
- Load Series Connection Box**
- OBC Charger Box**

- 5004ATM** : System Controller
- A190304** : 8HV Scanner
- A800003** : 8000 software Package
- A800004** : 19" Rack for Model 8000
- A800005** : PCI BUS GPIB Card (National Instrument)

\* Please refer to Model 8000's specifications for detail instruments

# Passive Component Test Solution

<b>Selection Guides</b>	<b>12-1</b>
<b>LCR Meter/Automatic Transformer Test System</b>	<b>12-3</b>
<b>Electrolytic Capacitor Analyzer</b>	<b>12-15</b>
<b>Programmable HF AC Tester</b>	<b>12-19</b>
<b>Milliohm Meter</b>	<b>12-21</b>
<b>Component Test Scanner</b>	<b>12-22</b>
<b>Automatic Test System</b>	<b>12-23</b>
<b>Options of Passive Component Test Instruments</b>	<b>12-35</b>

# Overview

Capacitor Test System

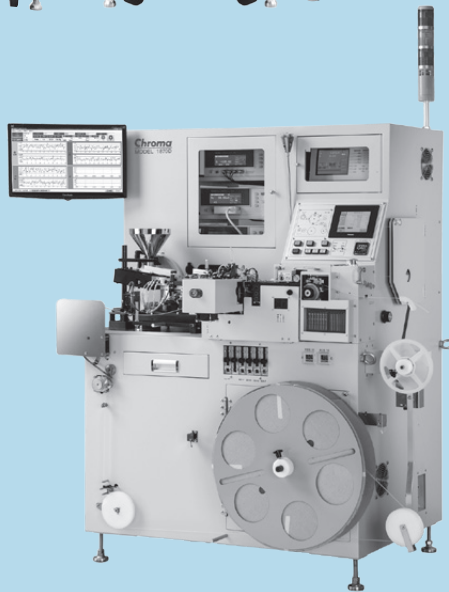
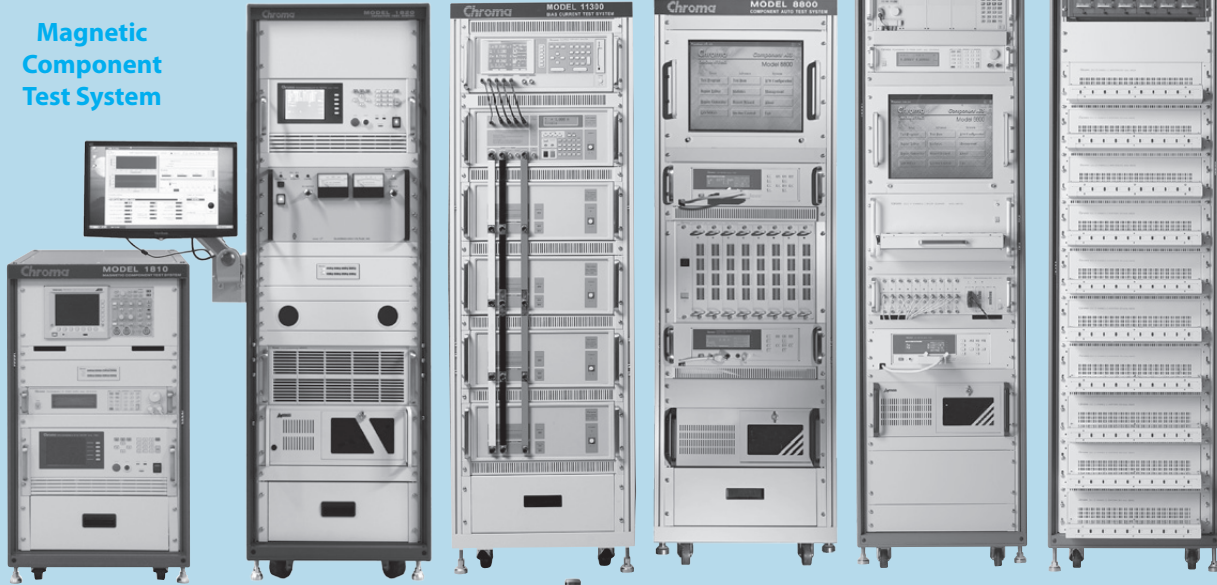
Bias Current Test System

Component ATS

EDLC ATS

EDLC LC Monitoring System

Magnetic Component Test System



Inductor Test & Packing Machine



Inductor Layer Short ATS

Milliohm Meter  
Capacitor Leakage Current/IR Meter  
Electrolytic Capacitor Analyzer

LCR Meter  
Programmable HF AC Tester



HF LCR Meter  
Automatic Transformer Tester

Automatic Component Analyzer  
Bias Current Source

Component Test Scanner



## LCR Meter Selection Guide

Model	Frequency Range	Impedance Range	Description	Page
11020	100Hz, 120Hz, 1kHz	0.1pF ~ 4.00 F	High speed capacitance inspection	12-7
11021	100Hz, 120Hz, 1kHz, 10kHz	0.1mΩ ~ 100MΩ	Digital bin-sorting and comparator functions, up to 1kHz only optional	12-4
11021-L	1kHz, 10kHz, 40kHz, 50kHz	0.1mΩ ~ 100MΩ	Digital bin-sorting and comparator functions	12-4
11022	50/60/100/120/1k/10k/ 20k/40k/50k/100k Hz	0.01mΩ ~ 100MΩ	Digital high speed measurement in all test frequencies, excellent low-impedance measurement accuracy, bin-sorting and comparator functions	12-5
11025	50/60/100/120/1k/10k/ 20k/40k/50k/100k Hz	0.01mΩ ~ 100MΩ	Identical Model 11022, and add transformer testing function	12-5
11050-30M (New)	75kHz~30MHz	0.1mΩ ~ 100MΩ	wide range test frequency, high speed measurement, and excellent accuracy	12-3
11050 (New)	1kHz~10MHz	0.1mΩ ~ 100MΩ	wide range test frequency, high speed measurement, and excellent accuracy	12-3
11050-5M (New)	60Hz~5MHz	0.1mΩ ~ 100MΩ	wide range test frequency, high speed measurement, and excellent accuracy	12-3
1062A	40Hz~200kHz, 30 points	0.01mΩ ~ 100MΩ	Excellent low impedance measurement accuracy and comparator function	12-6
1075	20Hz~200kHz	0.01mΩ ~ 100MΩ	Excellent low impedance measurement accuracy and bin-sorting function	12-6
3252	20Hz~200kHz	0.1mΩ ~ 100MΩ	LCR + transformer testing and frequency characteristics analysis function Built-in 1A/8mA bias current source optional	12-10
3302	20Hz~1MHz	0.1mΩ ~ 100MΩ	Identical Model 3252 1MHz edition	12-10

## Auto Transformer Test System Selection Guide

Model	Frequency Range	Impedance Range	Description	Page
13350 + A133502	20Hz ~ 200kHz	0.1mΩ ~ 100MΩ	High speed 20 channels/Transformer L/C/Z/DCR/Turns-ratio/ Pin-short/Balance scanning test function	12-8
13350 + A133505	20Hz ~ 200kHz	0.1mΩ ~ 100MΩ	High speed 80 channels/Transformer L/C/Z/DCR/Turns-ratio/ Pin-short/Balance scanning test function	12-8
3250 + A132501	20Hz ~ 200kHz	0.1mΩ ~ 100MΩ	20 channels/Transformer L/C/Z/DCR/Turns-ratio/ Pin-short/Balance scanning test function	12-10
3252 + A132501	20Hz ~ 200kHz	0.1mΩ ~ 100MΩ	Identical Model 3250 and add LCR Meter function	12-10
3302 + A132501	20Hz ~ 1MHz	0.1mΩ ~ 100MΩ	Identical Model 3252 1MHz edition	12-10
3312 + A132501	20Hz ~ 1MHz	0.1mΩ ~ 100MΩ	Identical Model 3302 and add Telecom parameter measurement function	12-12

## Bias Current Source / Test System Selection Guide

Model	Frequency Range	Impedance Range	Description	Page
1310	20Hz ~ 200kHz	0~10A	Economic type	12-13
1320	20Hz ~ 1MHz	0~20A	Programmable, and also can be controlled by Chroma 3252/3302 combined with Chroma 1320 to extend drive current	12-13
1320S	20Hz ~ 1MHz	0~20A	Slave (1320)	12-13
1320-10A	20Hz ~ 1MHz	0~10A	Identical 1320 10A edition, mainly used in PFC choke testing which higher DC resistance and the DC voltage dropped exceeds 6V	12-13
11300	20Hz~1MHz	0~300A	Intergration of 1320S with LCR Meter for large bias current testing of power choke	12-14

## Electrolytic Capacitor Tester Selection Guide

Model	Primary Function	Test Signal	Description	Page
11800	Ripple current tester	100Hz/120Hz/400Hz/1kHz, 0~30A DC Bias 0.5V~500V	For load life testing of electrolytic capacitor which used in power line rectifier	12-17
11801	Ripple current tester	20k~100kHz, 0~10A, DC Bias 0~500V	For load life testing of electrolytic capacitor which used in SMPS output filter	12-17
11810	Ripple current tester	20k~1000kHz, 0~10A, DC Bias 0~500V	For load life testing of high frequency MLCC, OS-CON, polymer capacitor that used by DC to DC converter	12-17
11200	Capacitor leakage current / IR meter	1.0~650V/800V, CC 0.5~500mA	For electrolytic capacitor leakage current and aluminum-foil W.V. testing	12-18
13100	Electrolytic capacitor analyzer	AC 100Hz/120Hz/1kHz/10kHz/ 20kHz/50kHz/100kHz, 1V/0.25V	For high and low frequency electrolytic capacitor I.Q.C.,F.Q.C. multi-parameter scanning testing (C/D/Z/ESR/LC)	12-15

## Component Test Scanner Selection Guide

Model	Primary Function	Option	Description	Page
13001	Scanner	A130007 40 channels scan module	For RJ-45 equipment, glass substrate, LCD glass substrate, printed circuit glass, PCB, EMI filter, ICT application. It could combined with Chroma 8800 Component ATE for process control and data collection	12-22

Milliohm Meter Selection Guide				
Model	Primary Function	Test Range	Description	Page
16502	DC, Pulsed	0.001mΩ~2MΩ	Digital milliohm meter with bin-sorting, comparator function, reduce thermal EMF affection	12-21

HF AC Tester Selection Guide				
Model	Primary Function	Option	Application Description	Page
11802	HF, HV, CV	A118031 HF HV 5kV/100mA max A118014 HF HV 2.5kV/200mA max A118017 HF HV 8kV/100kHz max	LCD inverter transformer (ceramic capacitor, cable, PCB) load life / withstanding voltage / breakdown voltage test	12-19
			EEFI, backlight load life / lamp current test	
			SMPS main transformer and active PFC choke load life test and electrical analysis	
			Medical equipment high frequency leakage current safety inspection	
	Automobile motor corona discharge inspection, analysis and production line			
HF, HV, CV	Step-up current test module + specified resonant inductor/ capacitor	Ballast capacitor / inductor ignition voltage load life test		
HF, HI, CC, Bias voltage	Ripple Voltage Test Module Chroma 11200 CLC / IR Meter (for DC voltage source with discharge function)	Snubber capacitor load life test		
HF, CV, Bias current Temperature meter	Step-up current test module + AC/DC coupling test fixture Chroma DC power supply (for DC bias current) Chroma 12061 Digital Multimeter (for temperature measurement)	DC-DC converter SMD power choke temperature rising test (DC Bias current with AC ripple voltage) and electrical analysis		
HF, HV, CV (or + DC source)	HF HV test module Option Chroma DC source*3	Function as HF HV AC +DC power source for FFI and SED device analysis		
11803	HF, CV, Bias current Temperature meter	Step-up current test module + AC/DC coupling test fixture Chroma DC power supply (for DC bias current) Chroma 12061 Digital Multimeter (for temperature measurement)	DC-DC converter SMD power choke temperature rising test (DC Bias current with AC ripple voltage) and electrical analysis	12-19
11805	HF, HI, Bias voltage	A118015 HF, HI 33V/30A max.	Snubber capacitor load life test	12-19
	HF, HV	A118018 HF, HV 1kV/1A max.	High voltage capacitor load life test	
11890	HF, HV, CV	A118031 HF HV 5kV/100mA max A118014 HF HV 2.5kV/200mA max	LCD inverter transformer( ceramic capacitor, cable, PCB) withstanding voltage test for production line	12-19
			Medical equipment high frequency leakage current safety inspection	
			Automobile motor corona discharge inspection for production line	
11891	HF, HV, CV	A118031 HF HV 5kV/100mA max A118014 HF HV 2.5kV/200mA max	Passive Component (inverter transformer, ceramic capacitor, cable, PCB etc.) High Frequency and High Voltage Load Life Test	12-19

Automatic Test System Selection Guide				
Model	Primary Function	Test Signal	Description	Page
1810	Magnetic Component Test System	DC Bias Current 60A max. HF AC Voltage 20kHz~1MHZ	Power choke, Low Inductance Inductor	12-23
1820 (New)	Capacitor Test System	DC Bias Voltage 3kV max. HF AC Current 10kHz~200kHz	Film Capacitor	12-24
1870D (New) 1870D-12 (New)	Inductor Test & Packing Machine	Polarity test/Layer short test/BIAS current test/ Hipot test/ DCR test/LsQ test	Testing and packing for Chip inductor	12-25
1871 (New)	Inductor Layer Short ATS	5 tests simultaneously /2 test simultaneously	Layer short testing and sorting for Chip inductor	12-26
8800	Component ATS	L/C/R/Z/DCR/Turns-ratio/ Insulation Resistance (IR)	For RJ-45 equipment (including LAN Modules, Ethernet IC, PoE IC, etc.), glass substrate, LCD glass substrate, printed circuit glass (including touch panel, etc), PCB, EMI filter and ICT applications	12-27
8801	EDLC ATS	C (DC), internal resistance (DC), ESR (AC)	For Electrical Double Layer Capacitor on production lines	12-29
8802	EDLC LC Monitoring System	Leakage Current (LC)	For Electrical Double Layer Capacitor on production lines	12-31



## KEY FEATURES

- Test Parameter : L/C/R/Z/Y/DCR/Q/D/  $\theta$
- Test Frequency :
  - 75kHz ~ 30MHz (11050-30M)
  - 1kHz ~ 10MHz (11050)
  - 60Hz ~ 5MHz (11050-5M)
- Test Level : 10mV ~ 5V
- Basic Accuracy : 0.1%
- 7ms fast speed measurement
- 3 kinds of output impedance modes
- Test signal monitoring function
- Compare & bin-sorting function
- Open/short zeroing & load correction function
- Detached measurement & display unit design
- Standard Handler, RS-232C, USB storage & external bias current control interface
- Optional GPIB or LAN interface

The Chroma 11050 series HF LCR Meter is a precision test instrument featured in measuring and evaluating the passive components with accuracy and fast speed. The measured items cover the primary and secondary parameters required for testing the inductance, capacitance, resistance, quality factor and loss factor of passive components. The HF LCR Meter has a broad testing frequency range 75kHz~30MHz/1kHz~10MHz/60Hz~5MHz suitable for analyzing component characteristics under different frequencies. Its 0.1% basic measurement accuracy not only makes the measured results show high stability but also high reliability. The fast 15ms measurement speed can effectively increase the productivity when working with the automated machines.

In addition to the excellent measurement features of other Chroma LCR Meters, the 11050 series also has a variety of convenient functions. It has 3 kinds of output impedance modes to satisfy the demands of measuring and working with other instruments. The flexible digital display allows adjustments to its best fit based on the testing resolution while the test signal monitoring function is able to view the voltage and current actually carried on the DUT. Also the timing settings of trigger delay, measure delay and average number of times allow the measurements to work closely with the automated machines to get the most accurate results within the limited testing time.

The detached design adopted by Chroma 11050 series uses dual CPU to process the testing and display. It not only increases the testing speed but also shortens the test leads' length when applying to the automated machines in improving the accuracy of high frequency measurement.



Another feature of Chroma 11050 series is complete interface configuration. The standard interfaces include Handler and RS-232C for hardware and software to set the test conditions, trigger measurement, judge test results and collect measured data. The USB interface is able to save the device settings and control the output of DC bias current source. GPIB and LAN are optional interfaces available for purchase as per user's demand for software communication.

Owing to the design of portable electronic communication products nowadays tends to be thin with low power consumption, the test frequency of power inductors is getting higher and that makes the equivalent series resistance of component become a critical indicator to identify good or bad products. The buffer capacitor plays an important role for overall circuit reliability and in order to work normally under high voltage transient environment, the equivalent series resistance has to remain at a very low level during high frequency. The Chroma 11050 series is focused on testing passive components under high frequency during development so that it is close to the user's actual requirements with enhanced key measurement functions.

The accuracy enhancement of low impedance measurements strengthens the usability of Chroma 11050 series in high frequency testing applications.

Designed with extensive considerations and enhancements of key features, Chroma 11050 series HF LCR Meter is the best selection for product characteristics analysis, fast testing in automated production line or parts incoming/outgoing management.

## ORDERING INFORMATION

- 11050** : HF LCR Meter 1kHz~10MHz
- 11050-30M** : HF LCR Meter 75kHz~30MHz
- 11050-5M** : HF LCR Meter 60Hz~5MHz
- A110211** : Test fixture (DIP)
- A110234** : Test leads (1M)
- A110501** : 4-Terminal SMD test fixture
- A133509** : GPIB & Handler interface
- A133510** : LAN & USB-H interface
- B110500** : Extension test lead for automation (BNC to SMA, 1M)

SPECIFICATIONS			
Model	11050-30M	11050	11050-5M
Test Parameter	L, C, R, Z, Y, DCR, Q, D, $\theta$		
<b>Test Signal</b>			
Test Frequency	75kHz ~ 30MHz $\pm (0.1\% + 0.01\text{Hz})$	1kHz ~ 10MHz $\pm (0.1\% + 0.01\text{Hz})$	60Hz ~ 5MHz $\pm (0.1\% + 0.01\text{Hz})$
Test Level	10mV ~ 1V; $\pm [(10 + fm)\% + 10\text{mV}]$ fm: test frequency [MHz]	$\leq 1\text{MHz}$ : 10mV ~ 5V; $\pm [(10 + fm)\% + 10\text{mV}]$ $> 1\text{MHz}$ : 10mV ~ 1V; $\pm [(10 + fm)\% + 1\text{mV}]$ fm: test frequency [MHz]	
Output Impedance	100 $\Omega$ , 25 $\Omega$ , OFF		
<b>Measurement Display Range</b>			
L	0.00001 $\mu\text{H}$ ~ 99.999MH		
C	0.00001pF ~ 999.999F		
R, Z	0.01m $\Omega$ ~ 9999.99M $\Omega$		
DCR	0.01m $\Omega$ ~ 999.99M $\Omega$		
Q, D	0.00001 ~ 99999		
$\theta$	-90.00° ~ 90.00°		
<b>Basic Accuracy</b>			
Z	$\pm 1.5\%$		$\pm 0.1\%$
$\theta$	$\pm 0.3\%$		$\pm 0.04^\circ$
DCR			$\pm 0.1\%$
<b>Measurement Speed</b>	Very Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)		
<b>Communication Interface</b>	RS-232C, Handler, USB storage, External bias current control, GPIB (option), LAN (option)		
<b>Measurement Functions</b>			
Trigger Mode	Internal, Manual, External, Bus		
Range Switching Mode	Auto, Hold		
Equivalent Circuit Mode	Series, Parallel		
Judgment	Compare, Bin-sorting		
Correction	Open/Short Zeroing, Load Correction		
<b>Others</b>			
Operating Environment	Temperature : 0°C ~ 40°C ; Humidity : 10% ~ 90%		
Power Consumption	60VA max.		
Power Requirement	100 ~ 240V $\pm 10\%$ , 47Hz ~ 63Hz		
Dimension (H x W x D)	230 x 428 x 290 mm / 9.06 x 16.85 x 11.42 inch		
Weight	Approx. 8 kg / 17.64 lb		



## ORDERING INFORMATION

- 11021** : LCR Meter 1kHz
- 11021** : LCR Meter 10kHz
- 11021-L** : LCR Meter
- A110104** : SMD Test Cable #17
- A110211** : Component Test Fixture
- A110212** : Component Remote Test Fixture
- A110232** : 4 BNC Test Cable with Clip#18
- A110234** : High Frequency Test Cable
- A110235** : GPIB & Handler Interface
- A110236** : 19" Rack Mounting Kit
- A110242** : Battery ESR Test Kit
- A133004** : SMD Test Box
- A165009** : 4 BNC Test Cable with Probe

## KEY FEATURES

- Test frequencies: 100Hz, 120Hz, 1kHz and 10kHz (9.6kHz) (11021) 1kHz, 10kHz, 40kHz, 50kHz (11021-L)
- Basic accuracy: 0.1% (11021), 0.2% (11021-L)
- 0.1mΩ ~99.99 MΩ measurement range, 4 1/2 digits resolution
- Lower harmonic-distortion affection
- Fast measurement speed (75ms)
- Standard RS-232 interface
- Optional GPIB & Handler interface
- Programmable trigger delay time is convenient for measurement timing adjustment in automatic production
- Bin-sorting function
- Comparator and pass/fail alarming beeper function
- Text mode 40x4 matrixes LCD display
- Friendly user interface
- Open/short zeroing
- On-line firmware refreshable (via RS-232)
- Input protection (1 Joule)

The Chroma 11021/11021-L LCR Meter are the most cost-effective digital LCR Meter, provides 100Hz, 120Hz, 1kHz, and 10kHz test frequencies for the 11021 and 1kHz, 10kHz, 40kHz, 50kHz test frequencies for the 11021-L. Standard RS-232 interface, optional GPIB & Handler interface, high speed and stable measurement capabilities enable the Chroma 11021/11021-L can be used for both component evaluation on the production line and fundamental impedance testing for bench-top applications.

The Chroma 11021/11021-L use lower harmonic-distortion phase-detection technology to reduce affection of measurement accuracy caused by hysteresis distortion in magnetic component or high dielectric-coefficient capacitor measurement, which is not provided in general low-end LCR Meters.

The 11021-L is the ideal selection for high frequency coil, core, choke, and etc. passive components incoming/outgoing material quality inspect and automatic production.

## SPECIFICATIONS

Model	11021	11021-L
<b>Measurement Parameter</b>		
Primary Display	L, C, R,  Z	
Secondary Display	Q, D, ESR, Xs, θ	
<b>Test Signals Information</b>		
Test Level	0.25V / 1V, ±(10% + 3 mV)	50mV/ 1V, ±10%+3mV
Test Frequency	100Hz, 120Hz, 1kHz, 10kHz (9.6kHz)	1kHz, 10kHz, 40kHz, 50kHz
Frequency Accuracy	±0.25%	±0.02%
Output Impedance (Typical)	Varies as range resistors 25, 100, 1k, 10k, 100k	
<b>Measurement Display Range</b>		
Primary Parameter	L: 0.01μH ~ 9.999kH, C: 0.01pF ~ 99.99mF, R, Z : 0.1m. ~ 99.99MΩ	
Secondary Parameter	Q: 0.1 ~ 9999.9, D: 0.0001 ~ 9999.9, θ : -180.00° ~ +180.00°	
Basic Accuracy *1	±0.1%	±0.2%
<b>Measurement Time (1KHz) *2</b>		
Fast	Freq = 1k/10kHz : 75ms Freq = 100/120Hz: 85ms	Freq = 1kHz/10kHz : 75ms Freq = 40kHz : 105ms Freq = 50kHz : 90ms
Medium	145ms	*3
Slow	325ms	*4
Trigger	Internal, Manual, External, BUS	
<b>Display</b>		
L, C, R,  Z , Q, D, R, θ	40 x 4 (Character Module) LCD Display	
<b>Function</b>		
Correction	Open/Short zeroing	
Equivalent Circuit Mode	Series, Parallel	
<b>Interface &amp; Input/Output</b>		
Interface	RS-232 (Standard), Handler & GPIB (Optional)	
Output Signal	Bin-sorting & HI/GO/LOW judge	
Comparator	Upper/Lower limits in value	
Bin Sorting	8 bin limits in %	
Trigger Delay	0 ~ 9999mS	
<b>General</b>		
Operation Environment	Temperature : 10°C ~ 40°C, Humidity < 90 % R.H.	
Power Consumption	50VA max.	
Power Requirement	90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz	
Dimension (H x W x D)	100 x 320 x 206.4 mm / 3.94 x 12.6 x 8.13 inch	
Weight	4 kg / 8.81 lbs	

**Note\*1** : 23 ± 5°C after OPEN and SHORT correction, slow measurement speed. Refer to operation manual for detail measurement accuracy descriptions.

**Note\*2** : Measurement time includes sampling, calculation and judge test parameter measurement.

**Note\*3** : Freq.=1kHz/10kHz 145ms Freq.=40kHz 185ms Freq.=50kHz 150ms

**Note\*4** : Freq.=1kHz/10kHz 325ms Freq.=40kHz 415ms Freq.=50kHz 400ms





## KEY FEATURES

- 0.1% basic accuracy
- Transformer test parameters (11025), Turns Ratio, DCR, Mutual Inductance
- 50Hz, 60Hz, 100Hz, 120Hz, 1kHz, 10kHz, 20kHz, 40kHz, 50kHz, 100kHz test frequencies
- 21ms measurement time ( $\geq 100\text{Hz}$ )
- Agilent 4263B LCR Meter commands compatible
- 4 different output resistance modes selectable for non-linear inductor and capacitor measuring
- High resolution in low impedance ( $0.01\text{m}\Omega$ ) and high accuracy 0.3% till  $100\text{m}\Omega$  range
- Adjustable DC bias current up to 200mA (constant  $25\Omega$ ) (11025)
- 1320 Bias Current Source directly control capability
- $0.01\text{m}\Omega \sim 99.99\text{M}\Omega$  wide measurement range (4 1/2 digits)
- Dual frequency function for automatic production
- BIAS comparator function
- Comparator function and 8/99 bin-sorting function
- Pass/fail judge result for automatic production
- Handler interface trigger edge (rising/falling) programmable
- Test signal level monitor function
- Standard GPIB, RS-232, and handler interface
- Open/short zeroing, load correction
- LabView® Driver

The Chroma 11022 and 11025 LCR Meters are the measurement instruments for passive components. They are applicable to the automatic manufacturers for passive components in material inspection. With the features of 21ms high-speed measurement and 0.1% accuracy, 11022 LCR Meter fulfills the requirements for fast production. Its functions of 8-level counting, 8/99 Bin-sorting, pass/fail judgment, and 50 sets of internal save and recall settings totally meet the production line requirements for easy operation.

The four impedance output modes can measure the results with the LCR Meters of other brands to get a common measurement standard. Chroma 11025 LCR Meter is compatible with HP 4263B LCR Meter IEEE-488.2 control interface and has three impedance output modes for selection. The measurement results can also be compared with other brand of LCR Meters. Chroma 11022/11025 is the ideal selection for passive components quality assurance and automatic production.



## ORDERING INFORMATION

- 11022** : LCR Meter
- 11025** : LCR Meter
- A110104** : SMD Test Cable #17
- A110211** : Component Test Fixture
- A110212** : Component Remote Test Fixture
- A110232** : 4 BNC Test Cable with Clip#18
- A110234** : High Frequency Test Cable
- A110236** : 19" Rack Mounting Kit
- A110239** : 4 Terminals SMD Electrical Capacitor Test Box (Patent)
- A110242** : Battery ESR Test Kit
- A110244** : High Capacitance Capacitor Test Fixture
- A110245** : Ring Core Test Fixture
- A113012** : Vacuum Generator for A132574
- A113014** : Vacuum Pump for A132574
- A132574** : Test Fixture for SMD power choke
- A133004** : SMD Test Box
- A133019** : BNC Test Lead, 2M (single side open)
- A165009** : 4 BNC Test Cable with Probe

## SPECIFICATIONS

Model	11022	11025
<b>Test Parameter</b>	L, C, R,  Z , Q, D, ESR, X, $\theta$	L, C, R,  Z , Q, D, ESR, X, $\theta$ DCR4, M, Turns Ratio, L2, DCR2
<b>Test Signals</b>		
Level	10 mV~1V, step 10 mV; $\pm(10\% + 3\text{ mV})$	
Frequency	50Hz, 60Hz, 100Hz, 120Hz, 1kHz, 10kHz, 20kHz, 40kHz, 50kHz, 100kHz; $\pm 0.01\%$	
Output Impedance (Nominal Value)	Constant $107 \times 25\Omega$ ; Constant $320 \times 100\Omega$ Constant $106 \times 2\Omega$ , for $Z \geq 10\Omega$ , 100mA (1V setting) for reactive load $\leq 10\Omega$ Constant $102 \times 25\Omega$ , for $Z < 1\Omega$ , $100\Omega$ for else	
DC Bias Current (Freq. $\geq 1\text{kHz}$ )	--	50mA max. for Constant $100\Omega$ 200mA max for Constant $25\Omega$ (AC level $\leq 100\text{mV}$ )
<b>Measurement Display Range</b>		
C (Capacitance)	0.001 pF ~ 1.9999F	
L, M, L2 (Inductance)	0.001 $\mu\text{H}$ ~ 99.99k	
Z (Impedance), ESR	0.01 m $\Omega$ ~ 99.99M $\Omega$	
Q (Quality Factor)	0.0001 ~ 9999	
D (Dissipation Factor)	0.0001 ~ 9999	
$\theta$ (Phase Angle)	$-180.00^\circ \sim +180.00^\circ$	
Turns Ratio (Np:Ns)	--	0.9~999.99
DCR	--	0.01 m $\Omega$ ~ 99.99M $\Omega$
<b>Basic Measurement Accuracy *1</b>	$\pm 0.1\%$	
<b>Measurement Time (Fast) *2</b>	21ms	
<b>Interface &amp; I/O</b>		
Interface	handler (50pin), GPIB, RS-232	
Output Signal	Bin-sorting & HI/GO/LOW judge	
Comparator	Upper/Lower limits in value	
Bin Sorting	8/99 bin limits in %, ABS	
Trigger Delay	0~9999ms	
<b>Display</b>	240 x 64 dot-matrix LCD display	
<b>Function</b>		
Correction	Open/ Short zeroing, load correction	
Averaging	1~256 programmable	
Cable Length	0m, 1m, 2m, 4m	
Test Sig. Level Monitor	Voltage, Current	
Equivalent Circuit mode	Series, Parallel	
<b>Memory (Store/ Recall)</b>	50 instrument setups	
<b>Trigger</b>	Internal, Manual, External, BUS	
<b>General</b>		
Operation Environment	Temperature : $10^\circ\text{C} \sim 40^\circ\text{C}$ Humidity : $< 90\%$ R.H.	
Power Consumption	65VA max	
Power Requirements	90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz	
Dimension (H x W x D)	100 x 320 x 347.25 mm / 3.94 x 12.6 x 13.67 inch	
Weight	5.5 kg / 12.11 lbs	

**Note\*1** :  $23 \pm 5^\circ\text{C}$  after OPEN and SHORT correction. Slow measurement speed. Refer to Operation Manual for detail measurement accuracy descriptions.

**Note\*2** : Measurement time includes sampling, calculation and judge of primary and secondary test parameter measurement.



### KEY FEATURES

- Test frequency : 20Hz ~ 200kHz, 0.2% programmable test frequency (1075)
- Test frequency : 40Hz ~ 200kHz, 30 Steps (1062A)
- Basic accuracy : 0.1%
- 3 different output impedance modes, measurement results are compatible with other well-know LCR meters
- High resolution (0.01mΩ) and high accuracy 0.3% till 400mΩ range are the right tool for low inductance
- Large capacitance, and low impedance component measuring
- Single-function keys, clear LED display, easy to operate
- 0.01mΩ~99.999mΩ wide measurement range with 5 digits resolution
- Optional Handler & GPIB interface



- 8 bin sorting and bin sum count function (1075)
- Primary parameter: HI/GO/LO and secondary parameter: GO/NG judge result (1062A)
- Alarm for GO/NG judge result
- L/C/R/Z nominal value, upper limit %, lower limit %, Q/D/R/θ limit setting display (1062A)
- 10 bins sorting and bin sum count function (1075)
- Test signal level monitor function

The 1062A/1075 LCR Meters are the measurement instruments for passive components. They are applicable to the automatic manufacturers for passive components in material inspection and production line. This series of LCR Meters can fully fulfill the fast and accurate requirements for automatic production. The functions of 8-level counting, pass/fail judgment, and 10 sets of internal save and recall settings meet the production line requirements for speed and quality, thus make this series of LCR Meters the best measurement instruments for material and production line inspection for passive components.

### ORDERING INFORMATION

- 1062A** : Precision LCR Meter
- 1075** : LCR Meter
- A110104** : SMD Test Cable #17
- A110211** : Component Test Fixture
- A110212** : Component Remote Test Fixture
- A110232** : 4 BNC Test Cable with Clip#18
- A110234** : High Frequency Test Cable
- A110239** : 4 Terminals SMD Electrical Capacitor Test Box (Patent)
- A110601** : GPIB & handler Interface
- A133004** : SMD Test Box
- A165009** : 4 BNC Test Cable with Probe



**Model 1075**

### SPECIFICATIONS

Model	1062A	1075
<b>Measurement Parameter</b>		
Primary Display	L, C, R, Z, Δ %	L, C, R, Z Δ, Δ %
Secondary Display	Q, D, ESR, θ	
<b>Test Signals Information</b>		
Test Level	10mV~2.5V(non-106x mode), 10mV/step	
Test Frequency	40 Hz~200 kHz, 30 steps	20 Hz~200 kHz, programmable
<b>Frequency Accuracy</b>	±0.01%	
Output Impedance(Typical)	Constant = 0 : Varies as range resistors; Constant = 1 : 25 Ω ± 5% Constant = 2 : 100 Ω ± 5% ; Constant = 3 : 2 Ω, for impedance ≥ 10 Ω ; 100mA (1V setting), for inductive load ≤ 10 Ω	
<b>Measurement Display Range</b>		
Primary Parameter	R,  Z  : 0.01mΩ~9999.9MΩ, L: 0.0001μH~9999.9H, C: 0.0001pF~9999.9mF	
Secondary Parameter	Q,D: 0.0001~9999, θ : -90.00°~+90.00°, ESR: 0.01mΩ~9999kΩ, Δ % : 0.0001%~999.99%	
<b>Basic Accuracy *1</b>	±0.1%	
<b>Measurement Time (Fast) *2</b>		
Frequency ≥ 1kHz	55 ms	
Frequency =120Hz	115 ms	
Frequency =100Hz	130 ms	
Trigger	Internal, External, Manual	
<b>Display</b>	L, C, R,  Z  : 5 digits Q, D, R, θ : 4 digits Freq./Voltage/Current : 3 digits D/Q Limit : 5 digits	L, C, R,  Z  : 5 digits Q, D, R, θ : 4 digits Freq./Voltage/Current : 3 digits Bin No./Range : 1 digits
<b>Function</b>		
Correction	Open/Short Zeroing	Open/Short zeroing, Load
Equivalent Circuit Mode	Series, Parallel	
<b>Interface &amp; Input/Output</b>		
Interface	GPIB, Handler (24 pin)	GPIB, Handler (24 pin)
Output Signal	Pass/Fail identification	Sorting Signal
Comparator	Upper limit/ Lower limit(%) setting	
Bin Sorting	--	8 bin sorting (%)
Memory	1 set	10 set
<b>General</b>		
Operation Environment	Temperature : 10°C ~ 40°C, Humidity : < 90 % R.H.	
Power Consumption	55VA max.	
Power Requirement	90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz	
Dimension (H x W x D)	130 x 410 x 353 mm / 5.12 x 16.14 x 13.9 inch	
Weight	6.2 kg / 13.66 lbs	

**1)** Warm up time: >10 min. **2)** Environment temperature : 23 ± 5°C **3)** OPEN/SHORT offset modification completed **4)** D < 0.1

**Note\*2 :** Measurement time includes all of the time for UUT measurement, calculation and primary/secondary parameters identification.



The Chroma 11020 Capacitance Meter is a high-speed precision Capacitance Meter. Provides 100Hz, 120Hz, and 1kHz test frequencies. Measurement time is only 5 milliseconds in 1kHz, and less than 15 milliseconds in 100Hz and 120Hz test frequencies. Combine with 0.1% basic accuracy and standard Handler interface, enable the Chroma 11020 can be used on high speed production line for various capacitors.

### KEY FEATURES

- Test frequencies: 100Hz, 120Hz, 1kHz
- Basic accuracy: 0.1%
- High measurement speed: 5ms in 1kHz, 15ms in 100Hz/120Hz
- Large LCD display (240x64 dot-matrix)
- Wide measurement range: 0.1pF ~ 3.999F
- Standard Handler interface
- Comparator and pass/fail alarming beeper function
- Setups backup function

### ORDERING INFORMATION

- 11020** : Capacitance Meter
- A110104** : SMD Test Cable #17
- A110211** : Component Test Fixture
- A110212** : Component Remote Test Fixture
- A110234** : High Frequency Test Cable
- A110236** : 19" Rack Mounting Kit
- A110239** : 4 Terminals SMD Electrical Capacitor Test Box (Patent)
- A110244** : High Capacitance Capacitor Test Fixture
- A133004** : SMD Test Box

SPECIFICATIONS	
<b>Model</b>	<b>11020</b>
<b>Test Parameter</b>	Capacitance, Dissipation factor
<b>Test Signals</b>	
Test Level	1V(10% + 3mV)
Test Frequency	100Hz, 120Hz, 1kHz
Output Impedance	Varies as range resistors
<b>Measurement Range</b>	
C	0.1pF~3.999F(100Hz, 120Hz), 0.01pF~399.9μF(1kHz)
<b>Basic Accuracy *1</b>	± 0.1%
<b>Measurement Speed(Fast) *2</b>	
C, Frequency ≥ 1kHz	5ms
C, Frequency = 100Hz, 120Hz	15ms
D factor measurement	2ms
Trigger	Internal, External
<b>Equivalent Circuit Mode</b>	Series, Parallel
<b>Interface&amp;Input/Output</b>	
Interface	Handler (24pin)
Output Signal	HI/GO/LO judge (Capacitor),GO/NG judge (D factor)
Comparator	Upper/Lower limits(% , ABS)
<b>Display</b>	240x64 dot-matrix LCD display
<b>Correction Function</b>	Zeroing
<b>Averaging</b>	1, 2, 4, 8, 16, 32, 64
<b>Memory</b>	1 instrument setups
<b>General</b>	
Operation Environment	Temperature:10°C ~ 40°C, Humidity : < 90 % RH
Power Consumption	65VA max.
Power Requirements	90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz
Dimension (H x W x D)	100 x 320 x 347.25 mm / 3.94 x 12.6 x 13.67 inch
Weight	5.5 kg / 12.11 lbs

**Note\*1** : The specification of accuracy is under the following conditions :

- 1) Warm up time : >10 min. 2) Environment temperature : 23 ± 5°C 3) OPEN/SHORT offset modification completed

**Note\*2** : Measurement time includes all of the time for UUT measurement, calculation and primary/secondary parameters identification.



Acquired from many years of marketing experiences and cumulative results, Chroma 13350 is the newest generation of Automatic Transformer Tester that not only retains the merits of old 3250 model but also has many new functions including the combination of measurement unit and scan box to reduce measurement error caused by long wire, C.T. test fixture and 80/20 channels scan box support, USB interface for test conditions back-up, LAN communication interface, separate setting of test frequency/voltage/speed, Fail Lock function and Auto Test. It solves the performance and quality problems as well as human errors occurred on production line for the transformer industry today.

For instance: To reduce human errors on production line, the 13350 Fail Lock function is able to lock the defect DUT (Device Under Test) when the test is done to prevent it from flowing out accidentally. In order to cut down the time for placement, the 13350 Auto Test function can conduct test directly without pressing the trigger key. In addition, the 13350 adopts the design of dual CPU to increase the test speed by processing the measurement and display units simultaneously.

The compensation function of 13350 can do OPEN/SHORT for individual channel to solve the errors due to different layout on various fixtures.

13350 provides 20Hz-200kHz test frequency and scan test items to cover low voltage test parameters for various transformers including Inductance (L), Leakage (Lk), Turn-Ratio, DC Resistance (DCR), Impedance (Z), Stray Capacity (C), Quality Factor (Q), Equivalent Series Resistance (ESR), Pin Short (PS), Winding Phase (PH) and Balance.

#### Applicable Test Options for Selection

##### A133502 20 Channels Scan Box

13350 uses split screen that allows the measurement unit to integrate the 20 channels scan box without using any connecting wires to reduce measurement errors. Furthermore, the 20 channels scan box has external standard test function that can perform verification test directly without any act of disassembly.

##### A133505 80 Channels Scan Box

13350 along with 80 channels scan box can mainly offer three different applications:

- 1) RJ-45 & LAN Filter test solution that can test up to 80 pins one time.
- 2) Transformer automation solution that can place 4 transformers on one carrier for scan test simultaneously.
- 3) Island-type production line planning that provides a time division multiplexing module to increase the equipment utilization rate.

##### A133506 C.T. (Current Transformer)

###### Test Fixture

When the 13350 works with A133506 C.T. Test Fixture, it can measure the turns, inductance and DC resistance easily and rapidly by putting in the C.T. directly.

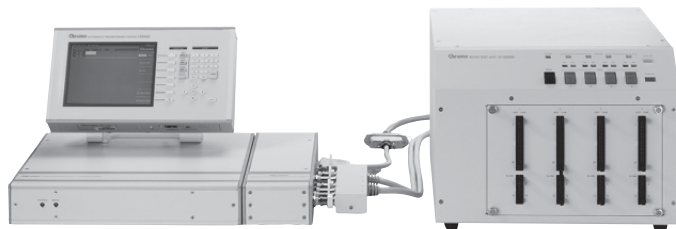
#### KEY FEATURES

- Test frequency 20Hz ~ 200kHz
- Turn Ratio, Phase, L, Q, Lk, ACR, DCR, Cp, Pin short, Balance
- Basic accuracy : 0.1%
- Three different output impedance modes
- Scan unit/box including :
  - 20ch scan test unit
  - 80ch\* scan box
  - C.T.\* test fixture

#### KEY FEATURES

- Compensation for individual channel
- \*Combine measurement unit with scanbox to reduce measurement errors
- \*USB storage interface
- \*10-100 LAN/ USB-H interface (option)
- \*Built-in programmable 100mA bias current (RJ-45)
- \*Test frequency, voltage and speed set separately
- \*Fail Lock function
- \*Auto Test function
- \*Equipped with external standard test on 20ch scan test unit
- \*Reduce the short-circuit loss in secondary side for leakage (Lk) test (A133502 20ch scan unit)
- \*Short-circuit pin selectable for every test item
- \*Multiple language: English & Simplified Chinese
- \*RS232 interface compatible SCPI commands

\* New features compared to Chroma 3250 Series



Model 13350 with A133505,A133507

#### ORDERING INFORMATION

**13350D** : Automatic Transformer Tester - Display Unit

**13350M-200k** : Automatic Transformer Tester - Measurement Unit

**A133502** : 20CH Scanning Box

**A133505** : 80CH Scanning Box

**A133506** : C.T. test fixture

**A133507** : Connecting Conversion Unit (I/F of 80CH scan box / provide I/O control interface/1320 DC bias cable link / BNC terminals)

**A133509** : GPIB Interface

**A133510** : LAN & USB-H Interface

**A133512** : Transformer Test Software

**B133500** : Fiberglass Board

(connecting A133502 with A132501 fixtures)

Video & Color  
Flat Panel Display  
LED/ Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/ IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



SPECIFICATIONS		
<b>Model</b>	<b>13350</b>	
<b>Main Function</b>	Transformer Scanning Test	
<b>Test Parameter</b>		
Transformer Scanning	Turn Ratio, Phase, Turn, L, Q, Leakage L, Balance, ACR, Cp, DCR, Pin Short	
<b>Test Signals Information</b>		
Test Level	Turn	10mV~10V, $\pm 10\%$ 10mV/step
	Others	10mV~2V, $\pm 10\%$ 10mV/step
Test Frequency	Turn	20Hz~200kHz, $\pm (0.1\% + 0.01\text{Hz})$ , Resolution: 0.01Hz
	Others	20Hz~200kHz, $\pm (0.1\% + 0.01\text{Hz})$ , Resolution : 0.001Hz (<1kHz)
Output Impedance	Turn	10 $\Omega$ , when level $\leq 2\text{V}$ / 50 $\Omega$ , when level > 2V
	Others	Constant = OFF : Varies as range resistors Constant = 320X : 100 $\Omega$ $\pm 5\%$ ; Constant = 107X : 25 $\Omega$ $\pm 5\%$ Constant=106X : 100mA $\pm 5\%$ (1V setting); for inductive load less than 10 $\Omega$ , 10 $\Omega$ $\pm 10\%$ , for impedance $\geq 10 \Omega$
<b>Measurement Display Range</b>		
L, LK	0.00001 $\mu\text{H}$ ~9999.99H	
C	0.001 pF~999.999mF	
Q, D	0.00001~99999	
Z, X, R	0.0001 $\Omega$ ~999.999M $\Omega$	
$\theta$	-90.00°~ +90.00°	
DCR	0.01m $\Omega$ ~99.999M $\Omega$	
Turn,Ratio	0.01~99999.99 turns (Secondary voltage less than 100 Vrms)	
Ratio (dB)	-39.99dB~+99.99dB (secondary voltage less than 100 Vrms)	
Pin-Short	11 pairs, between pin to pin	
<b>Basic Accuracy</b>		
L, LK, C, Z, X, Y, R	$\pm 0.1\%$ (1kHz if AC parameter)	
DCR	$\pm 0.5\%$	
$\theta$	$\pm 0.04^\circ$ (1kHz)	
Turn, Ratio (dB)	$\pm 0.5\%$ (1kHz)	
<b>Measurement Speed (Fast)</b>		
L, LK, C, Z, X, Y, R, Q, D, $\theta$	50 meas./sec.	
DCR	12 meas./sec.	
Turn, Ratio (dB)	10meas./sec.	
<b>Judge</b>		
Transformer Scanning	PASS/FAIL judge of all test parameters output from Handler interface, 100 bin sorting for Lk	
<b>Trigger</b>	Internal, Manual, External	
<b>Display</b>	Color 640x480 LCD panel	
<b>Equivalent Circuit Mode</b>	Series, Parallel	
<b>Correction Function</b>	Open/Short Zeroing, Load correction	
<b>Memory</b>	15 instrument setups, expansion is possible via memory card	
<b>General</b>		
Operation Environment	Temperature:10°C~40°C, Humidity: 10%~90% RH	
Power Consumption	60 VA max.	
Power Requirement	90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz (Auto Switch)	
Dimension (H x W x D)	13350M : 58 x 280 x 300 mm / 2.28 x 11.02 x 11.8 inch	
	13350D : 45 x 140 x 225 mm / 1.77 x 5.51 x 10.03 inch	
Weight	13350M : Approx. 3.5 kg / 7.71 lbs	
	13350D : Approx. 1.3 kg / 2.86 lbs	



### KEY FEATURES

- Test frequency: 20Hz~200kHz/1MHz, 0.02% accuracy
- Basic accuracy: 0.1%
- Different output impedance modes, measurement results are compatible with other well-known LCR meters
- Enhanced Turn Ratio measurement accuracy for low permeability core
- Fast Inductance/ Turn Ratio measurement speed up to 80 meas./sec
- Fast DCR measurement speed up to 50 meas./sec
- Graphical and tabular display of swept frequency, voltage current and bias current measurements (3252/3302)
- Built-in 8mA bias for RJ45 transmission transformer saturation condition (option)
- Leakage inductance 100 bin sorting and balance of leakage inductance for TV inverter transformer
- ALC (Auto Level Compensation) function for MLCC measurement (3252/3302)
- Test fixture residual capacitance compensation for transformer inductance measurement
- 1320 Bias Current Source directly control capability (3252/3302)
- 320x240 dot-matrix LCD display
- Support versatile standard and custom-design test jigs
- Four-terminal test for accurate, stable DCR, inductance and turn ratio measurements
- Built-in comparator; 10 bin sorting with counter capability (3252/3302)
- Lk standard value with Lx measure value
- 4M SRAM memory card, for setup back-up between units
- Standard RS-232, Handler, and Printer Interface, option GPIB Interface for LCR function only
- 15 internal instrument setups for store/recall capability



**Model 3302**

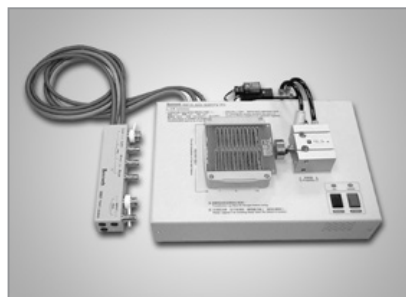


The 3250/3252/3302 Transformer Test System are the precision test systems, designed for transformer production line or incoming/outgoing inspection in quality control process, with high stability and high reliability.

The 3250/3252 provide 20Hz-200kHz test frequencies, and 3302 provides 20Hz-1MHz test frequencies. In addition to transformer scanning test function, the 3252/3302 have LCR Meter function. In test items, The 3250/3252/3302 cover most of transformer's low-voltage test parameters which include primary test parameters as Inductance, Leakage Inductance, Turns-Ratio, DC resistance, Impedance, and Capacitance (between windings) etc.; secondary test parameters as Quality Factor and ESR etc.; and pin-short test function. High-speed digital sampling measurement technology combined with scanning test fixture (A132501) design, improve low-efficiency transformer inspection to be more accurate and faster.

The 3250/3252/3302 even provide several output impedance selection to solve inductance measurement error problem caused by different test current caused by different output impedance provided by different LCR Meters. And, equivalent turns-ratio calculated from measured inductance of windings is also provided to improve turns-ratio measurement error problem caused by large leakage magnetic flux in transformer with low permeability magnetic core.

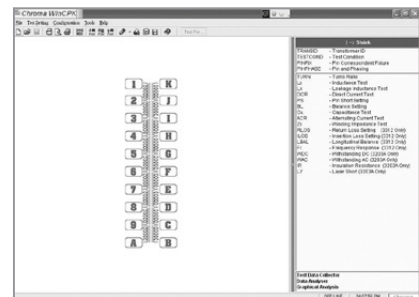
In addition to transformer scanning test function, the 3252/3302 have LCR Meter function, can be used in component incoming/outgoing inspection, analysis and automatic production line.



**A132501 :**  
Auto Transformer Scanning Box (3001A)

### ORDERING INFORMATION

- 3250 :** Automatic Transformer Test System
- 3250 :** Automatic Transformer Test System with 8mA Bias
- 3252 :** Automatic Component Analyzer
- 3252 :** Automatic Component Analyzer with GPIB interface
- 3302 :** Automatic Component Analyzer
- 3302 :** Automatic Component Analyzer with GPIB interface
- 3302 :** Automatic Component Analyzer with 8mA Bias
- 3302 :** Automatic Component Analyzer without Transformer Scan
- A110104 :** SMD Test Cable #17
- A110211 :** Component Test Fixture
- A110212 :** Component Remote Test Fixture
- A110234 :** High Frequency Test Cable
- A110239 :** 4 Terminals SMD Electrical Capacitor Test Box (Patent)
- A113012 :** Vacuum Generator for A132574
- A113014 :** Vacuum Pump for A132574
- A132501 :** Auto Transformer Scanning Box (3001A)
- A132563 :** WINCPK Transformer Data Statistics & Analysis Software for USB port
- A132574 :** Test Fixture for SMD power choke
- A133004 :** SMD Test Box
- A133006 :** 1A Internal Bias Current Source
- A133019 :** BNC Test Lead, 2M (singleside open)



**A132563 :** WINCPK Transformer Data Statistics & Analysis Software for Model 3250/3252/3302

Test Fixture	Model	3250	3252	3302	3312
A132547	4-4mm Test Fixture	●	●	●	●
A132572	3.5/4mm Test Fixture	●	●	●	●
A132573	3.2/3.5mm Test Fixture	●	●	●	●
A132579	7.5-5mm Test Fixture	●	●	●	●
A132583	3.0-3.0mm Test Fixture	●	●	●	●
A132584	3.5-3.5mm Test Fixture	●	●	●	●
A132585	3.8-3.8 mm Test Fixture	●	●	●	●
A132586	3.0-4.0 mm Test Fixture	●	●	●	●

SPECIFICATIONS			
Model	3250	3252	3302
<b>Main Function</b>	Transformer Scanning Test		Transformer Scanning Test + LCR Meter
<b>Test Parameter</b>	Turn Ratio, Phase, Turn, L, Q, Leakage L, Balance, ACR, Cp, DCR, Pin Short		
LCR METER	--	L, C, R,  Z , Y, DCR, Q, D, R, X, $\theta$ , Ratio (dB)	
<b>Test Signals Information</b>			
Test Level	Turn	10mV~10V, $\pm 10\%$ 10mV/step	
	Others	10mV~2V, $\pm 10\%$ 10mV/step	
Test Frequency	Turn	1kHz~200kHz, $\pm (0.1\% + 0.01\text{Hz})$ , Resolution: 0.01 Hz	1kHz~1MHz, $\pm (0.1\%+0.01\text{Hz})$ , Resolution : 0.01 Hz
	Others	20Hz~200kHz, $\pm (0.1\% + 0.01\text{Hz})$ , Resolution : 0.001 Hz (<1kHz)	20Hz~1MHz, $\pm (0.1\%+0.01\text{Hz})$ , Resolution 0.001 Hz (<1kHz)
Output Impedance Display	Turn	10 $\Omega$ , when level $\leq 2\text{V} / 50\Omega$ , when level > 2V	
	Others	Constant = OFF : Varies as range resistors Constant = 320X : 100 $\Omega \pm 5\%$ ; Constant = 107X : 25 $\Omega \pm 5\%$ Constant=106X : 100mA $\pm 5\%$ (1V setting); for inductive load less than 10 $\Omega$ , 10 $\Omega \pm 10\%$ , for impedance $\geq 10\Omega$	
<b>Measurement Display Range</b>			
L, LK	0.00001 $\mu\text{H}$ ~9999.99H		
C	0.00001 pF~999.999mF		
Q, D	0.00001~99999		
Z, X, R	0.00001 $\Omega$ ~99.9999M $\Omega$		
Y	0.01nS~99.9999S		
$\theta$	-90.00°~ +90.00°		
DCR	0.01m $\Omega$ ~99.999M $\Omega$		
Turn,Ratio	0.01~99999.99 turns (Secondary voltage less than 100 Vrms)		
Ratio (dB)	-39.99dB~+99.99dB (seconding voltage less than 100 Vrms)		
Pin-Short	11 pairs, between pin to pin		
<b>Basic Accuracy</b>			
L, LK, C, Z, X, Y, R	0.1% (1kHz if AC parameter)		
DCR	$\pm 0.5\%$		
$\theta$	0.03°(1kHz)		
Turn, Ratio (dB)	0.5% (1kHz)		
<b>Measurement Speed (Fast)</b>			
L, LK, C, Z, X, Y, R, Q, D, $\theta$	80meas./sec.		
DCR	50meas./sec.		
Turn, Ratio (dB)	10meas./sec.		
<b>Judge</b>			
Transformer Scanning	PASS/FAIL judge of all test parameters output from Handler interface, 100 bin sorting for LK		
LCR METER	--	10 bins for sorting & bin sum count output from Handler interface/PASS/FAIL judge output from Handler interface	
<b>Trigger</b>	Internal, Manual, External		
<b>Display</b>	320x240 dot-matrix LCD display		
<b>Equivalent Circuit Mode</b>	Series, Parallel		
<b>Correction Function</b>	Open/Short Zeroing, Load correction		
<b>Memory</b>	15 instrument setups, expansion is possible via memory card		
<b>General</b>			
Operation Environment	Temperature:10°C~40°C, Humidity: 10%~90% RH		
Power Consumption	140 VA max.		
Power Requirement	90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz		
Dimension (H x W x D)	177 x 430 x 300 mm / 6.97 x 16.93 x 11.81 inch		
Weight	9.2 kg / 20.26 lbs		

<b>Model</b>	<b>A132501</b>
<b>Standard Jig</b>	20 pins
<b>Test Contact pin</b>	Four terminals contact
<b>Control</b>	
Button	START, RESET
Indicators	GO, NG
<b>Solenoid Valve</b>	
Pressure	0.15~0.7Mpa(1.5~7.1kgf/cm <sup>2</sup> )
<b>General</b>	
Operation Environment	Temperature: 10°C~40°C, Humidity: 10%~90% RH
Power Consumption	40 VA max.
Power Requirement	90 ~ 264Vac, 47 ~ 63Hz
Dimension (H x W x D)	90 x 270 x 220 mm / 3.54 x 10.63 x 8.66 inch
Weight	3.2 kg / 7.05 lbs



## ORDERING INFORMATION

<b>3312</b> : Telecom Transformer Test System	<b>A110239</b> : 4 Terminals SMD Electrical Capacitor Test Box (Patent)
<b>A110104</b> : SMD Test Cable #17	<b>A132501</b> : Auto Transformer Scanning Box
<b>A110211</b> : Component Test Fixture	<b>A133004</b> : SMD Test Box
<b>A110212</b> : Component Remote Test Fixture	<b>A133006</b> : 1A Internal Bias Current Source
<b>A110234</b> : High Frequency Test Cable	

## KEY FEATURES

- Includes most test items in telecommunication transformer inspection.
- Programmable frequency : 20Hz~1MHz, 0.02% accuracy
- Basic accuracy : 0.1%
- 3 different output impedance modes, measurement results are compatible with other well-known LCR meters
- Enhanced Turn Ratio measurement accuracy for low permeability core
- Fast Inductance/ Turn Ratio measurement speed up to 80 meas./sec
- Fast DCR measurement speed up to 50 meas./sec
- 1320 Bias Current Source directly control capability
- 320x240 dot-matrix LCD display
- Support versatile standard and custom-design test jigs
- Four-terminal test for accurate, stable DCR, inductance and turn ratio measurements
- Built-in comparator; 10 bin sorting with counter capability
- 4M SRAM memory card, for setup back-up between units
- Standard RS-232, Handler and Printer interface, option GPIB Interface for LCR function only
- 15 internal instrument setups for store/recall capability

The 3312 Telecom Transformer Test System is a precision test system, designed for telecom transformer production line or incoming/outgoing inspection in quality control process, with high stability and high reliability.

The 3312 provides 20Hz-1MHz test frequencies. In addition to transformer scanning test function, the 3312 has LCR Meter function. In test items, the 3312 covers most of telecom transformer's low-voltage test parameters which include telecom test parameters as Return Loss (RLOS), Reflected Impedance (Zr), Insertion Loss (ILOS), Frequency response (FR), and Longitudinal Balance (LBAL) etc.; primary test parameters of general transformer as Inductance, Leakage Inductance, Turns-Ratio, DC resistance, Impedance, and Capacitance (between windings) etc.; secondary test parameters of general transformer as Quality Factor and ESR etc.; and pin-short test function. High-speed digital sampling measurement technology combined with scanning test fixture (A132501) design, improve low-efficiency telecom transformer inspection to be more accurate and faster.

The 3312 even provides several output impedance selection to solve inductance measurement error problem caused by different test current caused by different output impedance provided by different LCR Meters.

## SPECIFICATIONS

Model		3312
Main Function		Transformer Scanning Test + LCR Meter
Test Parameter		Turn Ratio (TR), Phase, Turn Inductance (L), Quality Factor (Q), Leakage Inductance (LK), Inductance Balance (BL), ACR, Capacitance, DCR, Pin Short, Return Loss (RLOS), Insertion Loss (ILOS), Frequency Response (FR), Longitudinal balance (LBAL)
LCR Meter		L, C, R, IZL, Y, DCR, Q, D, R, X, $\theta$
Test Signals Information		
Test Level	Turn, ILOS, Fr, LBAL	10mV ~ 10V, $\pm 10\%$ 10mV/step
	Others	10mV ~ 2V, $\pm 10\%$ 10mV/step
Test Frequency	Turn	1kHz ~ 1MHz, $\pm (0.1\% + 0.01\text{Hz})$ , Resolution : 0.01 Hz
	Others	20Hz ~ 1MHz, $\pm (0.1\% + 0.01\text{Hz})$ , Resolution: 0.001 Hz (<1kHz)
Output Impedance	Turn, ILOS, Fr, LBAL	10 $\Omega$ , when level $\leq 2\text{V}$ ; 50 $\Omega$ , when level > 2V
	Others	Constant = OFF : Varies as range resistors Constant = 320X : 100 $\Omega \pm 5\%$ Constant = 107X : 25 $\Omega \pm 5\%$ Constant = 106X : 100mA $\pm 5\%$ (1V setting), for inductive load less than 10 $\Omega$ , 10 $\Omega \pm 10\%$ , for impedance $\geq 10 \Omega$
Measurement Range		
Lx, x		0.00001 $\mu\text{H}$ ~ 9999.99H
C		0.00001 pF ~ 999.999mF
Q, D		0.00001 ~ 99999
Z, X, R		0.00001 $\Omega$ ~ 99.9999M $\Omega$
Y		0.01 nS ~ 99.9999S
$\theta$		-90.00° ~ +90.00°
DCR		0.01 m $\Omega$ ~ 99.999M $\Omega$
Turn		0.01 ~ 99999.99 turns (Secondary voltage less than 100 Vrms)
Pin-Short		11 pairs, between pin to pin
RLOS, ILOS, FR		-100dB ~ +100dB
LBAL		0dB ~ +100dB
Basic Accuracy		
L, LK, C, Z, X, Y, R		$\pm 0.1\%$ (1kHz if AC parameter)
DCR		$\pm 0.5\%$
$\theta$		$\pm 0.03\%$ (1kHz)
Turn		$\pm 0.5\%$ (1kHz)
RLOS		N/A (Zr: $\pm 0.1\%$ )
ILOS, FR, LBAL		$\pm 0.5\text{dB}$
Measurement Speed (Fastest)		
L, LK, C, Z, X, Y, R, Q, D, $\theta$		80meas./sec.
DCR		50meas./sec.
Turn, RLOS, ILOS, LBAL		10meas./sec.
Judge		
Transformer Scanning		PASS/FAIL judge of all test parameters output from Handler interface 10 bins for sorting & Bin sum count output from optional Handler interface
LCR Meter		PASS/FAIL judgement output from standard Handler interface
Trigger		Internal, Manual, External
Display		320x240 dot-matrix LCD display
Equivalent Circuit Mode		Series, Parallel
Correction Function		Open/Short Zeroing, Load correction
Memory		15 instrument setups, expansion is possible via memory card
General		
Operation Environment		Temperature: 10°C ~ 40°C, Humidity: 10%~90% RH
Power Consumption		140 VA max.
Power Requirement		90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz
Dimension (H x W x D)		177 x 430 x 300 mm / 6.97 x 16.93 x 11.81 inch
Weight		9.2 kg / 20.26 lbs





### KEY FEATURES

#### Model 1310

- Frequency response : 20Hz~200kHz
- 0.001A~10.00A, 90W output capability
- Forward / Reverse current switching capability
- Bias current sweep (2~11 points), automatic or manual trigger, for core characteristics analysis
- 16x2 LCD text display
- 0.001 Ω~199.99 Ω DCR measurement capability
- Long term continued maximum power output capability
- Excellent protection circuit, keep L Meter from damage as bias current was broken abnormally

### KEY FEATURES

#### Model 1320

- Frequency response : 20Hz~1MHz
- 0.001A~20.00A, 150W output capability, maximum 100A dc extendable with 1320S
- Forward / Reverse current switching capability



- Standard GPIB, Handler interface
- Bias current sweep (2~21 points), automatic or manual trigger, for core characteristics analysis
- Direct controlled by LCR Meter 3302/3252/11022/11025
- 16x2 LCD text display
- 0.01m Ω~199.99 Ω DCR measurement capability
- 50 internal instruments setups for store/recall capability
- Single bias current output timer capability (24 hours)
- Long term continued maximum power output capability
- Excellent protection circuit, keep L Meter from damage as bias current was broken abnormally

The 1320 Bias Current Source output can be controlled by LCR Meter Model 3302/3252/11022/11025 directly. The 1320S connected externally can output current up to 100A. The bias current scan frequency triggered automatically or manually can analyze the iron core characteristics in inductor for quality inspection and product feature analysis. They are the best measurement instruments combination for inductor test.

### ORDERING INFORMATION

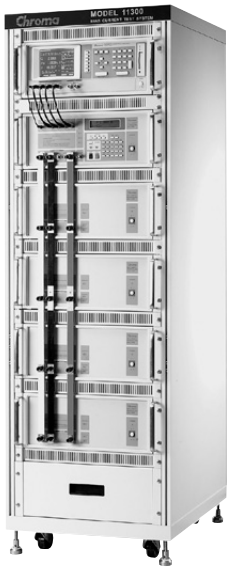
- 1310** : Bias Current Source 0~10A
- 1320** : Bias Current Source 0~20A
- 1320-10A** : Bias Current Source 0~10A
- 1320S** : Bias Current Source (Slave)
- A113011** : 4 Terminals Test Cable with Clip
- A115001** : Foot Switch #10



SPECIFICATIONS				
Model	1310	1320	1320S	1320-10A
<b>Bias Current Source</b>				
Output Current	0.00~10.00A dc Forward/Reverse	0.00~ 20.00A dc Forward/ Reverse 100A extendable when linked with 1320S	0.00~20.00A dc(Slave) Forward/Reverse *2	0.00~10.00A dc Forward/Reverse
Accuracy	0.000A~1.000A:1%+3mA 1.01A~10.00A:2%	0.000A~1.000A : 1% +3mA 1.001A~5.00A:2% 5.01A~20.00A:2% 20.1A~20.0(1+X)A:3% *1	3%	0.000A~1.000A:1%+3mA 1.001A~5.00A:2% 5.01A~10.00A:2%
Scan Test	Manual or Auto, 2~11 steps	Manual or Auto, 2~21 steps	---	Manual or Auto, 2~21 steps
Frequency Response	20Hz~200kHz	20Hz~1MHz	20Hz~1MHz	20Hz~1MHz
Maximum Power Continued Output Allowable Time	> 24 hours (below 40°C)			
Timer	---	0~24 hours	---	0~24 hours
Delay time	---	0.0~100.0 sec/step, adjustable	---	0.0~100.0 sec/step, adjustable
<b>DCR Meter Accuracy &amp; Resolution</b>				
DCR Range	20m Ω	---	2% + 0.07m Ω, 0.01m Ω	---
	200m Ω	---	2% + 0.2m Ω, 0.1m Ω	---
	2 Ω	3% + 0.002 Ω, 0.001 Ω	3% + 0.002 Ω, 0.001 Ω	---
	20 Ω	3% + 0.03 Ω, 0.01 Ω	3% + 0.02 Ω, 0.01 Ω	---
	200 Ω	3% + 0.3 Ω, 0.1 Ω	3% + 0.2 Ω, 0.1 Ω	---
<b>DCV Display</b>				
Display Range	---	0.00V~10.00V dc	---	0.00V~20.00V dc
Accuracy	---	2% + 0.05V dc	---	2% + 0.05V dc
Display	16 x 2 text dot matrix LCD		---	16 x 2 text dot matrix LCD
<b>General</b>				
Operation Environment	Temperature : 10°C~40°C, Humidity : 10%~90 % RH			
Power Consumption	250VA max.	650VA max.	600VA max.	650VA max
Power Requirements	90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz			
Dimension (H x W x D)	132 x 410 x 351 mm / 5.2 x 16.14 x 13.82 inch	177 x 430 x 450 mm / 6.97 x 16.93 x 17.72 inch		
Weight	8.8 kg / 19.38 lbs	17.5 kg / 38.55 lbs	15.5 kg / 34.14 lbs	17.5 kg / 38.55 lbs

**Note\*1** : X is the number of linked 1320S

**Note\*2** : 1320S is a slave current source of 1320



Chroma 11300 bias current test system is an integration test system of LCR Meter and Bias Current Source.

It consists of Chroma 3252/3302 series Automatic Component Analyzer and Chroma 1320 series Bias Current Source. The Chroma 1320 series bias current source output can be controlled by Chroma 3252/3302 LCR meter directly. The bias current output capacity can be selected up to 300A to satisfy various testing in R&D, QC, QA, and production applications.

The connector between bias current sources is low ESR (<10m ohm) design to reduce heat effect and get more accurate measurement result. The multi-function four terminal test fixture supports various DUT, include SMD DUT and DIP ring core DUT.

This system provides power choke characteristic sweep graph analysis through Windows® base software or sweep function of the meter. The bias current scan triggered automatically or manually can analyze the iron core characteristics in inductor for quality inspection and product feature analysis. The Chroma 11300 is a just right test solution for magnetic choke and core used in various power supply.

### ORDERING INFORMATION

- 11300** : Bias Current Test System
- A113008** : Four terminal test fixture for DIP 100A
- A113009** : Four terminal test fixture for SMD 60A (combined with A113008)
- A113010** : Four terminal PCB for SMD 100A (combined with A113008)
- A113012** : Vacuum Generator for A113009
- A113014** : Vacuum Pump for A113009
- A113017** : LCR Analysis Software
- LCR Meter** : Refer to 3252, 3302
- Bias Current Source** : Refer to 1320, 1320S
- A800004** : 19" rack 20U/35U/41U for Model 11300

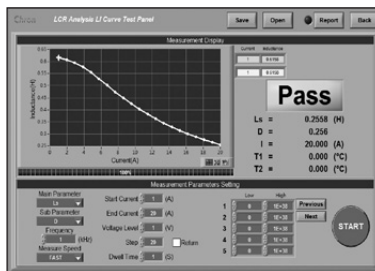
300A

### KEY FEATURES

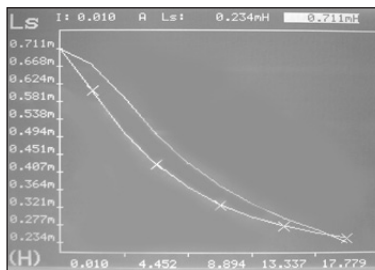
- High efficiency, forward / reverse current switching capability and sweep function
- High stability, frequency response from 20Hz to 1MHz
- High accuracy, 3% output current accuracy
- Expansion capabilities, up to 300A
- Vertical design, easy to maintain
- Flexible modular test system
- Multi-channel intakes in the front panel of rack and multi-fans exhausts in the back of rack
- Multi-function four terminal test fixture
- Low ESR (< 10m ohm) design for connectors between bias current sources
- Windows® based software



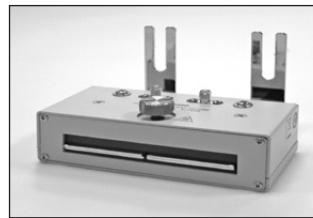
19" Rack 20U for Model 11300



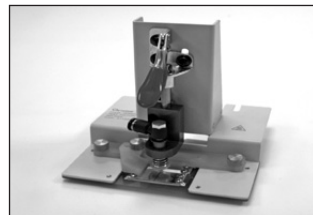
L-I Curve Software



Graphical Bias Current Characteristic Analysis



**A113008 :**  
Four terminal test fixture for DIP 100A



**A113009 :**  
Four terminal test fixture for SMD 60A (combined with A113008)

SPECIFICATIONS						
Model	11300					
Output Bias Current	20A	40A	60A	80A	100A	100A~300A
<b>LCR Meter</b>						
Model 3252/3302	•	•	•	•	•	*
<b>Bias Current Source</b>						
Model 1320	•	•	•	•	•	*
Model 1320S		1 Set	2 Sets	3 Sets	4 Sets	*
<b>General</b>						
19"Rack		20U			35U	*
Power Requirements	180~264Vac, 47~63Hz					*

\* Call for availability

Video & Color  
Flat Panel Display  
LED/Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Manufacturing System  
Intelligent Manufacturing System  
Turnkey Test & Automation



## KEY FEATURES

- C meter provides Z/C/D/Q/ESR parameters for test
- Available 7 test frequencies from 100~100kHz for selection
- 0.1% basic measurement accuracy
- The thin-film withstand voltage results can be displayed in graph by converting them to an actual rising curve
- CPK calculation function for 1000 capacitor test results that is convenient for analyzing the production capability
- 320 x 240 dot-matrix LCD display
- 200 sets of internal memories and 4M SRAM interface card for saving and recalling the parameter settings
- Designed for 100mΩ range with accuracy measurement up to 0.1mΩ
- Non-Relay switch is built in. It is safe and reliable as the discharge circuit is close to the fixed power
- Perform electric polarity test before charge to avoid the danger of explosion
- Softpanel for leakage current data statistics analysis
- Equipped with RS-232, printer and scanner controller interfaces
- Meet the test regulation of EIAJ RC-2364A
- A131001 scan box has four terminals designed for measuring accurate high frequency and low impedance (200 Vmax)

The Chroma 13100 Electrolytic Capacitor Analyzer is a general measurement instrument designed for analyzing the features of electrolytic capacitors. It has multiple functions that can be programmed based on the capacitor features by altering the settings to test metal oxidation thin-film withstand voltage, capacitor leakage current, capacitance, dissipation factor, impedance and equivalent serial resistance, etc.

Used with the special designed sequential switch test box A131001, it can complete the test for multiple capacitors or aluminum foil rapidly, accurately and simultaneously in a short time without changing any test wire.

The report printing function is capable of printing the test results correctly and completely; and the built-in data calculation function can compute the test data of the product instantly for CPK analysis. To avoid the inefficient calculation process done manually, a test software application is also available for you to create a quality report easily. It meets the EIAJ RC-2364A regulations for electrolytic capacitor test and is a test instrument of choice.

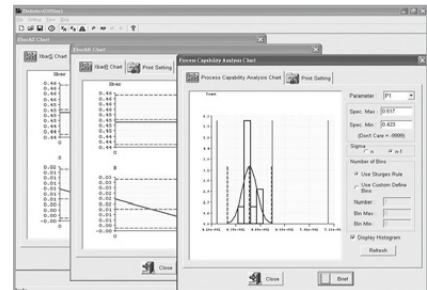
Chroma A131001 is a sequential switch test box of ten channels specially designed for Chroma 13100. Each test socket on the test box is implemented with Kelvin measurement, which is suitable for the precise measurement requirement for low impedance and low leakage current. With the SCAN function in 13100 it is able to control the C, D, Q, Z, ESR and LC tests for electrolytic capacitor to be done consecutively without switching the capacitor manually. This increases the test efficiency significantly as it costs only 1/10 of the original test time.

## ORDERING INFORMATION

- 13100** : Electrolytic Capacitor Analyzer
- A131001** : 10 Channels Switching Test Fixture
- A131002** : 4T BNC to BNC Lead



**A131001** : 10 Channels Switching Test Fixture (200 Vmax)



**13100 Softpanel**

SPECIFICATIONS	
<b>Model</b>	<b>13100</b>
Main Function	C Meter/Leakage Current Tester/Foil WV Tester/Scanner Controller
<b>C Meter</b>	
Test Parameter	Cs-D, Cs-Q, Cs-ESR, Cp-D, Cp-Q,  Z -ESR,  Z - $\theta$
<b>Test Signals</b>	
Level	1.0V/0.25V, $\pm 10\%$
Frequency	100Hz, 120Hz, 1kHz, 10kHz, 20kHz, 50kHz, 100kHz; $\pm 0.01\%$
Source Ro	25 $\Omega$ , 100 $\Omega$ , 25 $\Omega$ /C.C, 100 $\Omega$ /25 $\Omega$ four mode selectable
<b>Measurement Display Range/ Basic Accuracy *1</b>	
C	0.001pF ~ 1.9999F / $\pm 0.1\%$
Z, ESR	0.01m $\Omega$ ~ 99.99M $\Omega$ / $\pm 0.1\%$
D, Q	0.0001 ~ 9999 / $\pm 0.0005$
$\theta$	-90.00° ~ +90.00° / $\pm 0.03^\circ$
<b>Measurement Speed *2</b>	
Fast/Medium/Slow	Freq. = 100Hz 120Hz : 55ms / 120ms/ 750ms; Freq 1kHz : 35ms / 60ms / 370ms
<b>Function</b>	
Correction	Open / Short zeroing
Averaging	1~99 times
Test Signal Monitor	Vm, Im
<b>Leakage Current Tester</b>	
Test Parameter	LC, IR
<b>Test Signals</b>	
Voltage	1.0 V ~ 100 V, step 0.1 V; 101V~650 V, step 1V; (0.5% + 0.2V)
Charge Current Limit	V $\leq$ 100V: 0.5mA~500mA; V>100V: 0.5mA~150mA; step 0.5mA; (3% + 0.05mA)
<b>Measurement Display Range/ Basic Accuracy *3</b>	
LC (Leakage Current)	0.001 $\mu$ A ~ 99.9mA/ $\pm (0.3\% + 0.005\mu$ A)
Measurement Speed	45ms
<b>Function</b>	
Correction	Null zeroing
Averaging	1 ~ 99 times
Test Voltage Monitor	Vm: 0.0 V ~ 660.0V; (0.2%+0.1V)
Charge/ Dwell Timer	0 ~ 999 sec.
<b>Foil WV Tester</b>	
Test Parameter	Tr (Rise Time), Vt (Foil Withstand Voltage), Plot [logT, Vm]
<b>Test Signals</b>	
Voltage Limit	650 V typical
Constant Charge Current	0.5mA~100mA, step 0.5mA; (3% +0.05mA)
<b>Test Display Range</b>	
Tr (Rise Time)	0.05 ~ 120.00 sec.
Charge Voltage	0.1V ~ 660.0V
Plot [logT, Vm]	220 plots; Vm: 1.5~10 x Vf
Test Time	30 ~ 600 sec.
<b>Scanner Controller</b>	
Controllable Fixture	Chroma A131001
Test Parameter	C parameter pair x 2, LC parameter x 1
Sample Number	1~1000 pcs.
<b>Function</b>	
Correction	Fixture Open/ Short/ Null zeroing
Comparison Limit	Upper, Lower
Statistics	Maximum, Minimum, Average (X bar), Cpk
Interface	RS-232, Printer, Scanner Control Interface
Display	320 x 240 dot-matrix LCD display
<b>Memory (Store/Recall)</b>	
Internal	200 instrument setups
4M SRAM card (Option)	200 instrument setups (for copy and backup)
Trigger	Internal, Manual, BUS, Scanner
<b>General</b>	
Operation Environment	Temperature 0°C~40°C, Humidity < 90 % RH
Power Consumption	400 VA max.
Power Requirement	90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz
Dimension (H x W x D)	177 x 430 x 301.4 mm / 6.97 x 16.93 x 11.87 inch
Weight	14 kg / 30.84 lbs

**Note\*1** : 23 $\pm$ 5°C after Open and Short correction, slow measurement speed, refer to Operation Manual for detail measurement accuracy descriptions

**Note\*2** : 23 $\pm$ 5°C after Null correction, average exceeds 10 times, refer to Operation Manual for detail measurement accuracy descriptions

**Note\*3** : C/D meter in range >1 $\Omega$ , refer to Operation Manual for detail





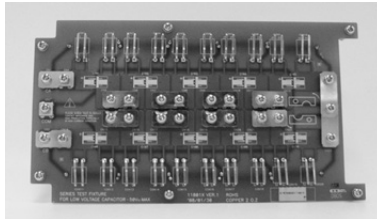
## KEY FEATURES

- Digital constant current output and constant peak voltage output control function
- Four terminal contact test jig design, ensure accurate monitoring of voltage dropped on capacitors under test (patent pending)
- Paired cooper-foil wiring test cable to reduce voltage drop on the current driving loop and to ensure accurate monitoring of ac level dropped on capacitors under test (patent pending)
- 0-500 V DC bias voltage source, 0.3% basic accuracy
- 0.01~30A, 100Hz/120Hz/400Hz/1kHz AC ripple current source, ( $\pm 0.5\%$  reading+0.1% of range) basic accuracy (Model 11800)
- 0.01~10A, 20kHz~100kHz AC ripple current source, 2% basic accuracy (Model 11801)
- 0.03~10A, 20kHz~1MHz AC ripple current source (Model 11810)
- Monitoring software (option) for multiple Ripple Current Testers
- Lower power consumption and lower electricity cost
- Large LCD display (320 x 240 dot-matrix)
- Alarm for indicating of normal or abnormal test termination, Tested time will be recorded if the test is terminated abnormally. An automatic discharge is always performed after test termination
- Standard RS485 interface is provided for computer monitoring
- Optional 20-fixtures Series or Parallel test jigs
- Digital timer inside
- CE marking (Model 11800/11801)

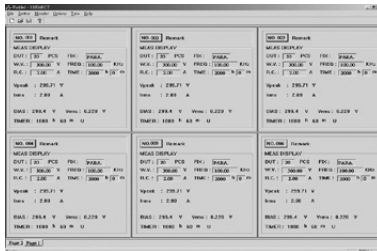
The Chroma 11800/11801/11810 Ripple Current Tester is a precision tester designed for electrolytic capacitors load life testing. Provides constant ripple current output and constant peak voltage ( $V_{peak} = V_{dc} + V_{ac\_peak}$ ) output digital control function. Let load life testing for electrolytic capacitors becomes easier and more reliable. And, The Chroma 11800/11801/11810 use excellent output amplifier design technology to reduce power consumption and internal temperature rising. For long time testing requirement, it can reduce electricity cost and perform high stability. The Chroma 11800/11801/11810 is a just right test solution for electrolytic quality evaluation.



Model 11801



A118029 : SMD Series Test Fixture for Low Voltage



A118010 : Monitoring Software for 11801/11800

## ORDERING INFORMATION

- 11800** : Ripple Current Tester 1kHz
- 11801** : Ripple Current Tester 100kHz
- 11810** : Ripple Current Tester 1MHz
- A118004** : Series Test Fixture
- A118005** : Parallel Test Fixture
- A118010** : Monitoring Software for Model 11800/11801
- A118028** : Series Test Fixture for Low Voltage
- A118029** : SMD Series Test Fixture for Low Voltage
- A118030** : PCB for SMD Capacitor

## SPECIFICATIONS

Model	11800	11801	11810
<b>Ripple Current Source</b>			
<b>Current Output Range</b>	0.01~30A	0.01~10A	0.03~10A, *3
<b>Frequency</b>	100Hz/120Hz/400Hz/1kHz $\pm 0.1\%$	20kHz~100kHz	20kHz~1MHz
<b>Accuracy *1</b>	0.010A~0.199A	$\pm (3\% + 0.005 A)$	0.03~0.39A, $\pm (3\% + 0.01 A), *2$
	0.20A~1.99A	$\pm (0.5\% \text{ of reading} + 0.1\% \text{ of range})$	0.40~10.0A, $\pm (2\% + 0.05 A), *2$
	2.0A~10A		--
	10.0A~30A	--	--
<b>Ripple Voltage Output Range</b>	90Vrms / 10Arms, 30Vrms / 30Arms	15Vrms maximum	
<b>DC Bias Voltage Source</b>			
<b>Voltage Output Range</b>	DC 0.5 ~ 500V, $\pm (0.3\% + 0.05V)$		
<b>Charge Current</b>	200mA, 40W Maximum		
<b>Signal Monitor Parameter Accuracy</b>			
<b>Irms (Ripple Current)</b>	0.001A~0.199A	$\pm (0.5\% \text{ of reading} + 0.1\% \text{ of range})$	$\pm (2\% + 0.005 A)$
	0.20A~1.99A		$\pm (2\% + 0.05 A)$
	2.0A~10A		$\pm (2\% + 0.2 A)$
	10.0A~30A		--
<b>Vpeak (Normally, set to capacitor rated voltage)</b>	$V_{peak} = V_{dc} + V_{ac\_peak}$		
<b>Vdc (DC Bias Voltage)</b>	$\pm (0.3\% + 0.05V)$		
<b>Vrms (Ripple Voltage)</b>	0~1.99V, $\pm (0.3\% \text{ of reading} + 0.5\% \text{ of range})$ 2.00~19.99V, $\pm (0.3\% \text{ of reading} + 0.1\% \text{ of range})$ 20.00V~200.0V, $\pm (0.3\% \text{ of reading} + 0.1\% \text{ of range})$	$\pm (1\% + 0.005V)$	$\pm (1\% + 0.01V) *2$
<b>Control Function</b>			
<b>Timer</b>	1 min~10000 hour, 30min error per year		
<b>Interface</b>	RS-485 (Standard)		
<b>Display</b>	320 x 240 dot-matrix LCD display		
<b>Operation</b>	Start, Stop, Continue		
<b>Protection</b>	OCP, OTP, Over Load		
<b>General</b>			
<b>Operation Environment</b>	Temperature : 10°C~40°C, Humidity : < 90 % RH		
<b>Power Consumption</b>	3000 VA max.	700 VA max.	1000VA max.
<b>Power Requirement</b>	198 ~ 242Vac, 47 ~ 63Hz		
<b>Dimension (H x W x D)</b>	221.5 x 440 x 609.8 mm / 8.72 x 17.32 x 24.01 inch	353.6 x 440 x 609.8 mm / 13.92 x 17.32 x 24.01 inch	221.5 x 440 x 609.8 mm / 8.72 x 17.32 x 24.01 inch
<b>Weight</b>	54 kg / 118.94 lbs	60 kg / 132.16 lbs	40 kg / 88 lbs

Note\*1 : 23  $\pm$  5°C

Note\*2 : Multiple accuracy for test frequency 20~100kHz (x 1), 101~500kHz (x 2.5), 501kHz~1MHz (x 5)

Note\*3 : Frequency > 500kHz : 0.10~10.0A only Note\*4 : Frequency > 500kHz : 0.100~10.00A only

All specifications are subject to change without notice.



### KEY FEATURES

- Electrolytic capacitor leakage current test function
- Insulation Resistance (IR) test function
- Constant current DC power source with discharge function
- Forward voltage function for Diode, LED, Zener Diode and Varistor
- Surge voltage test function for electrolytic capacitor (JIS C5101/5102/5140/5141)
- Option contact check function to improve test reliability
- Basic accuracy: 0.3%
- Aluminum-foil withstand voltage and rise-time test function (For EIAJ RC-2364A)
- Precision low constant current charge capability (0.5mA ± 0.05mA, meet EIAJ RC-2364A requirement for withstand voltage testing of lower WV aluminum-foil)
- Large charge current (500mA) capability to fasten charge speed
- 1.0V ~ 650V / 800V DC voltage source

- 0.001µA - 20.00mA leakage current test range with 4 digits resolution
- Standard RS-232 interface
- Optional GPIB & Handler interface
- Digital timer inside
- Comparator and pass/fail alarming beeper function
- Large LCD display (240 x 64 dot-matrix)
- Friendly user interface
- Easy use graphic user interface : softpanel (Option)

The Chroma 11200 Capacitor Leakage Current/IR Meter is Chroma's newest digital leakage current meter. Provides DC 1~650 V, 0.5mA~500mA (150mA for V>100V) DC power source or DC 1~800V, 0.5mA~500mA (50mA for V>100V) DC power source. Mainly used for electrolytic capacitor leakage current testing, and aluminum-foil withstand voltage testing (EIAJ RC-2364A). And also can be used for active voltage checking or leakage current testing of absorber, Zener diode, and Neon lamp etc.

Contact failure between a DUT and the measurement plane of an automatic component handler is a factor for compare error in production line testing. Contact check using the built-in measurement function (option) improves the accuracy and efficiency of comparing.

Standard RS-232 interface, optional GPIB & Handler interface, high speed and stable measurement capabilities enable the Chroma 11200 can be used for both component evaluation on the production line and fundamental leakage current testing for bench-top applications.

### ORDERING INFORMATION

- 11200** : Capacitor Leakage Current / IR Meter 650V
- 11200** : Capacitor Leakage Current / IR Meter 800V
- 11200** : Capacitor Leakage Current / IR Meter with contact check function 650V
- A110235** : GPIB & Handler Interface
- A110236** : 19" Rack Mounting Kit
- A112001** : Triangle Test Fixture
- A112004** : Softpanel for Model 11200



**A112004** : Softpanel of Model 11200

SPECIFICATIONS		11200 (650V)	11200 (800V)
<b>Model</b>		<b>11200 (650V)</b>	
Main Function		Capacitor Leakage Current / IR Meter	
Test Parameter		LC, IR	
<b>Test Signals Information</b>			
Voltage		1.0 V~100 V, step 0.1 V; 101V~650 V, step 1V; ± ( 0.5% + 0.2V)	1.0 V~100 V, step 0.1 V; 101V~800V, step 1V; ± ( 0.5% + 0.2V)
Charge Current Limit		V ≤ 100V: 0.5mA~500mA, 50W max. V > 100V: 0.5mA~150mA, 97.5W max. step 0.5mA; ± ( 3% + 0.05mA)	V ≤ 100V: 0.5mA~500mA, 50W max. V > 100V: 0.5mA~50mA, 40W max. step 0.5mA; ± ( 3% + 0.05mA)
Measurement Display Range		LC : 0.001µA~20.00mA	
Basic Measurement Accuracy *1		LC Reading : ± (0.3% + 0.005µA)	
Measurement speed	Fast	77 ms	
(Ext. Trigger, Hold Range,	Medium	143 ms	
Line Frequency 60Hz)	Slow	420 ms	
<b>Function</b>			
Correction		Null zeroing	
Test Voltage Monitor		Vm: 0.0 V~660.0V; ± (0.2% of reading + 0.1V)	Vm: 0.0 V~900.0V; ± (0.2% of reading + 0.1V)
Charge Timer		0~999 sec.	
Dwell Timer		0.2~999 sec.	
<b>Foil WV Tester</b>			
Test Parameter		Tr (Rise Time), Vt (Foil Withstand Voltage)	
Test Signals	Voltage Limit	650 V typical	800V typical
	Constant Charge Current	0.5mA~150mA, step 0.5mA; ± ( 3% of reading + 0.05mA)	0.5mA~50mA, step 0.5mA; ± ( 3% of reading + 0.05mA)
Test Display Range	Tr (Rise Time)	0.05~600.0 sec.	
	Charge Voltage	0.1V~660.0V	0.1V~900.0V
Test Time		30~600 sec.	
Interface		RS-232(Standard), Handler, GPIB (Optional)	
Display		240 x 64 dot-matrix LCD display	
Trigger		Internal, External, Manual, BUS	
<b>General</b>			
Operation Environment		Temperature : 10°C~40°C Humidity : < 90 % RH	
Power Consumption		400 VA max.	
Power Requirement		90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz	
Dimension (H x W x D)		100 x 320 x 346.1 mm / 3.94 x 12.6 x 13.63 inch	
Weight		8 kg / 17.62 lbs	

**Note\*1** : 23 ± 5°C after null correction. Refer to Operation Manual for detail measurement accuracy descriptions.



Chroma 11802 Series Programmable High Frequency AC Tester is a digital controlled high frequency AC source platform, can be combined with high frequency voltage/current step-up module to provide high voltage/high current. Chroma 11802 Series output test frequency is 20kHz~200kHz, which cover application frequency range for various SMPS, LCD inverter and etc.

Chroma 11802 Series provides digital functions, like programmable sine-wave output voltage controller to simulate the operation condition for DUT, and cycle count mode or timer mode for load life test, etc. Chroma 11802 Series uses tracking DC source inside for output amplifier to reduce power consumption and lower temperature rising. It reduces electricity cost and improves stability for long time testing. It is the best choice to perform quality verification for various electronic components which used under high frequency, like LCD Inverter and module, high voltage capacitors, primary of SMPS main power, CCFI, HCFI, and EEFI etc.

Chroma 11890 is the best tester for production line of HF HV electronic components withstanding voltage test, like LCD inverter transformer, ceramic capacitor, cable, PCB, automatic motor corona discharge inspection and medical equipment high frequency leakage current safety inspection. Chroma 11891 is a tester with only function HF HV

Load Life Test (CV and CC mode). It is suitable for passive component load life test.

### ORDERING INFORMATION

- 11802** : Programmable HF AC Tester 500VA
- 11803** : Programmable HF AC Tester 800VA
- 11805** : Programmable HF AC Tester 1000VA
- 11890** : HF Hipot Tester 500VA
- 11891** : HF HV Load Life Tester 500VA

### H.F. Current Step-up Module

- **A118011** : 10V/50A max.
- **A118015** : 33V/30A max.
- **A118019** : 16V/30A max.
- **A118037** : 30V/25A max.

### H.F. Voltage Step-up Module

- **A118014** : 2.5kV/200mA max.
- **A118016** : 250V/2A max.
- **A118017** : 8kV/60mA max.
- **A118018** : 1kV/1A max.
- **A118031** : 5kV/100mA max. (with shielding)
- **A118032** : 1kV/500mA max.
- **A118034** : 2.5kV/400mA max.

**Programmable HF AC Tester**  
**Model 11802/11803/11805**  
**HF Hipot Tester**  
**Model 11890**  
**HF HV Load Life Tester**  
**Model 11891**

### KEY FEATURES

- HF HV Load Life Test (CV and CC mode)
- HF Withstand Voltage Test (CV and CC mode)
- HF Breakdown Voltage Test (CV mode)
- Test frequency: 20kHz ~1MHz
- Wide output voltage and current range while combine with different module (Module is customized and based on the tester's power)
- Output voltage and current monitor
- Programmable output voltage waveform control
- Cycle count mode or time count mode for load life test timer
- Lower power consumption and lower temperature rising design
- Large LCD display (320 x 240 dot-matrix)
- Built-in digital timer

### APPLICATION LIST

Model	Primary Function	Option	Application Description
11802	HF, HV, CV	A118013 HF HV 5kV/100mA max A118014 HF HV 2.5kV/200mA max A118017 HF HV 8kV/100kHz max A118031 HF HV 5kV/100mA max + shielding	LCD inverter transformer (ceramic capacitor, cable, PCB) load life / withstanding voltage / breakdown voltage test
			EEFI, backlight load life / lamp current test
			SMPS main transformer and active PFC choke load life test and electrical analysis
			Medical equipment high frequency leakage current safety inspection
		Automobile motor corona discharge inspection, analysis and production line	
	HF, HV, CV	Step-up current test module + specified resonant inductor/ capacitor	Ballast capacitor / inductor ignition voltage load life test
	HF, HI, CC, Bias voltage	Ripple Current Test Module Chroma 11200 CLC / IR Meter (for DC voltage source with discharge function)	Snubber capacitor load life test
	HF, CV, Bias current Temperature meter	Step-up current test module + AC/DC coupling test fixture Chroma DC power supply (for DC bias current) Chroma 12061 Digital Multimeter (for temperature measurement)	DC-DC converter SMD power choke temperature rising test (DC Bias current with AC ripple voltage) and electrical analysis
	HF, HV, CV (or + DC source)	HF HV test module Option Chroma DC source	Function as HF HV AC +DC power source for FFI and SED device analysis
11803	HF, CV, Bias current Temperature meter	Step-up current test module + AC/DC coupling test fixture Chroma DC power supply (for DC bias current) Chroma 12061 Digital Multimeter (for temperature measurement)	DC-DC converter SMD power choke temperature rising test (DC Bias current with AC ripple voltage) and electrical analysis
11890	HF, HV, CV	A118013 HF HV 5kV/100mA max A118014 HF HV 2.5kV/200mA max A118031 HF HV 5kV/100mA max + shielding	LCD inverter transformer( ceramic capacitor, cable, PCB) withstanding voltage test for production line
			Medical equipment high frequency leakage current safety inspection
			Automobile motor corona discharge inspection for production line
11805	HF, HI, Bias voltage	A118015 HF, HI 33V/30A max.	Snubber capacitor load life test
	HF, HV	A118018 HF, HV 1kV/1A max.	High voltage capacitor load life test
11891	HF, HV, CV	A118013 HF HV 5kV/100mA max A118014 HF HV 2.5kV/200mA max	Passive Component (inverter transformer, ceramic capacitor, cable, PCB etc.)
			High Frequency and High Voltage Load Life Test

SPECIFICATIONS						
Model		11802	11890	11891	11805	11803
<b>AC Output</b>						
Frequency	Range (rms)	20kHz~200kHz, step 1kHz			10kHz~200kHz, step 1kHz	20kHz~1MHz, step 1kHz
Frequency accuracy	accuracy	± 0.02%				
Output Voltage	Range (rms)	165V maximum, step 1 V				1~143V, step 1 V
	accuracy	± (5% of setting + 0. 5V)				
	reading	± (4% of reading + 0. 5V)				
Output Current	Range (rms)	0.01A ~ 3.10A		0.05A ~ 6.20A	5.6A maximum	
	accuracy	± (5% of setting + 0.5A)				
	reading	± (4% of reading + 0.5A)				
Maximum Output Power		500VA		1kVA	800VA	
Output mode	HF HV Load Life Test (CV)	●		●	●	●
	HF HV Load Life Test (CC)	●		●	●	●
	HF WV Test (CV)	●	●		●	●
	HF WV Test (CC)	●			●	●
	HF Breakdown Voltage Test	●			●	●
<b>Control Function</b>						
Timer	Load Life Test	1 min ~ 10000 hour, 30min error per year				
	WV Test	0.1 sec ~ 999.9 sec				
<b>General</b>						
Operation Environment		Temperature : 10°C~ 40°C, Humidity : < 90% RH				
Power Consumption		2700 VA max.		3000 VA max.	2700 VA max.	
Power Requirement		198 ~ 242Vac, 47 ~ 63Hz				
Dimension (H x W x D)		241.5 x 440 x 609.8 mm / 8.72 x 17.32 x 24.01 inch				
Weight		32 kg /70.48 lbs				

Modules						
	Tester			Specification of Modules		
	11802/ 11890/ 11891	11805	11803	Voltage Output	Max. Current Output	Frequency (kHz)
<b>H.F. Current Step-up Modules</b>						
A118011	●			0.1V~10V, ± (5% of setting + 0.05V) *2	2.5A~50A, ± (4% of setting + 0.05A) *2	200 kHz
A118015		●		0.5V~33V, ± (5% of setting + 0.15V) *2	0.2A~30A, ± (4% of setting + 0.1A) *2	200 kHz
A118019	●			0.2V~16V, ± (5% of setting + 0.1V) *2	0.2A~30A, ± (4% of setting + 0.1A) *2	200 kHz
A118037			●	0.50V~30V, ± (4% of reading + 0.3V)	0.5A~25.0A (500kHz), 0.5A~15.0A (1MHz), ± (3% of setting + 0.2A)	1 MHz
<b>H.F. Voltage Step-up Modules</b>						
A118014	●			0.05kV~2.50kV, ± (5% of setting + 0.01kV) *2	1mA~200mA, ± (4% of setting + 0.3mA) *2	200 kHz
A118016	●			5V~250V, ± (5% of setting + 1V) *2	0.01A~2A, ± (4% of setting + 5mA) *2	200 kHz
A118017	●			0.05kV~8.00kV, ± (5% of setting + 0.02kV) *2	60mA (100kHz)	200 kHz
A118018		●		0.05kV~1.00kV, ± (5% of setting + 0.01kV) *2	0.01A~1A, ± (4% of setting + 3mA) *2	200 kHz
A118031	●			0.05kV~5.00kV, ± (5% of setting + 0.01kV) *2	0.5mA~100mA, ± (4% of setting + 0.3mA) *2	200 kHz
A118032	●			0.05kV~1.00kV, ± (5% of setting + 0.01kV) *2	2.5mA~500mA, ± (4% of setting + 1mA) *2	200 kHz
A118034		●		0.01kV~2.5kV, ± (5% of setting + 0.01kV) *2	1.5mA~400mA, ± (4% of setting + 0.2mA) *2	200 kHz

**Note\*1** : Under rated load and voltage correction is well performed

**Note\*2** : For test frequency above 100kHz, multiply the accuracy error by 2 times





### KEY FEATURES

- Basic accuracy : 0.05%
- Pulsed test current output mode is used to reduce thermal EMFs affection on milliohm measurement
- DC test current output mode is used to fasten measurement speed for inductive DUT
- Dry-circuit test current output mode (limited Max. 20mV) is used to measure such contact resistances where the maximum open-circuit voltage must be limited to 50mV
- Temperature correction (TC function) regardless of material or temperature
- Useful temperature conversion function for motor/ coil evaluation
- 4 channels R scan with balance check function for fan motor (combined with A165017 option)
- 0.001mΩ~1.9999MΩ wide measurement range with 4½ digits resolution
- Standard RS-232 interface
- Optional GPIB & Handler interface
- Bin-sorting function
- Comparator and pass/fail alarming beeper function
- Large LCD display (240 x 64 dot-matrix)
- Friendly user interface
- LabView® Driver

The Chroma 16502 Milliohm Meter is Chroma's newest digital Milliohm Meter. 0.001mΩ~1.9999MΩ wide measurement range. DC, Pulsed, and Dry-circuit test current driving modes, enable the Chroma 16502 can be properly used in DC resistance measurement for various inductive components (coil, choke, and transformer winding etc.), cable, metallic contact (connector, relay switch etc.) and conduction materials.

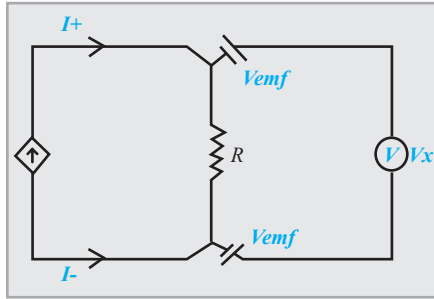
Using the A165014 Temperature Compensation Card with A165015 PT100 Temperature Probe, resistance values measured at ambient temperature can be corrected by applying a thermal coefficient so that the display shows the corresponding resistance values at any other temperature with temperature correction function. Temperature increase ( $\Delta t$ ) is obtained and displayed by converting resistance measurements and ambient temperature with convenient temperature conversion function. This function is especially useful for verifying motor windings or coils, where the maximum temperature increase needs to be determined when current is applied.

Pulsed  $\pm$  function application includes power choke, switch/Relay contract, multi-braided twisted wires, metallic foil or conductive material, thermo-sensitive material (fuse, thermistor sensor) etc. Dry Circuit function application includes switch /relay contract, thermo-sensitive material (fuse, thermistor sensor) etc. DC+ function application includes high inductance

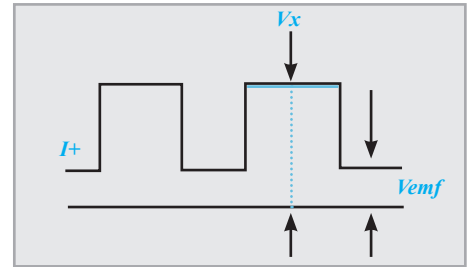


DUT, like primary of transformer (multi-turn) measurement with Measurement Delay Function to avoid the test current not produced that effect by high inductance DUT during test period.

Standard RS-232 interface, optional GPIB & Handler interface, high speed and stable measurement capabilities enable the Chroma 16502 can be used for both component evaluation on the production line and milliohm measurement for bench-top applications.



Vemf = Thermoelectric EMFs



$$V_x - V_{emf} = IR \quad V_{emf} = \text{Thermoelectric EMFs}$$

### ORDERING INFORMATION

- 16502** : Milliohm Meter
- A110235** : GPIB & Handler Interface
- A110236** : 19" Rack Mounting Kit
- A113012** : Vacuum Generator for A165018
- A113014** : Vacuum Pump for A165018
- A165013** : GPIB and Handler Interface with Temperature Compensation
- A165014** : Temperature Compensation Card
- A165015** : PT100 Temperature Probe
- A165016** : Pin Type Leads (flat)
- A165017** : 4 Channels R Scanner
- A165018** : Test Fixture for SMD Power Choke
- A165019** : Pin Type Leads (taper)
- A165022** : Four Terminal Test Cable

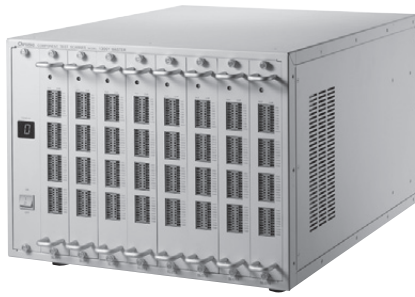
### SPECIFICATIONS

Model		16502
<b>Range Basic Measurement Accuracy *1; Test Current</b>		
20mΩ		± (0.1% of reading + 0.03 % of range) ; 1A typical
200mΩ		± (0.05% of reading + 0.03 % of range) ; 100mA typical
2Ω		± (0.05% of reading + 0.03 % of range) ; 10mA typical
20Ω		± (0.05% of reading + 0.03 % of range) ; 1mA typical
200Ω		± (0.05% of reading + 0.02 % of range) ; 1mA typical
2kΩ		± (0.05% of reading + 0.01 % of range) ; 1mA typical
20kΩ		± (0.1% of reading + 0.01% of range) ; 100μA typical
200kΩ		± (0.2% of reading + 0.01 % of range) ; 10μA typical
2MΩ		± (0.3% of reading + 0.01 % of range) ; 1μA typical
<b>Test Signal</b>		
Drive Mode		DC+, DC-, Pulsed+, Pulsed -, Pulsed $\pm$ , Stand by
Dry Circuit		Open Circuit Voltage less than 20mV; for 200mΩ, 2Ω, 20Ω ranges only
<b>Measurement Time *2</b>		
Fast		65ms
Medium		150ms
Slow		650ms
<b>Temp. Correction / Conversion Function</b>		
Temperature Measurement Accuracy (Option)	-10.0°C ~ 39.9°C	± (0.3% of reading + 0.5°C) *3
	40.0°C ~ 99.9°C	± (0.3% of reading + 1.0°C) *3
Temp. Sensor Type (Option)		PT100/ PT500
<b>Interface &amp; I/O</b>		
Interface		RS-232(Standard), GPIB, Handler (Optional)
Output Signal		Bin-sorting & Pass/Fail judge
Comparator		Upper/Lower limits in value
Bin Sorting		8 bin limits in %, ABS
Trigger Delay		0~9999ms
<b>Trigger Display</b>		Internal, Manual, External, BUS
<b>Correction Function</b>		240 x 64 dot-matrix LCD display
<b>General</b>		Zeroing
Operation Environment		Temperature : 10°C~40°C, Humidity : < 90 % R.H.
Power Consumption		80 VA max.
Power Requirement		90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz
Dimension (H x W x D)		100 x 320 x 346 mm / 3.94 x 12.6 x 13.62 inch
Weight		4.2 kg / 9.25 lbs

**Note\*1** : 23 ± 5°C after Zeroing correction. Slow measurement speed. Refer to Operation Manual for detail measurement accuracy descriptions.

**Note\*2** : Measurement time includes sampling, calculation and judge test parameter measurement.

**Note\*3** : Not include temp. sensor accuracy



In the recent years, component is more complicated and more multiple. It makes all tests be performed which are very complicated and different. The problem is not only the course is complicated and apt to make mistakes, but also the manpower cost more.

Chroma 13001 can perform switch and scan test for L, C, R etc measurement combine with LCR Meter (Chroma model 3302/3252/11022/11025) include turn rotation if the model has and IR test combine with Chroma 11200 CLC/IR Meter. It also offers short function for leakage inductance measurement. One unit could plug-in modules up to 8 slots. It is up to 320 channels for one unit if combined with 8 of option A1130007 40 channels module. It provides master and slave designed and up to 8 slave units for multiple scanner. User can control the output test circuit through RS-232, GPIB or USB interface.

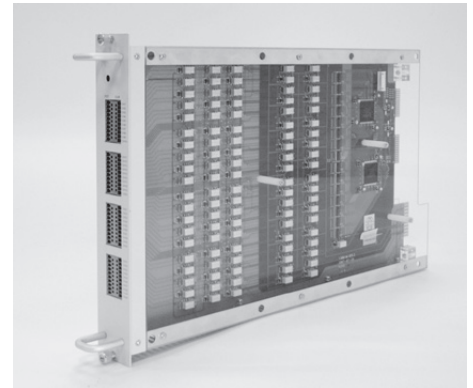
Chroma 13001 can be installed in Chroma 8800 Component ATE for DUT which a lot of procedures to test like RJ-45 equipment, glass substrate, LCD glass substrate, printed circuit glass, PCB, EMI filter ICT application. The 8800 ATS can save the manpower cost, reduce the mistake, data management to improve quality and efficiency.

## KEY FEATURES

- Support component test scanning
- Support 8 slots for plug-in (removable), up to 320 channels for one unit
- Option A130007 40 channels scan module, input up to 500VDC for IR test without switching
- Max. 8 slave units for multiple scanner (master/slave interface)
- Support Chroma LCR meter
- Support Chroma 3302/3252/11025 turn rotation function
- Support 11200 CLC/IR meter for IR test
- Standard RS-232, GPIB and USB interface
- 13001 can be installed in Chroma Component ATE model 8800
- Support ICT applications

## ORDERING INFORMATION

- 13001** : Component Test Scanner
- 13001** : Component Test Scanner (Slave)
- A130000** : 6 BNC Test Lead
- A130001** : 4 BNC Test Lead
- A130002** : IR Test Lead
- A130005** : Long Test Lead
- A130007** : 40 Channels Scan Module



**A130007** : 40 Channels Scan Module

## SPECIFICATIONS

Model	13001 (MASTER & SLAVE)
Mode	SCAN
Interface (Master only)	RS-232, USB, GPIB
<b>General</b>	
Operation Environment	Temperature: 0°C ~ 45°C, Humidity: 15% to 80% R.H@ ≤ 40°C
Power Consumption	150VA Max. (with rated load)
Power Requirements	90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz
Dimension (H x W x D)	310 x 440 x 573 mm / 12.2 x 17.32 x 22.56 inch
Weight	21 kg / 46.26 lbs (13001 main frame only, without module)

## MODULE SPECIFICATIONS

Module	A130007
Channel	40
Port	80
Max. voltage without switch	DC 500V
	AC 10V
Max. Current without switch	DC 1000mA
	AC 100mA

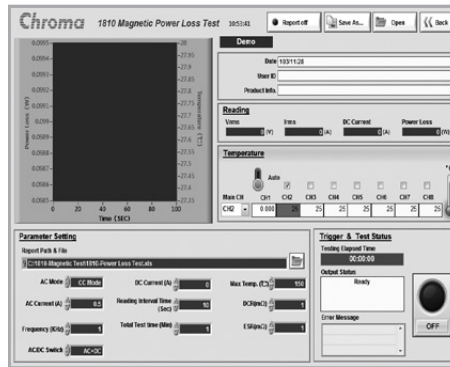


Magnetic component's heat comes from copper loss and iron loss. The copper loss caused by flowing current and wire resistance. The iron loss including Hysteresis Loss and Eddy Current Loss, mainly comes out from AC current. The inductance of magnetic component will drop unexpectedly if the temperature gets too high.

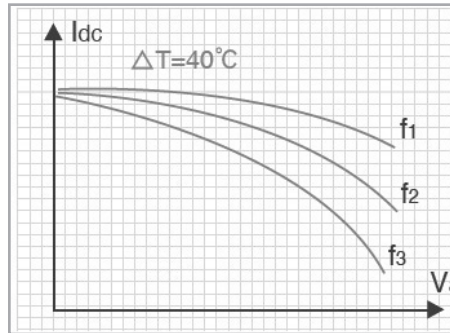
Chroma 1810 is a test system for detecting the power loss of magnetic component. It provides DC current and AC voltage to the component, and it has a temperature sensor detects the temperature on component. The analysis reports will record the result in computer by using test program. These statistic analysis reports are important for researching and quality control department.

### KEY FEATURES

- Sine Wave Voltage :  
20kHz~1MHz  
20kHz~500kHz
- 60A max DC Bias Current
- Power Loss Detection
- Temperature Detection
- Statistic Report with Software Control
- Customized test module



Test program



Load Current (Idc) and AC Voltage (Vac) Curve

### ORDERING INFORMATION

**1810** : Magnetic Component Test System  
**HF AC Tester** : Refer to Chroma Model 11802, 11803

**DC Source** : Refer to Chroma Model 62012P-80-60

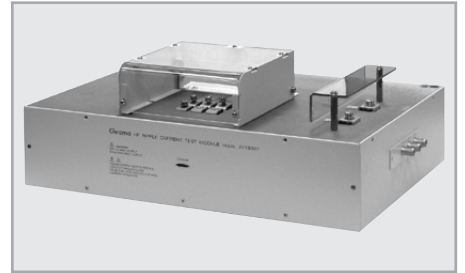
**Thermal/Multi-Function Data Logger** : Refer to Chroma Model 51101-8

**A118016** : H.F. Voltage Step-up Module - 250V/2A max.

**A118019** : H.F. Current Step-up Module - 16V/30A max.

**A118037** : H.F. Current Step-up Module - 30V/25A max.

**Oscilloscope** : Tektronix TDS3012C



A118037 : H.F. Current Step-up Module

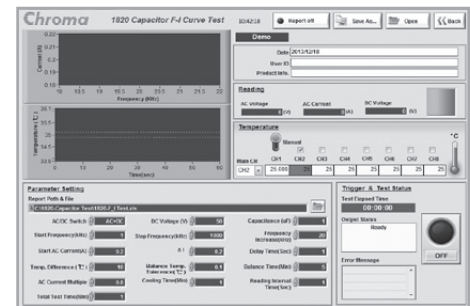
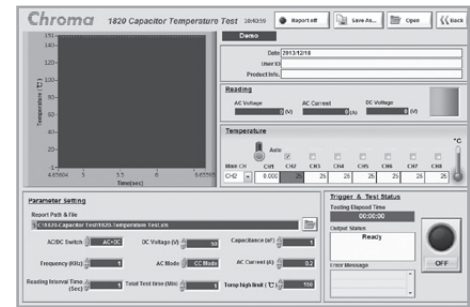


By higher withstanding voltage and lower ESR than electrolytic capacitors, the superior load life characteristic of film capacitors are suitable to be applied mainly in green energy industries such as Photovoltaic, Electric Vehicle, and wind power. When applying on circuits, high frequency large current may rise up capacitors' temperature and reduce their usable life. If the current withstanding and heat dissipation are not well-structured in the internal circuit, capacitors can even be burned. Therefore, observe the temperature rising characteristic under actual working condition is the best way to evaluate the endurance and reliability of film capacitors. It is also the verification and analysis capabilities that the capacitor manufacturers must have.

Chroma 1820 is able to provide the test condition of adding high frequency AC current on DC high voltage that DC bias voltage can up to 5kV and AC current frequency is from 1kHz to 20kHz / 10kHz to 200kHz with 1kVA / 2kVA maximum output power. It measures the multi-point temperature accurately by 8-channel temperature data logger. In addition to the standard test modules available for choosing, we also provide the customized module evaluation and design service for the requirements of mass current test applications. The control software specially developed for this system can set the test conditions, record the test data, provide the test report, and reflect the change of temperature rising by showing the real-time temperature curve.

By the function design of the software, Chroma 1820 can not only do the long-time temperature rising test based on users' setting test condition, but also increase or decrease the AC current and switch the test frequency by product temperature rising situation for evaluating the maximum withstanding current under different application frequencies. Whatever characteristic improvement and evaluation for product research & development, or quality verification and check for IQC, Chroma 1820 is the best platform to analyze the endurance and reliability of capacitors.

## Softpanel



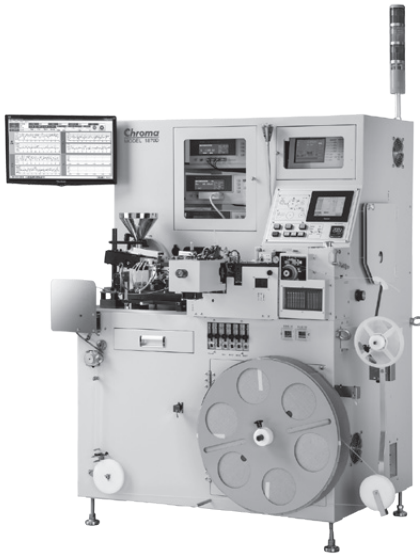
## KEY FEATURES

- High frequency sine wave current : 1kHz~20kHz  
10kHz~200kHz
- DC bias voltage : 5000V max.
- Capacitor endurance & temperature rising test
- Capacitor withstanding current test (frequency sweep)
- Support with software control
- Customized test module

## ORDERING INFORMATION

- 1820** : Capacitor Test System
- 11805** : Programmable HF AC Tester
- 11200** : Capacitor Leakage Current/IR Meter 800V
- 51101-8** : Thermal/Multi-function Data Logger 8ch
- A118015** : HF Current Step-up Module 33V/30A max.
- A118018** : HF Voltage Step-up Module 1kV/1A max.
- A118034** : HF Voltage Step-up Module 2.5kV/400mA max.
- Glassman** : HV DC Power Supply 5kV





## KEY FEATURES

- Test and packing speeds from 80ppm to 1,800ppm
- Standard functions
  - Inductance/quality factor test
  - Winding resistance test
  - Polarity test
- Optional functions
  - Layer short test
  - Insulation resistance test
  - Bias current test
- Circular vibrating plate design feeds inductors steadily and rapidly
- Index disc design eliminates dropped inductors
- Four-wire measurement test socket design
- Automatic discharge mechanism when feeding errors occur
- Each test station has an independent NG (No Good) product collection box
- Test without packaging function provided, good products gathered in bulk collection box
- Exclusive data collection software designed for monitoring product quality in real time
- Reserved stations for number spraying and automatic optical inspection
- Switchable Chinese/English/Japanese operating interface
- Equipment is fast, stable and safe

## APPLICATIONS

- Batch verification for RD and QA
- Fully functional electrical characteristics tests for production line
- Nominal value for production line fast testing
- System reserved space for marking and optical inspection of marks

The Chroma 1870D Series (1870D/1870D-12) are specifically designed automated test equipment for wafer-type power inductors. It comprises various test functions that are required for verifying wafer-type power inductors. In addition, an automated tape packaging machine at the end of production line is equipped to fulfill demand for automated manufacturing.

The standard test functions of Chroma 1870D series are inductance (Ls)/quality factor (Q), winding resistance(RDC) measurements and polarity tests, along with optional layer short (IWT), insulation resistance (IR) and BIAS current tests that cover all test items for measuring wafer-type power inductor quality and standard specifications.

As miniature inductors are widely used in the electronic products today, mass production of power inductors is necessary. The production capacity of Chroma 1870D/1870D-12 is up to 1,800 ppm, which can satisfy the quantity demanded. Besides testing, the 1870D/1870D-12 is also equipped with an automated packaging machine to tape and pack the inductors mechanically in order to meet the desired style of SMD production lines.

The Chroma 1870D/1870D-12 uses a circular vibrating plate that carries thin products at high speed for feeding. The circular vibrating plate uses a guide rail design, fiber detection and blow hole to determine the feed direction. This is fast and space saving when compared to traditional linear reciprocating mechanical feeders.

When moving inductors for testing, the traditional reciprocating or turret-type mechanical structure uses a nozzle to attract the inductor for movement, and the product often drops due to inertial effects or inaccurate positioning making it unable to test. The Chroma 1870D/1870D-12 uses an index disc design for testing, so that the equipment is within a closed architecture that can eliminate dropped inductors during high-speed movement. It is faster and more stable when compared to the traditional mechanical structure.

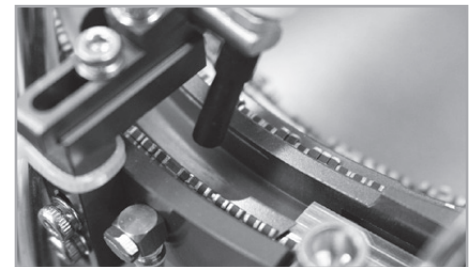
Chroma ATE Inc. not only specializes in electronic testing technology but are also masters in fixture design for automated test equipment. The test socket used by the Chroma 1870D/1870D-12 test station is a four-wire measurement design that is more accurate and stable than common automatic test equipment. The chip design applied to the connection of the test socket and inductor is easier to contact and has longer product life compared to a probe in use. The chip design is also more stable and easier to maintain than a probe.

The Chroma 1870D/1870D-12 has exclusive software for monitoring test status during production in real time, and saving the collected test data for each inductor. Real-time monitoring functions can benefit the production unit by reducing the production risk during manufacturing and cut down unnecessary

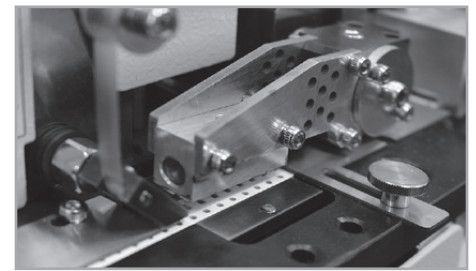
working hours. The data collection function is favorable to R&D and QA units for product analysis and quality control.

## Device Features

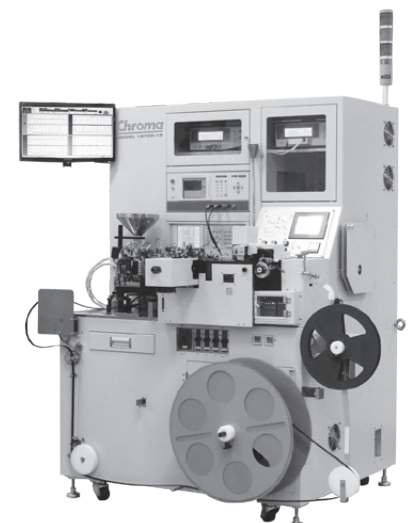
- Circular vibrating plate for feeding
- Auto discharge when encountering a feed error
- Movement of index disc
  - Closed space design for index disc without dropping any inductors
  - Fixed space easy for contact
  - Stable high-speed transfer
- Polarity test and direction reverse
- Four-wire measurement design of test socket
- Stable and long life span for specific test piece
- Independent NG (No Good) product collection box for each station
- Heat-seal module



Feeding fiber detector

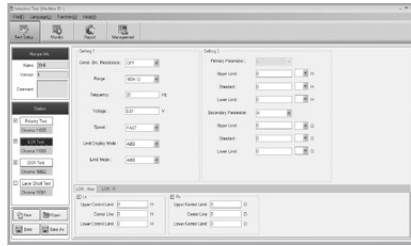


Heat-seal module

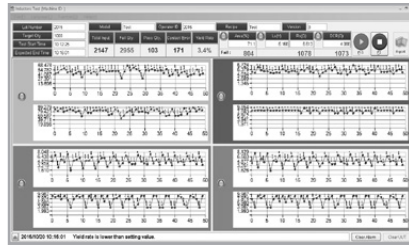


1870D-12

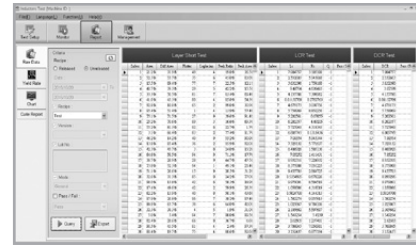
## Graphic User Interface



Parameter setting window

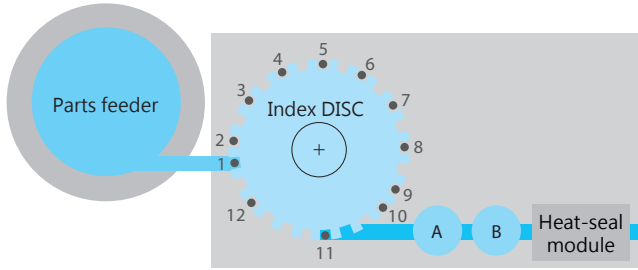


Test monitoring window



Basic information query window

## 1870D / 1870D-12 Configuration Diagram and Stations Depiction



### Stations

1. Feeding detect
  2. Polarity test
  3. Polarity reverse
  - \* 4. Layer short test (works with 19301A)  
Insulation resistance test (works with 11200)  
Bias current test (works with 11300)
  5. NG inductor discharge for station 4
  6. Winding resistance test (works with 16502)
  7. NG inductor discharge for station 6
  8. Inductor/quality factor test (works 11050 Series /3302)
  9. NG inductor discharge for station 8
  10. Good inductor receiver
  11. Move to packing tape
  12. Clean remaining inductors
  - A. Reserved for number spraying station
  - B. Reserved for automatic optical inspection station
- \* Choose one from three alternatives to work with installation testing for the 4th station

1870D Application Size Maximum Productivity						Unit : pcs/min				
W x D (mm)	3.2 x 2.5		2.5 x 2.0		2.0 x 1.6 / 2.0 x 1.2			1.6 x 0.8		
H (mm)	1.2	1.0	1.2	1.0	1.2	1.0	0.8	1.0	0.8	0.6
Single-sided electrode	600	600	800	800	800	800	1,000	800	800	1,200
Five-sided electrodes	900	900	1,200	1,200	1,500	1,500	1,500	1,500	1,500	1,800

- \* The maximum productivity listed above does not include layer short testing, insulation resistance testing, or bias current testing.
- \* Production efficiency > 1,200 pcs/min with paper tape used for packing. Do not use plastic tape.
- \* Above is the using efficiency of single size. Additional assessment is required for different size.

1870D-12 Application Size Maximum Productivity					Unit : pcs/min
W x D (mm)	4.0x4.0	6.0x6.0	8.0x8.0	10.0x10.0	12.0x12.0
Single-sided electrode	250	200	150	100	80

- \* Above maximum production efficiency does not include IWT test, IR test and BIAS I test.
- \* Above is the using efficiency of single size. Additional assessment is required for different size.

General Specifications	
Power requirement	Single phase 220V, frequency 50 Hz / 2.0kW
Air pressure system	CDA pressure 5~6 kg/cm <sup>2</sup> ; CDA flow: 150~200 L/min
Operating environment	8~38°C ; < 70%RH
Weight	approx. 450 kgs
Dimension (W x H x D)	1192 x 1660 x 1000 mm

## ORDERING INFORMATION

- |   |   |
|---|---|
| <b>1870D</b> : Inductor Test & Packing Machine    | <b>11300</b> : Bias Current Test System         |
| <b>1870D-12</b> : Inductor Test & Packing Machine | <b>16502</b> : Milliohm Meter                   |
| <b>11025</b> : LCR Meter                          | <b>19301A</b> : Impulse Winding Tester          |
| <b>11050 Series</b> : HF LCR Meter                | <b>3302</b> : Automatic Transformer Test System |
| <b>11200</b> : Capacitor Leakage Current/IR Meter |   |



## KEY FEATURES

- Applicable size 3.2mm x 2.5mm to 1.6mm x 0.8mm
- Test and packing speeds from 600ppm to 1500ppm
- Layer short judgment functions:
  - Area
  - Laplacian
  - $\Delta$  Peak Ratio
  - $\Delta$  Resonant Area
- Equipped with contact check function to extend the fixture lifespan.
- Provides 2 or 5 test stations for ATS selections based on testing requirements.
- Index disc design eliminates dropped inductors
- Four-wire measurement test socket design.
- Each test station has an independent NG (No Good) product collection box.
- Exclusive data collection software designed for monitoring product quality in real time
- Switchable Chinese/English/Japanese operating interface
- Equipment is fast, stable and safe

## APPLICATIONS

- Two layer short test stations for RD and QA batch verification
- Five layer short test stations for high-speed production line

The Chroma 1871 is an automatic test system specifically designed for chip inductors in testing layer short for mass production applications. This system inherits all judgment functions from the Chroma 19301A impulse winding tester including Area, Laplacian, and two new test functions -  $\Delta$  Peak Ratio and  $\Delta$  Resonant Area.

As miniature inductors are widely used in the electronic products today, mass production of power inductors is necessary. The production capacity of Chroma 1871 is up to 1,500ppm, which can satisfy the quantity demanded. It uses 5 layer short test stations to conduct the testing at one time for fast production. Alternatively, it can select 2 layer short test stations for R&D or QA unit use to run in a cost-effective way.

The Chroma 1871 uses a circular vibrating plate that carries thin products at high speed for feeding. The circular vibrating plate uses a guide rail design, fiber detection and blow hole to determine the feed direction. This is fast and space saving when compared to traditional linear reciprocating mechanical feeders.

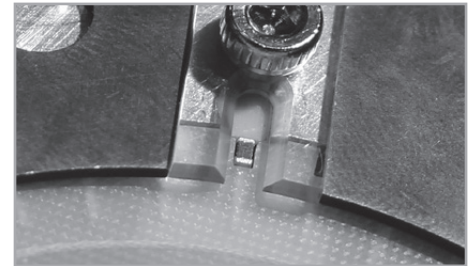
When moving inductors for testing, the traditional reciprocating or turret-type mechanical structure uses a nozzle to attract the inductor for movement, and the product often drops due to inertial effects or inaccurate positioning making it unable to test. The Chroma 1871 uses an index disc design for testing, so that the equipment is within a closed architecture that can eliminate dropped inductors during high-speed movement. It is faster and more stable when compared to the traditional mechanical structure.

Chroma ATE Inc. not only specializes in electronic testing technology but also masters in fixture design for automated test equipment. The test socket used by the Chroma 1871 is a four-wire measurement design that is more accurate and stable than common automatic test equipment. The chip design applied to the connection of the test socket and inductor is easier to contact and has longer product life compared to a probe in use.

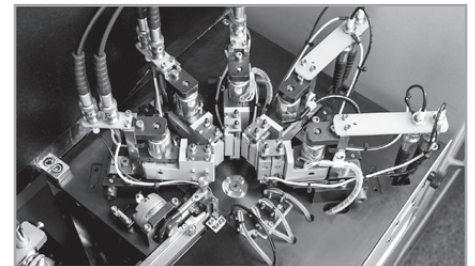
The Chroma 1871 has exclusive software for monitoring test status during production in real time, and saving the collected test data for each inductor. Real-time monitoring functions can benefit the production unit by reducing the production risk during manufacturing and cut down unnecessary working hours. The data collection function is favorable to R&D and QA units for product analysis and quality control. The software can perform data analysis to improve the product quality and increase profit.

## Device Features

- Circular vibrating plate for feeding
- Movement of index disc
  - Closed space design for index disc without dropping any inductors
  - Fixed space easy for contact
  - Stable high-speed transfer
- Five layer short test stations for parallel testing
- Four-wire measurement design of test socket
- Impulse Winding Tester Model 19301A
  - Test application 0.1  $\mu$  H~100  $\mu$  H
  - Impulse voltage 10V~1000V
  - <18ms high speed test
  - Impulse testing sampling rate (200MHz), 10 bits
  - Inductance contact check function
  - Voltage compensation function for differential inductance
  - Breakdown Voltage Analysis (BDV)
  - USB waveform storage and screen capture function
- Stable and long life span for specific test piece
- Independent NG (No Good) product collection box for each station



Closed space design for index disc



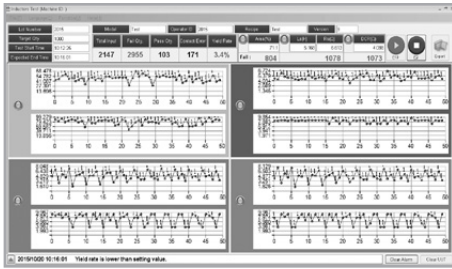
Five layer short test stations



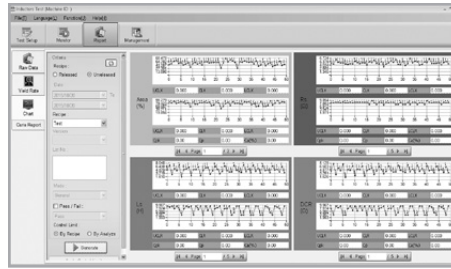
Impulse Winding Tester Model 19301A



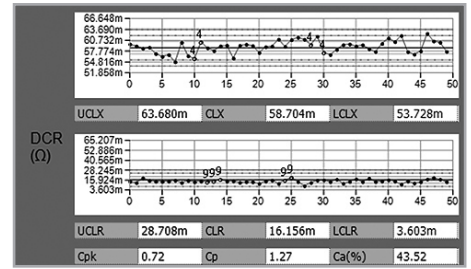
## Graphic User Interface



Test monitoring window

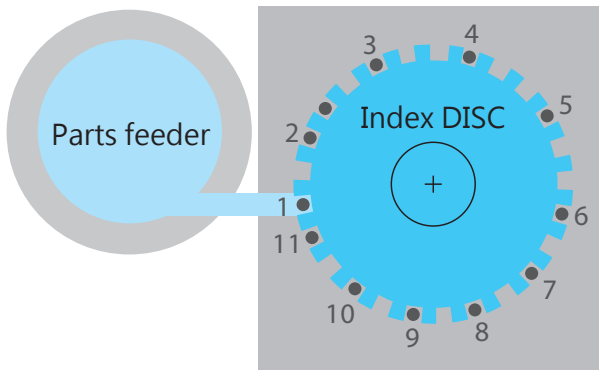


Control chart query window



Control limits calculated by tested data

## 1871 Configuration Diagram and Station Depiction



### Stations

1. Feeding detect
2. Layer short test station 1 (works with 19301A)
3. Layer short test station 2 (works with 19301A)
4. Layer short test station 3 (works with 19301A)
5. Layer short test station 4 (works with 19301A)
6. Layer short test station 5 (works with 19301A)
7. Area NG inductor discharge
8. Laplacian NG inductor discharge
9. Contact check NG inductor discharge
10. Good inductor receiver
11. Clean remaining inductors

\* Layer short test stations 3 to 5 are reserved when 2 stations are selected.

1871 Application Size Maximum Productivity								Unit : pcs/min		
WxD(mm)	3.2 x 2.5		2.5 x 2.0		2.0 x 1.6 / 2.0 x 1.2			1.6 x 0.8		
H(mm)	1.2	1.0	1.2	1.0	1.2	1.0	0.8	1.0	0.8	0.6
Single-sided electrode	600	600	800	800	800	800	800	800	800	800
Five-sided electrodes	900	900	1,200	1,200	1,500	1,500	1,500	1,500	1,500	1,500

\* The maximum productivity listed above does not include layer short testing, insulation resistance testing, or bias current testing.

General Specifications	
Power requirement	Single phase 220V ; frequency 60 Hz / 2.0kW
Air pressure system	CDA Pressure 5~6 kg/cm <sup>2</sup> , CDA Flow 150~200 L/min
Operating environment	8~38°C , < 70%RH
Weight	Approx. 500 kg
Dimension (W x H x D)	W 1280 x H 1495 x D 900 mm

## ORDERING INFORMATION

- 1871** : Inductor Layer Short ATS  
**19301A** : Impulse Winding Tester  
**A187100** : 1871 Data collection software





In recent years, as components become more complicated and multi-channel along with other complex problems, the cost of tests has skyrocketed for manufacturers. Chroma 8800 component automatic test system (ATS) is developed to effectively help manufacturers reduce the test cost and product risk. This system is able to complete all measurements and tests in one single test program. This powerful feature save time and reduce human operation errors that decrease the enterprise risk due to improper tests. The employment of open architecture software provides users a flexible, powerful and cost-effective automated test system that is deemed the best solution for component tests.

Chroma 8800 component automatic test system integrates different test instruments in the system based on test requirements. The open architecture software offers corresponding solutions by various test programs and products that give customers highly flexible test combinations. In addition, user expandable test items are provided for editing if new requirements arise.

This automatic test system uses a unique test command optimization technology to prevent the repetitive control commands from sending to the system hardware devices. This technology improves the system test speed dramatically. Users create new test items based on their requirements using the test item editor. The users can expand the test items as needed.

The system's integrated statistical and management functions generate various test statistical reports and performing system administration. Statistical reports are very important in factories for research and design (R/D) evaluation, quality assurance (QA) verification and production tests. Chroma 8800's Window 2000/XP environments provide test engineers with a dedicated components automatic test system in a familiar Windows environment and allows accesses to resources provided by Windows.

Chroma 8800 component automatic test system can combine different testers and hardware according to the test requirements. For instance, Chroma 13001 performs multi-channel scan test for inductance, capacitance and resistance along with turn ration (if applicable) measurements when combining with the LCR Meters like Chroma 3302/3252/11022/11025. The 8800 can do IR test as well as leakage inductance measurement that is designed specially for short-circuit when combining with Chroma 11200 CLC/IR Meter. Chroma 13001 Component Test Scanner supports up to 320 channels per unit when 8 optional A1130007 40-channel scan modules are installed. Up to 8 slaves of Chroma 13001 can be expanded externally for an 8800 component ATS and up to 2880 channels (1 master plus 8 slaves) can be tested to fulfill the requirements for multi-channel tests.

#### ORDERING INFORMATION

**8800:** Component Automatic Test System

**LCR Meter :** Refer to Model 11022 / 11025 / 3302 / 3252 series

**Scanner :** Refer to Model 13001 series

**Scan Module :** Refer to Model A130007 series

**IR Meter :** Refer to Model 11200 series

**A800005 :** PCI BUS GPIB Card (National Instrument)

#### KEY FEATURES

- Open architecture software
  - Expandable hardware support
  - Support instruments equipped with GPIB/RS-232 or RS485 interface
  - User editable test library (test Items)
  - User editable test programs
  - Statistical report
  - User privilege control
  - Test item/ program release control
  - Activity log
  - Support barcode reader
- Test command editor helps to improve test speed
- Comprehensive hardware modules provide highly accurate, repetitive measurements
- High test throughput by system test items
- High test throughput generated by system test items
- Cost effective
- Hardware expandable upon request
- Windows® 2000/ XP based software

\* Test items can be customized or created via the test item editor based on the requirements of various UUTs.

#### APPLICATIONS

- RJ-45 equipment (including LAN modules, Ethernet IC, PoE IC) test
- Glass substrate test (including solar panel)
- LCD glass substrate test
- Printed circuit glass (including touch panel) test
- PCB test
- EMI filter test
- Rechargeable battery test
- ICT applications

## SPECIFICATIONS

### Accurate and highly reliable hardware devices :

System Controller	
Model	PC/IPC
CPU	Pentium III 600 or faster
SRAM	256KB
DRAM	128MB or higher
Hard drive	2.1GB or higher
CD-ROM	24X or faster
Monitor	15"
Keyboard	101 keys
I/O	Mouse/Print port
System Interface	GPIB/RS-232
GPIB board	NI-PCI GPIB Card

Capacitor Leakage Current/ IR Meter		
Model	11200 (650V)	
Main Function	Capacitor Leakage Current / IR Meter	
Test Parameter	LC, IR	
Test Signals Information		
Voltage	1.0V~100V, step 0.1V; 101V~650V, step 1V; $\pm (0.5\% + 0.2V)$	
Charge Current Limit	$V \leq 100V$ : 0.5mA~500mA $V > 100V$ : 0.5mA~150mA, 65W max. step 0.5mA; $\pm (3\% + 0.05mA)$	
Measurement Display Range	LC : 0.001 $\mu$ A~20.00mA	
Basic Measurement Accuracy *1	LC Reading : $\pm (0.3\% + 0.005\mu A)$	
Measurement speed (Ext. Trigger, Hold Range, Line Frequency 60Hz)	Fast	77 ms
	Medium	143 ms
	Slow	420 ms
Function		
Correction	Null zeroing	
Test Voltage Monitor	$V_m$ : 0.0V~660.0V; $\pm (0.2\%$ of reading + 0.1V)	
Charge Timer	0~999 sec.	
Dwell Timer	0.2~999 sec.	

**Note\*1** :  $23 \pm 5^\circ\text{C}$  after Null correction. Refer to Operation Manual for detail measurement accuracy descriptions.

LCR Meter	
Model	11022
Test Parameter	L, C, R,  Z , Q, D, ESR, X, $\theta$
Test Signals	
Level	10 mV~1V, step 10 mV; $\pm (10\% + 3 \text{ mV})$
Frequency	50Hz, 60Hz, 100Hz, 120Hz, 1kHz, 10kHz, 20kHz, 40kHz, 50kHz, 100kHz ; 0.01%
Measurement Display Range	
C (Capacitance)	0.001pF~1.9999F
L, M, L2 (Inductance)	0.001 $\mu$ H~99.99kH
Z (Impedance), ESR	0.01m~99.99M $\Omega$
Q (Quality Factor)	0.0001~9999
D (Distortion Factor)	0.0001~9999
$\theta$ (Phase Angle)	-180.00° ~ +180.00°
Measurement Accuracy *1	$\pm 0.1\%$
Measurement Time (Fast) *2	21ms

**Note\*1** :  $23 \pm 5^\circ\text{C}$  after OPEN and SHORT correction. Slow measurement speed. Refer to Operation Manual for detail measurement accuracy descriptions.

**Note\*2** : Measurement time includes sampling, calculation and judge of primary and secondary test parameter measurement

Component Test Scanner	
Model	13001 (MASTER & SLAVE)
Mode	SCAN
Interface (Master only)	RS-232 , USB , GPIB
General	
Operation Environment	Temperature: $0^\circ\text{C} \sim 45^\circ\text{C}$ , Humidity: 15% to 80% R.H@ $\leq 40^\circ\text{C}$
Power Consumption	150VA Max. (with rated load)
Power Requirements	90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz
Weight	Approx.20Kg (13001 main frame only, without module)
Size(WxHxD)	About 430mm x 311mm x 570mm

Module	
Model	A130007
Channel	40
Port	80
Max. voltage without switch	DC 500V AC 10V
Max. Current without switch	DC 1000mA AC 100mA

Other hardware devices :

- Digital Multimeter (Chroma 12061 / Agilent-34401A / Keithley 2000), other types or brands of DMM supported upon request
- Digital Storage Oscilloscope (TDS-3000 / 5000 / 7000 series), other types or brands of DSO supported upon request



#### KEY FEATURES

- Suit for electrical double layer capacitor production line automatic test, test parameter includes Static Capacitance and Internal Resistance (IR and ESR) (for EIAJ RC-2377 Test Method of Electrical Double Layer Capacitor)
- Open architecture software
  - Expandable hardware support
  - Support GPIB instruments&RS-232/RS485 interface
  - User editable test library
  - User editable test programs
  - Statistic report
  - User authority control
  - Release control
  - Activity log
  - Multi-UUT test capability for single-output PSU
  - Support barcode reader
- Measurement function: C/ IR / ESR (For EIAJ RC-2377)
- High test throughput
- Synchronized measurement in multi-channel reduce the test time
- One DC source and one DC load design
- Hardware protect circuit
- Microsoft® Word based evaluation report or UUT characterization
- Cost effective
- Other hardware expandable upon request
- Windows® 2000/ XP based software



The Chroma Electrical Double Layer Capacitor Automatic Test System model 8801 is the ultimate solution for EDLC (electrical double layer capacitor) testing. The system includes a various range of hardware choice such as DC Sources, Electronic Loads, Timing Analyzer and LCR Meter. This flexibility combined with its open architecture software platform gives users a flexible, powerful and cost effective test system for almost all range of EDLC.

The Chroma 8801 EDLC ATS uses a unique test command optimization technology to prevent repetitive control commands from being sent to the system hardware devices. This improve test speed dramatically and makes the Chroma 8801 an ideal choice for both high speed production applications as well as design verification.

The Chroma 8801 EDLC ATS includes a sophisticated test executive which includes pre-written test items for standard EIAJ RC-2377 EDLC tests. User may also create new test items by using a special test item editing function, which users the capability to expand the test library unlimitedly.

This open architecture software also includes statistic and management functions, making the system capable to generate various test documents and performing system administration. Because the statistical reports are critically important in modern factories for R/D evaluation, QA verification and production tests, these functions are an integral part of the system.

Working under Window 2000/XP the model 8801 provides test engineers with a dedicated EDLC test system in an easy-to-learn Windows environment and allow access to resources provided by Windows.

This auto test system uses the unique test command optimization technology to prevent the repeating control commands from sending to the system hardware devices. This improves the system test speed dramatically and makes Chroma 8801, which uses open software architecture, but still highly efficient as optimized auto test system.

#### ORDERING INFORMATION

**8801** : EDLC Automatic Test System

**80611N** : Timing/Noise module

**5004ATM** : System Controller

**A880100** : EDLC 10 Channels C/IR Scanner

**A800005** : PCI BUS GPIB Card

(National Instrument)

**DC Load Module** : Refer to Model 6330A Series

**DC Source** : Refer to Model 62000P Series

**LCR Meter** : Refer to Model 11022

## SPECIFICATIONS

## Accurate and highly reliable hardware devices :

System Controller	
MODEL	PC/IPC
CPU	Pentium III 600 or faster
SRAM	256kB
DRAM	128MB or higher
Hard drive	2.1GB or higher
CD-ROM	24X or faster
Monitor	15"
Keyboard	101 keys
I/O	Mouse/Print port
System Interface	GPIB/RS-232
GPIB board	NI-PCI GPIB Card

LCR Meter	
Model	11022
Test Parameter	L,C, R, Z , Q, D, ESR, X, $\theta$
Test Signals	
Level	10 mV~1V, step 10 mV; $\pm$ (10% + 3 mV)
Frequency	50Hz, 60Hz, 100Hz, 120Hz, 1kHz, 10kHz, 20kHz, 40kHz, 50kHz, 100kHz; 0.01%
Measurement Display Range	
C (Capacitance)	0.001pF~1.9999F
L, M, L2 (Inductance)	0.001 $\mu$ H~99.99kH
Z (Impedance), ESR	0.01m~99.99M $\Omega$
Q (Quality Factor)	0.0001~9999
D (Distortion Factor)	
$\theta$ (Phase Angle)	-180.00°~ +180.00°
Measurement Accuracy *1	$\pm$ 0.1%
Measurement Time (Fast) *2	21ms

DC Source	
MODEL	62000P Series
Power rating	600, 1200W
Voltage range	0-100V/600V
Programmable current limit	Yes
Programmable OV point	Yes
Analog programming	Yes
Remote sensing	Yes
Line-drop compensation	5V

\* Please refer to respective product catalogs for detail specifications.

**Note\*1** : 23  $\pm$  5°C after OPEN and SHORT correction. Slow measurement speed. Refer to Operation Manual for detail measurement accuracy descriptions.

**Note\*2** : Measurement time includes sampling, calculation and judge of primary and secondary test parameter measurement

## Other hardware devices :

- Digital Multimeter (Chroma 12061/Agilent-34401A/Keithley 2000), other types or brands of DMM supported upon request
- Digital Storage Oscilloscope (TDS-3000/5000/7000 series), other types or brands of DSO supported upon request

Timing/Noise Analyzer	
MODEL	80611
NO. of input module	Up to 10
Noise measurement range	2V/0.4V
Low Pass Filter	Up to 20MHz
Input circuit	Differential input
Timing range	0-64 second
NO. of trigger input	6 sets
NO. of comparator	4 Input module
Controllable TTL bits	16 output / 16 input
Controllable floating relay	8
NO. of multiplex input	10
NO. of multiplex output	1 for DMM

Electronic Load	
MODEL	6330A Series
Load mode	CC/CR/CV
Power rating	30-1200W
Voltage range	1-500V
Current range	Up to 240A
Slew rate	Up to 10A/ $\mu$ s
Measurements	Voltage/Current
Monitoring output	No
Current share measurement	No
Noise measurement	No
Voltage sense input	Yes
Sync dynamic	Yes

\* Please refer to respective product catalogs for detail specifications.

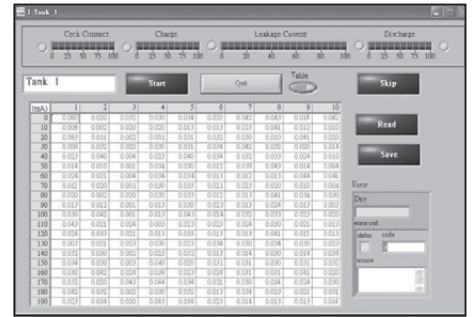




voltage alterable affection and increasing charge full voltage time. It offers 1A maximum charge / discharge per channel. The box offers leakage current GO/NG indications in front panel for each channel. The leakage current GO/NG indications will be automatic latched before enter discharge mode. Operators are easy to see every DUT test result for picking up pass or fail.

The System includes Windows® base control soft-panel. The soft-panel has multi-tank control capability. It offers sequence timing control base on one tank with setup time for charge, measurement leakage current, and discharge. The process bar is easy for operators to see the test process. Operators can set current limit values of leakage current, charge current, and discharge current through the soft-panel. The system has 2.5V – 5.0V charge voltage programmable capability.

The system includes a high power switching-mode rectifier (SMR) power supply. It offers a static state charge voltage to reduce the tiny voltage variation to speed up the leakage current result arrive and increase the leakage current accuracy.



### Monitoring Soft-Panel

\*Leakage Current Reading Value from Software only for Reference

### ORDERING INFORMATION

- 8802** : EDLC Leakage Current Monitoring System
- A880200** : EDLC 20CH LC Monitoring Box
- DC Power Supply** : Refer to Model 67300 Series\*

\* Please refer detailed information to Model 67300 Series

### KEY FEATURES

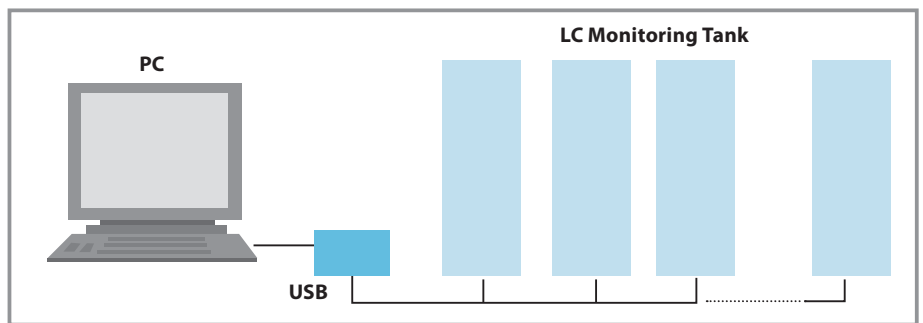
- Suit for electrical double layer capacitor leakage current long time test
- Test parameter includes leakage current
- Charge / discharge current limit function
- Voltage programmable, 0.9A maximum charge/discharge per-channel
- 1μA ~ 100mA, 0 ohm input resistance leakage current meter
- Multi-tank control capability
- Up to 200 channels per-tank
- Sequence timing control
- Windows base control soft-panel
- Leakage Current, charge current and discharge current limit value programmable
- Leakage current GO/NG indication on fixtures

\* Detail specification could be depended by customer requirement

The Chroma Electrical Double Layer Capacitor Leakage Current Monitoring System model 8802 is the ultimate solution for EDLC (electrical double layer capacitor) leakage current testing. The system includes modular monitoring boxes, and a control software to offer friend and flexible setup and multi-tank control, and a high power switching-mode rectifier (SMR) power supply. The design is adaptable for long time of EDLC leakage current test and huge amount of EDLC.

The System includes modular monitoring boxes. The monitoring box offers various range of leakage current meter from 1μA – 100mA. Each channel has individual 0 ohm input resistance leakage current meter. It suits the EDLC's low internal resistance characteristic and avoid that the meter existent effect inaccuracy leakage current measured. The box offers three circuits, charge, discharge and leakage current measurement circuit. Operators can finish the whole process in one system. Charge and leakage current circuit have design for reducing the charge

### Chroma 8802 EDLC LC Monitoring System



## SPECIFICATIONS

## Leakage Current Monitoring Box\*

<b>Model</b>	<b>A880200</b>	
<b>Main Function</b>	EDLC Charge / Leakage Current / Discharge Monitoring Box	
<b>Charge Information</b>		
<b>Charge Voltage (from DC Power Supply 67300 Series)</b>	2.5 ~ 6.0V, Step 0.1V, $\pm$ (1%)	
<b>Charge Current Limit</b>	0.1A ~ 0.9A Per Channel, Step 0.1A; $\pm$ (10% +0.05A); 18A max Per Box	
<b>Leakage Current Judgment</b>		
<b>Accuracy *1</b>		
Range	Normal Mode	
0.11mA	0.001mA~0.109mA	$\pm$ (8% of reading +3% of range), Step 0.001mA;
1.1mA	0.11mA~1.09mA	$\pm$ (8% of reading +3% of range), Step 0.01mA;
11mA	1.1mA~10.9mA	$\pm$ (8% of reading +3% of range), Step 0.1mA;
110mA	11mA~110mA	$\pm$ (8% of reading +3% of range), Step 1mA;
<b>Indication</b>	LED (Red Light for Fail)	
<b>Discharge Information</b>		
<b>Current Limit</b>	0.1A ~ 0.9A Per Channel, Step 0.1A; $\pm$ (10%+0.05A); 18A max Per Box	
<b>General</b>		
Operation Environment	Temperature: 10°C ~ 40°C Humidity: < 90%RH	
Power Consumption	1000VA max	
Power Requirement	180 ~ 264Vac, 47 ~ 63Hz	
Dimension (H x W x D)	131 x 428 x 613 mm / 5.16 x 16.85 x 24.13 inch	

**Note\*1** : 23  $\pm$  5°C after Null correction. Refer to the Operation Manual for detail measurement accuracy description

\*Detail specification could be depend by customer requirement

# Options of Passive Component Test Instruments

OPTIONS	MODEL	11021	11022	11025	1061A	1062A	1075	11020	3250	3252	3302	3312
A110104	SMD Test Cable	●	●	●	●	●	●	●	●	●	●	●
A110211	Component Test Fixture	●	●	●	●	●	●	●	●	●	●	●
A110212	Component Remote Test Fixture	●	●	●	●	●	●	●	●	●	●	●
A110232	4 BNC Test Cable with Clip #18	●	●	●	●	●	●					
A110234	High Frequency Test Cable	●	●	●	●	●	●	●	●	●	●	●
A110235	GPIB & Handler Card	●										
A110236	19" Rack Mounting Kit	●	●	●				●				
A110239	4 Terminals SMD Electrical Capacitor Test Box (Patent)		●	●	●	●	●	●		●	●	●
A110242	Battery ESR Test Kit	●	●	●								
A110244	High Capacitance Capacitor Test Fixture		●	●				●				
A110245	Ring Core Test Fixture		●	●								
A110501	4 Terminals SMD Test Fixture	●	●	●	●	●	●	●	●	●	●	●
A118030	PCB for SMD Capacitor		●	●	●	●	●	●		●	●	●
A132501	Auto Transformer Scanning Box (7.5~5mm Test Fixture)								●	●	●	●
A132574	Test Fixture for SMD Power Choke		●	●						●	●	
A133004	SMD Test Box	●	●	●	●	●	●	●	●	●	●	●
A133019	BNC Test Lead, 2M (single side open)	●	●	●	●	●	●	●		●	●	●
A165009	4 BNC Test Cable with Probe	●			●	●	●					

OPTIONS	MODEL	1310	1320	11300	13100	11800	11801	11810	11200	16502
A110235	GPIB & Handler Card								●	●
A110236	19" Rack Mounting Kit								●	●
A113008	4 Terminals Test Fixture for DIP 100A		●	●						
A113009	4 Terminals Test Fixture for SMD 60A		●	●						
A113010	4 Terminals PCB for SMD 100A		●	●						
A113011	4 Terminals Test Cable with Clip	●	●							
A115001	Foot Switch #10	●	●							
A118004	Series Test Fixture					●	●	●		
A118005	Parallel Test Fixture					●	●	●		
A118028	Series Test Fixture for Low Voltage						●	●		
A118029	Series Test Fixture for Low Voltage						●	●		
A118030	PCB for SMD Capacitor						●	●		
A131001	10 Channels Switching Test Fixture				●					
A165013	GPIB and Handler Interface with Temperature Compensation									●
A165014	Temperature Compensation Card									●
A165015	PT100 Temperature Probe									●
A165016	Pin Type Leads (flat)									●
A165017	4 Channels R Scanners									●
A165018	Test Fixture for SMD Power Choke									●
A165019	Pin Type Leads (taper)									●
A165022	4 Terminals Test Cable									●

# Options of Passive Component Test Instruments



**A110104**



**A110211**



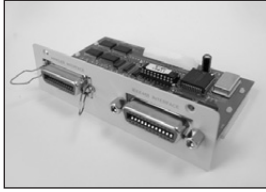
**A110212**



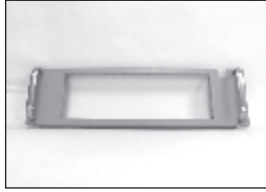
**A110232**



**A110234**



**A110235**



**A110236**



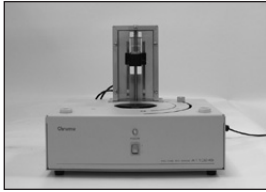
**A110239**



**A110242**



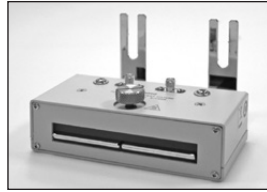
**A110244**



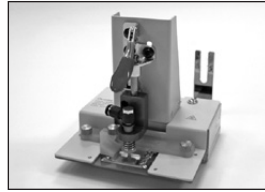
**A110245**



**A110501**



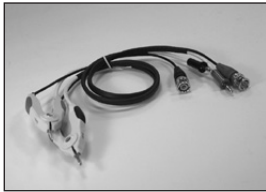
**A113008**



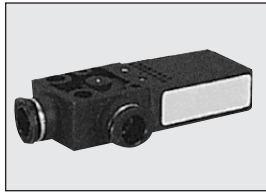
**A113009 (with 113008)**



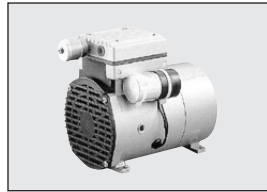
**A113010**



**A113011**



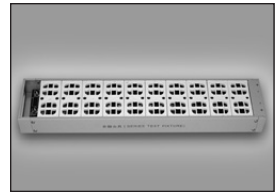
**A113012**



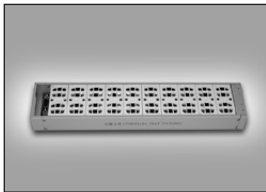
**A113014**



**A115001**



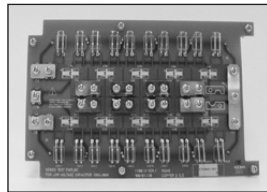
**A118004**



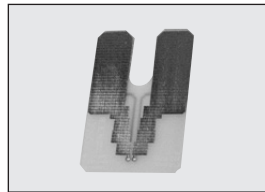
**A118005**



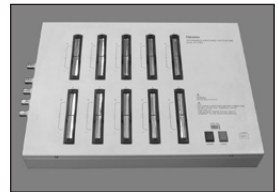
**A118028**



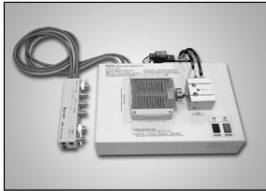
**A118029**



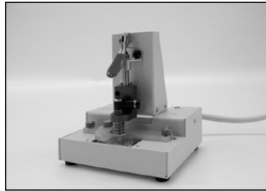
**A118030**



**A131001**



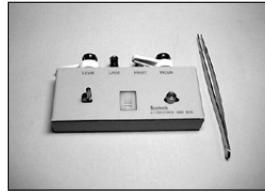
**A132501**



**A132574**



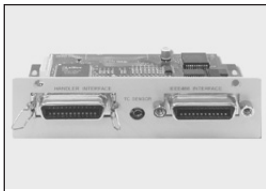
**A133019**



**A133004**



**A165009**



**A165013**



**A165014**



**A165015**



**A165016**



**A165017**



**A165018**



**A165019**



**A165022**

Video & Color  
Flat Panel Display  
Lighting  
LED/  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



# *Electrical Safety Test Solution*

<b>Selection Guides</b>	<b>13-1</b>
<b>Multi-function Electrical Analyzer</b>	<b>13-3</b>
<b>Hipot Tester</b>	<b>13-9</b>
<b>Impulse Winding Tester</b>	<b>13-14</b>
<b>Electrical Safety Test Scanner</b>	<b>13-17</b>
<b>Ground Bond Tester</b>	<b>13-19</b>
<b>Calibrator</b>	<b>13-20</b>
<b>Automatic Test System</b>	<b>13-21</b>
<b>Options of Electrical Safety Test Instruments</b>	<b>13-24</b>

### High Capacitance Electrolytic Capacitor ATS

### Electrical Equipment ATS

### Medical Electrical Safety ATS



### Multi-function Electrical Analyzer

### Hipot Tester

### Electrical Safety Test Scanner



### Calibrator



### Impulse Winding Tester



### Ground Bond Tester

# Selection Guides

## Electrical Safety Tester Selection Guide – Main Function

Model	AC/DC HIPOT			Insulation Resistance		Ground Bond		Leakage Current Test *1	Impulse Winding Test	Others	Page
	AC/DC output	Cutoff current	Flashover Detection	DC output	Range	Current	Range	Power Capacity			
19020 (CE)	5kVac 6kVdc	AC:10mA DC:5mA	AC:20mA DC:10mA	1kV	50GΩ	-	-	-		10/4 channels	13-9
19032 (CE)	5kVac 6kVdc	AC:40mA DC:12mA	AC:20mA DC:10mA	1kV	50GΩ	30A 60A*2	510mΩ*3	300V / 20A max.*2			13-3
19032-P (CE)	5kVac 6kVdc	AC:100mA DC:25mA	AC:20mA DC:10mA	1kV	50GΩ	40A	510mΩ*3	300V / 20A max.*2		500VA Floating Output	13-3
19035 (CE)	5kVac 6kVdc	AC:30mA DC:10mA	AC:15mA DC:10mA	5kV	50GΩ	-	-	-		DCR 8 ports scanner	13-5
19036 (CE)	5kVac 6kVdc	AC:100mA DC:25mA	AC:20mA DC:10mA	5kV	50GΩ	-	-	-	6kV	10 ports scanner	13-7
19052 (CE,TUV, UL)	5kVac 6kVdc	AC:30mA DC:10mA	AC:15mA DC:10mA	1kV	50GΩ	-	-	-			13-10
19053 (CE)	5kVac 6kVdc	AC:30mA DC:10mA	AC:15mA DC:10mA	1kV	10GΩ	-	-	-		8 ports scanner	13-10
19054 (CE,TUV, UL)	5kVac 6kVdc	AC:30mA DC:10mA	AC:15mA DC:10mA	1kV	10GΩ	-	-	-		4 ports scanner	13-10
19055 (CE)	5kVac 6kVdc	AC:100mA DC:25mA	AC:20mA DC:10mA	5kV	50GΩ	-	-	-		500VA Floating Output, corona detection	13-11
19056 (CE)	10kVac	AC:20mA	20mA	-	-	-	-	-			13-12
19057 (CE)	12kVdc	DC:10mA	10mA	5kV	50GΩ	-	-	-			13-12
19057-20 (CE)	20kVdc	DC:5mA	10mA	5kV	50GΩ	-	-	-			13-12
19071 (CE,TUV, UL)	5kVac	AC:20mA	AC:15mA	-	-	-	-	-		AC only	13-13
19073 (CE,TUV, UL)	5kVac 6kVdc	AC:20mA DC:5mA	AC:15mA DC:5mA	1kV	50GΩ	-	-	-			13-13
19301A (CE)									1kV	0.1μH min.	13-14
19305 (CE)									6kV	10μH min.	13-16
19305-10 (CE)									6kV	10 ports scanner	13-16
19572 (CE)	-	-	-	-	-	45A	510mΩ*3				13-19

**Note \*1** : Leakage current Test is required by standards of Electrical Appliances, Medical Equipment, IT products, and Video/Audio Appliances etc. (IEC 60065, 60335, 60601, 60950 etc.)

**Note \*2** : Options

**Note \*3** : It depends on current output

### Electrical Safety Tester Selection Guide - Sub-Function and Remote

Model	Sub-Function										Remote						Page	
	OSC	GFI	PA	GC	Smart Start	Scan	HFCC	HVCC	HSCC	Sub-Step	RS232	RS485 RS422	GPIB	9 pin D-SUB	Handler	USB		LAN
19020	●		●								●		●		●			13-9
19032	●		●		●	●					●		●	●				13-3
19032-P	●	●	●		●	●					●		●		●	●		13-3
19035	●	●	●			●				●		●		●				13-5
19036	●	●	●			●	●		●	●	●			●	●	●		13-7
19052	●	●	●	●	●						●		●	●	●			13-10
19053	●	●	●	●	●	●					●		●	●				13-10
19054	●	●	●	●	●	●					●		●	●				13-10
19055	●	●	●			●	●				●		●	●	●	●		13-11
19056	●	●	●				●	●			●		●	●				13-12
19057			●				●	●			●		●	●				13-12
19057-20			●				●	●			●		●	●				13-12
19071	●	●	●	●	●									●				13-13
19073	●	●	●	●	●						●	●		●				13-13
19301A											●				●	●	●	13-14
19305											●				●	●	●	13-16
19305-10			●			●					●				●	●	●	13-16

### Calibrator Selection Guide

Model	Primary	Function Calibrator Level	Description	Page
9102	Hipot Calibrator	AC 6Kv / DC 10kV / ACI/DCI 200mA / GB 32A, 100mΩ / IR 1000MΩ	For Hipot testing equipment calibration and verification	13-20



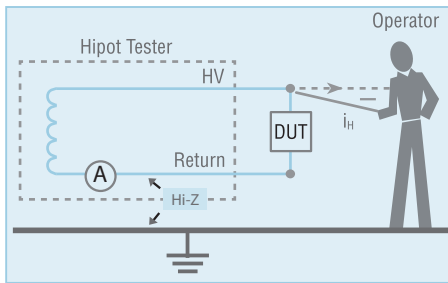


### KEY FEATURES - A190308 / A190350

- Plug in to 19032/19032-P for Hipot, Line Leakage Auto Scan
- Five Different Kinds Human Body RC Network
- Four measurements mode : Normal, Reverse, Single Fault Normal, Single Fault Reverse
- Up to 20A Line Input Current Capability
- Build in A/D and Calibration Data Memory Easy to Install
- Multiple Display Mode Voltage-LC, Amp-LC, VA-LC
- Earth LC, Enclosure LC, Patient LC and Patient Auxiliary LC Test

The 19032/19032-P are 5 in 1 Production Safety Analyzer. It can perform AC/DC Hipot, insulation resistance, grounding resistance and dynamic leakage current 5 safety test functions for electronic products. The dynamic leakage current scan device can be connected externally or built in to 19032 Series. It is capable of measuring the complicate safety requirements with easy installation and operation, and is the finest auto safety tester to increase production test efficiency.

Model 19032/19032-P have Twin-Port™ and OSC function to minimize the test time greatly; along with the super large screen display and intelligent operation mode, 19032 is the most powerful single unit for auto safety tester.



Floating output

### ORDERING INFORMATION

- 19032-P** : Electrical Safety Analyzer 500VA
- 19032** : Electrical Safety Analyzer
- A190301** : 8HV Scanning Box
- A190302** : 5HV/3GC Scanner
- A190303** : 3HV/5GC Scanner
- A190304** : 8HV Scanner
- A190305** : Line Leakage Current Scanner (generally)
- A190306** : Hipot/Line Leakage/Probe Scanner (10A)
- A190308** : Hipot/Line Leakage/Probe Scanner (20A)
- A190313** : 500VA Isolation Transformer
- A190314** : 1000VA Isolation Transformer
- A190316** : Dummy Load
- A190334** : Ground Bond 40A (19032)
- A190336** : 8HV/8GB Scanning Box
- A190337** : Ground Bond 60A (19032)
- A190338** : 19001 EST Software
- A190343** : 19" Rack Mounting Kit (19032)
- A190344** : HV Gun
- A190349** : Universal Corded Product Adapter
- A190350** : HV/LC/LAC/DC Probe Scanner (20A)
- A190353** : 4HV/4GC Scanner
- A190355** : 19" Rack Mounting Kit (19032-P)
- A190356** : GPIB Interface (19032-P)
- A190508** : GPIB Interface (19032)
- A190708** : ARC Verification Fixture



19032

### INTERNAL SCANNER FUNCTION FOR MODEL 19032/19032-P

Option		Hipot		GB			LC					
No.	Name	Ports	Voltage Max.	Ports	Current Max.	Power output	Reading	LC probe	Earth LC	Touch LC	Patient LC	Patient Aux LC
A190301	9030A (Ext.)	8 ports	5KVac 6KVdc	-	-	-	-	-	-	-	-	-
A190336	9030AG	8 ports		8 ports	40A	-	-	-	-	-	-	-
A190302	6000-01	5 ports		3 ports	30A	-	-	-	-	-	-	-
A190303	6000-02	3 ports		5 ports	30A	-	-	-	-	-	-	-
A190304	6000-03	8 ports		-	-	-	-	-	-	-	-	-
A190353	6000-11	4 ports		4 ports	40A *1	-	-	-	-	-	-	-
A190305	6000-04	L+N to E P to S		-	-	300V 10A	RMS	-	●	-	-	-
A190306	6000-05			-	-	300V 10A	RMS	P1&P2	●	●	●	●
A190308	6000-07			-	-	300V 20A	RMS	P1&P2	●	●	●	●
A190350	6000-08			-	-	300V 20A	RMS & Peak	P1&P2	●	●	●	●

**Note\*1** : GB Max Current 40A for Model 19032-P, and 30A for Model 19032

## SPECIFICATIONS

Model	19032	19032-P
<b>Mode</b>	ACWV / DCWV / IR / GB / LC	
<b>Withstanding Voltage Test</b>		
Output Voltage	DC : 0.05 ~ 6kV, AC : 0.05 ~ 5kV	
Load Regulation	≤ (1% +5V)	≤ (2% of setting +0.1% of full scale)
Voltage Regulation	2V	
Voltage Accuracy	± (1% of reading+0.1% of full scale)	± (2% of setting +0.1% of ull scale)
Cutoff Current	DC : 12mA, AC : 40mA	DC : 25mA, AC : 100mA
Current Resolution	0.1 μA DC ; 1 μA AC	
Current Accuracy	± (1% of reading +0.2% of full scale)	± (2% of reading +0.5% of range)
Output Frequency	50Hz ~ 600Hz	
Test Time	0.3 ~ 999 sec , continue	
Ramp Time	0.1 ~ 999 sec, Off	
Fall Time	0.1 ~ 999 sec, Off	
Waveform	Sine wave	
<b>Insulation Resistance Test</b>		
Output Voltage	DC : 0.05 ~ 1kV	
Voltage Resolution	2V	
Voltage Accuracy	± (1% of reading + 0.5% of full scale)	± (2% of reading + 0.5% of full scale)
IR Range	0.1MΩ ~ 50GΩ	
Resistance Resolution	0.1MΩ	
Resistance Accuracy	5% typical	
<b>Ground Bond Test</b>		
Output Current	AC : 1 ~ 30A	AC : 3 ~ 40A
Current Accuracy	± (1% of setting + 1% of full scale)	± (2% of setting + 0.1% of full scale)
GR Range	10mΩ ~ 510mΩ	
Resistance Resolution	0.1mΩ	
Resistance Accuracy	± (1% of reading + 0.1% of full scale)	± (1% of reading + 0.1% of full scale)
Test Method	4 wires	
<b>Flashover Detection</b>		
Setting Mode	Programmable setting	
Detection Current	AC, DC : 1~30mA	AC : 20mA, DC : 10mA
<b>Secure Protection Function</b>		
Ground Fault Interrupt	-	0.5mA ± 0.25mA AC
Floating Output to ground	-	<3mA, front output only (meet EN50191)
Panel Operation Lock	Present password	
Interlock	YES	
<b>GO/NG Judgment Window</b>		
Indication, Alarm	GO : Short sound, Green LED NG : Long sound, Red LED	
Data Hold	Least tests data memories	
Memory Storage	50 setups with up to 100 groups recall	
<b>Interface</b>		
Interface	9pin D-sub I/O control / RS-232 / GPIB (Optional)	
<b>General</b>		
Operation Environment	Temperature : 0°C ~ 40°C, Humidity : 20 % ~ 80 % RH	
Power Consumption	No load : < 100 W With rated load : 800 W	No load : < 100W Rated load : 1000W Maximum load : 1200W
Power Requirements	90~132Vac or 180~264Vac, 47~63Hz	
Dimension (H x W x D)	133 x 430 x 470 mm / 5.24 x 16.93 x 18.66 inch	133 x 430 x 500 mm / 5.22 x 16.93 x 19.69 inch
Weight	25.5 kg / 56.17 lbs	24 kg / 52.86 lbs
Cetification	CE	

Model	A190305~A190350 * (6000-04~08)
<b>Support Mode</b>	ACWV / DCWV / IR / LC
DUT Input Power Capacity	AC : 300V / 10A / 20A max.
Short Protection	20A, 250V fuse for DUT shorted.
<b>Measurement Mode</b>	
Input Characteristic	DC ~ 1MHz Input Impedance : 1M//20pF
Measurement Mode	Normal, Reverse, Single Fault Normal, Single Fault Reverse
Measurement Devices (Five measure device)	UL 544 NP, UL 544 P, UL 1563, UL 60601-1, IEC60601-1, UL 3101-1, UL/IEC 60950, UL 1950-U1*, UL 2601-U1*, IEC60990
Probe Connection	Line to Ground, Line to P2, P1 to P2
<b>HI-LO Limit</b>	
LC HI-LO Limit	0 ~ 9.99mA, 1 μ A resolution
Current HI-LO Limit	0 ~ 19.99Amp*
VA HI-LO Limit	0 ~ 4400VA
VA Resolution	0.1VA

\*Different options have different specification

Model	A190350 (6000-08)
Special Functions	LC DC Measurement U1, U2 (UL-1950) Hot Swap

Video & Flat Panel Display  
Lighting LED/  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semi-conductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



**Model 19035**  
**19035-M**  
**19035-S**

**FUNCTIONS**

- 5KVAC & 6KV DC Hipot Test
- 0.1MΩ ~50GΩ /5kV IR Test
- 50mΩ ~100kΩ DCR Test
- 8 Channel Scanner

**KEY FEATURES**

- SUB-STEP Function
- Open / Short Check (OSC)
- High Speed Contact Check (HSCC)
- Flashover Detection
- Key Lock Function
- RS-232 Interface (standard\*1)
- GPIB & HANDLER (optional)
- Friendly Interface
- CE Mark



**Wound Component Testing Solution**

The quality verification test items for Wound Component consist of AC/DC Hipot tests, Insulation Resistance (IR) test and Impulse Winding test. Chroma integrates above tests into 19035 Wound Component EST Scanner series performing safety tests for motor, transformer, heater related wound products. The wound component manufacturers in quality verification testing not only have reliable quality but also control product quality efficiently.

The 19035 Series support 5kVac/6kVdc high voltage output to conform with withstand test requirement for Wound Component, its maximum output current can up to 30mA. Insulation Resistance (IR) test measurement range is 1MΩ to 50GΩ and voltage output can up to 5kV. DCR can measure basic specification for Wound Component and also check the connection before testing safety withstand.

The 19035 Series also include powerful functions in Flashover detection and Open/ Short Check (OSC) as well as programmable voltage, time parameters, etc. for various DUTs features to promote testing reliability and product quality.

**Applications**

The 19035 is a comprehensive safety tester designed for motor, transformer, heater related wound component requirements. Most of wound components are equipped with multiple winding such as 3-phase motor, dual winding transformer, and etc.. The 19035 can be used to reach multiple points completion in one test by 8-channels scanning instead of switching test point manually. It saves test time and human cost.

The 19035 provides OSC and DCR functions to verify if bad contact or short circuit happened during test procedure. It solves the Wound Components of motor, transformer, etc occurred contact problems, so that test quality greatly enhanced and the life of test device prolonged.

**ORDERING INFORMATION**

- 19035** : Wound Component EST Scanner
- 19035-M** : Wound Component EST Scanner
- 19035-S** : Wound Component EST Scanner
- A165015** : PT100 temperature probe
- A190347** : GPIB & Handler & temperature interface
- A190348** : RS-232 interface
- A190351** : 8ch-16ch HV box for 19035
- A190358** : Handler indicator
- A190359** : 16ch HV external scanning box (H,L,X)
- A190702** : 40KV HV test probe



**A190351** : 8CH-16CH Scan Box



**A190359** : 16ch HV External Scanning Box (H,L,X)

SPECIFICATIONS			
Model	19035		19035-M
Mode	ACWV / DCWV / IR / DCR - 8CH		ACWV / DCWV / IR / DCR - 8CH
Channel Programming	H/L/X in 8CHs		H/X in CH 1,2,3,5,6,7 ; L/X in CH 4,8
<b>Withstanding Voltage Test</b>			
Output Voltage	AC:0.05 ~ 5KV, DC : 0.05 ~ 6kV		AC:0.05 ~ 5KV
Load Regulation	≤ (1% of setting + 0.1% of full scale)		
Voltage Resolution	2V		
Voltage Accuracy	± (1% of setting + 0.1% of full scale)		
Cutoff Current	AC : 30mA, DC : 10mA		
Current Resolution	AC : 1 μA, DC : 0.1 μA		
Current Accuracy	± (1% of reading + 0.5% of range)		
Output Frequency	50Hz / 60Hz		
Test / Ramp / Fall / Dwell Time	0.3 ~ 999 sec., continue / 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., off		
Waveform	Sine wave		
<b>Insulation Resistance Test</b>			
Output Voltage	DC : 0.05 ~ 5kV		--
Voltage Resolution	2V		--
Voltage Accuracy	1% of setting + 0.1% of full range		--
IR Range	0.1MΩ ~ 50GΩ		--
Resistance Resolution	0.1MΩ		--
Resistance Accuracy	≥ 1000V	1MΩ ~ 1GΩ : ± (3% of reading + 0.1% of full range) 1GΩ ~ 10GΩ : ± (7% of reading + 2% of full range) 10GΩ ~ 50GΩ : ± (10% of reading + 1% of full range)	--
	500V~1000V	0.1MΩ ~ 1GΩ : ± (3% of reading + 0.1% of full range) 1GΩ ~ 10GΩ : ± (7% of reading + 2% of full range) 10GΩ ~ 50GΩ : ± (10% of reading + 1% of full range)	--
	< 500V	0.1MΩ ~ 1GΩ : ± 3% of reading + (0.2*500/Vs)% of full scale	--
Scanner Unit	8 ports, ± phase (4W DCR only 4 ports)		
<b>DC Resistance Measurement</b>			
Test Signal	<DC 10V. < DC 140mA		
Measurement mode	2 terminals (2W) / 4 terminals(4W) measurement selectable ; Range : 50mΩ~500kΩ		
Measurement Accuracy (2W/ 4W)	1 Ω (4W only)	-- / ± (0.5% of reading + 0.5% of range)	
	10 Ω	± (2% of reading + 0.5% of range) / ± (0.5% of reading + 0.05% of range)	
	100 Ω	± (2% of reading + 0.5% of range) / ± (0.5% of reading + 0.05% of range)	
	1k Ω	± (2% of reading + 0.5% of range) / ± (0.5% of reading + 0.05% of range)	
	10k Ω	± (2% of reading + 0.5% of range) / ± (0.5% of reading + 0.05% of range)	
	100k Ω	± (2% of reading + 0.5% of range) / ± (0.5% of reading + 0.05% of range)	
<b>Flashover Detection</b>			
Setting Mode	Programmable setting		
Detection Current	AC : 1mA ~ 15mA, DC : 1mA ~ 10mA		
<b>Secure Protection Function</b>			
Fast Output Cut-off	0.4ms after NG happen		
Ground Fault Interrupt	0.5mA ± 0.25mA AC, ON/OFF		
Panel Operation Lock	Present password		
Interlock	YES		
<b>GO/NG Judgment Window</b>			
Indication, Alarm	GO : Short sound, Green LED; NG : Long sound, Red LED		
Data Hold	Least tests data memories		
Memory Storage	50 instrument setups with up to 20 test steps		
Interface	RS-232*1 (Standard), RS-232*1 or GPIB & Handler & Temperature interface (Optional)		
<b>General</b>			
Operation Environment	Temperature: 0°C ~ 45°C, Humidity: 15% to 95% R.H@ ≤ 40°C		
Power Consumption	500VA		
Power Requirements	90~132Vac or 180~264Vac, 47~63Hz		
Dimension (H x W x D)	133x430x470mm/5.24x16.93x18.50 inch		
Weight	Approx.20 kg/44.09 lbs		

Video & Color  
Flat Panel Display  
LED/ Lighting  
Optical Devices  
Photovoltaic test & Automation  
Optical Inspection  
Automated  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semicconductor/ IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation





## KEY FEATURES

- 5 in 1 composite analyzer scanner (ACW / DCW/ IR / IWT / DCR)
- 5kV AC/6kV DC Hi-pot test
- 5kV Insulation Resistance test
- Impulse Winding Tester (IWT)
- IWT high sampling rate(200MHz)
- 10 channels 4-wire DCR test
- $\Delta$  / Y motor DCR calculation
- L/Q test with Chroma 3252/3302 (option)
- HSCC (High Speed Contact Check)
- Support max. 40 channels scanning test
- Automatic data export
- English, Traditional Chinese and Simplified Chinese User Interface
- USB waveform storage& Hand copy function
- Graphic color display
- Standard LAN,USB,RS232, HANDLER interface
- GFI (Ground Fault Interrupter) for bod protection

Chroma 19036 is the industry's first test device that combines the functions of impulse tester and hipot analyzer for testing the impulse of wound components. The tester has 5kVac/6kVdc high voltage output and 6kV impulse voltage that can comply with the wound components test demands by providing maximum 10 channels output for multichannel scanning tests to save time and labor costs.

The quality verifications of wound components include AC/DC hipot test, IR test and impulse winding test. Chroma integrates the above tests into 19036 Wound Component EST Analyzer that can perform safety tests on wound products like motors, transformers and heaters to verify their quality with efficiency.

Since the poor insulation of coil often causes layer short, cross-line short and pin short, layer short circuit test is required for coils as the reason could be initial design error, poor fabrication process or bad insulation material. Moreover, the wound components for safety tester need to be tested with Impulse Winding Tester (IWT) to check the insulation ability of windings. It can measure multiple test points in one test instead of switching test points manually.

Combining with impulse winding test function the 19036 has 6kV impulse voltage, AREA SIZE COMPARISON, DIFFERENTIAL AREA COMPARISON, FLUTTER DETECTION, LAPLACIAN DETECTION, and  $\Delta$  Peak ratio judgment that are effective methods for detecting poor coil insulation.

19036 is equipped with a patented 4-wire test port that has both Drive and Sense in compliance with hipot specification to provide 10 channels of 4-wire



test functions. Up to 40ch of scanning test can be conducted when 19036 is configured with 16ch scan box.

19036 also has HSCC functions to check for any bad contact prior test. It can solve the test fail problems caused by motor or transformer bad contact and improve the test quality as well as prolong the test equipment life °

The motor test standard such as UL 1004-1 requires high power safety tester. For the user that needs to test large leakage current or perform large equipment electrical safety tests, Chroma 19036 that has the capability of outputting and measuring AC 100mA/ DC 20mA with high power hipot tests and other safety tests integrated into one is the most suitable device to bring the maximum benefit to production line and quality assurance. The 500VA design is also compliant with IEC/UL for output power requirements.

## Product Applications

### Rotating Motor Component: $\Delta$ /Y-type Motor, Fan, Rotor/Stator

The application of motors from EV motor, server motor to actuator motor and fan, impulse test, hipot tests and DC resistance tests need to be performed in the fabrication process to ensure the product quality. The JB/T 7080 GB mechanical industry standards and regulations are followed for tests.

The DCR measurement on the 19036 can perform four-wire test and each single endpoint can cover Drive and Sense for 10 independent channels to test 3 DUTs in one scan. It improves the production capacity. Each channel can be set to high voltage output / reference port / close separately.

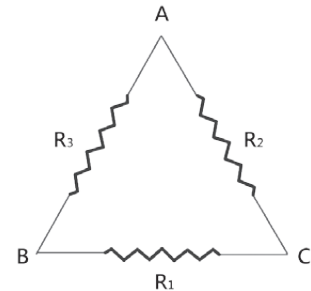
### Test Items for Y-type Motor

- HSCC / OSC
- DCR Test
- Impulse Test
- Hi-pot -Sub step test



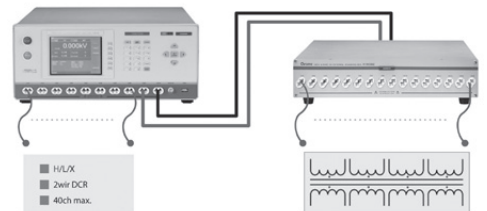
### Winding of $\Delta$ -type and Y-type Motor

To solve the problem of unable doing DCR measurement on the  $\Delta$ -type and Y-type motor winding (no center-tapped), Chroma 19036 adds  $\Delta$ -type and Y-type motor winding DCR calculation function to get the value of R1,R2 and R3 directly.



### 40 Channels Scanning Test

A190359 scanner has 16 test channels and each of them can set to H (high voltage output), L (reference point) or Off . The combination of 19036 and A190359 can apply to in small amount but diversified DUTs or with multiple PINs as well as cell type production line to complete all test within one station.



## ORDERING INFORMATION

- 19036** : Wound Component EST Analyzer
- A165015** : PT100 temperature probe
- A190359** : 16ch HV External Scanning Box
- A190361** : Wound Component EST Software
- A190362** : 16ch 4-wire HV External Scanning Box
- A190363** : 4-wire test cable with clip
- A190364** : 4-wire test cable with bare wire (1.5m)
- A190365** : 4-wire test cable with bare wire (3m)

SPECIFICATIONS		
<b>Model</b>		<b>19036</b>
<b>AC/DC Withstanding Test</b>		
<b>Output Voltage</b>		AC: 0.05~5.0kV / DC : 0.05~6.0kV
<b>Load Regulation</b>		≦ (1% of output + 0.1% of full scale)
<b>Voltage Accuracy</b>		± ( 1% of setting + 0.1% of full scale)
<b>Voltage Resolution</b>		2V
<b>Cutoff Current</b>		AC: 0.001mA~120mA (Voltage ≦4kV) AC: 0.001mA~100mA (Voltage >4kV) DC: 0.0001mA~20mA
<b>Current Accuracy</b>		± (1% of reading + 0.5% of range)
<b>Test Timer</b>		Test time:0.3 ~ 999 sec., and continue Ramp / Fall / Dwell time:0.1 ~ 999 sec., and off
<b>Output Frequency</b>		50Hz / 60Hz
<b>Waveform</b>		Sine wave
<b>Insulation Resistance Test</b>		
<b>Output Voltage</b>		DC : 0.050 ~ 5.000kV, Steps:0.002kV
<b>Load Regulation</b>		≦ (1% of output + 0.1% of full scale)
<b>Voltage Accuracy</b>		± ( 1% of setting + 0.1% of full scale)
<b>IR Range</b>		0.1MΩ ~ 50GΩ
<b>Resistance Accuracy</b>	>1kV	1MΩ ~ 1GΩ : ± (3% of reading + 0.1% of full range)
		1GΩ ~ 10GΩ : ± (7% of reading + 2% of full range )
		10GΩ ~ 50GΩ : ± (10% of reading + 1% of full range)
	≧0.5kV and ≦1kV	0.1MΩ ~ 1GΩ : ± (3% of reading + 0.1% of full range)
		1GΩ ~ 10GΩ : ± (7% of reading + 2% of full range )
	<0.5kV	10GΩ ~ 50GΩ : ± (10% of reading + 1% of full range)
		1MΩ ~ 1GΩ : ± (5% of reading + (0.2*500/Vs)% of full scale)
<b>Impulse Winding Test</b>		
<b>Applied Voltage, Step, and Energy</b>		0.1 ~ 6kV ,10V Step ,Max 0.21 Joules
<b>Inductance Test Range</b>		More than 10uH
<b>Sampling Speed</b>		10bit / 5ns (200MHz)
<b>Sampling Range</b>		11 Range
<b>Pulse Number</b>		Pulse Number: 1~32, Dummy Pulse Number: 0~9
<b>Detection Mode</b>		Area / Differential Area : Flutter/ Laplacian Detection/ Δ Peak ratio
<b>DC Resistance Measurement</b>		
<b>Test Signal</b>		<DC 10V , <DC 200mA
<b>Measurement Range</b>		0.1mΩ ~ 500kΩ
<b>Measurement Accuracy</b>	100mΩ	± (0.5% of reading + 1% of full range)
	1Ω	± (0.5% of reading + 0.2% of full range)
	10Ω	± (0.5% of reading + 0.05% of full range)
	100Ω	± (0.5% of reading + 0.05 % of full range)
	1kΩ	± (0.5% of reading + 0.05 % of full range)
	10kΩ	± (0.5% of reading + 0.05 % of full range)
	100kΩ	± (0.5% of reading + 0.05 % of full range)
<b>Flashover Detection</b>		
<b>Detection Current</b>		Programmable setting AC : 20mA ; DC : 10mA
<b>Contact Check Function</b>		
<b>Contact Check</b>		OSC (open/short check) HFCC (High Frequency Contact Check) HSCC (High Speed Contact Check)
<b>Electrical Hazard Protection Function</b>		
<b>Ground Fault Interrupt</b>		0.5mA ± 0.25mA AC, ON/OFF
<b>Key Lock</b>		Yes (password control)
<b>Interlock</b>		YES
<b>Indication, Alarm</b>		GO : Short sound, Green LED; NG : Long sound, Red LED
<b>Memory Storage</b>		200 sets, max. 60 steps per set
<b>Interface</b>		
<b>Standard : RS232, Handler ,USB , LAN interface</b>		
<b>General</b>		
<b>Operation Environment</b>		Temperature: 0°C ~ 45°C, Humidity: 15% to 95% R.H@ ≦ 40°C
<b>Power Consumption</b>		No Load: <150W ; Rated Load: <1000W
<b>Power Requirements</b>		90 ~ 264Vac, 47 ~ 63Hz
<b>Dimension (W × H × D)</b>		428 × 177 × 500mm / 16.850 x 6.969 x 19.685 inch
<b>Weight</b>		26kg / 57.32 lbs

Video & Color  
Flat Panel Display  
LED/ Lighting  
Optical Devices  
Photovoltaic test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/ IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



## KEY FEATURES

- 10/4 channels in one design
- 10 sets of sync output and measurement
- AC/DC/IR 3 in 1 EST test
- Master/Slave link - 10 units max.
- Programmable V-output and limits
- OSC (Open/Short Check)
- Flashover detection
- 1MΩ ~ 50GΩ insulation resistance test
- Standard RS-232 / Handler interface
- Optional GPIB interface
- Large LCD panel
- Panel lockup function
- Easy operating interface
- CE Mark
- High Efficiency Hipot Test Solution

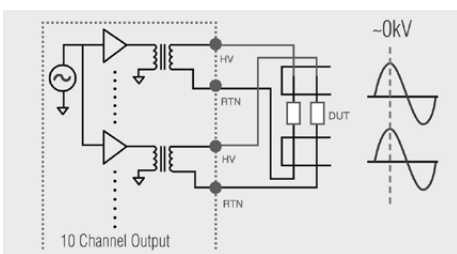
## High Efficiency Hipot Test Solution

Hipot test is one of the major test items in electrical safety test. All electrical components and products including transformers, capacitors, power supplies, chargers and home appliances all require hipot test.

With more than 20 years experience in developing the instruments for test and measurement, Chroma creates the 19020 multi-channel hipot tester with a brand new architecture. It can measure the hipot leakage current of all channels at the same time and conduct tests on 100 DUTs at most simultaneously.

There is no need to purchase various Hipot testers to save the production line space if Chroma 19020 is in use. Its one time multi-channel test can increase the efficiency of electrical regulatory test. It improves the productivity and reduces the risk of test for the products that require hipot test only.

Chroma 19020 also has powerful functions in Flashover detection and Open/Short Check. It contains several international patents and is the best tool for electrical regulatory hipot test as not only reliable quality can be obtained, highly efficient test platform can be created.



19020-synchronized output



## World's First Sync Hipot Test (Patent Registered)

Chroma 19020 has equipped with the world's first sync hipot test function that one single unit can perform 10 channels sync output and measurements simultaneously. Maximum 10 units (master & slave) can be controlled to have 100 channels in total. They can be grouped for output to avoid creating voltage difference due to adjacent tests as well as to improve the productivity.

## ORDERING INFORMATION

- 19020** : Multi-channel Hipot Tester
- 19020-4** : Multi-channel Hipot Tester (4CH)
- 19021** : Multi-channel Hipot Tester (AC)
- 19021-4** : Multi-channel Hipot Tester (AC/4CH)
- 19022** : Multi-channel Hipot Tester (DC/IR)
- 19022-4** : Multi-channel Hipot Tester (DC/IR/4CH)
- 19023-8-20** : Multi-channel Hipot Tester (8kVAC/4CH)
- A190200** : 19" Rack Mounting Kit for 19020 Series
- A190201** : 3-way Scanner Box (10CH)
- A190202** : 3-way Scanner Box (4CH)
- A190203** : 19020 Series Hipot Tester software
- A190508** : GPIB Interface

\* HV cable is option for customize requirement

## SPECIFICATIONS

Model	19020	19021	19022	19023-8-20
Mode	ACWV/DCWV/IR/ Multi-channel	ACWV/ Multi-channel	DCWV/IR/ Multi-channel	ACWV/ Multi-channel
<b>Withstanding Voltage Test</b>				
Output Voltage	AC : 0.05 ~ 5kV, DC : 0.05 ~ 6kV	AC : 0.05 ~ 6kV	DC : 0.05 ~ 8kV	AC : 0.05 ~ 8kV
Load Regulation	≅ (1% of setting + 0.1% of full scale)			
Voltage Resolution	2V			
Voltage Accuracy	± (1% of setting + 0.1% of full scale)			
Cutoff Current	AC : 0.01~10mA, DC : 0.001~5mA	AC : 0.01 ~ 8mA	DC : 0.001 ~ 3.5mA	AC : 0.01 ~ 20mA
Current Resolution	AC : 1 μA, DC : 0.1 μA			
Current Accuracy	± (1% of setting + 0.5% of full scale)			
Output Frequency	50Hz / 60Hz			
Flashover Detection	AC : 1mA ~ 20mA ; DC : 1mA ~ 10mA , step 0.1mA			
Test Time	0.03 ~ 999.9 sec, continue			
Ramp Time	0.1 ~ 999.9 sec, off			
Fall Time	0.1 ~ 999.9 sec, off			
Dwell Time	0.1 ~ 999.9 sec, off			
Waveform	Sine wave			
<b>Insulation Resistance Test</b>				
Output Voltage	DC : 0.05 ~ 1kV	-	DC : 0.05 ~ 1kV	-
Voltage Resolution	2V			
Voltage Accuracy	± (2% of setting + 0.5% of full range)			
IR Range	1MΩ ~ 50GΩ			
Resistance Accuracy	≥ 500V	1MΩ ~ 1GΩ : ± 3% of reading + 0.1% of full range 1GΩ ~ 10GΩ : ± 7% of reading + 0.2% of full range 10GΩ ~ 50GΩ : ± 10% of reading + 1% of full range		
	< 500V	1MΩ ~ 1GΩ : ± 3% of reading + (0.2*500/Vs)% of full scale		
Test Time	0.3 ~ 999.9 sec, continue			
<b>Memory Storage</b>				
Save/Recall	30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memory			
<b>Secure Protection Function</b>				
Fast Output Cut-off	0.4ms after NG happen			
Panel Operation Lock	Present password			
Interlock	YES			
<b>GO/NG Judgment Window</b>				
Indication, Alarm	GO : Short sound, Green LED NG : Long sound, Red LED			
Data Hold	Least tests data memories			
Memory Storage	30 instrument setups with up to 10 test steps			
<b>Interface</b>				
RS-232, Handler & GPIB				
CANBus & data control interface are used for Max. 10 units of master & slaves connection				
<b>General</b>				
Operation Environment	Temperature : 0°C ~ 45°C Humidity : 15%~95% RH @ ≯40°C and no condensation			
Power Consumption	Standby : < 250W ; With rated load : < 1000W			
Power Requirements	90~264Vac ; 47~63Hz			
Dimension (HxWxD)	174 x 428 x 600 mm / 6.85 x 16.85 x 23.62 inch			
Weight	Approx.40 kg/88.18lbs			



### KEY FEATURES

- 3 in 1 Tester : AC, DC, IR
- Programmable output voltage to 5kV AC and 6kV DC
- Trip current programmable to 30mA AC and 10mA DC
- Insulation resistance to 50GΩ/1000V DC
- Built-in 8 channel SCANNER (19053 only)
- Built-in 4 channel SCANNER (19054 only)
- Open/Short Check (OSC)
- Ground Fault Interrupt (GFI)
- ARC detection (Flashover)
- Storage of 50 Tests Setups with 100 Steps per setup

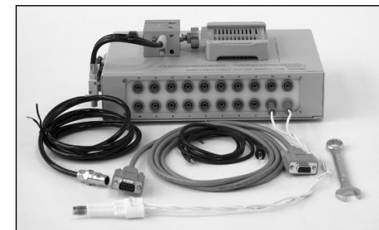


- Optional transformer test fixture (19053 only)
- Standard RS-232 Interface
- Optional GPIB Interface

The Chroma Hipot Tester 19052/19053/19054 provides 3 models to choose. The 19052 includes AC/DC/IR Hipot testing and insulation resistance (IR) measurements, the 19053 which combines both AC and DC Hipot tests and IR measurements with 8HV scan channel capability into a single compact unit, and the 19054 which combines both AC and DC Hipot tests and IR measurements with 4HV scan channel capability into a single compact unit. The front panels of the testers make them easy to operate. Digital display and user friendly control allows test parameters and limits to be set easily without the high voltage activating.

### ORDERING INFORMATION

- 19052** : Hipot Tester (AC/DC/IR)
- 19053** : Hipot Tester (AC/DC/IR/8CH SCAN)
- 19054** : Hipot Tester (AC/DC/IR/4CH SCAN)
- A190344** : HV Gun
- A190512** : Auto Control TR. Scan Box (3002B)
- A190508** : GPIB Interface
- A190517** : 19" Rack Mounting Kit for Model 19052/19053/19054
- A190518** : Hipot Tester software
- A190702** : 40kV HV Test Probe
- A190704** : Start Switch
- A190708** : ARC Verification Fixture



**A190512** : Auto Control TR. Scan Box (3002B)

SPECIFICATIONS			19052	19053	19054
<b>Model</b>			19052	19053	19054
<b>Mode</b>			ACWV / DCWV / IR	ACWV / DCWV / IR / SCAN	ACWV / DCWV / IR / SCAN
<b>Withstanding Voltage Test</b>					
Output Voltage			AC : 0.05 ~ 5kV, DC : 0.05 ~ 6kV		
Load Regulation			≤ (1% + 5V)		
Voltage Resolution			2V		
Voltage Accuracy			±(1% of reading + 5 counts)		
Cutoff Current			AC : 30mA, DC : 10mA		
Current Resolution			AC : 1μA, DC : 0.1μA		
Current Accuracy			±(1% of reading + 5 counts)		
Current Frequency			50Hz/ 60Hz		
Test Time			0.3 ~ 999 sec, continue		
Ramp up Time			0.1 ~ 999sec, off		
Waveform			Sine wave		
<b>Insulation Resistance Test</b>					
Output Voltage			DC : 0.05 ~ 1kV	DC : 0.05 ~ 1kV	
Voltage Resolution			2V	2V	
Voltage Accuracy			±(1% of reading + 5 counts)		
IR Range			1MΩ~ 50 GΩ	1MΩ~ 10 GΩ	
Resistance Resolution			0.1MΩ	0.1MΩ	
Resistance Accuracy	≥ 500V	1MΩ~2.5GΩ	±(5% of reading + 2% of full scale)		
		2.2GΩ~50GΩ	±(15% of reading + 1% of full scale)		
	< 500V	0.1MΩ~250MΩ	±(10% of reading + 2% of full scale)		
		0.22GΩ~50GΩ	±(15% of reading + 1% of full scale)		
Scanner Unit			--	8 ports, ±phase	4 ports, ±phase
<b>ARC Detection (Flashover)</b>					
Setting Mode			Programmable setting		
Detection Current			AC : 1mA ~ 15mA, DC : 1mA ~ 10mA		
<b>Secure Protection Function</b>					
Fast Output Cut-Off			0.4 ms after NG happen		
Fast DC discharge			0.2 sec		
Ground Fault Interrupt (GFI)			0.5mA ± 0.25mA AC, Close		
Panel Operation Lock			Present password		
Continuity Check			1Ω ± 0.2Ω, Off		
GO/NG Judgment Window					
Indication, Alarm			GO: Short sound, Green LED; NG: Long sound, RED LED		
Data Hold			Least tests data memories		
Memory Storage			99 steps or 99 groups for total 500 memory locations		
<b>Remote Connector</b>					
Real Panel connector			Input : Start, Stop, Interlock (at 11 pin terminal block only) ; Output : Under test, Pass, Fail		
<b>General</b>					
Operation Environment			Temperature: 0°C ~ 40°C, Humidity: ≤ 80 % RH		
Power Consumption			No load: <100 W, With rated load: ≤ 500 W max.		
Power Requirement			100V / 120V / 220V(AC ± 10%) / 240V(AC + 5% ~ -10%), 50 / 60 Hz		
Dimension (H x W x D)			105 x 320 x 400 mm / 4.13 x 12.6 x 15.75 inch		
Weight			15 kg / 33.4 lbs	15.4 kg / 33.92 lbs	16.5 kg / 36.34 lbs
Certification			UL, TUV, CE	CE	UL, TUV, CE





## FUNCTIONS

- Hipot
  - AC 5kV/100mA
  - DC 6kV/25mA
- Insulation
  - 5kVmax
  - 1MΩ~50GΩ

## KEY FEATURES

- 500VA output rating
- Floating output complies with EN50191
- Corona Discharge Detection (CDD, 19055-C)
- Flashover Detection
- Discharge Level Analysis (DLA)
- Open Short Check (OSC)
- High Frequency Contact Check (HFCC)
- Ground Fault Interrupt
- Standard RS-232 & HANDLER interface
- Option GPIB interface
- Key lock when fail
- Programmable voltage & test limit
- Support A190301 8HV Scanning Box

## APPLICATIONS

**Motor** : The 19055 Series Hipot Analyzers with 500VA output rating can be used to test and analyze the withstand voltage of high power and leakage current for the products like motor stators and rotors with high parasitic capacitance. Corona detection can be used for turn-to-turn or turn-to-ground test to avoid winding insulation failure from corona discharge.

**Transformer** : When using a power transformer under the normal voltage, a primary side corona discharge could cause the adjacent components to be damaged if occurred. Thus, the function of Corona Discharge Detection (CDD) of 19055-C can be used to detect if there is any corona discharge occurred to improve the product quality.

**High Voltage Capacitor, Photocoupler & Insulation Material** : If any gaps, voids or impurities appeared when doing molding in the manufacturing process, the insulation capability may be affected. The Corona Discharge Detection (CDD) equipped by 19055-C is able to detect if there is any corona discharge occurred to enhance the product quality.

Chroma 19055 Series Hipot Analyzers are designed for hipot tests and analysis. The tests of AC/DC/IR can be programmed in 5kV/100mA with 500VA output rating which complies with the EN50191 requirements. (Please refer to the application notes for more detail information.)

The 19055-C has not only the AC/DC/IR tests but also a new measurement technology - Corona Discharge Detection (CDD) that can detect the following via the Discharge Level Analysis (DLA).

- Corona discharge Start Voltage (CSV)
- Flashover Start Voltage (FSV)
- BreakDown Voltage (BDV)



As to the Contact Check during Hipot test, Chroma 19055 Series is equipped with a new function of High Frequency Contact Check (HFCC) besides the Open Short Check (OSC). By conducting the Contact Check during Hipot test, it can increase the test reliability and efficiency significantly.

For convenience use, Chroma 19055 has large LCD screen for operation and judgment. In addition, the GFI human protection circuit and Floating safety output prevent the operators from electrical hazard.



Chroma Discharge in motor

## ORDERING INFORMATION

- 19055** : Hipot Analyzer (AC/DC/IR)
- 19055-C** : Hipot Analyzer (AC/DC/IR with Corona discharge detection)
- A190301** : 8HV Scanning Box
- A190355** : 19" Rack Mounting Kit
- A190356** : GPIB Interface
- A190708** : ARC (Flashover) Verification Fixture

## SPECIFICATIONS

Model		19055/19055-C	
Mode		ACWV / DCWV / IR	
<b>Withstanding Voltage Test</b>			
Output Voltage		AC : 0.05 ~ 5KV, DC : 0.05 ~ 6KV	
Load Regulation		≤ (1% of setting + 0.1% full range)	
Voltage Accuracy		± (1% of setting + 0.1% full range)	
Voltage Resolution		2V	
Cutoff Current		AC : 100mA ; DC : 25mA	
Current Accuracy		± (1% of reading + 0.5% of range)	
Current Resolution		AC : 1μA, DC : 0.1μA	
Output Frequency		50Hz ~ 600Hz	
Test/Ramp/Fall/Dwell Time		0.3 ~ 999 sec., continue / 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., off	
Waveform		Sine wave	
<b>Insulation Resistance Test</b>			
Output Voltage		DC : 0.05 ~ 5kV	
Voltage Resolution		2V	
Voltage Accuracy		± (1% of reading + 0.1% of full scale)	
IR Range		0.1MΩ ~ 50GΩ	
Resistance Resolution		0.1MΩ	
Resistance Accuracy	>1kV	1MΩ ~ 1GΩ	± (3% of reading + 0.1% of full scale)
		1GΩ ~ 10GΩ	± (7% of reading + 2% of full scale)
		10GΩ ~ 50GΩ	± (10% of reading + 1% of full scale)
	~1kV	1MΩ ~ 1GΩ	± (3% of reading + 0.1% of full scale)
		1GΩ ~ 10GΩ	± (7% of reading + 2% of full scale)
		10GΩ ~ 50GΩ	± (10% of reading + 1% of full scale)
	<500V	0.1MΩ ~ 1GΩ	± (3% of reading + (0.2 x 500V/s)% of full scale)
<b>Flashover Detection</b>			
Setting Mode		Programmable setting	
Detection Current		AC: 20mA; DC: 10mA	
<b>Contact Check Function</b>			
HFCC		High frequency contact check	
OSC (open/short check)		600Hz, 0.1s	
<b>Electrical Hazard Protection Function</b>			
Floating output design		Leakage current <3 mA	
Fast Output Cut-off		0.4ms after NG happen	
Ground Fault Interrupt		0.5mA ± 0.25mA AC, ON/OFF	
Panel Operation Lock		Present password	
Interlock		YES	
<b>GO/NG Judgment Window</b>			
Indication, Alarm		GO : Short sound, Green LED ; NG : Long sound, Red LED	
Memory Storage		100 sets, max. 50 steps per set	
<b>Interface</b>			
Interface		RS-232, Handler interface (Standard), GPIB interface (Optional)	
<b>General</b>			
Operation Environment		Temperature: 0°C ~ 45°C, Humidity: 15% to 95% R.H@ ≤ 40°C	
Power Consumption		500VA	
Power Requirements		90~132Vac or 180~264Vac, 47~63Hz	
Dimension (H x W x D)		130 x 430 x 500 mm / 5.12 x 16.93 x 19.69 inch	
Weight		Approx. 20kg / 44.09 lbs	



Chroma 19056/19057 Hipot Analyzer is an equipment specially designed for testing and analyzing ultra-high withstand voltage. The series of models include 10kVac/12kVdc/20kVdc with maximum AC20mA/DC10mA output can perform AC/DC withstand voltage and insulation resistance tests with contact check during production line test. In addition to the patented OSC (Open Short Check), High Voltage Contact Check is added to test the components with high insulation capability when high voltage outputs to improve the testing reliability and efficiency.

The Hipot Analyzer provides high withstand voltage analysis for optical couplers, HV relays, HV switches and PV modules, which have better insulation capability.

Charge and discharge are required for capacitive components when doing DC withstand voltage test. The Hipot Analyzers have fast charge function that can increase the production test efficiency.

## KEY FEATURES

- 10kV AC & 20kV DC withstand voltage test
- 0.1M $\Omega$ ~50G $\Omega$  insulation impedance test
- BDV (BreakDown Voltage test)
- HVCC (High Voltage Contact Check)
- OSC (Open Short Check)
- GFI (Ground Fault Interrupt) human protection circuit
- Fast charge/discharge function
- Programmable output & test limit
- Standard RS232 & HANDLER interface
- Optional GPIB interface
- Key lock function

## ORDERING INFORMATION

- 19056** : Hipot Analyzer AC10kV
- 19057** : Hipot Analyzer DC12kV/IR
- 19057-20** : Hipot Analyzer DC20kV/IR
- A190316** : Dummy Load
- A190355** : 19" Rack mounting kit
- A190356** : GPIB interface
- A190519** : HV contact check box (HVCC)
- A190702** : 40kV HV test probe
- A190708** : ARC verification fixture

## SPECIFICATIONS

Model	19056	19057	19057-20
Mode	ACWV	DCWV / IR	DCWV / IR
<b>Withstanding Voltage Test</b>			
Output Voltage	AC: 0.1~10kV	DC: 0.1~12kV	DC : 0.1 ~ 20kV
Load Regulation	$\pm$ (1% of output + 10V), Rated load		
Voltage Accuracy	$\pm$ (1% of setting + 0.1% of full scale), 10V resolution		$\pm$ (1.5% of setting + 0.1% of full scale), 10V resolution
Voltage Regulation	2V		
Cutoff Current	0.01~20mA	0.001~10mA	0.001~5 mA
Current Accuracy	0.100mA~2.999mA : $\pm$ (1% of reading + 0.3% of full range) 3.00mA~20.00mA : $\pm$ (1.5% of reading + 0.3% of full range)	$\pm$ (1% of reading + 0.5% of full range)	
Current Resolution	AC : 1 $\mu$ A, DC : 0.1 $\mu$ A		
Output Frequency	50Hz / 60Hz		
Test/Ramp/Fall/Dwell Time	0.3 ~ 999 sec., continue / 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., off		
Waveform	Sine wave		
<b>Insulation Resistance Test</b>			
Output Voltage	-	DC : 0.1 ~ 5kV	
Voltage Resolution	-	2V	
Voltage Accuracy	-	1% of setting + 0.5% of full scale	1.5% of setting + 0.5% of full scale
IR Range	-	0.1M $\Omega$ ~ 50G $\Omega$	
Resistance Resolution	-	0.1M $\Omega$	
Resistance Accuracy	$\geq$ 0.5kV	1M $\Omega$ ~ 1G $\Omega$	$\pm$ (3% of reading + 0.5% of full scale)
		1G $\Omega$ ~ 10G $\Omega$	$\pm$ (5% of reading + 1% of full scale)
		10G $\Omega$ ~ 50G $\Omega$	$\pm$ (10% of reading + 1% of full scale)
	<0.5kV	1M $\Omega$ ~ 1G $\Omega$	$\pm$ 5% of reading + (0.5*300/Vs)% of full scale
<b>Flashover Detection</b>			
Setting Mode	Programmable setting		
Detection Current	AC : 1mA~20mA	DC : 1mA~10mA	
<b>Contact Check Function</b>			
Contact Check	OSC (open/short check) HVCC(High Voltage contact check)	HVCC(High Voltage contact check)	HVCC(High Voltage contact check)
<b>Electrical Hazard Protection Function</b>			
Ground Fault Interrupt	0.5mA $\pm$ 0.25mA AC, ON/OFF	-	-
Key Lock	Yes (password control)		
Interlock	YES		
<b>GO/NG Judgment Window</b>			
Indication, Alarm	GO : Short sound, Green LED; NG : Long sound, Red LED		
Memory Storage	100 sets ,max. 50 steps per set		
Interface	Standard-RS232, Handler interface ,USB , SCAN ; Optional - GPIB interface		
<b>General</b>			
Operation Environment	Temperature: 0 $^{\circ}$ C ~ 45 $^{\circ}$ C ; Humidity: 15% to 95% R.H@ $\leq$ 40 $^{\circ}$ C		
Power Consumption	500VA		
Power Requirements	90~132Vac or 180~264Vac, 47~63Hz		
Dimension (HxWxD)	130x430x500 mm/5.12x16.93x19.69 inch		
Weight	28kg / 61.7 lbs		



Chroma 19070 series are the smallest Hipot Testers currently available in the world. Its super mini size is easy to carry and the large LCD display is suitable for viewing measurement results. These sophisticated Hipot Testers are most applicable to safety test for electronic components.

### ORDERING INFORMATION

- 19071** : Hipot Tester (AC)
- 19073** : Hipot Tester (AC/DC/IR)
- A190344** : HV Gun
- A190701** : Remote Control Box
- A190702** : 40kV HV Test Probe
- A190704** : Start Switch
- A190706** : 19" Rack Mounting Kit for Model 19070 series
- A190708** : ARC Verification Fixture

### KEY FEATURES

- Compact size Hipot tester
- Three instruments in one: AC Hipot, DC Hipot, Insulation Resistance (19073)
- Open/Short Check (OSC)
- ARC detection (Flashover)
- Provide reliable and stable test results
- Storage of 10 Tests Setups with 60 Steps per setup
- Ground Fault Interrupt (GFI)



**A190701** : Remote Control Box



**A190702** : 40kV HV Test Probe

### SPECIFICATIONS

Model		19071	19073
Mode		ACWV	ACWV / DCWV / IR
<b>Withstanding Voltage Test</b>			
Output Voltage		AC : 0.05 ~ 5kV	AC : 0.05~ 5kV, DC : 0.05 ~ 6kV
Load Regulation		≤(1% + 5V)	
Voltage Resolution		2 V	
Voltage Accuracy		±(1.0% of reading + 5 counts)	
Cutoff Current		AC : 0.1mA ~ 20mA	AC : 0.1mA ~ 20mA, DC : 0.01mA ~ 5mA
Current Resolution		AC : 1μA, DC : 0.1μA	
Current Accuracy		±(1.0% of reading + 5 counts)	
Current Frequency		50Hz/ 60Hz	
Test Time		0.3 ~ 999 sec, continue	
Ramp up Time		0.1 ~ 999 sec, off	
Waveform		Sine wave	
<b>Insulation Resistance Test</b>			
Output Voltage		-	DC : 50 ~ 1000 V
Voltage Resolution		-	2V
Voltage Accuracy		-	±(5% of reading + 5 counts)
Resistance Accuracy	≥ 500V	1MΩ ~ 1000MΩ	± (4% of reading + 5 counts)
		1GΩ ~ 10GΩ	± (7% of reading + 5 counts)
		10GΩ ~ 50GΩ	± (12% of reading + 5 counts)
< 500V	0.1MΩ ~ 1000MΩ	± (7% of reading + 5 counts)	
<b>ARC Detection</b>			
Setting Mode		Programmable setting	
Detection Current		AC : 1mA ~ 20mA, DC : 1mA ~ 5mA	
<b>Secure Protection Function</b>			
Fast Output Cut-off		Approx. 0.4mS, after NG happen	
Fast Discharge		Approx. 0.2S, Typical	
Ground Fault Interrupt		0.5mA ± 0.25mAac (ON), OFF	
Continuity Check		0.1Ω ~ 5.0Ω ± 0.2Ω, GC MODE	
Panel Operation Lock		Yes	
<b>GO/NG Judgment Window</b>			
Indication, Alarm		GO: Short sound; NG: Long sound	
Data Hold		Least tests data memories	
Step Hold		Step signal trigger ON / OFF	
Memory Storage		10 tests setups with 60 steps pre setup	
<b>General</b>			
Operation Environment		Temperature: 0°C ~ 40 °C, Humidity: ≤ 80 % RH	
Power Consumption		No load : < 60 W, With rated load : ≤ 300 W	
Power Requirement		100V / 120V / 220V / 240V, 50 / 60 Hz	
Dimension (H x W x D)		105 x 270 x 350 mm / 4.13 x 10.74 x 13.78 inch	105 x 270 x 350 mm / 4.13 x 10.63 x 13.78 inch
Weight		11 kg / 24.23 lbs	
Certification		UL, TUV, CE	



## KEY FEATURES

- Apply high/low inductance test (0.1uH~100uH)
- 10V~1000V impulse voltage test, with 0.06V test resolution
- 20mS high speed test (P1.0 for ACQ)
- Inductance contact check function
- Inductance differential voltage compensation function
- High impulse test sampling rate (200MHz), 10bits
- Breakdown Voltage Analysis (BDV)
- Low voltage range to increase the sensibility of waveform analysis (25V/50V/100V/200V/400V/800V/1000V)
- Traditional Chinese/Simplified Chinese/English user interface
- USB port for storing waveform & screen capture
- Graphical color display
- Standard LAN, USB and RS232 interface

The Chroma 19301A impulse Winding Tester combines high & low inductance test technologies, has a maximum impulse voltage of 1000V, and a high speed sampling rate of 200MHz which satisfies most of the test requirements for power inductor products with a wide inductance range from 0.1uH to 100uH. The built-in functions of Area Size Comparison, Differential Area Comparison, FLUTTER Value, LAPLACIAN Value,  $\Delta$ PEAK or  $\Delta$ PEAK RATIO, PEAK RATIO and  $\Delta$ RESONANT AREA functions are able to inspect coils for poor insulation effectively.

The inspection of wound components for production includes the electrical characteristics test and the withstand voltage test of the electrical safety standard. Poor insulation of a coil, which is a common issue that causes layer short and/or short circuit with the output pin during use, can be caused by bad design, bad molding process, or deterioration of the insulation material. Therefore, it is necessary to perform the layer short test on any winding component or coil.

The 19301A, which is specifically designed for wound component tests, utilizes a high voltage & low capacitance capacitor (low test energy) in parallel with a coil to form an RLC resonant, which is called damping. Analyzing the decay of the waveform via an analysis technology with high speed, precise, and accurate sampling can successfully detect poor insulation within a



All specifications are subject to change without notice.

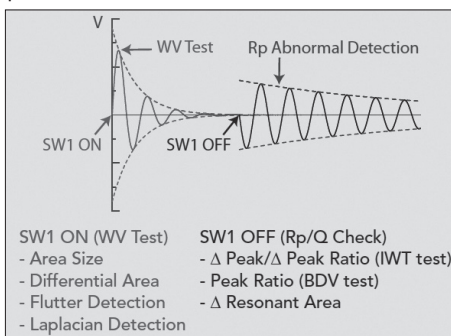
coil. It provides the winding quality test and the withstand voltage test on the cores for power inductors, and also makes the manufacturer and user checks of the quality of winding component products more efficient.

## Rp Check

The Peak Ratio and the  $\Delta$  Peak or  $\Delta$  Peak Ratio are unique testing technologies from Chroma. Before performing any tests, a large core loss or a short circuit between the core and enamel insulated wire of wound components can cause the Q values to drop (smaller Rp).

Under the breakdown voltage (BDV) test mode, the Peak Ratio can be used to detect the changes of the parallel resistance (Rp) of the DUT for inspecting the abnormality or deterioration of the Rp. After the withstand voltage test is done and the switch is opened (SW1 OFF), it calculates the Peak Ratio from the measurement, which is the ratio of the 2nd peak value to the 1st peak value of the oscillatory voltage waveform. As the voltage increases continuously, the Peak Ratio can inspect the changes of the Rp that are caused by the abnormality or deterioration in order to find the breakdown voltage (BDV) or the deterioration voltage (DTR.V). The larger Peak Ratio indicates the greater Rp value, which also means the higher Q value.

Under the impulse winding test (IWT) mode, the  $\Delta$  Peak or  $\Delta$  Peak Ratio can be used for detecting defective products by comparing the Peak Ratio from the test product with a known good product. After the withstand voltage test is done and the switch is opened (SW1 OFF), it uses the Peak Ratios from the DUT and the sample to calculate the  $\Delta$  Peak or  $\Delta$  Peak Ratio, which is the difference of the Peak Ratio between the DUT and the sample or the difference of the Peak Ratio between the DUT and the sample in the decay ratio from the sample for identifying defective products.

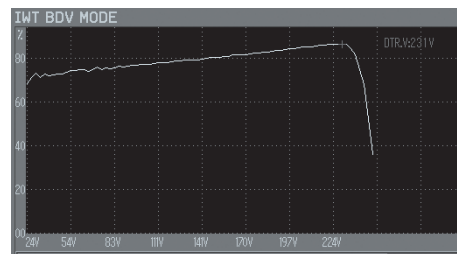


WV Test & Peak Ratio Waveform

## Breakdown Voltage (B.D.V)

The 19301A has breakdown voltage analysis built in. The start voltage, end voltage, and percentage between each step can be set under the breakdown voltage (BDV) test mode. While the test voltage increases in each step, it can use Area Size, Laplacian, and Peak ratio functions to judge whether the result from each function is over

the specified limit in order to find the withstand voltage of the test coil. In addition, it can also use the Deterioration Detection function to find the deterioration voltage (DTR.V). R&D engineers can analyze and research the product and improve any weaknesses of a coil design by using these functions under BDV test mode.



Deterioration Detection

## Contact Check ( Patent: I516773)

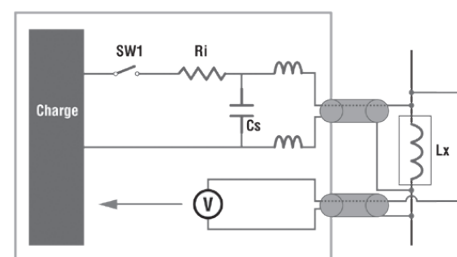
The Chroma 19301A performs a Contact Check, which can extend the service life of the fixture or probe, before the test in order to avoid poor contact or open circuits that would cause the 19301A to generate a high voltage output, preventing arcing to the fixture or probe and damage to the DUT.

## High/Low Inductance Products Test

The 19301A not only has low inductance product test technology but also covers high inductance product tests. It is able to test products with inductance values from 0.1uH to 100uH. When the sample is measured for inductance, the 19301A automatically switches to the proper range according to the measurement for the sample and test. This waveform sample is then used to compare with the DUT to verify that the DUT has the proper waveform. This is a very convenient function for the operator. Combining the applications of the high & low inductance test technologies into a single layer short tester not only reduces changeover time on the production line helping production management, but also reduces the cost of facility/equipment for the factory.

## 4-Terminal Measurement

Since the voltage detection of common 2-wire layer short test device is inside the current loop, the measured voltage is quite different from the DUT for low inductance measurement. The Chroma 19301A uses dual coaxial 4-wire detection to significantly improve the voltage accuracy for correct test results.



4-Terminal Measurement Diagram

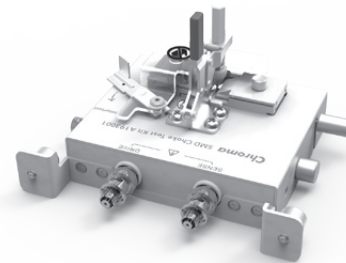


## High Speed Automated Testing Application

The low inductance products are used in smartphones, tablet PCs, etc., so the size of the inductor trends toward smaller, thinner and lighter. Fully automated test and packing machines, which have a high production speed, are used in producing these inductors. Therefore, high speed test equipment is required to satisfy the high speed of production. The Chroma 19301A provides high speed tests and uses dual coaxial 4-wire detection (4-Terminal Measurement) to reduce the impact of wiring length, which can work perfectly with automated machines for layer tests in order to provide greater benefit for customers. The shortest length of time for the high speed test has been improved to 18ms, which can considerably improve the quantity of automated production output.

## SMD Power Choke Test Fixture

The size of a low inductance Power Choke is quite small. Chroma has developed a 4-Terminal measurement fixture (patent), which can work with the voltage compensation by inductance difference, specifically for the SMD Power Choke in order to facilitate the operation of the layer short test and to improve test efficiency for the R&D engineer, the product developer, and the QA staff.

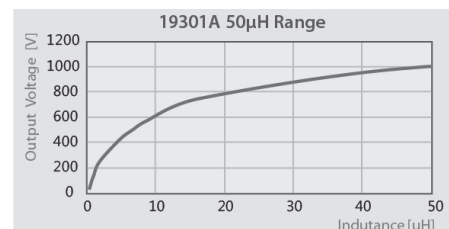
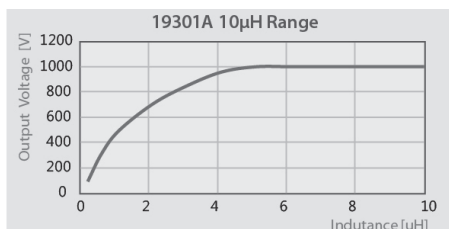
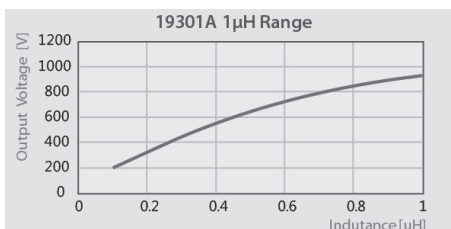


SMD Power Choke Test Fixture (A193001)

SPECIFICATIONS	
Model	19301A
Applied Voltage (Vpeak), Step	10V~1000V, 1V *1, *2
Test Inductance Range	0.1μH ~ 100μH
Voltage Accuracy	± [1% of setting x (1+0.5μH / Lx) + 2% of Range]
Sampling Rate	10bit / 5ns (200MHz)
Sampling Range	8 Ranges : 0, 1, 2, 3, 4, 5, 6, 7
Pulse Number	Pulse Number : 1~32 ; Excitation Pulse Number : 0~9
Screen Display Resolution	640 x 480 dots (VGA)
Waveform Display Range	colors display 512 x 256 dots
Detection Mode	Area / Differential Area / Flutter Value / Laplacian Value / Δ Peak Ratio / Δ Resonant Area
Test Time	Pulse1.0 : 20ms (ACQ)
Electrical Hazard Protection Function	
Key Lock	Yes (password control)
Interlock	Yes
Indication, Alarm	GO : Short sound, Green LED ; NG : Long sound, Red LED
Interface	RS232, Handler, USB, LAN interface
General	
Operation Environment	Temperature : 0°C ~ 45°C, Humidity : 15% to 95% R.H @ ≤ 40°C
Power Consumption	No Load : <150VA ; Rated Load : <1000VA
Power Requirements	100~240Vac, 50 / 60Hz
Dimension (W x H x D)	177 x 428 x 500 mm / 16.85 x 6.97 x 19.69 inch
Weight	26 kg / 57.32 lbs

Note \*1 : Using standard test cable shipped along with Chroma's Tester is suggested as long test cable will affect the maximum voltage output.

Note \*2 : Use a standard 1 meter test cable to test the maximum voltage spec. as the table shown below.



## ORDERING INFORMATION

- 19301A** : Impulsing Winding Tester
- A193001** : SMD Choke Test Fixture
- A193002** : 1m Test Wire + Test Clip
- A193003** : 1m Test Wire + Flat Head Cutting
- A193004** : 1m Test Cable BNC to BNC (including BNC Male Connector x 2)
- A193005** : 19301A Software



### 特點

- High impulse test sampling rate (200MHz), 10bits
- 6kV impulse test
- Breakdown Voltage Analysis (BDV)
- High speed test
- 10 channels scan test (19305-10)
- Support max. 40channels scanning test
- Traditional Chinese/Simplified Chinese/English user interface
- USB port for storing waveform & screen capture
- Graphical color display
- Standard LAN, USB and RS232 interfaces

The Chroma 19305 series Impulse Winding Tester included with one channel (19305) and 10 channels output (19305-10), the 19305 series has 6kV impulse voltage and 200MHz high speed sampling rate to improve sensitivity of discharge detection. To test more than 10uH, the built-in Area Size Comparison, Differential Area Comparison, FLUTTER value, LAPLACIAN value, and ΔPeak ratio functions are able to inspect the coils for poor coil insulation.

The inspection of winding components includes electrical characteristics and safety withstand voltage tests. Commonly poor insulation of coils is the root for causing layer short and output pin short-circuited during usage. The reason could result from bad initial design, poor process or deterioration of insulating materials; therefore, adding the coil layer short test to winding components has its necessity.

The impulse winding test is to impose a non-destructive, high speed and low energy voltage impulse on the DUT (Device Under Test) to analyze/compare the equivalent waveform



Model 19305-10



of yield and defect products for good and no good judgment. The main function of impulse winding test is to discover the potential defects such as layer short, corona or partial discharge that is difficult to find in wound components in early phase.

The Chroma 19305 series is an equipment specifically designed for testing winding components utilizing a high voltage charged micro capacitor (low test energy) and coil under test to form an RLC parallel resonant. Analyzing the oscillation decayed waveform via a high speed and sophisticated sampling process technique can successfully detect the coils with poor insulation. Analyzer can perform impulse tests on wound components like motors, transformers wound products. Not only reliable quality but also efficient product control would be obtained when implementing it to quality verification by wound component test.

The Chroma 19305-10 can providing maximum 10 channels output for multichannel scanning tests to save time and labor costs in the manufacturers.

### Five kinds of waveform judgement for testing

- Area Size
- Differential Area
- Flutter Value
- Laplacian Value
- ΔPeak ratio

### Product Application

Transformer, Motor, Generator, Ignition Coil, Relay, Solenoid Valve, Inductance and other coils.

### ORDERING INFORMATION

- 19305** : Impulse Winding Tester
- 19305-10** : Impulse Winding Tester (10ch)
- A190359** : 16ch HV External Scanning Box



A190359 : 16ch HV External Scanning Box

SPECIFICATIONS		
Model	19305	19305-10
Channel	1ch	10ch
Applied Voltage, Step, and Energy	100V ~ 6000V 10V Step	
Inductance Test Range	More than 10uH	
Sampling Speed	10bit / 5ns (200MHz)	
Sampling Range	11 Range : 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	
Pulse Number	Pulse Number: 1~32 Dummy Pulse Number: 0~9	
Detection Mode	Area / Differential Area ; Flutter Value / Laplacian Value / ΔPeak ratio	
<b>Electrical Hazard Protection</b>		
Key Lock	Yes (password control)	
Interlock	Yes	
Indication, Alarm	GO : Short sound, Green LED ; NG : Long sound, Red LED	
<b>Interface</b>		
	RS232, USB, LAN interface	
<b>General</b>		
Operation Environment	Temperature : 0°C ~ 45°C Humidity : 15% to 95% R.H@ ≤ 40°C	
Power Consumption	No Load : <150W Rated Load : <1000W	
Power Requirements	100~240Vac, 50 / 60Hz	
Dimension (H x W x D)	177 x 428 x 500 / 16.85 x 6.97 x 19.69 inch	
Weight	26kg / 57.32 lbs	



### Removable and Master/Slave design

Because different products have different requirements and test procedures, Chroma 19200 offers different scanning modules for combinations. These modules are: AC LINE module, GENERAL module, AC LINE2 module, EARTH module, GB&GBF module and SWITCH module. Due to different modules have different functions, users are able to combine different modules for your needs.

### High / Low voltage circuit insulation

Most of products have to perform Electrical Safety Test (high voltage) and Function Test (low voltage). Chroma 19200 supports high and low voltage isolation by SWITCH module. User can combine high and low voltage tests like LCR measurement, power performance and function test for one sequence in one station and data collecting. That improves test efficiency and reduces occurred test risk.

### KEY FEATURES

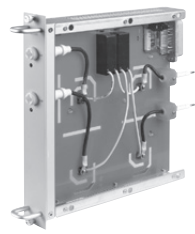
- Support Electrical Safety Test Scanning
- Support High / Low voltage circuit insulation (Switch module)
- Support 8 slots for plug-in (removable)
- Max. 9 slaves for multiple scanners (master/slave interface)
- Standard RS-232 and USB interface
- Optional GPIB interface
- CE Mark
- 19200 can be installed in Chroma Electrical Equipment ATS model 8900

In recent years, International Electrotechnical Commission (IEC) in order to make consumers safer while using the electrical products, join more requirements to test in the standard. It makes electric to fit requirements by all tests be performed which are very complicated and different. The problem not only the course is complicated and apt to make mistakes, but also the manpower costs more.

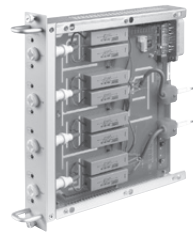
Chroma 19200 can perform high / low voltage switch and scan all safety tests by EST Analyzer (Chroma 19032) inputs such as withstanding test; Some modules support 20A for Leakage Current test and Function Test; GB & GBF modules support 40A and Ground Floating.

Chroma 19200 can be installed in Chroma 8900 electrical equipment ATS for DUT which needs a lot of procedures to test like medical equipment, medical power, UPS, motor, etc., ATS can save the manpower cost, reduce the mistake, data management to improve quality and efficiency.

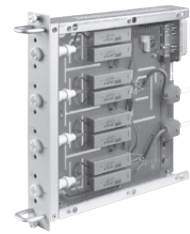
### MODULE DESCRIPTION



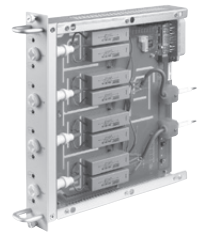
AC LINE MODULE



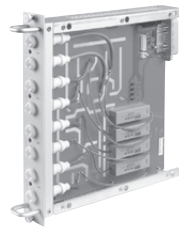
AC LINE2 MODULE



GENERAL MODULE



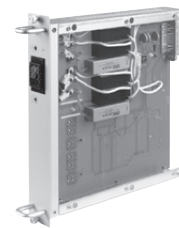
EARTH MODULE



SWITCH MODULE



GB MODULE



GBF-1 MODULE



GBF-2 MODULE

### SPECIFICATION (MASTER & SLAVE)

<b>Model</b>	<b>19200</b>
<b>Mode</b>	SCAN
<b>Withstanding Voltage Test Scan</b>	
Max. Voltage	AC : 5kV, DC : 6kV
<b>Insulation Resistance Test Scan</b>	
Max. Voltage	DC : 5kV
<b>Ground Bond Test Scan</b>	
Max. Current	40A
<b>Leakage Current Test Scan</b>	
Max. Voltage	AC 300V
Max. Current	20A
<b>Interface</b>	RS-232 , USB (Standard), GPIB (Optional)
<b>General</b>	
Operation Environment	Temperature: 0°C ~ 45°C ; Humidity: 15% to 95% R.H.@ ≤ 40°C
Power Consumption	500VA
Power Requirements	90~132Vac or 180~264Vac, 47~63Hz
Dimension (H x W x D)	310.8 x 438 x 495 mm / 12.24 x 17.24 x 19.49 inch
Weight	35 kg / 77.09 lbs
Certification	CE

MODULE SPECIFICATION									
Module Name		AC LINE	GENERAL	AC LINE2	EARTH	GB	GBF-1	GBF-2	SWITCH
Port No.		2	4	4	4	4	2	4	8
HIGH/LOW switch		●	●	●	●	●			
Max. Voltage		5KVac 6KVdc	5KVac 6KVdc	5KVac 6KVdc	5KVac 6KVdc	15V peak	5KVac 6KVdc	5KVac 6KVdc	5KVac 6KVdc
Max. current		20A	100mA	100mA	100mA	40A	40A	40A	100mA
Test Item	Function Type								
WVAC/WVDC/IR Test	HIGH	●	●	●					
	LOW	●	●	●	●				
GB Test	Drive ±, Sense ±					Earthed 4 channels set + or -	Floating 1 channels	Floating 2 channels	
LC Test	LINE	●							
	NEUTRAL	●							
	SENSE HIGH		●	●					
	SENSE LOW		●		●				
	EARTH		●	●	●				
	LINE2			●					

**Note\*1** : GB, GBF-1 and GBF-2 only can be used on frame #0

**Note\*2** : GBF-1 and GBF-2 have GB floating function

**Note\*3** : The GENERAL, ACLINE2, EARTH modules have flexible design which can be exchanged flexibly by terminals for different tests

## ORDERING INFORMATION

**19200** : Electrical Safety Test Scanner (Master)

**19200** : Electrical Safety Test Scanner (Slave)

**A190349** : Universal corded product adapter

**A190508** : GPIB Interface

**A192000** : AC LINE module

**A192002** : AC LINE2 module

**A192003** : GENERAL module

**A192004** : EARTH module

**A192005** : GB module

**A192006** : GBF-1 module

**A192007** : GBF-2 module

**A192008** : SWITCH module

**A192010** : Power entry adapter of GBF module

**A192011** : Blank Plate





The 19572 are instrument dedicated to measure the grounding resistance within the range of 0.1~510mΩ. Its compact and easy to operate feature is most suitable for the grounding test in production line. By supplying high reliability and stability test results with built-in resistance compensate function; it is an economical and useful grounding tester.

### ORDERING INFORMATION

- 19572** : Ground Bond Tester
- A190701** : Remote Control Box
- A195702** : GPIB Interface

### KEY FEATURES

- Wide resistance measurement range : 0.1 ~ 510 mΩ
- High performance AC current output : 45 A
- Compact size ground bond tester
- Provide reliable and stable test results
- Built-in resistance compensation function
- Standard RS-232 interface
- Optional GPIB Interface
- Compatible with the model 19070 series Hipot Tester

### SPECIFICATIONS

Model	19572
Mode	Ground Bond
<b>Grounding Resistance Test</b>	
Output Current	AC : 3 ~ 45A
Resolution	3 ~ 30A, 0.01A / 30.1 ~ 45A, 0.1A
Current Accuracy	± (1.5% of setting + 0.5% of full scale)
Output Frequency	50Hz / 60Hz
Resistance Range	0.1 ~ 510 mΩ
Resistance Resolution	(R display counts/ I display counts) ≥ 0.2, Resolution: 1mΩ (R display counts/ I display counts) < 0.2, Resolution: 0.1mΩ
Resistance Accuracy	± (2% of reading + 0.5% of full scale)
Offset	A predetermined value can be subtracted from the measured value and the result of subtraction can be display The result of subtraction can be compared with a Good/NO Good judgment reference value, and the result of comparison can be use for the Good/NO Good judgment
Offset Range	0 ~ 100mΩ
Test Time	0.5 ~ 999 sec., continue
Waveform	Sine wave
GO/NG Judgment	A no-good judgment is made when a resistance greater than the high limit value is detected. A no-good judgment is made when the output current is cutout and a no-good Alarm signal is delivered. If no abnormal state is detected during the test time, a good judgment is made and a good signal is deliver.
Limit	Hi-Limit : 0.1 ~ 510mΩ ; Low-Limit : off, 0.1mΩ ~ Hi-Limit Value, 510mΩ max.
<b>General</b>	
Operation Environment	Temperature : 0°C ~ 40 °C, Humidity : ≤ 80 % RH
Power Consumption	No load(Ready state) : < 100 W, With rated load : ≤ 880W max.
Power Requirement	100V / 120V / 220V (AC ± 10%) / 240V (AC -10% ~ +5%), 50 / 60 Hz
Dimension (H x W x D)	105 x 320 x 400 mm / 4.13 x 12.60 x 15.75 inch
Weight	16 kg / 35.24 lbs
Certification	UL, CE



## KEY FEATURES

- Adequate for versatile testers
- Precise designed standard calibration kit
- Stable & accurate calibration equipment
- Standard GPIB Interface and RS-232 Interface

The 9102 Hipot Calibrators is specially designed standard devices for instrument calibration lab. The 9102 can simulate multiple loads and apply to various Hipot testers. These calibration equipment can save manufacturers a great deal of regular calibration fee.

## ORDERING INFORMATION

**9102** : Hipot Calibrator

SPECIFICATIONS		
<b>Model</b>	<b>9102</b>	
<b>Withstanding Voltage Test</b>		
<b>Voltage Meter</b>		
Range	AC : 2kV / 6kV, DC : 2kV / 10kV	
Accuracy	AC : 0.3 % + 6 counts, DC : 0.2% + 2 counts	
Resolution	0.1V / 1V	
<b>Current Meter</b>		
Range	200 $\mu$ A / 2mA / 20mA / 200mA	
Accuracy	AC : 0.3% + 6counts, DC : 0.2% + 2 counts	
Resolution	10 nA/ 100nA/ 1 $\mu$ A/ 10 $\mu$ A	
Dummy Load (1.2kV max.)	36mA : 33.3k $\Omega$ , 100W ; 24mA : 50k $\Omega$ , 80W 12mA : 100k $\Omega$ , 30W ; 4.8mA : 250k $\Omega$ , 10W 2.4mA : 500k $\Omega$ , 7W ; 0.12mA : 10M $\Omega$ , 1W	
<b>Grounding Resistance Test</b>		
<b>Voltage Meter</b>		
Range	AC : 6V (0.050V ~ 6.000V)	
Accuracy	AC : 0.3% + 6 counts	
Resolution	1 mV	
<b>Current Meter</b>		
Range	AC : 45A (0.500A ~ 45.000A)	
Accuracy	AC : 0.3% + 6 counts	
Resolution	10 mA	
Dummy Load	45A Max. : 100 m $\Omega$ , 250W	
<b>Insulation Resistance Test</b>		
	Value	Accuracy
Standard Resistance(1.2kV max.)	1000 M $\Omega$	2%
	90.9 M $\Omega$	1%
	9.9 M $\Omega$	1%
<b>General</b>		
Operation Environment	Temperature: 0°C ~ 40°C, Humidity : $\leq$ 80% RH	
Power Requirement	100V / 120V / 220V / 240V, 50 / 60 Hz	
Dimension (H X W X D)	89 x 430 x 400 mm / 3.5 x 16.93 x 15.75 inch	
Weight	8 kg / 17.62 lbs	



Because the requirement in standard of the electric product increase day by day,, the testing cost then increasing . In order to help the manufacturer Reduce testing cost and products risk effectively, Chroma provide 8900 electrical equipment auto test system (ATS) be the best solution by program the test of the complicated procedure like the medical equipment safety and function test and instrument safety and function test.

8900 electrical equipment ATS can completion that amount measurement and test procedure in once automatically.This strong function not only can be report formatted simply, but reduce the careless mistake of the artificial writing and improper test. Chroma 8900 electrical equipment ATS is suitable for all electrical equipment test solution within Electrical Safety Test.

Chroma 8900 electrical equipment ATS solve the Electrical Safety Test and special FUNCTION test solution. The system can combine different testers in the system accordding with different test request what your need. The software is all open architecture structure which can offer the corresponding program and the most flexible test item in accordance with special test procedure to the customer for special products.

The all open architecture software of 8900 systems includes the strong report editor and generator, statistical analysis and functions of management. Management of various types of different test reports and operation that these functions make the system have the ability to control quality and reduce risk. These statistical analysis and report function are indispensable for quality control and product line testing in a modern electrical manufacturer.

## FUNCTIONS

- Support electrical safety test and function test scanning :
  - AC/DC WV Test
  - IR Test
  - GB Test
  - LC Test (all types)
  - Function test
- Expandable Measurement function
  - LCR Meter
  - AC/DC Source
  - DC Load
  - Power Analyzer
  - Timing/Noise Analyzer
  - DMM
  - Oscilloscope
  - Other with GPIB or RS-232 device

## KEY FEATURES

- Open architecture software
- Expandable hardware
- Editable test library
- Editable test programs
- Editable and Test Item
- Editable reports
- Statistic report
- User authority control
- Activity log
- Support Barcode reader

## APPLICATIONS

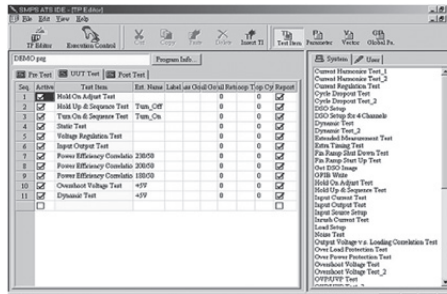
- House Appliance
- SMPS/Charger/UPS
- Motor Function Test
- Large EL Capacitor
- PCB
- Medical Device
- Line Transformer

## ORDERING INFORMATION

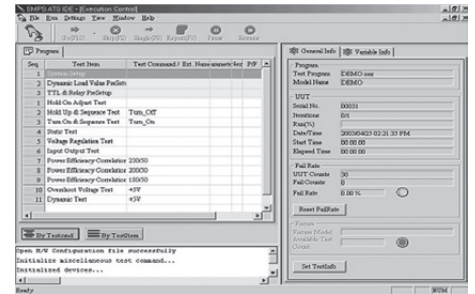
System	
<b>8900</b>	Electrical Equipment ATS
Instrument	
<b>Electrical Safety Analyzer</b>	Refer to Model 19032-P
Leakage Current Test Module	6000-05(10A) and 6000-08(20A) for 19032-P
Multi Channel Module	6000-01 (3GC/5HV), 6000-02 (5GC/3HV), 6000-03 (8HV), for 19032-P
Isolation Transformer	500VA (A190313)/ 1000VA(A190314)
<b>Electrical Safety Test Scanner</b>	Refer to Model 19200
Scan Modules for 19200	AC Line Module(A192000)      General Module (A192003)
	AC Line2 Module(A192002)      Earth Module (A192004)
	GB Module(A192005)      GBF-1 Module (A192006)
	GBF-2Module(A192007)      Switch Module (A192008)
<b>LCR Meter</b>	Refer to Model 11022, 11025
<b>AC Source</b>	Refer to Model 6500, 61500, 61600, 61700 series
<b>DC Source</b>	Refer to Model 62000P Series
<b>Power Analyzer</b>	Refer to Model 6633 series
<b>Power Meter</b>	Refer to Model 66200 series
<b>DC Load</b>	Refer to Model 6310A, 63200A, 6330A Series
<b>Timing/Noise Analyzer</b>	80611
<b>Timing/Noise module</b>	80611N
Cable and Accessory	
<b>A600009</b>	GPIB Cable (200 cm)
<b>A600010</b>	GPIB Cable (60cm)
<b>A800005</b>	PCI BUS GPIB Card (National Instrument)



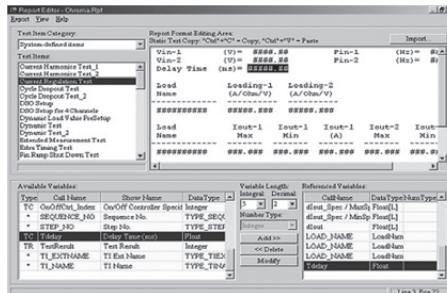
Soft Panel



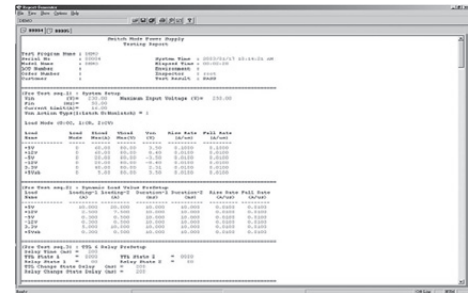
Test Program Editing



Running GO/NOGO



Test Report Editing



Statistical Report

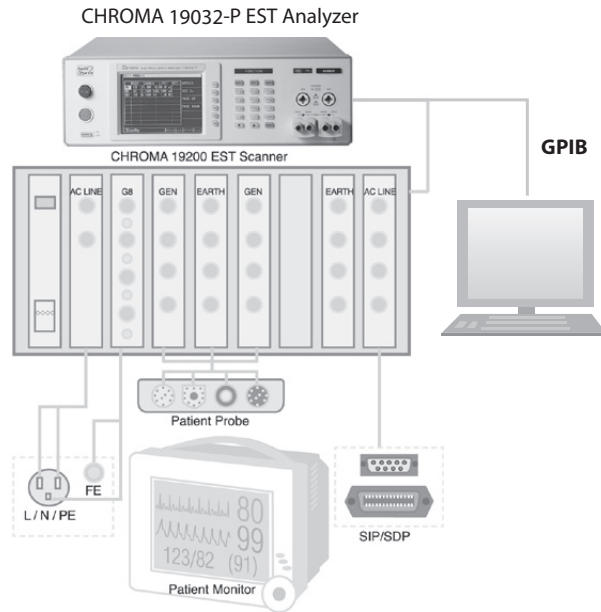
## KEY FEATURES

- Support electrical safety test and function test scanning :
  - AC/DC WV Test
  - IR Test
  - GB Test
  - Earth Leakage Current
  - Enclosure Leakage Current
  - Patient Leakage Current
  - Patient Auxiliary Leakage Current
- Support customize function test (option)
- Open architecture software
- Automatically generate and save test report

The safety standard of medical equipment is very strict. Because the medical equipment keeps in touch with the health of the doctor and patient frequently, make several Electrical safety tests can't be ignored especially leakage current test which has already become the most important test in electrical safety test.

The leakage current test of medical equipment includes four kinds - ELC, ECLC, PLC, PALC - to test besides AC/DC/IR/GB test. Additionally, normal / reverse / single fault normal / single fault reverse four powers and earth switch, let medical equipment safety test difficulty and complexity further.

Chroma 19200 can allocate different modules for special medical equipment test reach flexible and time saving. Chroma 19200 with 8900/8910 test system can store test procedure and result via computer for data mining and researching of line manager and Quality control department.



## ORDERING INFORMATION

System		
<b>8910</b>	Medical Electrical Safety ATS base on 8900	
<b>Main Instrument</b>		
<b>Electrical Safety Tester</b>	Refer to Model 19032-P	
Leakage Current Test Module	6000-08 (20A) for 19032-P	
Multi Channel Module	6000-01 (3GC/5HV), 6000-02 (5GC/3HV), 6000-03 (8HV), for 19032-P	
Isolation Transformer	500VA (A190313)/ 1000VA(A190314)	
<b>Electrical Safety Test Scanner</b>		
	Refer to Model 19200	
Scan Modules for 19200	AC Line Module(A192000)	General Module (A192003)
	AC Line2 Module(A192002)	Earth Module (A192004)
	GB Module(A192005)	GBF-1 Module (A192006)
	GBF-2Module(A192007)	Switch Module (A192008)
<b>AC Source</b>		
	Refer to Model 6400, 6500, 61500, 61600, 61700 series	



# High Capacitance Electrolytic Capacitor ATS Model 1911



The system is a aluminum electrolytic capacitor with high capacitance designed for measuring LC and C/D/Z/ESR. It provides the best test solution to high capacity electrolytic capacitor with data record function. The general users spend longer time to wait LC test in testing high capacitance electrolytic capacitor. The system can install 8 electrolytic capacitors maximum at a time to enhance 8 times of productivity. It will sound an alarm after the test is completed. The operating personnel process other operations to increase the time efficiency in testing.



The screen consists of DUT model number and lot number information. The software will automatically bring out DUT test specifications which includes LC test voltage, Dwell time, current limit and C/D/Z/ESR value. Count Pass/Fail ratio at the lowermost of main program for analysis convenience of production line engineer.

## KEY FEATURES

- Test parameter LC/C/D/Z/ESR
- Test 8 electrolytic capacitors
- Constant current for test leakage current
- Special test clip fix DUT
- Testing specification from program management
- Test report auto generate
- Statistic analysis
- Software interface easy to operate



## ORDERING INFORMATION

1911 : High Capacitance Electrolytic Capacitor ATS

## SPECIFICATIONS

Accurate and highly reliable hardware devices :

Capacitor Leakage Current/ IR Meter	
<b>Model</b>	<b>11200 (650V)</b>
Main Function	Capacitor Leakage Current / IR Meter
Test Parameter	LC, IR
Test Signals Information	
Voltage	1.0 V~100 V, step 0.1 V; 101V~650 V, step 1V; ± (0.5% + 0.2V)
Charge Current Limit	V ≤ 100V: 0.5mA~500mA V > 100V: 0.5mA~150mA, 97.5W max. step 0.5mA; ± (3% + 0.05mA)
Measurement Display Range	LC : 0.001 μ A~20.00mA
Basic Measurement Accuracy *1	LC Reading : ± (0.3% + 0.005 μ A)
Measurement speed (Ext. Trigger, Hold Range, Line Frequency 60Hz)	Fast: 77 ms Medium: 143 ms Slow: 420 ms
Function	
Correction	Null zeroing
Test Voltage Monitor	Vm: 0.0 V~660.0V; ± (0.2% of reading + 0.1V)
Charge Timer	0~999 Sec.
Dwell Timer	0.2~999 Sec

LCR Meter	
<b>Model</b>	<b>11022</b>
<b>Test Parameter</b>	L, C, R,  Z , Q, D, ESR, X, θ
Test Signals	
Level	10 mV~1V, step 10 mV; ± (10% + 3 mV)
Frequency	50Hz, 60Hz, 100Hz, 120Hz, 1kHz, 10kHz, 20kHz, 40kHz, 50kHz, 100kHz; ± 0.01%
Measurement Display Range	
C (Capacitance)	0.001 pF~1.9999F
L, M, L2 (Inductance)	0.001 μ H~99.99kH
Z (Impedance), ESR	0.01m~99.99M Ω
Q (Quality Factor)	
D (Distortion Factor)	0.0001~9999
θ (Phase Angle)	-180.00° ~ +180.00°

Note\*1 : Swith module for leakage current measure

Note\*2 : GB module for C/D/Z/ESR measure

Scanner	
<b>Model</b>	<b>19200</b>
Swith Module *1	
Channels	8ports, 4HV relays
Isolation Voltage	max up to DC 6KV / AC 5KV
Max Current	40A
GB Module *2	
Channels	4 Channels Driver & Sense
Max Current	40A

# Options of Electrical Safety Test Instruments

## FIXTURES AND ACCESSORIES

No.	Description	19020	19032	19032-P	19035	19036	19052	19053 19054	19055	19071 19073	19572	19056 19057 19057-20	19305-10
* A190301	8HV Scanning box (5KV max) (9030A)		●	●					●				
* A190313	500VA Isolation Transformer		●	●									
* A190314	1000VA Isolation Transformer		●	●									
* A190316	Dummy Load (3KV/25A)	●	●	●	●	●	●	●	●	●	●	●	
A190321	GPIB Interface		●	●									
* A190334	Ground Bond 40A		●										
* A190336	8HV/8GB Scanning Box (9030AG)		●	●									
* A190337	Ground Bond 60A		●										
A190338	19001 EST Software		●	●									
A190343	19" Rack Mounting Kit for 19032		●		●								
* A190344	10kV HV Gun		●	●	●		●	●		●		●	
A190346	RS-232 Cable for Impulse Winding Tester Connection				●								
A190347	GPIB & Handler Interface				●								
A190348	RS-232 Interface for 19035				●								
* A190349	Universal Corded Product Adapter		●	●									
* A190351	8ch-16ch HV box for 19035				●								
A190355	19" Rack Mounting Kit				●								
A190356	GPIB Interface for 19032-P			●					●				
A190359	16 channel HV External Scanning Box (H, L, X)				●	●							●
* A190362	16 channel 4 wire HV External Scanning Box (H, L, X)					●							
A190506	RS422 Interface												
A190508	GPIB Interface	●						●			●		
* A190512	Auto Transformer Scan Box (3002B)				●			●					
A190517	19" Rack Mounting Kit							●	●				
* A190701	Remote Control Box									●	●		
* A190702	40KV HV Probe		●	●	●		●	●	●	●	●	●	
* A190704	Start Switch		●	●	●		●	●	●	●	●	●	
A190706	19" Rack Mounting Kit									●			
* A190708	ARC Verification Fixture	●	●	●	●	●	●	●	●	●		●	

(\*) see pictures below



A190301



A190313



A190314



A190316



A190334



A190336



A190337



A190344



A190349



A190351



A190362



A190512



A190701



A190702



A190704



A190708

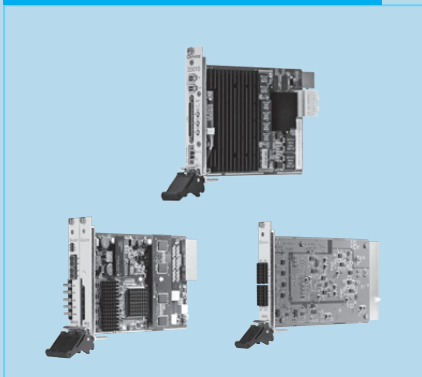
All specifications are subject to change without notice.

Video & Color  
Flat Panel Display  
LED/ Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/ IC  
PXI Test & Measurement  
General Purpose  
Manufacturing System  
Turnkey Test & Automation

# Semiconductor/IC Test Solution

<b>Selection Guide</b>	<b>14-1</b>
<b>PXIe Digital IO Card</b>	<b>14-3</b>
<b>Programmable Pin Electronics Module</b>	<b>14-4</b>
<b>Four-quadrant DUT Power Supply</b>	<b>14-5</b>
<b>VLSI Test System</b>	<b>14-6</b>
<b>SoC/Analog Test System</b>	<b>14-9</b>
<b>Final Test Handler</b>	<b>14-17</b>
<b>System Level Test Handler</b>	<b>14-21</b>
<b>Other Application Test Handler</b>	<b>14-25</b>

## PXI/PXIe IC Test Platform



## VLSI Test System



PXIe Digital IO Card  
Programmable Pin Electronics Module  
Four-quadrant DUT Power Supply

## SoC/Analog Test System



## Final Test Handler



Hybrid Single Site Test Handler

Full Range Active Thermal Control Handler

Tri-Temp Quad-site Test Handler

Octad-site Test Handler

RF Solution Integrated Handler

## System Level Test Handler



Hybrid Single Site Test Handler

Tabletop Single Site Test Handler

Automatic System Function Tester

## Other Application Test Handler



Die Test Handler

Miniature IC Handler

Test-In-Tray Handler



## Selection Guide - VLSI Test System

	MXDPS	MXUVI	MXREF	MLDPS	MLDPS-16	Remark	PAGE
<b>V Range</b>	± 16 V	± 12 V	± 48 V	12 V/± 6 V	12 V/± 6 V	--	--
<b>C Range</b>	± 2 A	± 1 A	± 250 mA	± 1 A (± 6V)	± 1 A (± 6V)	--	--
<b>Channel</b>	8 /board	16 /board	16 /board	32 /board	16 /board	--	--
<b>Slot</b>	S slot	S / IO slot	S / IO slot	S / IO slot	S / IO slot	--	--
<b>4 wires VI</b>	Yes	Yes	Yes	Yes	Yes	1 -S/2CH	--
<b>Current Gain</b>	None	Yes (4A)	Yes (1A)	Yes (8A)	Yes (8A)	--	--
<b>3380D</b>	O	O	O	O	S	--	<b>14-6</b>
<b>3380P</b>	O	S	O	O	O	--	<b>14-7</b>
<b>3380</b>	O	O	O	O	O	Flexible	<b>14-8</b>

## Selection Guide - SoC/Analog Test System - 1

	DPS	HDDPS	PMU	VI45	PVI100	PAGE
<b>V Range</b>	±16V	±12V	±16V	±45V	±100V (±50V)	--
<b>I Range</b>	800mA	1A	250mA	100mA	2A (4A)	--
<b>Channels</b>	16	48	2	32	8	--
<b>Slot</b>	DPS	DPS	None	I/O slot	I/O slot	--
<b>3650-CX</b>	O	--	O	O	O	<b>14-9</b>
<b>3650</b>	O	--	O	O	O	<b>14-11</b>
<b>3650-EX</b>	--	O	O	O	O	<b>14-13</b>

## Selection Guide - SoC/Analog Test System - 2

	ADDA	HDADDA	PAGE
<b>Fs Max</b>	500KHz	500KHz	--
<b>Resolution</b>	16 Bit	16 Bit	--
<b>Channels</b>	1	32	--
<b>Slot</b>	None	I/O slot	--
<b>3650-CX</b>	O	--	<b>14-9</b>
<b>3650</b>	O	O	<b>14-11</b>
<b>3650-EX</b>	--	O	<b>14-13</b>

## Selection Guide - SoC/Analog Test System - 3

	DPS64	HCDPS	HDVI	PAGE
<b>V Range</b>	12V/±6V	±4V	70V ~ -40V	--
<b>C Range</b>	1A	32A	200mA	--
<b>Channels</b>	64	4	32	--
<b>Slot</b>	I/O slot	I/O slot	DPS	--
<b>3680</b>	O	O	O	<b>14-15</b>

## Selection Guide - SoC/Analog Test System - 4

	HDAVO	HDADDA2	PAGE
<b>Sample Rate</b>	400Msps	2Msps	--
<b>Resolution</b>	16 Bits	24 Bits	--
<b>Channels</b>	4	4	--
<b>Slot</b>	I/O slot	DPS	--
<b>3680</b>	O	O	<b>14-15</b>

S : Standard

O : Option

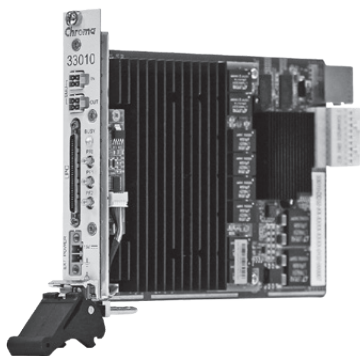
-- : None

Selection Guide - Final Test Handler - 1						
Temperature condition			Final Test			
			3110	3110-FT	3180	3240-Q
Hot	Ambient	Ambient	O	O	O	O
	High Temperature (General Heater)	~150°C±3°C ~125°C±3°C	O O	-- --	O O	-- O
ATC	Tri-Temperature (TEC Control)	-40°C~125°C±2°C -40°C~150°C±2°C ~-55°C	O O O	O -- --	-- -- --	-- -- --
	High Temperature (ATC : Active Thermal Control)	~135°C±2°C	O	--	--	--
PTC	Passive cooling (PTC : Passive Thermal Control)	<300W, <85°C	O	--	--	--
PAGE			14-21	14-16	14-19	14-20

Selection Guide - Final Test Handler - 2						
Temperature condition			Final Test			
			3160	3160A	3160C	3160F
Hot	Ambient	Ambient	O	O	O	O
	High Temperature (General Heater)	~150°C±3°C ~125°C±3°C	O O	O O	O O	-- --
ATC	Tri-Temperature (TEC Control)	-40°C~125°C±3°C -40°C~150°C±3°C ~-55°C	-- -- --	-- -- --	O O O	-- -- --
	High Temperature (ATC : Active Thermal Control)	~135°C±2°C	--	--	--	--
PTC	Passive cooling (PTC : Passive Thermal Control)	<300W, <85°C	--	--	--	--
PAGE			14-17	14-17	14-18	14-17

Selection Guide - System Level Test Handler						
Temperature condition			System Level Test			
			3110	3111	3240	3260
Hot	Ambient	Ambient	O	O	O	O
	High Temperature (General Heater)	~150°C±3°C ~125°C±3°C	O O	-- O	-- O	O O
ATC	Tri-Temperature (TEC Control)	-40°C~125°C±2°C -40°C~150°C±2°C ~-55°C	O -- O	-- -- --	-- -- --	O -- O
	High Temperature (ATC : Active Thermal Control)	~135°C±2°C	O	--	--	O
PTC	Passive cooling (PTC : Passive Thermal Control)	<300W, <85°C	O	--	--	O
PAGE			14-21	14-22	14-23	14-24

O : Option  
-- : None



Interface, Test Data Output, Binning and Sequence Control, Wafer Map, Summary Tool, and rich sets of prober/handler drivers. The user debugging tools include a Data Logger, Debug Plan, TCM, Shmoo, Pattern Editor, Waveform, and more. A CAD to ATE pattern conversion tool is also supported to cover WGL/STIL/VCD/EVCD conversions.

## Addressing the emerging market and test cost challenges

With a high-density per pin and per site architecture, full suite of ATE Pin Electronics (PE) card functions, expandable channel count, and a rich set of software support, the 33010 digital IO card will help users address the emerging market and test cost challenges. 33010 PXle cards can be easily adopted with other PXI/PXle solutions such as RF, SMUs, and Mixed-signal cards to address a variety of applications such as MCUs, Sensors, RF ICs, PMICs, or ICs with combined functions.

### KEY FEATURES

- Standard PXle-Hybrid [3U] compatible bus type
- 100MHz maximum clock rate
- 32 channels per board
- Extendable up to 256 channels in one chassis
- Any pin to any site
- Per board sequencer architecture (multiple time domains supported)
- Per-pin timing with per-pin, per-cycle bidirectional control
- Per-pin time & frequency measurement
- Per-pin DC level & PMU
- 16 timing sets with on-the-fly timing changes
- 64M sequencer command memory per pin
- 64M vector memory per pin
- SCAN pattern function support
- Windows 7 operating system
- LabView and LabWindows support
- Proprietary CRAFT\_PXI software tools option
- Master / Slave architecture for boards chaining
- Similar to pattern and timing structure as 3380D/3380P/3380 series ATE

### APPLICATIONS

- Semiconductor
- LED / Laser Diode
- Solar Cell
- Battery / BMS
- Transistor
- Automotive
- Avionics
- Power Electronics
- Sensor / IoT

Chroma 33010 is a high-density 100MHz PXle digital IO card designed for characterizing, validating, and testing a variety of digital and mixed-signal ICs. Each IO card consists of a Sequencer Pattern Generator (SQPG) and 32 channels of full ATE-like features. The 33010 IO card is expandable up to 256 channels. Some unique features of the 33010 include an on-board SQPG, per pin timing/levels/PMU/TFMU, multiple time domains, and multi-threaded testing for complex IC testing. Each channel is also equipped with 64M vector memory, 16 timing sets with on-the-fly timing change, and per pin timing and frequency measurements up to 400 MHz.

### Proprietary Software, CRAFT\_PXI and other rich features of software support

In addition to LabView and LabWindows support, Chroma provides a proprietary software option, CRAFT\_PXI, for Windows-based systems. CRAFT\_PXI contains a full set of production tools and user debugging tools. The production tools include ease-of-use GUI software with an Operator

### SPECIFICATIONS

<b>Model</b>	<b>33010</b>
Clock Rate	100 Mhz
Pin Channels per Card	32 pins (chained to max. 256 pins)
Pattern Memory	64M
Sequence Control Memory	64M
Parallel Testing Capability	Any pin to any site
<b>Timing Generator per Pin</b>	
Timing Generators	8 edges per pin (4 drive / 2 strobes / 2 IO markers)
No. of Timing Sets	16
Rate Setting Resolution	625 pS
Rate Setting Range	10ns to 5ms
<b>Driver / Comparator / Load</b>	
Pin Driver (Vil/Vih) Range	-1.5V to +6V
Pin Driver (Vil/Vih) Accuracy	± 10mV
Output Current Limit	75 mA
Output Impedance	50 ± 5 Ω
Pin Comparator (Voh/Vol) Range	-1.5V to +6V
Pin Comparator (Voh/Vol) Accuracy	± 10mV
Pin Load (Iol/Ioh) Range	± 25mA
Vref Setting Range	-1.5V to +6V
<b>Scan Chains</b>	
Scan Chains Numbers	Configurable to 1, 2, 4, 8 chains per board
Scan Pattern Memory Size	3G / 1.5G / 768M / 384M
<b>PPMU</b>	
Channel	Per Pin (32 Chs FIMV / FVMI)
Voltage Force Range	-2.0V to +6V
Current Measured Range	± 2uA / ± 10uA / ± 100uA / ± 1mA / ± 40mA
Current Force Range	± 2uA / ± 10uA / ± 100uA / ± 1mA / ± 40mA
Voltage Measured Range	-2.0V to +6V
<b>Time &amp; Frequency Measurement</b>	
Maximum Frequency Measurement	Per pin, 400MHz
Maximum Time Measurement	Per pin, 40 sec. (0.025Hz / resolution : 10ns)
Free-run Clock	Per Pin, Max. : 200MHz
<b>Others</b>	
System Environment	Window 7
Programming Language	C \ C# \ Labview
Power Consumption	80W
Dimension	PXle 3U

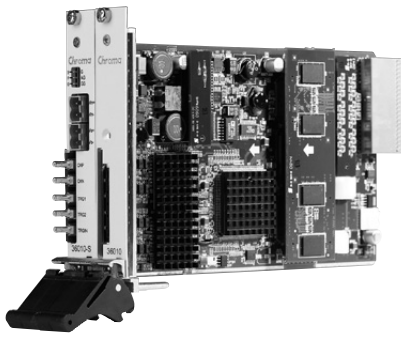
<b>Optional PXle Power Supply</b>	<b>A330101 (AP15)</b>
Input Voltage (VAC)	100 ~ 240 ± 10% V <sub>LN</sub>
Source Line Frequency Range	47 ~ 63Hz
Input Current, Continuous (A)	0.1 ~ 2.7A
Output Range (Vdc)	17.6~18.9VDC ± 5%
Output Current, Continuous (A)	11.2A
Output Voltage Ripple Noise	150mV
Max. Support Watt	up to 200W (33010 x 4)
Occupy Slots	2 slots

### ORDERING INFORMATION

**33010** : PXle Digital IO Card  
**A330101** : PXle Power Supply, 15V (option)  
**Demo Board**) (option)



PXle Power Supply A330101



## KEY FEATURES

- Standard PXI compatible Bus type
- 100MHz maximum data rate
- 8 channels with per-pin, per-cycle bidirectional control
- Scalable architecture to provide up to 64-pin
- 32M sequence command memory
- More than 17 pattern sequence commands
- Per-pin architecture
- 32M vector memory per pin
- 32 sets of clock and waveform per pin
- Waveforms changes on-the-fly
- Programmable tri-level driver in 610uV resolution
- One high voltage driver per board
- Per-channel PMU
- Per-channel timing measurement unit
- Support scan pattern function
- Windows 2000/XP operating system
- Support LabView and LabWindows
- Proprietary software tools option

## APPLICATIONS

- Logic and mixed signal validation and test
- Digital pattern generator and vector capture
- Consumer IC and electronics test
- Logic test subsystem for DC and RF ATE

The 36010 is a 100MHz programmable pin electronic module designed for characterizing, validating and testing digital and mixed signal IC or electronics. Each module consists of a Sequence Pattern Generator and Logic Pin Electronics Card containing 8 channels. The 36010 module is expandable to provide up to 64 channels hardware resource for various purposes. Besides, based on the per-pin architecture, each channel is equipped with 32M vector memory, 32 sets of clocks, 32 sets of waveforms and one PMU channel. It provides fast and accurate testing, with same performance and features as other stand ATE equipment.

## Sequence Pattern Generator

The Sequence Pattern Generator of the 36010 module provides more than 17 sequence commands including "jump", "match", "loop", "repeat" and etc. to control the flow of pattern execution. It equips with 32M sequence command memory, which allows each vector to has its own sequence command to control the flow of pattern execution flexibly. Besides, each Sequence Pattern Generator can support up to 8 Logic Pin Electronics Cards, which means it can support up to 64 I/O channels and performs testing on 8 DUT simultaneously.

## Logic Pin Electronics Card

In each Logic Pin Electronics Card, it adopts Chroma® PINF ICs on it to achieve high timing accuracy and flexible waveform output functions. The per-pin timing generator provides 32 sets of clock containing 6 programmable edges. As for the per-pin waveform generator, it provides each digital I/O channel 32 sets of programmable waveform with the change-one-the-fly feature. In

the analog function, the Logic Pin Electronics card has the tri-level driver and comparator with 610uV programmable resolution. It also equips with active load, per-pin PMU and high voltage driver functions. Moreover, the 36010 supports scan pattern function for scan test.

## Proprietary Software, CRISP

In addition to support the LabView and LabWindows environments, Chroma® also provides the proprietary software option, CRISP. To cover the various requirements for the IC debugging, CRISP contains lots of software modules. Running on the Microsoft Windows XP® operation system and using C++ as the test program language, CRISP provides users the flexible, easy-to-use and fast-runtime GUI software to meet the various demands. The project IDE tool makes it easy to create the test program quickly. In the test program debugging stage, CRISP provides the suite of debugging software tools for user, which includes Plan Debugger, Datalog, Waveform, Scope, SHMOO, Pin Margin, Wafer Map, Summary, Histogram, STDF, Test Condition Monitor, Pattern Editor, and so on.

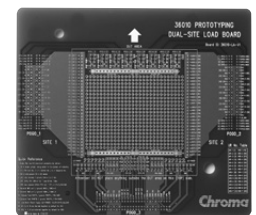
## ORDERING INFORMATION

- 36010** : Programmable Pin Electronics Card
- A360100** : Sequence Pattern Generator
- A360101** : Load Board Test Fixture
- A360102** : 250W/48V DC Power Supply
- Universal Load Board**
- CRISP System Software**

## SPECIFICATIONS

Model	36010
Test Rate	50/100MHz
Channels Per Board	8 (Scalable to 64 channels)
Vector Depth	32M
Sequence Control Memory	32M
Number of Sequence Control Command	17
Parallel test capability	8
<b>Timing Generator Per Pin</b>	
No. of Edges	6 edges / pin (2 Driver, 2 Driver & I/O, 2 Strobe)
No. of Timing Sets	32 sets / pin
Rate / Edge Setting Resolution	125ps / 62.5ps
Rate Setting Range	20ns → 1mS
<b>Waveform Generator Per Pin</b>	
No. of Waveform Sets	32 sets / pin
<b>Driver</b>	
VIL/VIH Range	-1.5V~+5.9V / -1.4V~+6V
VIL/VIH Accuracy	± 5mV@VIH ≥ VIL+200mV
Output Current (Static/Dynamic)	± 50mA/ ± 100mA
Output Impedance	50 ± 5 Ω
<b>Comparator</b>	
VOL/VOH Range	-1.5V ~ +6V
VOL/VOH Accuracy	± 15mV

Programmable Load	
IOL/IOH Range	± 12mA
IOL/IOH Accuracy	± 25uA
VREF Setting Range	-1.5V ~ +6V
VREF Accuracy	± 50mV
<b>High Voltage Driver</b>	
HV Channel	1 HV channels / board
VIL/VIH Range	0V ~ +13.5V
VIL/VIH Accuracy	± 20mV
VIL/VIH Output Current	± 60mA
<b>Scan Chain</b>	
Chain number / LPC	1/2/4
Size per chain	256M/128M/64M
<b>PPMU</b>	
Channel Number	1 channel / 1 pin
Voltage Force Range	-1.5V ~ +6V
Current Measured Range	32mA/2mA/200µA/20µA/2µA
Current Forced Range	32mA/2mA/200µA/20µA/2µA
Voltage Measured Range	-1.5V ~ +6V
<b>Power and Dimensions</b>	
Power Consumption	25W per Slot
Size	PXI 3U Standard Board (Extendable)
Cooling System	Standard PXI Chassis Fan (Forced Air Cooling)



Universal Load Board



Load Board Test Fixture





## KEY FEATURES

- 4 channels in a PXI compatible Bus type
- +5V/-2V and +10V/-2V force ranges
- 16-bit voltage force resolution
- 18-bit current measurement resolution
- 6 selectable ranges from 5 $\mu$ A to 250mA for current measurement
- Programmable current clamp function
- Ganged function available for larger current
- Board-to-board isolation
- Windows 2000/XP operating system
- Support LabView and LabWindows
- Proprietary software tools for data analysis

## APPLICATIONS

- Logic and mixed signal validation and test
- Consumer IC and electronics test
- DUT Power Supply

The 36020 is a four-quadrant programmable DUT power supply in a single-slot 3U PXI module. Each 36020 features 4 channels with the ability to source voltage and measure current. There are two selectable voltage ranges, +5V/-2V and +10V/-2V, with 16-bit resolution for programming the voltage output. In order to provide better accuracy, 36020 provides six selectable current ranges including  $\pm 5 \mu A$ ,  $\pm 25 \mu A$ ,  $\pm 250 \mu A$ ,  $\pm 2.5mA$ ,  $\pm 25mA$  and  $\pm 250mA$  with 18-bit resolution for the current measurement functionality. Moreover, the board-to-board isolation design makes it possible to source the larger voltage than 10V by the series connection with multiple 36020 modules. The versatile supply rails and high accuracy make 36020 an excellent general-purpose, four-quadrant power supply for design validation and manufacturing test application. Especially, the extraordinary accuracy in the small current measurement makes the 36020 very suitable for semiconductor IC test.

## Power Supply with Precision Source and Measurement Capability

The 36020 uses a combination of switching and linear regulation to provide the excellent voltage source and accuracy. It has the ability to source voltage from each of its four outputs. It can be programmed in 113  $\mu V$  steps on the +5V/-2V range and 189  $\mu V$  steps on the +10V/-2V channels. As a current measure unit, it can measure in minimum 47.6pA resolution on each channel in the  $\pm 5 \mu A$  current range. You can use this impressive level of current resolution in many power supply applications.

## Proprietary Software, CRISP

In addition to support the LabView and LabWindows environment, Chroma® provides the front panel tool of the 36020 for users to quickly troubleshoot or debug. Users can monitor or refer the setting of the 36020 through this front panel tool. Besides, Chroma® also provides the proprietary software option, CRISP, for the 36020 to meet the demands of users for various purposes. Based on Microsoft Windows XP® operation system and C++ programming language, CRISP provides the powerful, easy-to-use, intuitive, and fast-runtime GUI tools for users. For the test debugging and data analyzing purposes, CRISP provides users the abundant software modules for the 36020, including Datalog, SHMOO, Summary, Histogram, STDF and Test Condition Monitor.

## ORDERING INFORMATION

**36020** : Four-quadrant DUT Power Supply  
**CRISP System Software**



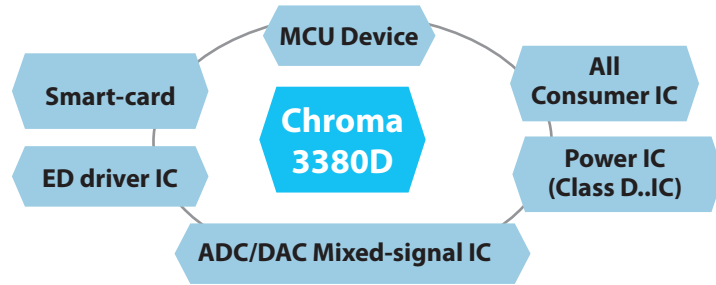
## SPECIFICATIONS

Model		36020
Input		PXI Internal Power
Channel Number		4
<b>Voltage Source</b>		
Range		VR1: +10v/-2v VR2: +5v/-2v
Resolution		16bits
Accuracy		$\pm 0.1\%+4.64mV$
Noise		3mVrms
<b>Current Measurement</b>		
Range		$\pm 5\mu A$ , $\pm 25\mu A$ , $\pm 250\mu A$ , $\pm 2.5mA$ , $\pm 25mA$ , $\pm 250mA$
Resolution		18bits
Accuracy	250mA	$\pm 0.2\%+200\mu A$
	25mA	$\pm 0.15\%+20\mu A$
	2.5mA	$\pm 0.15\%+2\mu A$
	250 $\mu A$	$\pm 0.15\%+200nA+1nA/V$
	25 $\mu A$	$\pm 0.15\%+150nA+1nA/V$
	5 $\mu A$ range	$\pm 0.15\%+50nA+1nA/V$
<b>Slew Rate</b>		5v/25 $\mu s$
<b>Load Regulation</b>		2mV
<b>Load Transient</b>		
Time Response		100 $\mu s$
Voltage Response		50mv
<b>Overshoot/Undershoot</b>		<3%
<b>Clamp Flag Response</b>		100 $\mu s$
<b>Clamp Resolution</b>		10bits
<b>Protection Function / Alarm Flag</b>		Short current limit Clamp alarm flag
<b>Max Stable Load Capacitance</b>		100 $\mu F$



## The Full Application Functions

Logic, ADDA, LCD, LED, Power, ALPG, Match, and etc.

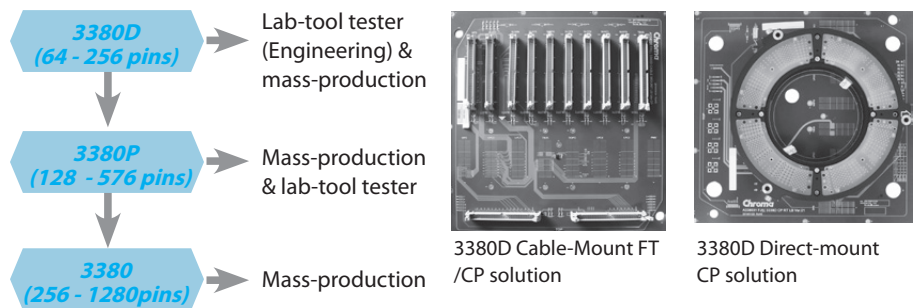


## 3380D Linking for mass-production

C-M Kits : Compatible with 3360D/3360P C-M FT/CP & D-M Kits : Compatible 3360P D-M probe card

### KEY FEATURES

- 100 MHz clock rate
- 50/100 MHz data rate
- 256 I/O digital I/O pins
- Up to 256 sites Parallel testing
- 32/64/128M Pattern Memory
- Various VI source
- Flexible HW-architecture (Interchangeable I/O, VI, ADDA,)
- Real parallel Trim/Match function
- Time & Frequency Measurement Unit (TFMU)
- AD/DA test (16/24bits option)
- SCAN test option (max 1G M/chain)
- ALPG test option for embedded memory
- STDF tools support
- Test program/pattern converter (J750, D10, S50, E320, SC312, V7, TRI-6020)
- User friendly Windows 7 environment
- CRAFT C/C++ programming language
- SW (Software) Same as 3360 & 3360P
- D-M Probe-card compatible with 3360P DM Probe-card
- C-M DUT-card compatible with 3360D/3360P C-M DUT-card(FT/CP)
- Direct mount fixture can be compatible with 3360P probe-Card
- Cable mount fixture can be compatible with 3360D & 3360P



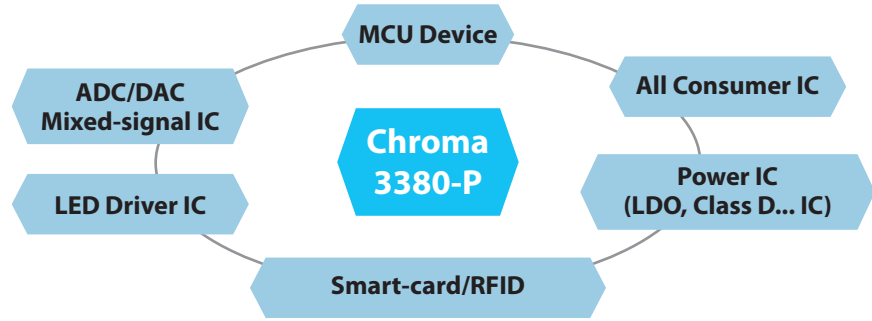
## SPECIFICATIONS

Standard Specification	3380D
Clock Rate	50/100 Mhz
Data Rate	50/100 Mbps
Pin Channels	256 Pins
Pattern Memory	32M(S) / 64 & 128M (option)
Parallel Testing Capability	256 DUTs
EPA	± 500ps
Resource Per Pin Architecture	Yes
VI source	8CH : MXDPS, 16CH : MLDPS-16(S) / MXUVI / MXREF, 32CH : MLDPS
PMU (± 48V, ± 100 mA )	16 Channels /board
HV-Pins driver ( +5.9V to +13.5V )	4 channels /board
PPMU (-2V~+ 6V, ± 32 mA )	Per Pin (FIMV/FVMI)
Programmable Active Load ( ± 12 mA)	Per Pin
TFMU (Time/Freq Measure unit:Max 400Mhz)	Per Pin
Free-run Clock ( Max: 200Mhz )	Per Pin
Windows Environment	Windows 7
Programming Language	C/C++
3380D Test Option Specification	
AD/DA Converter Test Option ( MXAWI/MXAWI2 )	4 AWG/ 4 DIG ( 16/24bits)
Mixed- Signal test option ( PXI )	24bits, 200MS/s
MXUVI ( DPS ± 12V, ± 1A, CG ± 4A )	16 Channels /board
MXDPS ( DPS ± 16V, ± 2A )	8 Channels /board
MXREF ( DPS ± 48V, ± 250mA, CG ± 1A )	16 Channels /board
MLDPS ( DPS + 12V/± 500mA, ± 6V/± 1A , CG max ± 8 A )	32 Channels /board
SCAN Option	1G bits/ chain
ALPG Memory Test Option	16X, 16Y, 16D /board
3380D System And Dimension	
Power consumption Max	2KVA (VI Option to Max. 3KVA)
Test Head	W365 x D586 x H412 mm ( Max:45Kg)
Power Box	W220 x D372 x H187 mm ( Max:15Kg)

Note 1: "Cable-Mount" as standard, "Direct-Mount" as option.

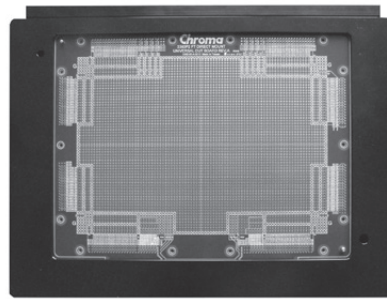


## Most Flexible Configuration for Various Devices

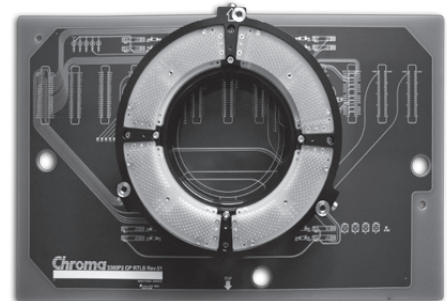


## CP/FT Direct/Cable Mount Solutions

CP/FT Direct/Cable Mount Solutions available from engineering to Production;  
Maintain Compatibility to 3360 & 3360P



3380-P FT Direct-mount



3380-P CP Direct-mount

### KEY FEATURES

- 50/100 Mhz clock rate
- 50/100 Mbps data rate
- 512 digital I/O pins ( Max 576 digital I/O pins)
- Up to 512 sites parallel testing
- 16/32M pattern memory
- Various VI source
- Flexible HW-architecture (Interchangeable I/O, VI, ADDA)
- Real parallel trim/Match function
- Time & Frequency Measurement Unit (TFMU)
- AD/DA test option
- SCAN test option (max 1G/chain)
- ALPG test option for embedded memory
- STDF tools support
- Test program/pattern converter (J750, D10, V50, E320, SC312, V7, TRI-6020, ITS9K)
- User friendly Windows 7 environment
- CRAFT C/C++ programming language
- Software same as 3360 & 3360-P

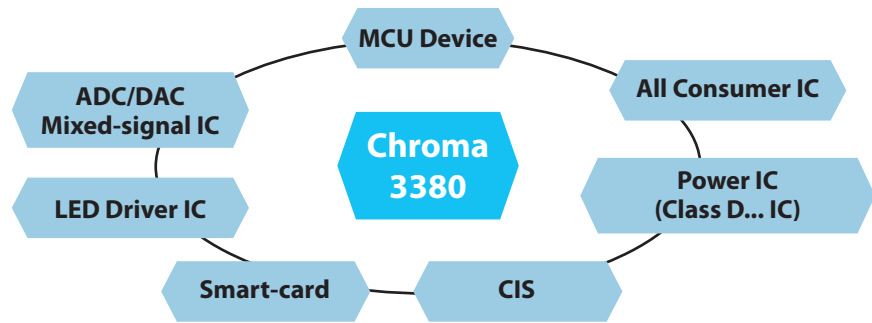
### SPECIFICATIONS

Model	3380P
Clock Rate	50 / 100Mhz
Data Rate	50 / 100Mbps
I/O Channels	512 Pins ( Max:576Pins)
Pattern Memory	16M / 32M(Optional) 2X: 32M / 64M(option)
Parallel Testing Capability	512 DUTs
EPA	± 500ps
Resource Per Pin Architecture	Yes
VI source	8CH: MXDPS, 16CH: MXUVI/MXREF, 32CH: MLDPS
PMU(± 48V, ± 100 mA )	16 Channels /board
HV-Pins driver ( +5.9V to +13.5V )	4 channels /board
PPMU (-2V~+ 6V, ± 32 mA )	Per Pin (FIMV/FVMI)
Programmable Active Load ( ± 12 mA)	Per Pin
TFMU (Time/Freq Measure unit:Max 400Mhz)	Per Pin
Free-run Clock ( Max: 200Mhz )	Per Pin
Windows Environment	Window 7
Programming Language	C/C++
Test Option	Specification
AD/DA Converter Test Option	4 AWG / 4 DIG (16 bits)
Mixed- Signal test option ( PXI )	24bits, 200MS/s
MXUVI (DPS ± 12V, ± 1A, CG max : ± 4A)	16 Channels /board
MXDPS (DPS -8V~+16V, ± 2A )	8 Channels /board
MXREF (DPS ± 48V, ± 250mA, CG max : ± 1A)	16 Channels /board
MLDPS (DPS +12V/ ± 500mA, ± 5V/ ± 1A, CG max : ± 4/8A)	32 Channels /board
SCAN Option	1G bits/ chain
ALPG Memory Test Option	16X, 16Y, 16D /board
System And Dimension	
Power Consumption	Max : 3KVA
Only Test Head	W640xD470XH639 mm ( Max:100Kg)

\* **Note 1:** "Direct-Mount" as Standard, "Cable-Mount" as Option



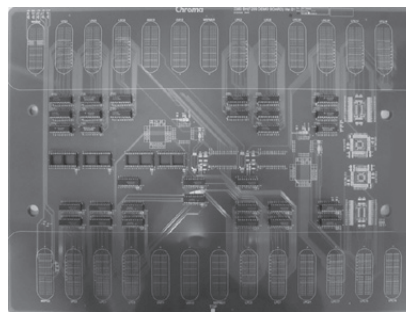
Rich Functions and Wide Coverage : Logic, MCU, ADDA (Mixed-signal); Power, LED driver, Class D; CIS, SCAN, ALPG, Match..etc



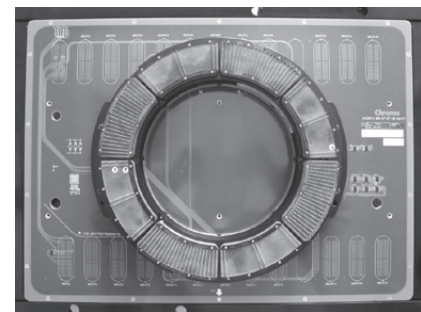
CP/FT Direct mount solutions available from engineering to production; CP maintain compatibility to J750

### KEY FEATURES

- 50/100 MHz clock rate
- 50/100 Mbps data rate
- 1024 I/O pins (Max :1280 I/O pins)
- Up to 1024 sites Parallel testing
- 32/64 M pattern memory
- Various VI source
- Flexible HW-architecture (Interchangeable I/O, VI, ADDA,)
- Real parallel trim/match function
- Time & frequency measurement unit (TFMU)
- High-speed time measurement unit (HSTMU)
- AD/DA test option
- SCAN test option (max 1G M/chain)
- ALPG test option for embedded memory
- STDF tools support
- Test program/pattern converter (J750, D10, V50, E320, SC312, V7, TRI-6020, ITS9K)
- User friendly windows 7 environment
- CRAFT C/C++ programming language
- SW (Software) same as 3380P & 3360P



3380 FT Direct-mount



3380 CP Direct-mount (compatibility with J750)

SPECIFICATIONS	
Model	3380
Clock Rate	50 / 100Mhz
Data Rate	50 / 100Mbps
I/O Channels	1024 Pins ( Max:1280 Pins)
Pattern Memory	16M / 32M (Option)2X: 32M / 64M (option)
Parallel Testing Capability	1024 DUTs
EPA	± 500ps
Resource Per Pin Architecture	Yes
VI source	8CH : MXDPS, 16CH : MXUVI/MXREF, 32CH : MLDPS
PMU ( ± 48V, ± 100 mA )	32 Channels
HV-Pins driver ( +5.9V to +13.5V )	4 channels /board
PPMU (-2V~+ 6V, ± 32 mA )	Per Pin (FIMV/FVMI)
Programmable Active Load ( ± 12 mA)	Per Pin
TFMU (Time/Freq Measure unit:Max 400Mhz)	Per Pin
Free-run Clock ( Max: 200Mhz )	Per Pin
Windows Environment	Window 7
Programming Language	C\C++
3380 Test Option	Specification
AD/DA Converter Test Option	4 AWG / 4 DIG (16 bits)
Mixed- Signal test option ( PXI )	24bits, 200MS/s
MXUVI (DPS ± 12V, ± 1A, CG max : ± 4A)	16 Channels /board
MXDPS (DPS -8V~+16V, ± 2A )	8 Channels /board
MXREF (DPS ± 48V, ± 250mA, CG max : ± 1A)	16 Channels /board
MLDPS (DPS +12V/ ± 500mA, ± 5V/ ± 1A, CG max : ± 4/8A)	32 Channels /board
SCAN Option	1G bits/ chain
ALPG Memory Test Option	16X, 16Y, 16D /board
System And Dimension	
Power Consumption	Max : 8KVA
Test Head	W714 x D717 x H458 mm ( Max : 165Kg)
Main Frame	W766 x D700 x H1562 mm ( Max : 160Kg)

\* Note \*1: "Direct-Mount" as Standard





## KEY FEATURES

- 50 / 100MHz; 200Mhz (MUX) Clock Rate
- 50 / 100Mbps; 200 Mbps (MUX) Data Rate
- Up to 256 digital I/O pins
- 16/32 (option) MW vector memory
- 16/32 (option) MW pattern instruction memory
- Per-pin timing/PPMU/frequency measurement
- Up to 4-32 16-bit ADDA channels option
- SW configurable scan chains in 1024M depth or up to 32 scan chains/board
- ALPG option for memory test
- Up to 16 high-voltage pins
- 16 high-performance DPS channels
- Overall timing accuracy <math>\pm 550ps</math>
- 8 ~ 32-CH / board for VI45 analog option
- 2 ~ 8-CH / board for PVI100 analog option
- Microsoft Windows® XP OS
- C++ and GUI programming interface
- CRISP, full suite of intuitive software tools
- Air-cooled, All-in-one design and space-saving footprint
- Cable mount / Direct mount

## APPLICATIONS

- MCU/MCU + Embedded Memory
- NAND Flash Controller
- PC I/O
- Switch ICs
- Smart Power Management Devices
- Mixed Signal, Digital and Analog ICs
- ADC/DAC/CODEC ICs
- Consumer ICs
- Engineering, Wafer Sort and Final Test
- Power ICs
- LED Driver ICs

## Chroma 3650-CX brings you the low cost and high performance test solution

3650-CX adopts the all-in-one design to provide a compact size ATE with very low cost, high accuracy and high throughput for customers to save the cost and raise the profit. With the versatile test capabilities and powerful software tools, 3650-CX is designed for MCU, NAND flash controllers, the peripheral devices of PC, switch devices, LED driver ICs, power ICs and consumer SoC devices.

## CRISP, the powerful system software for 3650-CX

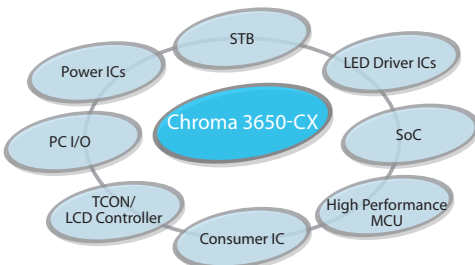
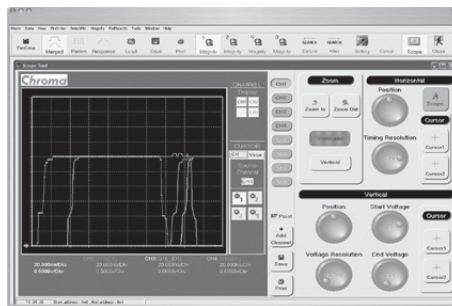
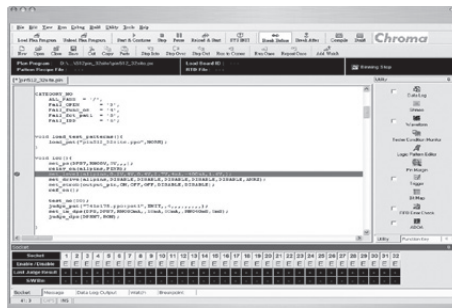
The 3650-CX features powerful suite of software tools using Chroma Integrated Software Platform, CRISP. It not only provides the rapid test developing functions, CRISP also covers all needs for test debugging, production and data analysis. Base on the Microsoft Windows XP® operation system and C++ programming language, CRISP provides powerful, easy-to-use, intuitive and fast-runtime GUI tools for users. The CRISP includes test plan debugger, pattern editor, waveform tool, scope tool, pin margin, Shmoo, wafer map, histogram, STDF tool, datalog and etc.

## All-in-one design and compact size to save the floor space

With the air-cooled and zero footprint tester-in-a-test-head design, 3650-CX delivers high throughput in a highly integrated package for minimum floor space. With an optional manipulator, 3650-CX can be used in both package and wafer sort test.

## Peripheral

The 3650-CX provides multiple drivers for communications with handler and prober by GPIB and TTL interface. The supported handlers or probers include SEIKO-EPSON, SHIBASOKU, MULTITEST, ASECO, DAYMARC, TEL, TSK and OPUS II, and so forth.



SPECIFICATIONS	
<b>Model 3650-CX</b>	
Clock Rate	50 / 100Mhz; 200Mhz (MUX mode)
Data Rate	50 / 100Mbps; 200Mbps (MUX mode)
Pattern Memory Size	16 / 32M (Option)
Overall Timing Accuracy	$\pm 550\text{ps}$ (Window), $\pm 450\text{ps}$ (Edge)
Software /Programming Language / OS	CRISP/ C++ / Windows XP
Pin Electronics Board	LPC
IO Channels	64-pin / Board X 4 Boards / System
Vector Depth	16 / 32M per pin
Drive VIL / VIH	-2 ~ +6V / -1.9 ~ +7V
Maximum Driver Current	50mA (static) / 100mA (dynamic)
Comparator VOL / VOH	-2 ~ +7V
Compare Modes	Edge, Window
EPA (Drive / IO / Compare)	$\pm 300\text{ps}$ / $\pm 300\text{ps}$ / $\pm 300\text{ps}$
Dynamic Load Current	$\pm 35\text{mA}$
Timing Sets	32 sets per pin
Timing Edges	6 (2 Drive, 2 Drive & IO, 2 Compare)
Rate / Edge Resolution	125 / 62.5ps
Waveform Sets	32 sets per pin
Waveform Format	4096 Timing-Waveform Combination Changes on-the-fly
Utility Pin Relay Control	64 (8 / Board), 128 bit relay board option available
PPMU/Frequency Measurement Unit (OSC)	per pin
DUT Power Supply	DPS
Channels	16-CH / Board X 1 Boards / System
Voltage Range	$\pm 8\text{V}$ , $\pm 16\text{V}$
Maximum Output Current	0.8A / 1-CH
Current Gang Channels	8
Precision Measurement Unit	PMU
Channels	2-CH / Board X 4 Boards / System
Voltage Range	$\pm 2.5\text{V}$ , $\pm 8\text{V}$ , $\pm 16\text{V}$
Current Range	$\pm 800\text{nA}$ ~ $\pm 250\text{mA}$
<b>Options</b>	
<b>ADDA/HD-ADDA</b>	
Channels	1 ADDA CH / LPC or 32 CH HD-ADDA / board
AWG / Digitizer	per channel
Resolution / Max. Conversion Rate	ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz
Voltage Range	$\pm 2.5\text{V}$ / $\pm 4.5\text{V}$ / $\pm 9\text{V}$
Algorithm Pattern Generator (ALPG)	X = 16, Y = 16 / D = 16
Scan	1 / 2 / 4 / 8 / 16 / 32 scan chains, Max 1024M depth
<b>VI45</b>	
Channels	8 ~ 32-CH / Board
Voltage / Current Range	$\pm 45\text{V}$ / $\pm 100\text{mA}$
Current Ganged Channels	4 buses for 8 channels, x2 – x8, 800mA max
TMU	per channel
<b>PVI100</b>	
Channels	2 ~ 8-CH / Board
Voltage / Current Range	$\pm 100\text{V}$ / $\pm 2\text{A}$ , $\pm 50\text{V}$ / $\pm 4\text{A}$
Current Ganged Channels	x2 – x8, 32A max
TMU	per channel
<b>System and Dimension</b>	
Power Consumption	3.5KW Max
Cooling System	Forced Air Cooling
Frame Size	L 643 x W369 x H 760 mm
Weight	130Kg



50/100 MHz

### KEY FEATURES

- 50 / 100MHz; 200Mhz (MUX) Clock Rate
- 50 / 100Mbps; 200Mbps (MUX) Data Rate
- Up to 512 digital I/O pins
- 16/32 (option) MW vector memory
- 16/32 (option) MW pattern instruction memory
- Per-pin timing/PPMU/frequency measurement
- Up to 8-32 16-bit ADDA channels option
- SW configurable scan chains in 1024M depth or up to 32 scan chains/board
- ALPG option for memory test
- Up to 32 high-voltage pins
- 32 high-performance DPS channels
- Overall timing accuracy < ± 550ps
- 8 ~ 32-CH / board for VI45 analog option
- 2 ~ 8-CH / board for PVI100 analog option
- MRX option for 3rd party PXI instruments
- Microsoft Windows® XP OS
- C++ and GUI programming interface
- CRISP, full suite of intuitive software tools
- Test program and pattern converters for other platforms
- Accept DIB and probe card of other testers directly
- Support STDF data output
- Air-cooled, small footprint tester-in-a-test-head design

### Chroma 3650 brings you the most cost-effective SoC tester

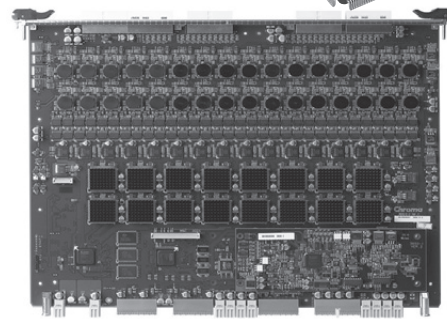
Chroma 3650 is an SoC tester with high throughput and high parallel test capabilities to provide the most cost-effective solution for fabless, IDM and testing houses. With the full functions of test, high accuracy, powerful software tools and excellent reliability, 3650 has the versatile test capabilities for high-performance microcontroller, analog IC, consumer SoC devices, and wafer sort applications.

### High performance in a low-cost production system

The 3650 achieves lower test cost not only by reducing the cost of tester system but also by testing more devices faster and the high parallel test capability. With the Chroma PINF IC and the sophisticated calibration system, 3650 has the excellent overall timing accuracy within ± 550ps. The pattern generator of 3650 has up to 32M pattern instruction memory. By having the same depth as the vector memory, Chroma 3650 allows to add pattern instruction for each vector. Moreover, the powerful sequential pattern generator provides the variety of pattern commands to meet the demands of complex test vectors. The true test-per-pin architecture and the flexible site mapping with no slot boundaries are designed for multi-site test with high throughput. Up to 512 digital pins, 32 device power supplies, per-pin PMU and the analog test capability, 3650 delivers a combination of high test performance and throughput with cost-effective test solution.

### High parallel test capability

The powerful, versatile parallel pin electronics resources of 3650 can simultaneously perform identical parametric tests on multiple pins. The 3650 integrates 64 digital pins onto one single LPC board. In each LPC board, it contains 16 high performance Chroma PINF ICs which supports 4 4 channels timing generator. The integration of local controller circuitry manages resources setup and result readout, and therefore cuts the overhead time of the system controller. With the any-pin-to-any-site mapping design, 3650 provides up to 32 sites high throughput parallel testing capabilities to enlarge the mass production performance with more flexible and easy layout.



64 channel Digital Pin Card

### Flexibility

The semiconductor industry is a fast moving one, and capital equipment must be built to outlive several device generations and applications. With varieties of available options, such as AD/DA converter test, ALPG for memory test, high voltage PE, multiple scan chain test, VI45 & PVI100 analog options, Chroma 3650 makes sure that it will serve you for years to come.

Moreover, Chroma 3650 platform architecture allows development of focused instruments by third-party suppliers that can be easily added for specific applications. It can stretch the boundaries of test by covering a broader range of devices than ever before possible in a low-cost production test system.

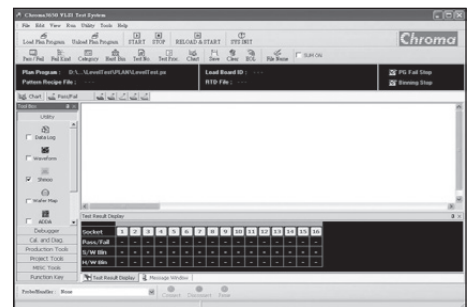


CP Docking Solution for other Tester Platform

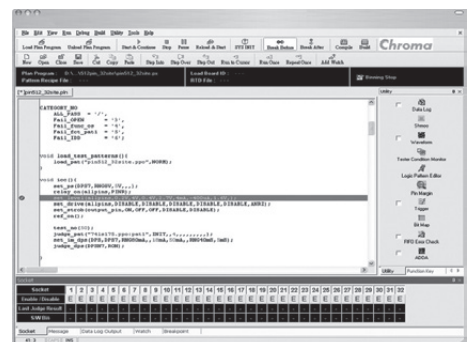
### Powerful suite of software tools – CRISP

The 3650 features the powerful suite of software tools using Chroma Integrated Software Platform, CRISP. Not only provides the rapid test development function, CRISP covers all needs for test debugging, production and data analysis. The CRISP integrates the software functions of test development, test execution control, data analysis and tester management together. Based on the Microsoft Windows XP® operation system and C++ programming language, CRISP provides the powerful, easy-to-use, intuitive, and fast-runtime GUI tools for users. In the Project IDE tool, test developer can easily shift between standard template, user-defined template and C++ code-based editor to create their test program quickly and automatically scale to multi-site for parallel test. Besides, CRISP also provides the test program and test pattern converters to facilitate the test conversion from other tester platforms to 3650.

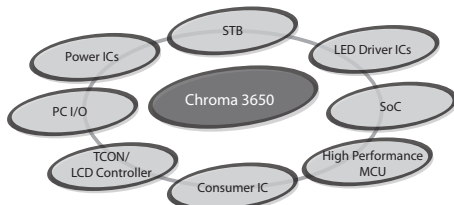
For the test program execution controller, user can select the System Control tool or Plan Debugger tool for normal mode or debugging mode. In the Plan Debugger tool, user can control the execution of test program by setting break point, step, step-into, step-over, resume execution, variable-watch and variable-modify, etc. For the test debugging and data analyzing purposes, 3650 provides abundant software utility tools. Datalog, Waveform and Scope tools are designed to support the measured data and digital waveform display. To find the parametric margin, SHMOO and Pin Margin tools can easily accomplish debug

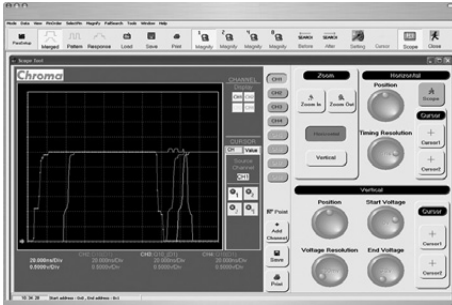


System Control

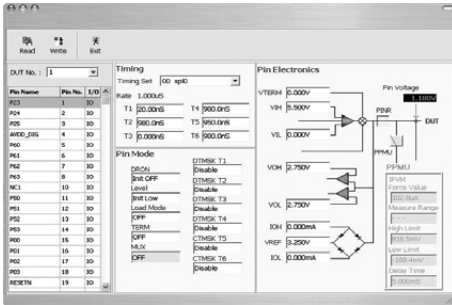


Test Program Debugger





Scope Tool



Channel Debugger

by auto-mode or manual-mode execution. Besides, the Wafer Map, Summary, Histogram and STDF tools are very helpful and powerful for collecting the test results and analyzing the parametric characterization. As for the Test Condition Monitor and Pattern Editor tools, they provide the superior functions for run-time debugging to change the test conditions or pattern data without breaking the test or modifying the source files. Besides, CRISP also prepares the ADDA tool and Bit Map tool for the analog and ALPG option. Using the ADDA tool, user can not only see the AD/DA test result by graphic tool, user can also create the ADC pattern easily. The full suite of powerful GUI tools will definitely meet the various purposes for test debugging and test report.

The OCI tool is the solution of CRISP for mass production. Easy-and-correct operation is the most important request for production run. Programmer can customize the setup of OCI tool by the Production Setup tool to meet the production environment requirement in advance. Then, what an operator has to do is just to select the planned process to start the mass production.

### Peripheral

The 3650 provides multiple drivers for communications with handler and prober by GPIB and TTL interface. The supported handlers or probers include SEIKO-EPSON, SHIBASOKU, MULTITEST, ASECO, DAYMARC, TEL, TSK and OPUS II, and so forth. In addition to provide the convenient converter tools for test platform migration, 3650 provides the adaptor board solution for existed tester platform to save the cost of users. Through the adaptor board solution, Chroma 3650 can accept the DIB and probe card of other testers directly to save the cost for making the new load boards and probe cards.

### Small footprint

With the air-cooled and small footprint tester-in-a-test-head design, 3650 delivers high throughput in a highly integrated package for minimum floor space. A mainframe cabinet contains the power distribution units and the space for third-party instruments. With an optional manipulator, 3650 can be used in both package and wafer test.

### Application support

Chroma offers the application support solutions to its new and established customers to accurately meet user needs. On request Chroma can provide customized support designed around your specific needs. Whether you need ramp up production, want to capitalize on emerging market opportunities, enhance productivity, lower testing costs with innovative strategies, Chroma worldwide customer support staff is committed to generate timely and efficient solution for you.

SPECIFICATIONS	
<b>Model</b>	<b>3650</b>
Clock Rate	50 / 100Mhz; 200Mhz (MUX mode)
Data Rate	50 / 100Mbps; 200Mbps (MUX mode)
Pattern Memory Size	16 / 32M (Option)
Overall Timing Accuracy	± 550ps (Window), ± 450ps (Edge)
Software / Programming Language / OS	CRISP/ C++ / Windows XP
<b>Pin Electronics Board</b>	<b>LPC</b>
IO Channels	64-pin / Board X 8 Boards / System
Vector Depth	16 / 32M per pin
Drive VIL / VIH	-2 ~ +6V / -1.9 ~ +7V
Maximum Driver Current	50mA (static) / 100mA (dynamic)
Comparator VOL / VOH	-2 ~ +7V
Compare Modes	Edge, Window
EPA (Drive / IO / Compare)	± 300ps / ± 300ps / ± 300ps
Dynamic Load Current	± 35mA
Timing Sets	32 sets per pin
Timing Edges	6 (2 Drive, 2 Drive & IO, 2 Compare)
Rate / Edge Resolution	125 / 62.5ps
Waveform Sets	32 sets per pin
Waveform Format	4096 Timing-Waveform Combination Changes on-the-fly
Utility Pin Relay Control	64 (8 / Board), 128 bit relay board option available
PPMU/Frequency Measurement Unit (OSC)	per pin
<b>DUT Power Supply</b>	<b>DPS</b>
Channels	16-CH / Board X 2 Boards / System
Voltage Range	± 8V, ± 16V
Maximum Output Current	0.8A / 1-CH
Current Gang Channels	8
<b>Precision Measurement Unit</b>	<b>PMU</b>
Channels	2-CH / Board X 8 Boards / System
Voltage Range	± 2.5V, ± 8V, ± 16V
Current Range	± 800nA ~ ± 250mA
<b>Options</b>	
<b>ADDA</b>	
Channels	1 ADDA CH / LPC or 32 CH HD-ADDA / board
AWG / Digitizer	per channel
Resolution / Max. Conversion Rate	ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz
Voltage Range	± 2.5V / ± 4.5V / ± 9V
<b>Algorithm Pattern Generator (ALPG)</b>	X = 16, Y = 16 / D = 16
<b>Scan</b>	1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 / 2048M scan depth
<b>VI45</b>	
Channels	8 ~ 32-CH / Board
Voltage / Current Range	± 45V / ± 100mA
Current Ganged Channels	4 buses for 8 channels, x2 - x8, 800mA max
TMU	per channel
<b>PVI100</b>	
Channels	2 ~ 8-CH / Board
Voltage / Current Range	± 100V / ± 2A, ± 50V / ± 4A
Current Ganged Channels	x2 - x8, 32A max
TMU	per channel
<b>MRX</b>	<b>Mixed Resource BoX</b>
No of slots	10 slots per chassis (max 2 chassis)
Instruments	PXI-based instruments
<b>System and Dimension</b>	
Power Consumption	5.5KW / forced air cooling
Test Head Dimension (L X W X H)	800 X 744 X 612 mm
Mainframe Dimension (L X W X H)	850 X 850 X 1680 mm



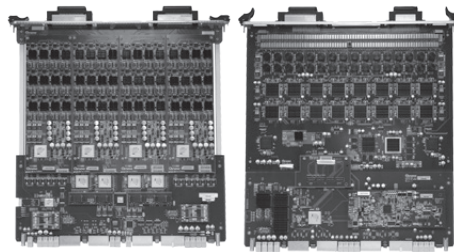


## Flexibility

Semiconductor manufacturing is a fast moving industry; more and more devices are highly integrated with various functions. Capital equipment must be built to outlive several device generations and applications. With varieties of available options, such as AD/DA converter test, ALPG for memory test, high voltage PE, multiple scan chain test, VI45 & PVI100 analog test options and HDADDA mixed-signal test options, Chroma 3650-EX can provide a wide coverage for customer to test different kind of devices with flexible configurations. Moreover, Chroma 3650-EX platform architecture allows development of focused instruments by third-party suppliers that can be easily added for specific applications. It can stretch the boundaries of test by covering a broader range of devices than ever before possible in a low-cost production test system.

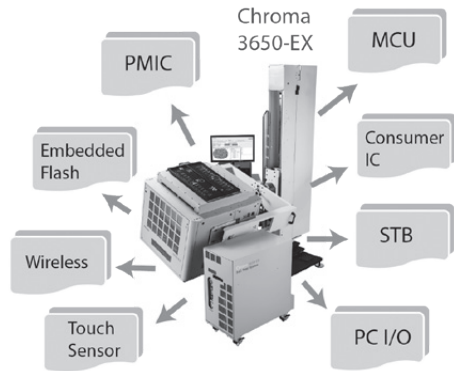
## KEY FEATURES

- 10 interchangeable slots for digital, analog and mixed-signal applications
- 50/100 MHz clock rate, 100/200 Mbps data rate
- Up to 512 sites parallel test
- Up to 1024 digital I/O pins
- 32/64 MW vector memory
- Up to 32 CH PMU for high precision measurement
- Per-pin timing/ PPMU/ frequency measurement
- Scan features to 4G depth / 32 scan chains
- ALPG option for memory test
- Switching timing accuracy  $\pm 300$ ps
- Up to 64 CH high-voltage pins
- 96 CH high density DPS
- 32 CH HDADDA mixed-signal option
- 8~32 CH VI45 analog option
- 2~8 CH PVI100 analog option
- MRX option for 3rd party PXI/PXIe applications
- Microsoft Windows® 7 OS
- C++ and GUI programming interface
- CRISP, full suite of intuitive software tools
- Test program and pattern converters for other platforms
- Accept DIB and probe card of other testers directly
- Support STDF data output
- Air-cooled, small footprint tester-in-a-test-head design



128-Channel Logic Pin Card

48-Channel High Density Device Power Supply



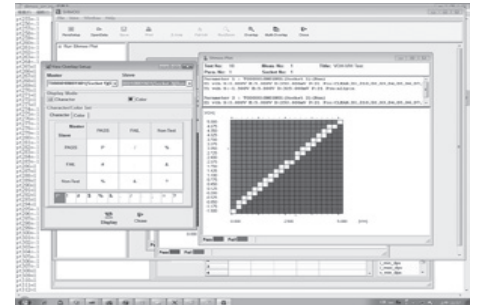
## Powerful suite of software tools – CRISP

3650-EX features the powerful suite of software tools using Chroma Integrated Software Platform(CRISP). Not only provides the rapid test development function, CRISP covers various tools for test debugging, production and data analysis. CRISP integrates software functions of test program development, test execution control, data analysis and tester management together. Based on the Microsoft Windows 7® operation system and C++ programming language, CRISP

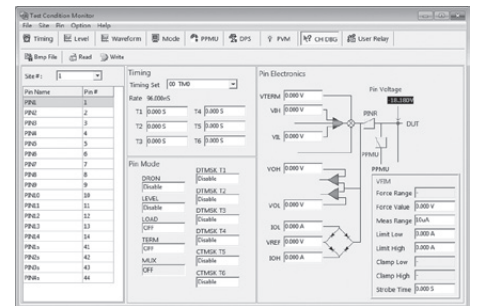
## High parallel test capability

The powerful, versatile parallel pin electronics resources of 3650-EX can simultaneously perform identical parametric tests on multiple pins. 3650-EX integrates 128 digital pins into one slot. In each LPC board, it contains high performance Chroma PINF ICs which supports timing generation. The integration of local controller circuitry manages resources setup and result readout, and therefore cuts the overhead time of the system controller. With the any-pin-to-any-site mapping design, 3650-EX provides up to 512 sites high throughput parallel testing capabilities to enlarge the mass production performance with more flexible and easy layout.

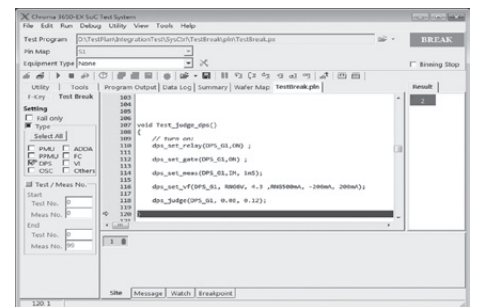
provides the powerful, easy-to-use, intuitive, and fast-runtime GUI tools for users. In the Project IDE tool, test developer can easily shift between standard template, user-defined template and C++ code-based editor to create their test program quickly and automatically scale to multi-site for parallel test. Besides, CRISP also provides the test program and test pattern converters to facilitate the test conversion from other tester platforms to 3650-EX.



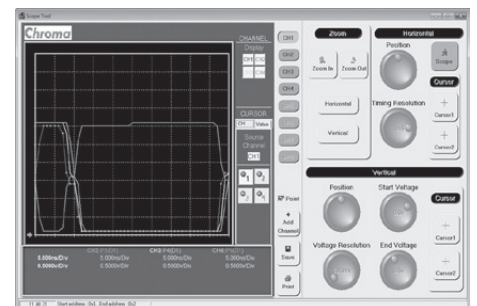
Shmoo tool



TCM tool



System Control



Scope Tool

### Chroma 3650-EX brings you the most cost-effective SoC tester

Chroma 3650-EX is specifically designed for high-throughput and high parallel test capabilities to provide the most cost-effective solution for fabless, IDM and testing houses. With the full functions of test capability, high accuracy, powerful software tools and excellent reliability, 3650-EX is ideal for testing consumer devices, high-performance microcontrollers, analog devices and SoC devices.

### From design to production

Chroma 3650-EX build-in MRX solution can support PXI instrumentation which can provide users wider coverage to different kind of applications. For those users use PXI instrumentation for their design validation and verification, they can move PXI instrumentation directly to 3650-EX for production. There will be less uncorrelated issues happened on design stage and production by using the same PXI instrumentation. Chroma 3650-EX had successfully integrated several PXI solutions like Audio, Video and RF applications not only on hardware integration, also for build-in libraries and tools in software to help users control PXI instrumentation more easily and enable accelerated test program development, reducing product time to market.

SPECIFICATIONS	
<b>Model</b>	<b>3650-EX</b>
Digital IO Channels	1024 Channels
Test Speed	50/100MHz (2/4 Edges), 200MHz (Mux)
Multi-site Test Capability	Maximum 512 sites
Software / Programming language/ Operating System	CRISP / C++ / WINDOWS 7
<b>Logic Pin Card</b>	<b>HDLPC</b>
IO Channels	64 / 128 CH per board
Pattern Memory	32 / 64M vector Depth
Drive VIL / VIH	-1.5 ~ +6.4V/-1.4 ~ +6.5V
Maximum Drive Current	50mA (static) / 100mA (dynamic)
Comparator VOL / VOH	-1.5 ~ +6.5V
Comparator Modes	Edge, Window
EPA (Drive / IO / Compare)	±300ps / ±300ps / ±300ps
Dynamic Load Current	±25mA
High Voltage Driver	4 channels per 64 IO / 0V ~ 15V, maximum 64 CH per system
Timing Edges	6 (2 Drive, 2 Drive & IO, 2 Compare)
Rate / Edge resolution	125ps / 62.5ps
Utility Pin Control	8 utility bits per 64 IO, maximum 128 bits per system
SCAN	1 / 2 / 4 / 8 / 16 / 32 scan chains, maximum 4G depth
Algorithm Pattern Generator (ALPG)	X = 16, Y = 16 / D = 16
<b>Precision Measurement Unit</b>	<b>PMU</b>
Number of channels	2 CH per 64 IO / maximum 32 CH per system
Voltage Range	±2.5V, ±8V, ±16V
Current Range	±800nA ~ ±250mA
<b>Device Power Supply</b>	<b>HDDPS</b>
Number of channels	48 CH per board / maximum 96 CH per system
Voltage Range	±6V, ±12V
Maximum Output Current	1A / 6V, 500mA / 12V
Current Gang Channels	x2 ~ x6, Maximum 6A
<b>Mixed-signal options</b>	<b>HDADDA</b>
Number of channels	32 CH per board / maximum 64 CH per system
Sampling Rate	500 KHz
Resolution	16 Bit
Voltage Range	±2.5V / ±4.5V / ±9V
<b>Analog Options</b>	<b>VI45</b>
Number of channels	8~32 CH per board
Voltage / Current Range	±45V / ±100mA
Current Ganged Channels	x2 ~ x8, 800mA maximum
AWG / DVM / TMU	1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU
<b>Analog Options</b>	<b>PVI100</b>
Number of channels	2~8 CH per board
Voltage / Current Range	±100V / ±2A, ±50V / ±4A
Current Ganged Channels	x2 ~ x8, 32A maximum
AWG / DIG / DVM / TMU	2~8 CH AWG / 2~8 CH DIG / 2~8 CH DVM / 2~8 CH TMU
<b>Mixed-signal and RF Box</b>	<b>MRX</b>
Number of slots	18 PXI / PXIe compatible slots
<b>System and Dimension</b>	
Power consumption / Cooling	Maximum 10.8KW / Forced air cooling
Test Head Dimension (L x W x H)	800 x 744 x 806 mm
Mainframe 2 Dimension (L x W x H)	680 x 352 x 730 mm



Semiconductor manufacturing is a fast moving industry; more and more devices are highly integrated with various functions. Capital equipment must be built to outlive several device generations and applications. Chroma 3680 can provide a wide coverage for customer to test different kind of devices with flexible configurations.

Chroma 3680 is specifically designed for high-throughput and high parallel test capabilities to provide the best solution for fabless, IDM and testing houses. With the full functions of test capability, high accuracy, powerful software tools and excellent reliability, Chroma 3680 is ideal for testing consumer devices, high-performance microcontrollers, analog devices and SoC devices.

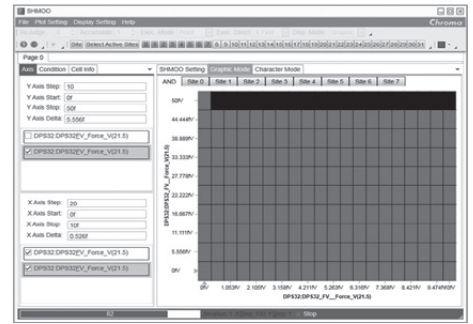
### KEY FEATURES

- 25 interchangeable slots for digital, analog and mixed-signal applications
- 250 Mbps up to 1Gbps data rate
- Up to 512 sites parallel test
- Up to 2048 digital I/O pins
- 256 MW vector memory (512 MW option)
- Up to 32 CH PMU for high precision measurement
- Per-pin timing/ PPMU/ frequency measurement
- Scan features to 16G depth/scan chains
- Switching timing accuracy  $\pm 150$ ps
- Up to 128 CH High density DPS32
- High density HDADDA2 mixed-signal option\*
- High density HDVI analog option\*
- Efficient high power HCDPS analog option\*
- High performance HDAVO option\*
- Microsoft Windows 10 OS
- C#.NET and GUI programming interface
- CRISPro, full suite of intuitive software tools
- Test program and pattern converters for other platforms
- Accept DIB and probe card of other testers directly
- Support STDF data output and customized data format
- Air-cooled, small footprint tester-in-a-test-head design

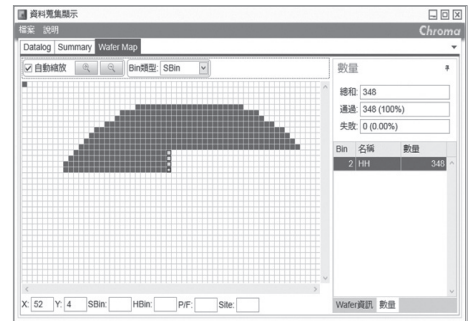
\* Call for availability

### APPLICATIONS

- Microcontroller Unit (MCU)
- Digital Audio
- Digital TV (DTV)
- Set Top Box (STB)
- Digital signal processing (DSP)
- Network Processor and Field Programmable Gate Array (FPGA)



Shmoo Tool



Wafer Diagram Tool

SPECIFICATIONS	
<b>Model</b>	<b>3680</b>
Digital IO Channels	2048 Channels
Date Rate	250Mbps, up to 1Gbps
Multi-site Test Capability	512 sites
Software	CRISPro
Programming language	C#.NET
Operating System	Windows <sup>®</sup> 10
Logic Pin Card	LPC128
IO Channels	128 CH per board
Pattern Memory	256 / 512M(option) vector depth
Drive VIL / VIH	-1.5 ~ +6.4V/-1.4 ~ +6.5V
Maximum Drive Current	50mA (static) / 100mA (dynamic)
Comparator VOL / VOH	-1.5 ~ +6.5V
Comparator Modes	Edge, Window
EPA (Drive / IO / Compare)	$\pm 150$ ps / $\pm 150$ ps / $\pm 150$ ps
Dynamic Load Current	$\pm 25$ mA
External High Voltage Driver	8 CH per 18V, maximum 192 CH per system
High Voltage Driver	13.5V, 32 CH per instrument board
Timing Edges	6
Rate / Edge resolution	50ps / 12.5ps
Utility Pin Control	8 utility bits per 64 IO, maximum 256 bits per system
SCAN	1 / 2 / 4 / 8 / 16 / 32 scan chains, maximum 16G depth
Precision Measurement Unit	PMU
Number of channels	1 CH per 32 IO
Voltage Range	$\pm 2.5$ V, $\pm 8$ V, $\pm 24$ V
Current Range	$\pm 800$ nA ~ $\pm 250$ mA
Device Power Supply	DPS32
Number of channels	32 CH per board / maximum 128 CH per system
Voltage Range	-6V~+6V, -6V~+12V
Maximum Output Current	1A / 6V, 500mA / 12V
Current Gang Channels	x2 ~ x32, Maximum 32A
System and dimension	
Power consumption / Cooling	14.4KW / Forced air cooling
Test Head Dimension (L x W x H)	900 x 744 x 706 mm
Mainframe Dimension (L x W x H)	802 x 596 x 1018 mm

### ORDERING INFORMATION

**3680** : SoC/Aanlog SoC/Analog Test System



# Full Range Active Thermal Control Handler Model 3110-FT



## KEY FEATURES

- Temperature Test from -40~125°C
- Final Test
- 3x3 mm~45x45 mm Package
- Contact Force Control 1~10 kg (Optional)
- Up to 4 Output Trays
- Remote Control Operation
- Yield Monitor
- Intelligent Auto Retest & Auto Retry
- Real-time Tray Status

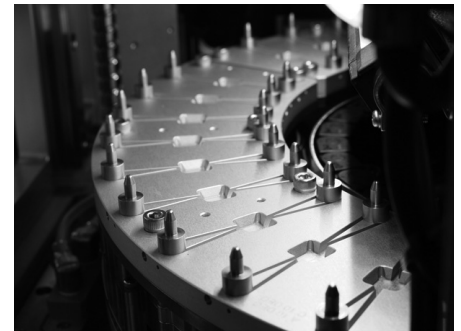
Ideal for characterization and test development, the Chroma 3110-FT is an innovative pick & place system for IC testing in Final Test. The system is capable of handling a vast variety of device types and sizes ranging from 3x3 mm to 45x45 mm. To further increase productivity, the 3110-FT offers an optional remote control function allowing operation of the handler from any location with an internet connection. Equipped with 2 auto output tray stacks and 2 manual output trays, the 3110-FT will maximize the loading and unloading capacity to save cost and time all within a 1.4 m<sup>2</sup> floor space.

The 3110-FT can be configured to support virtually any industry standard communication interface and provide different docking options for various testers. It is also capable of supporting thermal test environments from -40°C to 125°C which will insure the durability of the devices. With a user-friendly graphic interface and quick device change setup, changeover is short and easy further increasing flexibility and productivity.

SPECIFICATIONS	
Model	3110-FT
Dimensions (WxDxH)	1000 mm x 1350 mm x 1900 mm (signal tower excluded)
Weight	900 kg
Facility	Power : AC200V, Single Phase, 50/60Hz, 8.8 KVA Max. Compressed Air : 0.5 MPa or higher (dry and clean air) Flow Rate : 800 L/min, constant supply
Applicable Device	Type : QFP, SOP, TSSOP, QFN, BGA Package Size : 3x3 mm to 45x45 mm Package Height : 0.5 mm to 5 mm Lead / Ball pitch : 0.5 mm / 0.4 mm and above
Category	4 categories (2 auto, 2 manual)
Contact Method	Direct Contact / Drop and Press
Contact Force	50 kgf (standard) 1 to 10 kgf, ±10% (optional)
Temperature Range	-40~125°C (contact head accuracy ±2°C, Pre-soak and Post-recovery buffer accuracy ±10°C)
Rotator	±90°
Interface	Standard : RS-232, TCP/IP Option : GPIB, TTL
Index Time	6 sec. (Excluding tester communication time)
Jam Rate	1/3,000



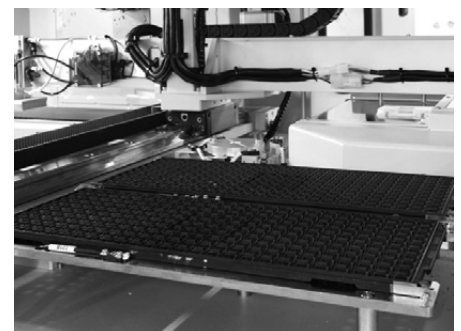
Loading



Pre-soak and Post-recovery



Rotator



Binning

## ORDERING INFORMATION

**3110-FT** : Full Range Active Thermal Control Handler





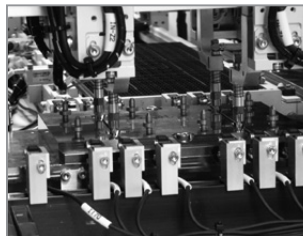
## KEY FEATURES

- 9K pcs throughput ( Model 3160 / 3160A )
- Flexible array test and fingerprint pattern test (Model 3160F)
- 1~10 Kgf miniature contact force (Model 3160F)
- In line 1 x 4 flexible DUT configuration (Model 3160 / 3160F )
- In line 1 x 4 & matrix 2 x 2 flexible DUT configuration (Model 3160A)
- Motor arm Z (Model 3160A)
- Side knock cylinder (Model 3160A)
- Auto empty (option) (Model 3160A / 3160F)
- Programmable pitch probes
- Side mount available
- Programmable pneumatic air damper control to reduce contact force impact
- Intelligent shuttle IC leftover check
- Yield monitor (individual contact head)
- Universal change kits
- ESD enhanced

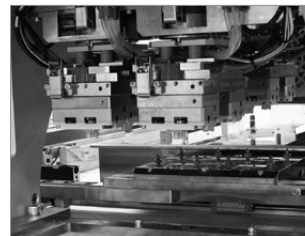
The Chroma 3160/3160A/3160F handler is a productive pick and place system for high volume multi-site IC testing. Saving floor space, time and cost, the 3160 Series handler can increase production productivity and efficiency with its innovative design. The system is configurable for single, dual or quad test sites.

The Chroma 3160/3160A/3160F are also capable of handling various package sizes and types then bin them according to customers' specified test results. The 3160 series system has a reliable handling mechanism, is compatible with standard conversion kits and has a streamlined automation sequence, which results in high throughput with low jam rate. Its precisely adjustable contact force, fine alignment positioning and various device sensors also reduces unexpected device damage and helps extend test socket lifetime while maintaining or increasing production yields.

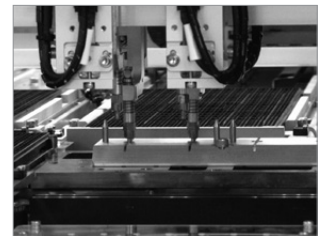
SPECIFICATIONS			
Model	3160	3160A	3160F
Dimension (W x D x H)	1700 x 1300 x 2000 mm	1800 x 1380 x 2050 mm	
Weight	Approx. 900 kg	Approx. 1,200 kg	
Facility	Power : AC 220, 50 / 60 Hz single phase, 10 KVA max. Compressed air : 0.5 MPa or more (dry & clean air), Consumption 120 l/min., constant supply		
Applicable Device	Package carried on type : BGA, QFP, CSP, PLCC, TSOP, PGA, etc. Package size : 3 mm x 3 mm to 50 mm x 50 mm		Type : BGA, QFP, CSP, QFN, Flip chip, TSOP, etc. Package size : 3 mm x 3 mm to 25 mm x 25 mm
Contact Mode	Direct Contact / Drop and Press		
Interface	Standard : TTL Option : GPIB, RS232	Standard : TTL x 2 & GPIB x 1 Option : RS232, TCP/IP	
Multiple Site (4 sites)	In line : 1 x 4, pitch X = 40 mm	In line : 1 x 4, pitch X = 40/57.15/60 mm Matrix : 2 x 2, pitch XY = 57.15 x 63.5/80x60 mm	In line : 1 x 4, pitch X = 40 mm
Contact Area	Test head area : 550 mm (from socket center) Socket mounting height : 1,000 mm (1,100 mm option)	Test head area : 600 mm (from socket center) Socket mounting height : 1,100 mm (1,200 mm option)	
Index Time (excluding tester communication time)	0.4 sec.	0.38 sec.	2.5 sec.
Jam Rate	1/8,000	1/10,000	1/8,000
Applicable Tray	JEDEC		
Category	6 categories (3 auto, 3 manual)		
Contact Force (accuracy ± 1 kgf)	50 kgf	80 kgf	1~10 kgf
Temperature	Operating mode : ambient		
High Temperature (option)	Operating mode : 40°C~ 150°C (heating time : within 30 min.) Accuracy : contact head ± 3°C, pre-heater ± 5°C		
SOCKET CCD (option)	--	CCD checks socket and prevents double stack of parts in the socket	--
Fingerprint pattern generator	--	--	Array testing Fingerprint pattern testing



Loading



Test Site



Unloading

## ORDERING INFORMATION

- 3160** : Quad-site FT Test Handler
- 3160A** : Quad-site FT Test Handler
- 3160F** : Fingerprint FT Test Handler



Model 3160A



## KEY FEATURES

- Advance thermal technology (Nitro TEC)
- Faster index time 0.6 sec
- Active thermal control and full range temperature
- Chamber less design
- Support multiple sites (Single, Dual or Quad test sites)
- Simple, quick kit changeover

## Nitro TEC Thermal Technology

Chroma releases new thermal solution "Nitro-TEC thermal technology" which is a combination of Nitrogen and TEC control system. Comparing to traditional LN2 cooling system, Nitro-TEC thermal technology brings the below advantages to user.

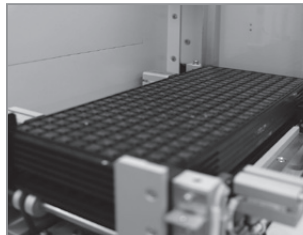
- ATC control system with better temperature accuracy during testing
- Allows customer switch Hot and Cold temperature test quickly
- Soaking room with liquid nitrogen to pre-cool device efficiently
- Shorten the down time, when maintaining handler or exchanging kits
- Less LN2 consumption

Chroma 3160C Handler is productive pick & place system for high volume multi-site IC testing. It is capable of handling various package types of device and supports Single, Dual or Quad test sites. The reliable handling mechanism and functionality outfit leads to high throughput and low jam rate. Chroma 3160C can increase production productivity and efficiency and shorten the time of exchanging kits. The system come with Active Thermal Control (ATC) System to test the DUT -40°C to 125°C.

SPECIFICATIONS	
<b>Model</b>	<b>3160C</b>
Dimension (W x D x H)	2,300 mm x 1,850 mm x 2,100 mm
Weight	Approx. 1,650 kg
Facility	Power : AC220, 50/60 Hz single-phase, 10 KVA max. Dry air : -70°C dew point, 0.5 Mpa, 1,200 L/min. LN2 source : 0.35Mpa (50 Psi), consumption 0.6 kg/min.
Applicable Device	Type : BGA, QFP, CSP, QFN, Flip chip, TSOP, etc. Package size : 3 mm x 3 mm to 50 mm x 50 mm (Ball pitch > 0.35mm)
Contact Mode	Direct contact / drop and press
Interface	Standard : TTL & GPIB Option : RS-232, TCP/IP
Multiple Site	Dual sites : 1 x 2 (80 mm) Qual sites : 1 x 4 (40 mm) Qual sites : 2 x 2 (80 x 60 mm)
Contact Area	Test Head Area : 600 mm (from socket center) Socket mounting height : 1,100 mm (1,200 mm option)
Index Time	0.6 sec. (excluding tester communication time), max. uph up to 3,200 at zero test time
Rotation Function (option)	± 90°, ± 180°
Jam Rate	1/5,000 for ambient / hot / cold temperature mode
Category	7 categories (3 auto, 4 manual)
Contact Force	120 kgf
Thermal Range	Temperature range : -40°C to 125°C before contact Test head : set-point ± 3°C before contact Pre-soak buffer and input shuttle : set-point ± 5°C before contact
Coolant	Non-conductive, 3M Novec thermal fluid
Changeover Time of Change Kit	15 mins

## ORDERING INFORMATION

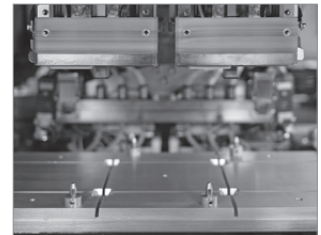
**3160C** : Tri-Temp Quad Sites Test Handler



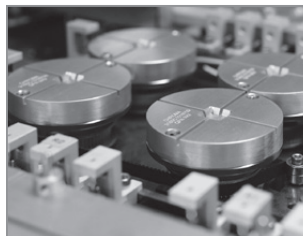
Auto tray load / unload



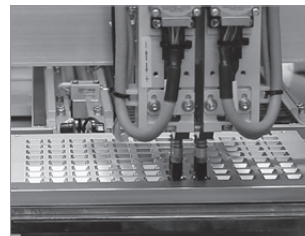
Pre-soak



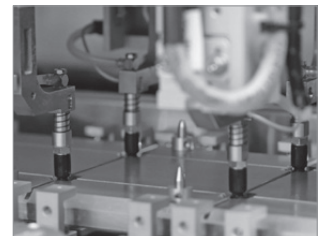
Test head



Rotator



Defrost



Programmable probe



### KEY FEATURES

- Up to x8 Parallel Test Sites
- Up to 9000 UPH
- Flexible Test Site Configuration
- Dampened Contact Force
- Contact Force Auto Learning
- 3x3 mm ~ 50x50 mm Packages
- Temperature Test from Ambient ~ 150 °C
- Intelligent Auto Retest & Auto Retry
- Yield Monitor

The Chroma 3180 Handler is a productive pick & place system for high volume multi-site IC testing. Saving floor space, time and cost, the 3180 can increase production productivity and efficiency with its innovative design. The system is configurable for single, dual, quad or octal test sites and can be upgraded to test the DUT up to 150 °C.

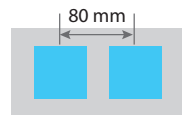
The Chroma 3180 is also capable of handling various package sizes and types then bins them according to customer specified test results. The system has a reliable handling mechanism, is compatible with standard Conversion Kits and has a streamlined automation sequence, which results in high throughput with low jam rate. Its precisely adjustable contact force, fine alignment positioning and various device sensors also reduces unexpected device damage and helps extend test socket lifetime while maintaining or increasing production yields.

SPECIFICATIONS	
<b>Model</b>	<b>3180</b>
Dimension (WxDxH)	1860 mm x 1380 mm x 2050 mm
Weight	Approx. 1300 kg
Facility	Power : AC220, 50/60 Hz Single-Phase, 10 KVA Max. Compressed Air : 0.5 MPa or higher (dry and clean air) Flow Rate : 120 L/min., constant supply
Applicable Device	Type : BGA, QFP, CSP, QFN, Flip chip, TSOP, etc. Package Size : 3 mm x 3 mm to 50 mm x 50 mm *
Contact Mode	Direct contact / Drop and Press
Interface	Standard : TTL, GPIB Option : RS232, TCP/IP
Multiple Site	Octal Sites (4x2) Matrix Quad Sites (2x2) In-line Quad Sites (4x1)
Contact Area	Test Head Area : 600 mm (from socket center) Docking Height : 1100 mm (1000/1200mm option)
Index Time	0.4 sec (excluding tester communication time)
Jam Rate	1/10,000
Category	6 categories (3 auto, 3 manual)
Contact Force	Up to 120 kgf
Mounting Type	Direct mount / Side Mount
Applicable Tray	JEDEC
Throughput (Max.)	Up to 9000 UPH (Illustrated by BGA 4x6, 20x37 tray matrix)
High Temperature (Option)	Operating Range : ~ 150°C (Heating time < 30 min.) Accuracy : Contact Head $\pm 3^\circ\text{C}$ , Pre-heater $\pm 5^\circ\text{C}$

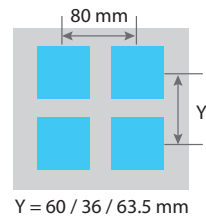
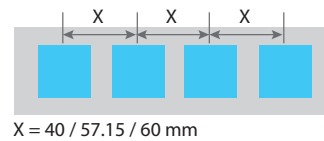
\* Maximum package size may vary due to test site pitch

### TEST SITE CONFIGURATION

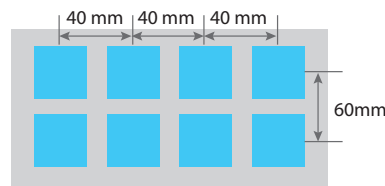
#### Dual-site



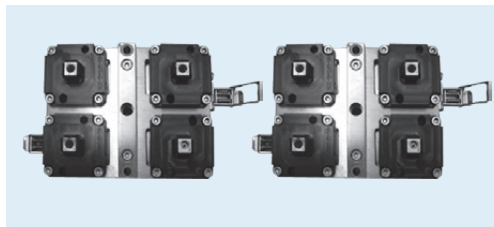
#### Quad-site



#### Octal-site



### KIT CONFIGURATION



Quick Fit Kit (standard)

### ORDERING INFORMATION

**3180** : Octal-site FT Test Handler



### KEY FEATURES

- Cost-effective Integrated RF Solution
- Customized RF Isolation Chamber with Integrated Tester Docking
- Up to 120 mm Test Site Pitch
- Up to x8 Parallel Test Site
- 3x3 mm ~ 45x45 mm Package
- Precise Positioning
- Compatible with JEDEC and EIAJ tray

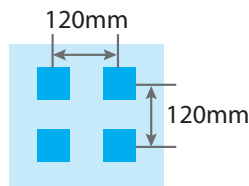
The Chroma 3240-Q is a unique and innovative handler with integration of RF/Wireless isolation chamber. The system is configured for up to octal-site with individual isolation for true parallel test. With a streamlined automation sequence, precise Pick & Place system, flexible test site configuration, high throughput and low jam rate, the 3240-Q is ideal for RF/Wireless production test.

The Chroma 3240-Q is also capable of handling various package sizes and types, accurately binning according to customer specified test results. With automatic Input/Output tray stacks, the 3240-Q can accommodate both JEDEC and EIAJ tray standards. Optional temperature control extends the test capability to provide high temperature testing up to 150°C.

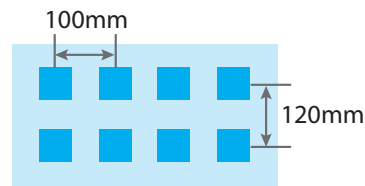
SPECIFICATIONS	
<b>Model</b>	<b>3240-Q</b>
Dimension (WxDxH)	1360 mm x 1390 mm x 1930 mm
Weight	900kg
Facility	Power : AC200V, Single phase 50/60Hz, 10 KVA Max. Compressed Air : 0.5 MPa or higher (dry and clean air) Flow Rate : 150 L/min, constant supply
Applicable Device	Type : CSP, BGA, Gull Wing Package Package Size : 3 mm x 3 mm to 40 mm x 40 mm Package Height : 0.5 mm to 5 mm Lead / Ball pitch : 0.5 mm / 0.4 mm and above
Category	3 categories (1 auto, 2 manual)
Applicable Tray	JEDEC or EIAJ
Index Time	4 sec.
Contact Method	Direct Contact / Drop and Press
Contact Force	Up to 50 ± 1 kgf
Test Site Configuration	4 sites, 2x2, Pitch X = 120 mm, Y = 120mm 8 sites, 4x2, Pitch X = 100 mm, Y = 120mm
PCB Same Site Isolation	-63dB
PCB Different Site Isolation	-91.5dB
Chamber Far Field Isolation	2.4GHz : -80dB @ Distance >250mm (=2*λ2.4GHz)
Jam Rate	1/5,000
Interface	GPIO
Hot Temperature (Option)	Operating Range : Ambient ~ 125°C (Heating Time < within 30 min.) Accuracy : Contact Head ± 3°C, Pre-heater ± 5°C

### TEST SITE CONFIGURATION

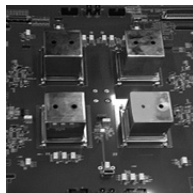
Quad-site



Octal-site



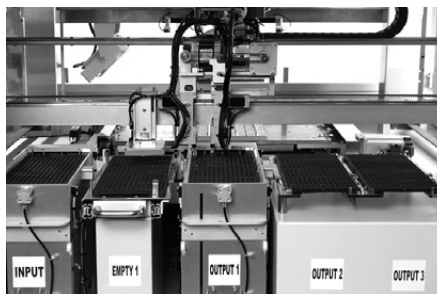
### RF CHAMBER ILLUSTRATIONS



Bottom Cover



Top Cover



Loading



Pre-alignment

### ORDERING INFORMATION

**3240-Q** : RF Solution Integrated Handler





### KEY FEATURES

- FT + SLT Handler – Two In One
- Perfect for Device Engineering Characterization Gathering and Analysis
- Auto Tray Load/unload & Device Sorting capability
- Without socket damage issue
- Air damper for good contact balance
- Shuttle remain IC check function
- Camera for real time system monitoring
- Optional Tri-temp IC test function (-55°C ~ 150°C)
- High power cooling function (option)
- Diskless download function (option)

Chroma 3110 is a single site pick & place IC handler which supports various types of package such as QFP, QFN, TSOP, BGA,  $\mu$ BGA and CSP, etc. The handler uses P & P technology to pick up devices from JEDEC trays, move them to the test site. The 3110 consists system level tests that are designed to fully exercise programs as a whole and check all integrated elements function properly. It is capable to handle tri-temperature test environment since ambient to thermal or low temperature.

In addition to the capability of handling 3x3mm to 55x55mm devices, the machine is equipped with 1 auto stacks and 2 manual bin plates to maximize the loading and unloading capacity. It features a user-friendly graphic user interface based on Windows system and also provides interfaces for docking with various testers.

### ORDERING INFORMATION

- 3110** : Hybrid Single Site Test Handler
- 3100-TT** : Tri-temp Control (option)
- 3100-A** : Active Thermal Control Module (option)
- 3100-P** : Unity Passive Thermal Control (option)
- 3100-C** : Cooling Pipe (option)

SPECIFICATIONS	
<b>Model</b>	<b>3110</b>
Dimensions (WxDxH)	900 mm x 1250 mm x 1800 mm (Signal Tower excluded)
Weight	75 0 kg
Facility	Power : AC 220V, 50/60 Hz Single-phase Maximum Power Consumption : 3.0KVA Max Controller Circuit: 1.0 KVA Max. Heater Circuit : 2.0 KVA (Option)
Compressed Air	Dry Air of 5.0 kg/cm <sup>2</sup> ( 0.49 Mpa ) or higher, constant supply
Applicable Device	Type : BGA series, $\mu$ BGA, QFP series, QFN, Flip-Chip, TSOP Package Size : 3 mm x 3 mm to 55 mm x 55 mm Depth : 0.5 mm to 5 mm Lead / Ball pitch : 0.4 mm / 0.5 mm and above
Interface	Standard : RS-232,TCP/IP Option : GPIB and TTL
Jam Rate	1/3000
Categories	4 Categories (128 bin signals for RS232)
Contact Force	80 kgf (Accuracy $\pm$ 1kgf), 125Kgf (Option)
Temperature	Operating Mode : Ambient
Tri Temp Control (Option)	Temperature Range : -40°C ~ 135°C $\pm$ 2°C (-55°C ~150 °C Option)
ATC Module (Option)	Temperature Range : Ambient ~ 135°C $\pm$ 2°C (150°C Option)
Unity PTC (Option)	Temperature Range : ~ 85 °C (up to 300W Heat Dissipation)
Cooling Pipe (Option)	Temperature Range : ~ 85 °C (up to 125W Heat Dissipation)
Advantage	ECD function (Easy-edit communication define) Single Movement Retest Contact pick and place system Yield control (Average yield of socket) Continue Fail
Option	Remote Control Rotation ( $\pm$ 90 degree) Auto Load / Unload : 1 input / 2 unload (with 2 manual unload) Fixed Load / Unload : 1 input / 4 unload

### Final Test Configuration



3110 with tester



3110 with tri-temp chamber & tester

### System Level Test Configuration



3110 with tri-temp chamber



3110 with module board

Chroma Thermal Control Solutions	Products	Capability	Configurations						
			Test Plug Design	Dry Air	Standalone Water Chiller	Chamber	TEC Controller	External Piping	
Active Thermal Control Solution	3100-TT	-55°C ~ 150 °C $\pm$ 2°C	Heat Exchanger+TEC (Peltier)	Yes	Yes	Yes	Yes	Yes	
	3100-A	Ambient ~ 135 °C $\pm$ 2°C	Water Chiller Cooling+TEC (peltier)	No	Yes	No	Yes	Yes	
			Closed-loop Liquid Cooling+TEC (peltier)	No	No	No	Yes	No	
Passive Cooling System	3100-P	~ 85°C (< 300W Heat Dissipation)	Closed-loop Liquid Cooling	No	No	No	No	No	
	3100-C	~ 85°C (< 125W Heat Dissipation)	Cooling Pipe	No	No	No	No	No	



## KEY FEATURES

- 600 mm (W) x 565 mm (D) x 800 mm (H)
- JEDEC trays (2)
- IC packages: 5x5 mm to 45x45 mm
- Software configurable binning
- Air damper contact
- Optimizes IC force balance
- Maximize test socket lifetime
- Double stack protection
- Continuous automated re-test

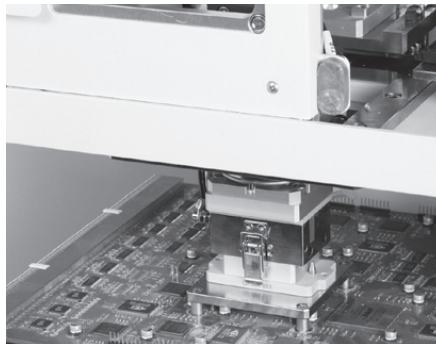
The Chroma 3111 Tabletop Single Site Test Handler is an automated Pick & Place system ideal for engineering and test development of IC System Level Testing (SLT). The 3111 system is capable of handling a vast variety of device types and sizes ranging from 5x5mm to 45x45mm.

To maximize productivity, the 3111 offers a remote function allowing handler control from any distant location through an internet connection. Equipped with two software allocatable JEDEC trays, the 3111 maximizes the engineering test capability saving cost and time, all within a 60 cm<sup>2</sup> table space. A user-friendly graphic interface (Windows™) system provides a quick and easy device setup, change or changeover simplifying the process and increasing efficiency.

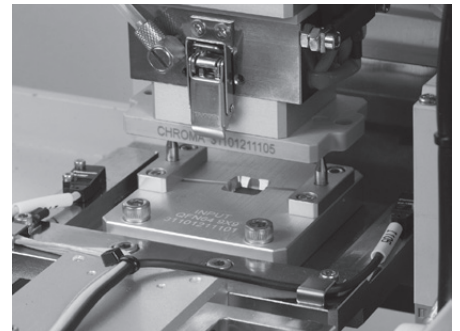


SPECIFICATIONS	
<b>Model</b>	<b>3111</b>
Dimension (WxDxH)	600 mm x 565mm x 800 mm (Signal Tower excluded)
Weight	Net Weight 80 kg
Facility	Power : AC 220V-240V, 50Hz/60Hz, single-phase,2.3kva Dry Air of 5.0 kg/cm <sup>2</sup> (0.49 MPa) or higher, constant supply
Device Type	Type: BGA series, _BGA, QFP series, QFN, Flip-Chip, TSO Package size : 5 mm x 5 mm to 45 mm x 45 mm Thickness : 0.5 mm to 5 mm Lead / Ball pitch : 0.4 mm / 0.5 mm and above
Test Site	Single site
Jam Rate	1/3000
Tray Classification	1 Category
Tray	JEDEC
Binning	128 software bins
Rotator	± 90 degree
Contact Force	10 kgf - 50 kgf ( ± 1kgf)
Contact Mode	Direct Contact / Drop and Press
Tester Interface	Standard : RS-232, TCP/IP Option : GPIB
Socket CCD (Option)	CCD checks socket to prevent double stack of parts in the socket

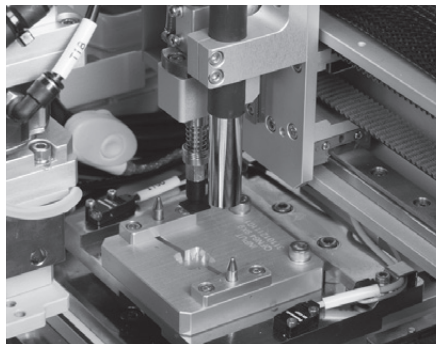
**Note 1** : 3111 alarm mail function is available by e-mail server setting



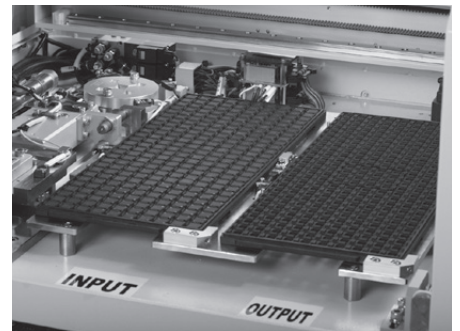
Test Site



Shuttle



Pin1 CCD



Category

## ORDERING INFORMATION

**3111** : Tabletop Single Site Test Handler



## KEY FEATURES

- Reliable high-speed pick & place handler
- Auto contact-force learning
- Gull wing package capability
- No socket damage
- Air damper for contact balance
- IC-in-socket protection
- NS-5000/6000 change kits compatible

Chroma 3240 is an innovative handler for high volume/multi-site IC testing at system level. It is capable of handling packages of various types including QFP, TQFP, BGA, PGA, etc. The handler uses pick and place technology to pick up devices from JEDEC trays, move them to the test site, then move them to the appropriate bin after test. It features a 90-degree device rotation which is required for various pin one orientations.

Chroma 3240 can test up to 4 devices in parallel at high temperature with ATC (Auto Temperature Cooling) ranging from 50°C to 125°C.



SPECIFICATIONS	
<b>Model</b>	<b>3240</b>
Dimension (WxDxH)	1640 mm x 1190 mm x 1774 mm (Excluding Signal Tower)
Weight	Net Weight 800kg
Facility	Power : AC 220V , 50/60 Hz Single-phase Maximum Power Consumption : 3.0 KVA Max Controller Circuit : 3.0 KVA Max. Heater Circuit : 1.0 KVAMax.
Compressed Air	Dry Air of 5.0 kg/cm <sup>2</sup> ( 0.49 Mpa ) or higher constant supply
Vacuum Source	Built-Diaphragm Vacuum Pump : Pumping Volume 100 L/min Ultimate Pressure : 100 Torr Max.
Applicable Device	Package Type : BGA series , $\mu$ GA, PGA, QFP series, CSP, BCC, QFN , Flip-Chip , TSOP Package size : 7 mm x 7 mm to 40 mm x 40 mm Depth : 0.9mm to 5mm Lead / Ball pitch : 0.4mm / 0.5mm and above Weight : 0.2g to 20g
Multiple Testing Layout	4 sites (Pitch 400 mm)
Index Time	2.1 sec (Excluding test communication time) / One site cycle time : 3.2 Sec.
Jam Rate	1/3000 pcs
Applicable Tray	Type : Input / Empty Tray : 130 mm ~ 143 mm (D) by 310 mm ~ 330 mm (W) Output Tray : 135 mm ~ 150 mm (D) by 290 mm ~ 330 mm (W) Capacity : Input / Empty Tray : Elevator with 210 mm stroke (JEDEC) Output Tray 1, 2, 3 : Elevator with 210 mm stroke (JEDEC)
Categories	3 Categories (Max. 128 bin signals with RS-232)
Contact Area	Test Site Pitch : 400mm Test Module Dimensions : 400 mm x 400 mm
Contact Force	Max. 50 kgf ( Accuracy $\pm$ 1kgf )
High Temperature (Option)	Operating Mode : Room Temperature / High Temperature Temperature Range : $\sim$ 125°C (Heat-up time : Within 30 min) Accuracy : Pre-heater Buffer $\pm$ 5°C , Contact Area $\pm$ 3°C
Tester Interface	Standard : TTL Option : RS-232, GPIB
Special Function	Tray map fit for production analysis Universal kit design Change over time within 15 min. ECD function (Easy -edit Communication Define) for various equipment Two Tray (Color tray) mode available Continue Fail Alarm Auto Z function Yield Control (Average yield of socket) Yield Monitor (Per contact head plug) ATC (Auto Temperature Cooling) High Temperature Function

## ORDERING INFORMATION

**3240** : Automatic System Function Tester





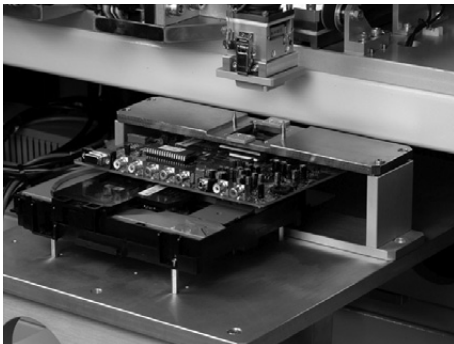


## KEY FEATURES

- Reliable high-speed pick & place handler
- Auto contact-force learning
- Gull wing package capability
- No socket damage
- Air damper for contact balance
- IC-in-socket protection
- Invention patent 190373, 190377, 1227324 & 125307
- Thermal Control Configurations
  - Tri Temp Control
  - Close-Loop Active Thermal Control (ATC) Module
  - Unity PTC (Passive Thermal Control)

Chroma 3260 is an innovative handler for high volume/multi-site IC testing at system level. It is capable of handling packages for various types including QFP, TQFP, BGA, PGA, etc. The handler uses pick and place technology to pick up devices from JEDEC trays, move them to the test site, then move them to the appropriate bin after test.

Chroma 3260 can test up to 6 devices in parallel at high temperature with ATC (Auto Temperature Cooling) ranging from -40°C to 125°C.



SPECIFICATIONS		
<b>Model</b>	<b>3260</b>	
Dimension (WxDxH)	2570 mm x 1360 mm x 1780 mm	
Weight	1300 kg	
Facility	Power : AC 220, 50/60 Hz Single-Phase Maximum Power Consumption : 6.0 KVA Max Controller Circuit : 3.0 KVA Max Heater Circuit : 3.0 KVA (Option)	
Compressed Air	Dry Air of 5.0 kg/cm <sup>2</sup> (0.49 Mpa) or higher, constant supply	
Vacuum Source	Build-in Diaphragm Vacuum Pump: Pumping Volume : 100 L/min Ultimate Pressure : 100 Torr (-13.3 Kpa) Max.	
Applicable Device	Type : BGA series, $\mu$ BGA, Pga, QFP series, CSP, BCC, QFN, Flip-Chip, TSOP Outer dimensions: 4 mm x 4 mm to 45 mm x 45 mm Lead / Ball pitch : 0.4 mm / 0.5 mm and above	
Multiple Testing Layout	6 sites (Pitch 400 mm)	
Index Time	3.0 sec (excluding test communication time)/ One site cycle time : 3.5 Sec	
Ram Rate	1/5000 pcs	
Applicable Tray	JEDEC and EIAJ	
Categories	4 categories (6 categories for option)	
Contact Force	Max. 60 Kgf (accuracy $\pm$ 1kgf) by servo motor (80 Kgf for Option)	
Soak Hot Temperature (Option)	Operating Mode : Room Temperature / High Temperature Temperature Range : 50°C to 150°C (Heat-up time: Within 30 min) Accuracy : Pre-heater Buffer $\pm$ 5°C, Contact Area $\pm$ 3°C Cooling Head : 10°C + 5°C	
Temperature Control (Option)	Operating Mode : Room Temperature / Cold Temperature Temperature Range : room temperature ~ -55°C Accuracy : Contact Area $\pm$ 3°C	
	Tri Temp Control (Option)	Temperature Range : -40°C ~ 125°C $\pm$ 2°C (150°C Option) or -55°C ~ 135°C $\pm$ 2°C (150°C Option)
	ATC Module (Option)	Temperature Range : Ambient ~ 135°C $\pm$ 2°C (150°C Option)
Unity PTC (Option)	Temperature Range : ~ 85 °C (up to 300W Heat Dissipation)	
Tester Interface	Standard : RS-232 Option : GPIB, USB and TTL	
Features	Universal kit design ECD function (Easy-edit communication define) Two tray (Color tray) mode available Continuous fail retest function Real pick and place system Yield control (Average yield of socket) Yield monitor (Per contact head plug) System Invention Patent No.: 190373 Process Invention Patent No.: 190377	
Option	CCD camera for device orientation detection Socket sensor / Socket CCD RF Shielding Box : 55db for PCIe, 80~90db for PCI/USB/RS232 Rotator (90 degree) Fault Auto Correlation Test (FACT) Built in Continuity Test (BICT) PoP handling capacity	

## ORDERING INFORMATION

**3260** : Automatic System Function Tester







## KEY FEATURES

- Reliable Pick&Place bare die test handler
- Multi-plate input and automated test sorting capability
- Omni-directional adjustable probe stage (X/Y/Z/θ)
- Stage remain die check function
- x12 output tray and programmable output binning
- Real time yield control monitor (Per Dut)
- Real time probing status monitoring

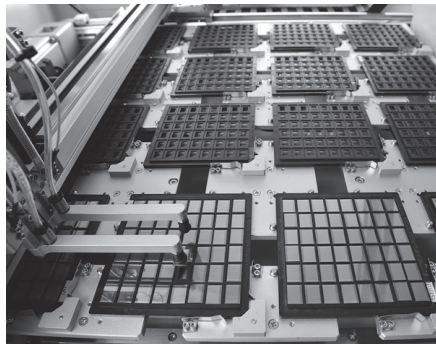
Chroma 3112 is a productive pick and place handler for high volume single or multi-site bare die testing. It is capable to handle various of bare die. The handler 3112 uses P&P technology to pick up bare die from chip tray, move them to the test stage and bin them upon sorting result. High throughput with low jam rate is the consequence result from the reliable handling mechanism and functionality outfit. The remain die check function reduce unexpected damages occurred.

The automation of testing and sorting techniques that applied to the bare die testing, not only in the production efficiently, reducing human resources and ensuring the test quality, but also reducing the testing defect rate.

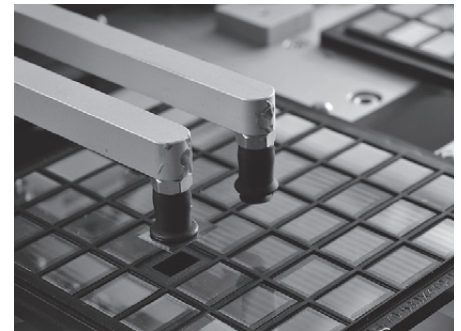


3112 tabletop handler

SPECIFICATIONS	
<b>Model</b>	<b>3112</b>
Dimension (WxDxH)	1020 mm x 870mm x 1300 mm
Weight	Net Weight < 250 kg
Facility	Power : Single-phase, AC 220V, 60 Hz / 2.4KVA Compressed Air : Dry Air of 5.0 kg/cm <sup>2</sup> ( 0.5 Mpa ) or higher, constant supply
Application Die Size	5 x 5 mm to 15 x 15 mm
Test Site Number	Single site ; Dual site
Input Loader	4 manual tray
Number of sorting catagories	12 manual output tray (128 bin software bins)
Probe Card Outside Dimension	4470 x 5620 mil (113.5 x 142.7 mm) * Probe card provide by customer
Carrier Tray Outside Dimension	Standard size : 101.4 x 101.4 mm
Contact Force	Max. 10 kgf
Probe Alignment (X/Y/Z/θ)	Manual alignment by probing stage
Interface	Standard : RS 232 Optional : GPIB
UPH	> 360 (Test Time : 7 sec.) Cycle Time : 4.5 sec. Index Time : 5 sec.
Jam Rate	1/2000 (exclude any sticky residue)
Change Over Time	< 10 min.



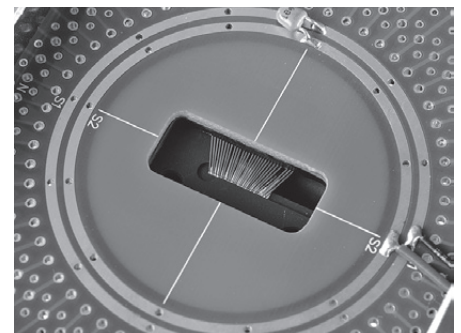
Loading



Picking Up



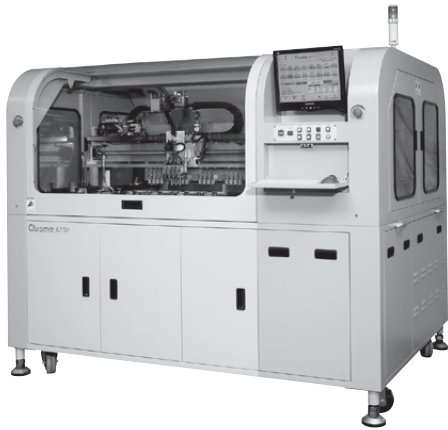
Positioning



Testing

## ORDERING INFORMATION

**3112** : Die Test Handler

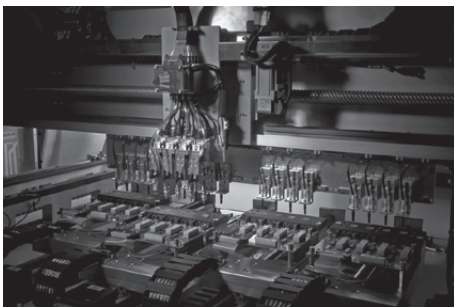


## KEY FEATURES

- High throughput for CIS Testing
- Reliable high-speed pick & place handler
- 3x3 mm miniature device handling capability
- Air damper for contact balance
- Socket damage free

Chroma 3270 is an innovative handler for high volume/multisite miniature IC testing, especially for CIS Testing (CMOS Image Sensor), at system level. It is capable of handling devices of a large variety of package types including QFP, TQFP, BGA, PGA, etc. The handler uses pick and place technology to pick up devices from JEDEC trays, move them to the test site, then move them to the appropriate bin after test.

Chroma 3270 can handle 16 devices for parallel test at ambient temperature to high temperature 50°C

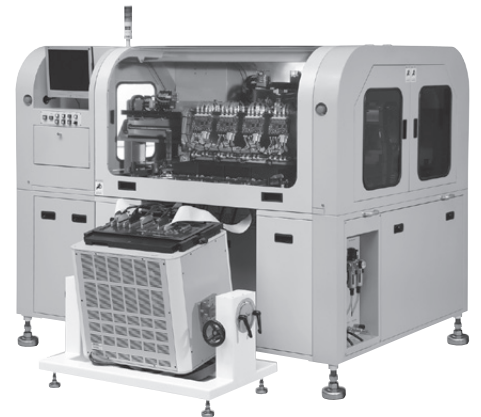


## SPECIFICATIONS

Model	3270
Dimension (WxDxH)	2100 mm x 1540 mm x 1720 mm
Weight	Net Weight 1300 kg
Facility	Power : AC220V ± 10%, 50/60 Hz 3-Phase Maximum power consumption : 12KVA, 20A Compressed Air : Dry air of 5.0 kg/cm <sup>2</sup> (0.49 Mpa) or higher, constant supply
Applicable Device	Type : BGA series, μBGA, PGA, QFP series, CSP, WCSP, PLCC, QFN, TSOP Outer dimensions : 3 mm x 3 mm to 14 mm x 14 mm Lead / Ball pitch : 0.4 mm / 0.5 mm above
Multiple Test Sites	16 sites
Index Time	5 sec (Exclude power and communication time)
Cycle Time	One site cycle time 6 sec (4 site simultaneously, tray pitch fixed)
Jam Rate	1/2000 pcs
Applicable Tray	Standard tray size : JEDEC 135.9 mm(W) x 315 mm(L) Tray thickness : 7.62 mm
Categories	5 Categories, 1 Auto, 4 Fixed (accepts 128 bin signals for RS-232)
Contact Force	Max. 50 kgf (Accuracy force ± 1kgf)
High Temperature (Optional)	Operating mode : room temperature / high temperature Temperature setting range : Ambient to 50°C
Tester Interface	Standard : RS-232

## ORDERING INFORMATION

**3270** : Miniature IC Handler



# Test-In-Tray Handler

# Model 3280



## KEY FEATURES

- Tester & Handler Integration
- Test 120pcs micro SD in parallel
- Test-in-Tray, no pick & place arm before sorting
- UPH = 5400 with 70 sec test time
- SD Protocol Aware Tester
- DC Measurements
- 32MB Buffer Memory per site
- Microsoft Windows XP OS
- Software provides tray map and binning information
- Compact Size: 164cm X 79cm X 180cm
- Options:
  - 3rd party test tools
  - Change Kits for mini SD, SD and MMC
  - Loading Content

The Chroma 3280 is an innovative integration system for testing and handling SD cards in parallel without picking any part before sorting. SD Protocol Aware and Focused DC tests in the 3280 brings a revolutionary test methodology to all SD cards (include MMC). The benefit to customers is lower manufacturing cost from the high throughput of the 3280. The compact size of 3280 also saves floor space in the manufacturing facility.

The cost sensitivity involved with consumer products challenges traditional final test methodology. To reduce the cost to consumers, manufacturers must recognize the fact that SD cards are built upon Known Good Die (KGD). This recognition will narrow the tester's focus to assembly related defects rather than retesting KGD. A new focused tester that tests for assembly will be smaller and less expensive than traditional solutions. That smaller size then allows for more parts to be tested in parallel in a reduced area, further reducing the unit of test cost. Additionally, the high yield of SD cards using KGD leads to a small footprint Test-in-Tray mechanism. This integrated combination of tester and handler with a reduced footprint facilitates low cost solution of the Chroma 3280.

## Chroma 3280 provides a high throughput solution to SD cards manufacturers

**Test-In-Tray** provides the most efficient method to move DUTs from input site to test site without the use of a pick-and-place arm. The average index time from input stack to test hive about 10 seconds for 120pcs micro SD cards.

**High Parallel Test** A Test Hive is integrated into Chroma 3280 which provides the capability to test 120pcs micro SD cards simultaneously. Typically, it takes 70 seconds test time for 120pcs 1GB micro SD card.

**Pick Up Reject SD card Only** By using the Test-In-Tray and high yield SD cards, the Chroma 3280 only picks up defective devices from the sorting tray to the reject tray and replaces the good devices from the buffer tray to the sorting tray. Assuming a 98% yield rate only need to be removed 2~3 devices from the sorting tray. Therefore, the average sorting time is less than the average testing time. That also enables the testing and sorting to be concurrent, so sorting will be completed before testing.



Test-in-Tray

## Firecracker II

The design circuit of the Firecracker II is identical to a single test circuit (Fire Channel) in the test hive of the Chroma 3280. The Firecracker II provides a very convenient tool for generating a test program off line. Users can plug in micro SD, mini SD, SD and MMC devices on the left side of the cartridge. USB connector is located at the right side of the Firecracker II which can be connected with a USB cable to communicate with a portable device such as a notebook computer.



## Test Coverage

### SD Protocol Aware Tests

- Check CID Reg
- Check CSD Reg
- Check OCR Reg
- Check SCR Reg
- Check SD Status
- Functional Test

### DC Measurements

- Open/Shorts
- ESD Diodes
- Power Up Idd
- Leakage

### Software Functions

- Password control system for user privileges management
- Provide safety detecting alarm system
- Auto alarm for binning time-out error
- Visual display for error jam area
- Provide off-line mode for dummy running
- Real-time testing result display
- Individual DUT enable and disable control
- Yield display for each output tray
- Real-time UPH display
- Multiple yield stop monitor functions
- Loading device counter control
- Door-opened interrupt protecting function
- Emergency stop control
- Keep alarm log for over 30 days

Sorting Status														
Buffer Tray														
113	105	97	89	81	73	65	57	49	41	33	25	17	9	1
114	106	98	90	82	74	66	58	50	42	34	26	18	10	2
115	107	99	91	83	75	67	59	51	43	35	27	19	11	3
116	108	100	92	84	76	68	60	52	44	36	28	20	12	4
117	109	101	93	85	77	69	61	53	45	37	29	21	13	5
118	110	102	94	86	78	70	62	54	46	38	30	22	14	6
119	111	103	95	87	79	71	63	55	47	39	31	23	15	7
120	112	104	96	88	80	72	64	56	48	40	32	24	16	8
Sort Tray														
113	105	97	89	81	73	65	57	49	41	33	25	17	9	1
114	106	98	90	82	74	66	58	50	42	34	26	18	10	2
115	107	99	91	83	75	67	59	51	43	35	27	19	11	3
116	108	100	92	84	76	68	60	52	44	36	28	20	12	4
117	109	101	93	85	77	69	61	53	45	37	29	21	13	5
118	110	102	94	86	78	70	62	54	46	38	30	22	14	6
119	111	103	95	87	79	71	63	55	47	39	31	23	15	7
120	112	104	96	88	80	72	64	56	48	40	32	24	16	8
Reject Tray														
113	105	97	89	81	73	65	57	49	41	33	25	17	9	1
114	106	98	90	82	74	66	58	50	42	34	26	18	10	2
115	107	99	91	83	75	67	59	51	43	35	27	19	11	3
116	108	100	92	84	76	68	60	52	44	36	28	20	12	4
117	109	101	93	85	77	69	61	53	45	37	29	21	13	5
118	110	102	94	86	78	70	62	54	46	38	30	22	14	6
119	111	103	95	87	79	71	63	55	47	39	31	23	15	7
120	112	104	96	88	80	72	64	56	48	40	32	24	16	8

**DUT\_Status**

Pass

Fail

No Contact

Not Present

Done

Sorting Status

SPECIFICATIONS	
<b>Model</b>	<b>3280</b>
<b>System</b>	Test-In-Tray Handler
<b>Basic Specification</b>	Temperature Control Range : Ambient Tray Input: 1 Auto Stack. Output Tray : 1 Auto Stack Test hive interfaced with Tester Tester integrated into Handler One Pick & Place arm, one buffer tray and one reject tray
<b>Tester</b>	Chroma TnT Production Test Tool Skymedi Production Test Tool By Customer Request: Phison, Silicon Motion & InCOMM
<b>Change Kit</b>	One micro SD change kit per handler SD, Mini SD and MMC (optional)
<b>Facility</b>	Power : 220VAC $\pm$ 10%, 50/60 Hz, single phase, less than 4KW Compressed Air : 0.5MPa
<b>Applicable Package</b>	micro SD mini SD, SD and MMC (Optional)
<b>Applicable Tray</b>	Standard tray size: JEDEC 135.9mm(W)x 315mm(L) Applicable tray thickness: 7.62mm
<b>Dimensions and Weight Limit</b>	1640 mm (W) x 790 mm(D) x 1800 mm(H); WEIGHT: 650KG
<b>Index Time and Throughput</b>	Max. UPH = 42,000, when test time is 0 UPH = 5400, when test time is 70 sec with DUTs better than 97% yield
<b>Pick &amp; Place Arm</b>	X Arm Max. Speed: 2.9 M.P.S. Y Arm Max. Speed: 3.75 M.P.S. Regular Sorting Speed: 6 sec per failed DUT Sorting concurrently occurs with testing
<b>Device Contact method</b>	960 Pogo Pins each insertion 7.1 Newton per DUT 8 Pogo pins per DUT Current Motor Max. Force: 320KG F
<b>Test Interface</b>	Standard : RS-232, USB Option : Ethernet
<b>Loader and Un-loader Capacity</b>	Input Tray Stacker : 1 Automatic with 30 JEDEC Trays Output Tray Stacker : 1 Automatic with 30 JEDEC Trays
<b>System Jam Rate</b>	Less than 1/5000 devices
<b>Kit conversion time</b>	Less than 5 min. for SD products Change Kit Setting File is saved in handler. Any necessary software and hardware adjust within 1 minute

## ORDERING INFORMATION

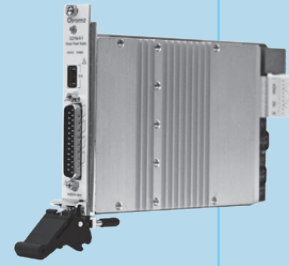
**3280** : Test-In-Tray Handler



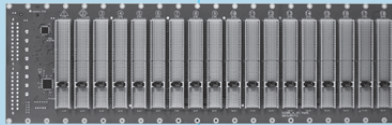
<b>General-purpose Chassis &amp; Backplane</b>	<b>15-1</b>
<b>High Precision Source Measure Unit</b>	<b>15-2</b>
<b>Device Power Supply</b>	<b>15-5</b>
<b>Programmable DC Power Supply</b>	<b>15-6</b>
<b>Extension Card</b>	<b>15-7</b>



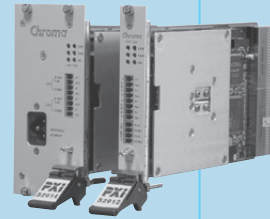
**General Purpose Chassis**



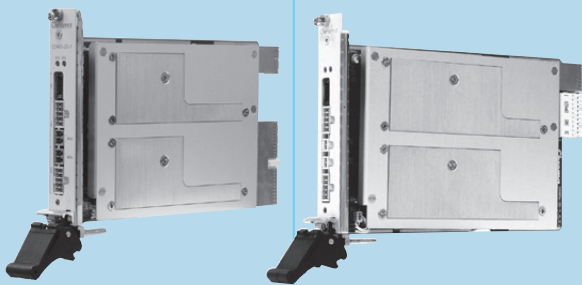
**Device Power Supply**



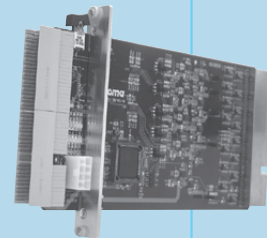
**PXI Backplane**



**Programmable DC Power Supply**



**High Precision  
Source Measure Unit**



**Extension Card**



8/14/18-Slot

### KEY FEATURES- CHASSIS

- High-capacity 8-slot/14-slot/18-slot PXI/cPCI backplane
- Low-profile 4U rugged design
- Easily convertible for rack or bench used
- 51 CFM for 3/4/6 high pressure tube-axial fans
- 175W/ea plug-in power supply
- Removable fans and air filter
- Optional DC ( 24V ) input configuration available
- Comprehensive EMC shielding

### KEY FEATURES- BACKPLANES

- Compliant With PXI Specification R2.0
- Accepts Both PXI and CompactPCI (PICMG 2.0 R3.0) 3U Modules
- Standard 3U Form Factor
- Two ATX Sockets and Screw Terminals for +3.3V, +5V, +12V & -12V DC Output Connection
- 64-Bit PCI BUS On P1 & P2, Supports N-1 BUS- Mastering I/O Slots. (N : Slots)
- System Controller Slot Is Located In Slot 1
- Trigger Controller Slot Is Located In Slot 2, Providing Individual Triggers To All Other Peripherals
- Dimension :
  - 8-slot / 227.3mm x 128.7 mm x 3.2 mm
  - 14-slot / 337.5mm x 128.7mm x 3.2mm
  - 18-slot / 420.6mm x 128.7mm x 3.2mm

### Chassis

The PXI-52100 platform features the industry-standard, 8-slot/14-slot/18-slot PXI/ CompactPCI backplane integrated into a 3U Eurorack enclosure with a bay for removable power supplies.

With hot pluggable power supplies and optional battery packs, 52100 offers the widest application range of all chassis on the market.

Mounting attachment locations allow the PXI-52100 to be mounted against a wall or bulkhead, with the card cage extended in front for easy access to adapter card. The rear of the card cage is enclosed to protect the backplane from contamination as well as provide shielding for RFI/EMI.



### Power Supplies

The PXI-52100 chassis accepts removable power supply modules of the cPWR series. The power connector is a PCI 47M 400A1 connector, compliant with PICMG 2.11 Power Interface Specification standard, a mechanically and electrically roBust connector.

### Backplanes

PXI (PCI eXtensions for Instrumentation) defines a rugged PC platform for measurement and instrumentation. PXI products are compatible with the CompactPCI industrial computer

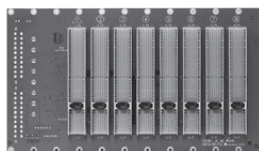
standard but offer additional features, such as environmental specifications, software requirements, and built-in timing and triggering. Moreover, PXI backplane provides configuration control and longer product lifetimes than typical desktop design.

PXI backplane is designed for instrumentation computer. Its architecture makes rapid repair by board substitution possible and system upgrades and changes are greatly simplified, with minimum resulting system downtime.

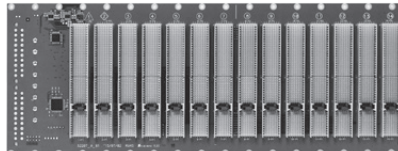
SPECIFICATIONS			
Chassis	52101	52102	52105
<b>Backplane</b>	• 3U-sized; PXI backplane • Compliant with PXI Specification R2.0 • PXI and CompactPCI (PICMG 2.0 R3.0) 3U modules		
<b>Accessible Slots</b>	8 slots	14 slots	18 slots
<b>Power Supply</b>	Output: 175W max. x 2 sets		Output: 175W max. x 4 sets
	• AC Input: 90V to 264V • DC Input: 18V to 36V		
<b>BUS Width</b>	64-bit		
<b>Rack Mounting</b>	4U, 19" EIA format		
<b>Cooling Capacity</b>	Slot cooling capacity in worst-case slot is 50W		
<b>Module Cooling</b>	Forced air circulation ( positive pressurization) via 51 cfm (x3)	Forced air circulation ( positive pressurization) via 51 cfm (x4)	Forced air circulation ( positive pressurization) via 51 cfm (x6)
<b>Slot Airflow Direction</b>	P1 to P2, bottom of module to top of module		
<b>Module Cooling Fan MTBF</b>	75,000+hr		
<b>Weight</b>	8.5kg	9.5kg	13.5kg
<b>Dimensions (WxDxH) mm</b>	• Desktop: 442.2 x 257.8 x 192.1 • Rack-mount: 482.6 x 257.8 x 177.0		• Desktop: 442.2 x 481.2 x 192.1 • Rack-mount: 482.6 x 481.2 x 177.0
<b>Operating Temp.</b>	0°C ~ 55°C		
<b>Storage Temp.</b>	-20°C ~ 70°C		
<b>Humidity</b>	10 ~ 95% @ 40°C, non-condensing		
<b>Packaged Vibration</b>	5 ~ 100Hz: 0.015G2/Hz; 100 ~ 200Hz: -6 dB/Oct; 200 Hz: 0.0038 G2/Hz		
<b>Unpackaged Vibration</b>	5 ~ 55 ~ 5Hz 0.38mm Peak to Peak		
<b>Drop Test</b>	Falling Height: 76 cm; Falling: 1 corner/3 edges/6 faces		
<b>Shock Test (Operating)</b>	Acceleration: 10G; Pulse width: 11ms; Pulse shape: half sine wave; No. of shock: 3 shocks for bottom side		

### ORDERING INFORMATION

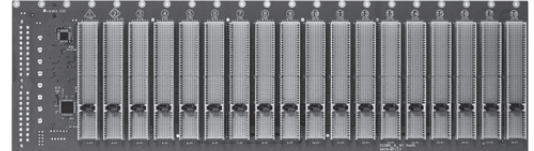
	Chassis (w/Backplane)	AC Power Supply (Input 110/220Vac)
<b>52101-1/52102-1</b>	1	2
<b>52105-1</b>	1	4
<b>52101-A</b>	8-Slot, 3U 64-Bit PXI Backplane	
<b>52102-A</b>	14-Slot, 3U 64-Bit PXI Backplane	
<b>52105-A</b>	18-Slot, 3U 64-Bit PXI Backplane	



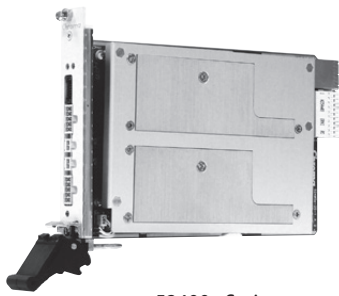
52101-A : 8-slot backplane



52102-A : 14-slot backplane



52105-A : 18-slot backplane



52400e Series

### KEY FEATURES & FUNCTIONS

- PXI Express Peripheral Module (X1 PCI Express Link) (Model 52400e Series)
- Four quadrant operation
- 18-bit source/measure resolution (multiple selectable ranges)
- Low output noise
- High measurement speed (100k s/S)
- High output slew rate
- Optional measurement log
- DIO/Trigger bits
- Output profiling by hardware sequencer
- Programmable output resistance
- Floating & Guarding output
- 16 Control Bandwidth Selection
- Master / Slave operation
- Driver with LabView/LabWindows & C/C# API
- Softpanel GUI

### APPLICATIONS

- Semiconductor Test
- LED / Laser Diode Test
- Battery Test
- Transistor Test
- Solar Cell Test
- Electric Vehicle Test
- Avionics Test
- Power Electronics Test
- Sensor Test

The Chroma 52400e is a series of 3U PXI Express module that can host 2 programmable source/measure channels, while 52400 is a series of 3U PXI module hosting 2 programmable source/measure channels. They are designed for highly accurate source or load simulation with precision voltage with precision voltage and current measurement.

The SMU combines four-quadrant operation with precision and high speed measurement. This makes the SMU an ideal instrument in many parametric test applications ranging from ICs, two-leaded components such as sensors, LEDs, laser diodes, transistors, to solar cells, batteries and many other electronic devices.



52400e/52400 Series

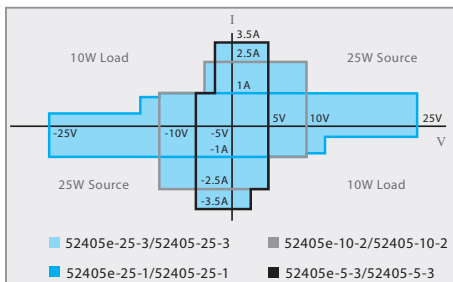
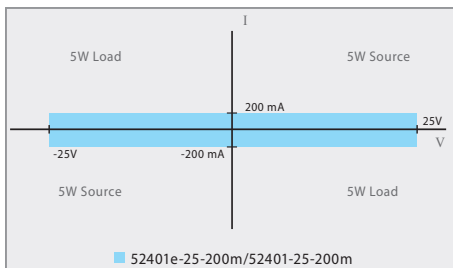


The 52400e/52400 series feature: 16 selectable control bandwidths to ensure high speed output and stable operation; multiple source/measure ranges with an 18-bit DAC/ADC to provide the best resolution and accuracy available with a sampling rate up to 100K s/S; programmable internal series resistance for battery simulation;  $\pm$ force,  $\pm$ sense and  $\pm$ guards lines to avoid leakage current and reduce settling time -- especially useful for low current test applications.

The 52400e/52400 series have patented hardware sequence engine that uses deterministic timing to control each SMU. The sequencer's on-board memory can store up to 65535 sequencer commands and 32k measurement samples per channel, allowing cross module/card synchronization and latency free output control and measurement. No PC communication is required during execution of the hardware sequencer test process. C#, LabView, LabWindows APIs and versatile soft front panels come standard with each SMU. The back connectors are compatible with both PXIe and hybrid chassis. All of these features enable easy integration to PXIe or PXI-hybrid systems designed for a wide range of applications.

### Four Quadrant Operation

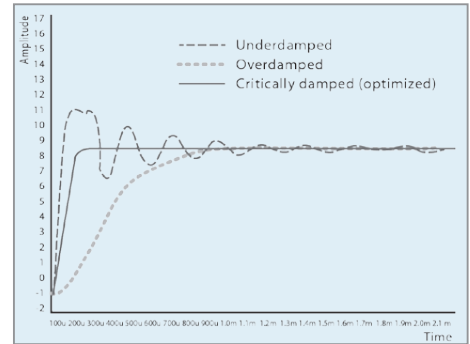
All 52400e/52400 series SMUs support four quadrant operation for applications that require a reverse voltage/current source or load. During a load operation, the module is limited by the PXI chassis' standard of 20W heat dissipation per slot. Shown below are the quadrant diagrams with the operating regions of the Chroma PXIe/PXI SMUs.



### Control Bandwidth Selection

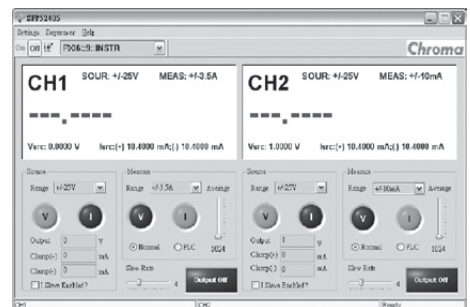
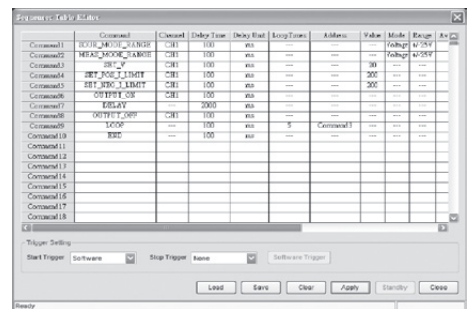
To reduce test times, Chroma's SMUs are designed for fast response providing high speed output voltage and current. The impedance of the DUT, fixture, or cabling may cause loop instability under voltage or current source mode. An unstable loop can cause saturation, oscillation, or even damage the DUT.

To prevent system instability, the 52400e/52400 series SMUs provide 16 user selectable control bandwidths, eliminating the need for external capacitors or inductors placed near the DUT. This results in faster output rise time, reduced voltage ripple and noise, and reduced transient response. The control bandwidth can be modified via software to maximize test flexibility and minimize downtime when changing DUTs.



### Unique Hardware Sequencer

The Chroma Hardware Sequencer is a powerful tool that can predefine commands as instrument executable steps. This allows latency free control and measurement since no PC interaction is required during execution. Once the instrument receives the start trigger, it will execute step commands in the sequencer table line by line or as defined by the trigger. Shown below are the soft panels for the SMU in hardware sequencer mode (left) and direct operation mode (right).

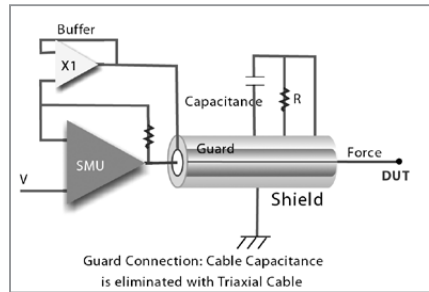
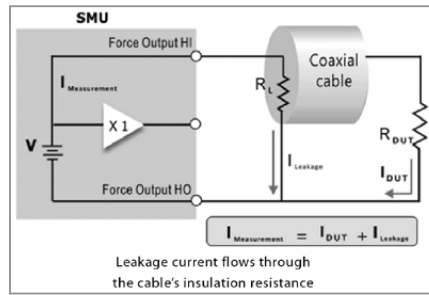




## Versatile Soft Front Panel Guarding for Low Current Application

Guarding is an important technique for very-low current measurements. Guarding reduces leakage current error and decreases settling time. This is achieved by keeping the potential of the guard connector at the same potential as the force conductor, so current does not flow between the force and guard conductors. Guarding also eliminates the cable capacitance between the SMU and DUT.

The Chroma 52400e series features two  $\pm$ guard wires per channel, resulting in faster and more accurate measurements.



## Master/Slave Operation

For maximum flexibility, the 52400e/52400 series SMUs support Master/Slave operation when higher current under FVMI (Force Voltage Measure Current) mode is required. To ensure accurate current sharing between modules and maximum performance, Master/Slave operation is only allowed between SMUs of the same model number.

Current sharing is achieved by one channel operating as the Master under FVMI mode while the Slaves operate in FIMV mode. The Master channel is programmed in voltage mode while the Slaves are set to current mode. The Slaves will follow the Master's set voltage. The wiring diagram for current sharing in master/slave control is shown to the right.

SPECIFICATIONS						
Model Name	52401e-6-1 52401-6-1	52401e-25-200m 52401-25-200m	52405e-5-3 *1 52405-5-3 *1	52405e-10-2 *1 52405-10-2 *1	52405e-25-1 *1 52405-25-1 *1	52405e-25-3 *1 52405-25-3 *1
Slots	1					
Output Channels	4			2		
Source	3W x 4		5W x 2		25W x 2	
Load	1.8W x 4		5W x 2		10W x 2	
Input Voltage	Backplane Power		External 48VDC source required *2			
Input Current	2.5A Max		0.7A Max		2.2A Max	
Output Isolation	Isolated but share common LO		Isolated		Isolated by External Power Supply	
Bit Resolution	16 Bits		18 bits			
Programmable Loop Bandwidth	8 steps		16 steps			
Settling Time	<30 $\mu$ Sec, typically					
Force Voltage ranges	$\pm 6V$	$\pm 25V, \pm 10V, \pm 5V, \pm 2.5V, \pm 1V, \pm 500mV$	$\pm 5V, \pm 2V, \pm 1V, \pm 500mV, \pm 200mV, \pm 100mV$	$\pm 10V, \pm 5V, \pm 2V, \pm 1V, \pm 500mV, \pm 200mV, \pm 100mV$	$\pm 25V, \pm 12.5V, \pm 10V, \pm 5V, \pm 2V, \pm 1V, \pm 500mV, \pm 200mV, \pm 100mV$	$\pm 25V, \pm 12.5V, \pm 10V, \pm 5V, \pm 2V, \pm 1V, \pm 500mV, \pm 200mV, \pm 100mV$
Force Current Ranges	$\pm 1A, \pm 100mA, \pm 10mA, \pm 1mA, \pm 100\mu A, \pm 10\mu A$	$\pm 200mA, \pm 20mA, \pm 2mA, \pm 200\mu A, \pm 20\mu A, \pm 2\mu A, \pm 200nA$	$\pm 3.5A, \pm 2.5A, \pm 1A, \pm 100mA, \pm 10mA, \pm 1mA, \pm 100\mu A, \pm 10\mu A, \pm 1\mu A$	$\pm 2.5A, \pm 1A, \pm 100mA, \pm 10mA, \pm 1mA, \pm 100\mu A, \pm 10\mu A, \pm 1\mu A$	$\pm 1A, \pm 100mA, \pm 10mA, \pm 1mA, \pm 100\mu A, \pm 10\mu A, \pm 1\mu A$	$\pm 3.5A(\le 5V), \pm 2.5A(\le 10V), \pm 1A, \pm 100mA, \pm 10mA, \pm 1mA, \pm 100\mu A, \pm 10\mu A, \pm 1\mu A$
Measure Voltage Ranges	$\pm 6V$	$\pm 25V, \pm 10V, \pm 5V, \pm 2.5V, \pm 1V, \pm 500mV, \pm 250mV, \pm 100mV, \pm 50mV, \pm 25mV, \pm 10mV, \pm 4mV$	$\pm 5V, \pm 2V, \pm 1V, \pm 500mV, \pm 200mV, \pm 100mV$	$\pm 10V, \pm 5V, \pm 2V, \pm 1V, \pm 500mV, \pm 200mV, \pm 100mV$	$\pm 25V, \pm 12.5V, \pm 10V, \pm 5V, \pm 2V, \pm 1V, \pm 500mV, \pm 200mV, \pm 100mV$	$\pm 25V, \pm 12.5V, \pm 10V, \pm 5V, \pm 2V, \pm 1V, \pm 500mV, \pm 200mV, \pm 100mV$
Measure Current Ranges	$\pm 1A, \pm 100mA, \pm 10mA, \pm 100\mu A, \pm 10\mu A$	$\pm 200mA, \pm 20mA, \pm 2mA, \pm 200\mu A, \pm 20\mu A, \pm 2\mu A, \pm 200nA$	$\pm 3.5A, \pm 2.5A, \pm 1A, \pm 100mA, \pm 10mA, \pm 1mA, \pm 100\mu A, \pm 10\mu A, \pm 1\mu A$	$\pm 2.5A, \pm 1A, \pm 100mA, \pm 10mA, \pm 1mA, \pm 100\mu A, \pm 10\mu A, \pm 1\mu A$	$\pm 1A, \pm 100mA, \pm 10mA, \pm 1mA, \pm 100\mu A, \pm 10\mu A, \pm 1\mu A$	$\pm 3.5A(\le 5V), \pm 2.5A(\le 10V), \pm 1A, \pm 100mA, \pm 10mA, \pm 1mA, \pm 100\mu A, \pm 10\mu A, \pm 1\mu A$

Model Name	52401e-6-1	52401e-25-200m	52405e-5-3 *1	52405e-10-2 *1	52405e-25-1 *1	52405e-25-3 *1
Force Voltage Accuracy	0.02% reading + 0.01% F.S.	0.05% reading + 0.0076% F.S. (≥500mV Range) 0.02% reading + 25uV (<500mV Range)	0.05% reading + 0.008% F.S. (≥500mV Range) 0.05% reading + 25uV (<500mV Range)			
Force Current Accuracy	0.1% reading + 0.1% F.S. (1A Range) 0.05% reading + 0.05% F.S. (<1A Range)	0.05% reading + 0.05% F.S. (≥2uA Range) 0.05% reading + 200pA (<2uA Range)	0.1% reading + 0.1% F.S. (>1A Range) 0.05% reading + 0.05% F.S. (≤1A Range)			
Measure Voltage Accuracy	0.02% reading + 0.01% F.S.	0.05% reading + 0.0076% F.S. (≥500mV Range) 0.05% reading + 25uV (<500mV Range)	0.05% reading + 0.008% F.S. (≥500mV Range) 0.05% reading + 25uV (<500mV Range)			
Measure Current Accuracy	0.1% reading + 0.1% F.S. (1A Range) 0.05% reading + 0.05% F.S. (<1A Range)	0.05% reading + 0.05% F.S. (≥2uA Range) 0.05% reading + 200pA (<2uA Range)	0.1% reading + 0.12% F.S. (>1A Range) 0.05% reading + 0.05% F.S. (≤1A Range)			
Wideband Source Noise	< 30 mV pp 20Mhz BW No Load					
Measurement Sampling Rate	600K Samples/s	100K Samples/s				
Output Connection	5 Wires (± Force, ± Sense, +Guard)	6 Wires (±Force, ±Sense, ±Guard)				
Measurement Log	32K Samples/channel					
Output Profiling	65535 Steps					
Trigger Input	Programmable 4 Ch	1 Ch	Programmable 8 Ch			
Trigger Output						
Floating Output	No	Channel Isolated				
Master/Slave Mode	Yes	No	Yes			
Programmable Resistance	Yes	No	Yes			
Regulatory Compliance	CE/FCC					

**Note \*1** : If chassis has less than 38.2W/slot, then the below output limitations apply.

2.5Amp range = 50% on duty cycle, 500mSec maximum continuous on time

3.5Amp range = 40% on duty cycle, 500mSec maximum continuous on time (1250mSec off during maximum on time case)

If the PXI-SMU card is over temperature, it will automatically disconnect output to protect the unit.

**Note \*2** : Required Voltage Range 48V ± 5% ; Required Voltage Noise ≤ 100mVpp

All specifications are subject to change without notice.

## ORDERING INFORMATION

**52401e-6-1** : High Precision Source Measurement Unit, 6V/1A

**52401e-25-200m** : High Precision Source Measurement Unit, 25V/200mA

**52405e-5-3** : High Precision Source Measurement Unit, 5V/3.5A

**52405e-10-2** : High Precision Source Measurement Unit, 10V/2.5A

**52405e-25-1** : High Precision Source Measurement Unit, 25V/1A

**52405e-25-3** : High Precision Source Measurement Unit, 25V/3.5A

**A524006** : External AC-DC Power Adapter (drives up to 3x 52401e or 1x 52405e SMUs)

**A524011** : High Power External AC-DC Adapter (drives up to 3x 52405e SMUs)

**A524009** : 52405e Output Triaxial Cable

Video & Color  
Flat Panel Display  
Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Optical Inspection  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



Chroma 52310e series is a programmable PXI-Express DPS (Device Power Supply) Card designed for high-accuracy and reliable output power for device test applications. Its compact size, easy level of integration, and high flexibility make the 52310e series ideal for multi-channel power supplies.

Chroma 52310e series features 8 selectable control bandwidths to ensure high speed output and stable operation; multiple current measurement ranges with a 20-bit DAC/ADC provide the highest resolution and accuracy with a sampling rate up to 600K S/sec; programmable internal series resistance for battery simulation.

Chroma 52310e DPS series has a patented hardware sequence engine that has deterministic timing to control each DPS channel. The sequencer's on-board memory can store up to 1024 sequencer commands and 32k measurement samples per channel.

Each 52310e DPS card can be configured to load-share by connecting channels in parallel. This enables users to achieve higher output currents on the same card.

A versatile soft front panel and C / C# / LabVIEW / LabWindows APIs are provided for rapid test development and deployment. The back connector is compatible with both PXIe and hybrid chassis slots. All of these features enable easy integration to PXIe or PXI-hybrid systems designed for a wide range of applications.

Chroma 52310e series programmable device power supplies are designed specifically for test applications that demand precision output voltage/current and tightly coupled measurement capabilities. It provides a cost-effective solution ideal for a broad range of design and production applications such as semiconductor and components manufacturing.

## KEY FEATURES

- 4 Isolated channels of  $\pm 6V$ , 1 A (max)
- 20-bit measurement resolution
- Low output noise
- Maximum sampling rate of 600 KS/s
- Deterministic output by hardware sequencer
- Programmable output resistance
- 8 selectable control bandwidths
- Master/Slave operation
- Drivers with LabVIEW/ LabWindows & C/C# API
- Soft panel GUI
- PXI Express Peripheral Module (X1 PCI Express Link)

## APPLICATIONS

- Semiconductor
- Components Manufacturing

## ORDERING INFORMATION

**52314e-6-1** : Device Power Supply

SPECIFICATIONS	
Model	52314e-6-1
Slot	1
Output Channels	4
Source Power	6W peak (3W continuous) x 4
Max. Current	1A Max (Surge capability)
Input Voltage	PXI-Express backplane power
Output Isolation	Isolated, but share a common LO
Bits Resolution	20 bits for measurement; 16 bits for programming; 16 bits for current clamping
Programmable Loop Bandwidth	8
Force Voltage Ranges	$\pm 6V$
Measure Voltage Ranges	$\pm 6V$
Measure Current Ranges	1A, 100mA, 10mA, 1mA, 100uA, 10uA
Force Voltage Accuracy	0.02% reading + 0.01% F.S.
Measure Voltage Accuracy	0.02% reading + 0.01% F.S.
Measure Current Accuracy	0.1% reading + 0.1% F.S. (1A) 0.05% reading + 0.05% F.S. (<1A)
Output Voltage Ripple & Noise	<50mV pp 20MHz BW Full Load
Measurement Sampling Rate	600K Samples/second for both V & I
Programming Output Resistance	Up to 1 ohm (1A range); Up to 10 ohm (100mA range)
Output Ganging	Channels must be on the same DPS card (1A range only)
Output Connection	4-Wire ( $\pm$ Force / $\pm$ Sense)
Measurement Log	32K Samples per channel
Output Profiling	1024 Steps per channel
Digital In	Programmable 4 CH
Digital out	
Master/Slave Mode	Yes
Programmable Resistance	Yes
Control Interface	PXI-Express
Regulatory Compliance	CE/ FCC

\* Unless otherwise noted, specifications are only valid under the following conditions:

Ambient temperature  $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ ; After 30 minutes warm-up period; Self-calibration performed within the last 24 hours.



0~48VDC/2AMP/60W

### KEY FEATURES

- Dual Isolated outputs; 0-48VDC/ 2A MAX./ 60W, programmable
- Direct Universal AC input via front panel (Model 52914)
- External Trigger function
- Programmable current limit
- Over voltage, over current and short circuit protection
- Remote Voltage Sense
- 16 Bit read back voltage and current at output
- Supplies can be connected in series

Chroma 52912/52914 programmable DC power supplies are designed specifically for test applications that demand precise output voltage/current and tightly coupled measurement capabilities. Chroma 52912/52914 provides you a good return on investment. The versatile design and world-class performance of Chroma 52912/52914 make them ideal for a broad range of design and production applications in markets as diverse as communications, semiconductor, and components manufacturing.

### Measurement Function

In operation, the measurement capabilities include quickly sourcing I/V and then measuring I/V automatically without processor intervention. The 52912/52914 has built-in hardware sequence list that can execute command and store data in FIFO without processor action. With the tight integration of a Chroma 52912/52914, you'll get high speeds for high throughput and high measurement accuracy and repeatability for yield integrity.

### Power Levels

The 52912/52914 Programmable power supplies provide two independent and isolated 60W (MAX) power supplies, and each channel is programmable from 0-48VDC to a maximum of 2.0 Amps. The 52912/52914 include programmable current limit to protect critical UUT's from excessive current, output will automatically switch into constant current mode when limit is reached. For greater power or voltage applications, channels can be connected in series.

### Input Power

To avoid excess power draw from the PXI backplane, the 52912 draws input power (+56VDC) via front panel connections. This approach not only minimizes power required



from the backplane but also maintains complete isolation between backplane logic and power conversion circuitry for noise immunity. For applications where +56VDC is not available, Chroma 52912 provides an optional AC-DC adapter which allows the instrument to be operate from 100~240VAC mains. Chroma 52914 incorporates the AC-DC converter circuit on board. Universal power (100~240VAC) is applied to the front panel directly in order to produce the dual isolated programmable outputs.

### Compliant to PXI and cPCI Standards

The 52912/52914 Programmable power supplies comply with the latest PXI Revision 2.0 specifications of the PXI System Alliance (PXISA) as well as the CompactPCI specifications as defined by the PCI Industrial Computer Manufacturing Group (PICMG). Thus, the 52912/52914 may be used in either PXI or CompactPCI mainframes.

### ORDERING INFORMATION

**52912** : PXI/cPCI Programmable DC Power Supply (DC Input)

**52914** : PXI/cPCI Programmable DC Power Supply (AC Input)

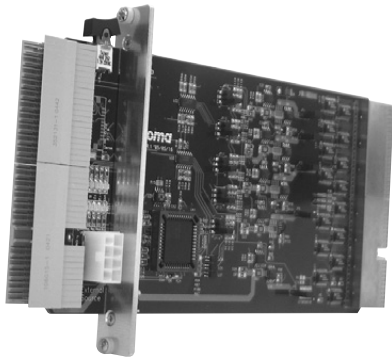
**A529102** : AC/DC Adapter (for Model 52912)



A529102

SPECIFICATIONS		
Model	52912 (CE)	52914
Dimensions	1-Slot, 10x16cm	3-Slot, 10x16cm
<b>Output</b>		
Voltage/Current/Power	Channel #1 : 0 ~ 48VDC, 2A MAX., 60W Channel #2 : 0 ~ 48VDC, 2A MAX, 60W	
Voltage Accuracy	0.5% of programmed value ± 50mV	
Voltage setting resolution	12 Bits	
Line Regulation	0.1%	
Load Regulation	0.1% (10% to 90% load change)	
Transient Response (20MHz)	Peak transient less than 150mV and return to within 5% less than 2ms following 20% load change. (Test Condition: 24V@1.44A~1.8A, 48V@0.8A~1A) at 25°C	
Current Limit Accuracy	0.5% ± 50mA (12 Bits Resolution)	
Read back	Voltage: ± 0.2% of Reading + 60mV Current: ± 0.5% of Reading + 10mA	
Rise Time	< 50 ms (10% ~ 90%)	
Efficiency	84% typical	
<b>Measurement Function</b>		
Maximum sampling rate	5K S/s of each channel	
Input Impedance	5k Ω	
Trigger sources	Software, external	
Buffer size	2K samples per channel	
Data transfers	Polling	
<b>Sequence Function</b>		
Trigger sources	Software, external	
Input Impedance	3.78k Ω	
Buffer size	256 command words per channel	
<b>Input</b>		
DC Input	Isolated + 56VDC (dual)	--
AC Input	100V ~ 240VAC, 50 or 60 Hz (Optional A529102)	100 ~ 240VAC, 50 or 60 Hz
<b>Software API</b>	• VISA compatible via National Instrument's VISA 2.5 or above • 20 Windows DLL's API	
<b>PCI Data BUS</b>	PCI V2.2 compliant, 33MHz, 32 Bits	
<b>Operating Temperature</b>	0°C ~ 55°C	
<b>Operating Humidity</b>	10% ~ 90 % relative	
<b>Storage Temperature</b>	-30°C ~ 70°C	
<b>Isolation</b>		
Channel to Channel	500V	
Channel to Chassis	500V	
<b>Standards</b>	• PXISA PXI 2.0 • PICMG 2.0 R3.0 CompactPCI	





The function of PXI extension card is to extend the PXI backplane signal outside of the chassis. Inserting the PXI card to extension card can easily check or measure the PXI card's signal under power on condition, which resolves the problems of inconvenient inspection due to the PXI card inside the chassis for RD or maintenance personnel. PXI extension card is able to isolate the voltage and signals sent to the PXI card for hot swap when the system is powered on. Every time the extension card activates it can supply the power required for PXI initialization. It eliminates the need for rebooting PC when users read and re-write the configuration files.

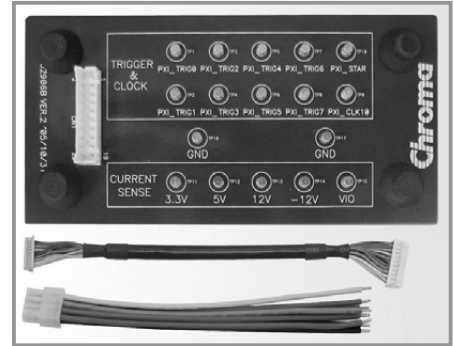
### KEY FEATURES

- Extend PXI backplane signals
- 3U 64-bit PXI extension card available for hot swapping PXI card
- Extend PXI BUS to outside of chassis, easy for inspection
- Able to use voltage meter to measure the power consumption of +5V, +3.3V, +12V, -12V and VIO
- Use Jumper to control the cutoff current
- Power is controlled by mechanical switches
- Provide external power device
- Provide short circuit protection

PXI extension card allows users to measure the voltage consumption power of PXI standard 5 sets voltage easily using the voltage meter. The extension card has over current protection circuit that can prevent the system backplane and other related components from damage once the PXI card malfunctions. Jumpers on the extension card are available for users to define the current range for protection; in addition an outward power connector is attached to supply the power externally instead of using the backplane power.

### ORDERING INFORMATION

**52906** : Extension Card



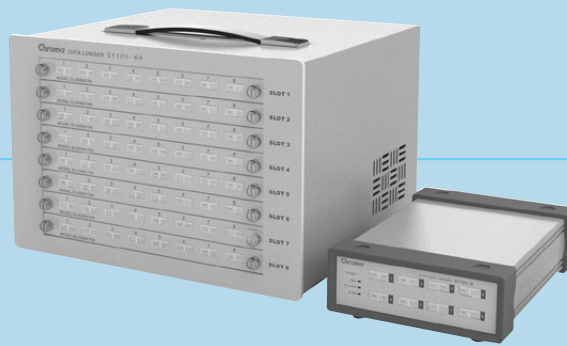
**Test Board**

SPECIFICATIONS	
<b>Model</b>	<b>52906</b>
<b>BUS</b>	PXI / Compact PCI 32 or 64 bit
<b>Input Requirement</b>	5V at 250 mA, 12V at 100 mA, -12V at 100 mA
<b>Input for UUT</b>	From chassis or the external power, configurable by jumpers for each power source
<b>Output Current Limit Protection</b>	5V, up to 5 Amps, 3 limitations jumper selectable 3.3V, up to 3 Amps, 3 limitations jumper selectable VIO, up to 2 Amps, 3 limitations jumper selectable 12V, up to 1.25 Amps, 3 limitations jumper selectable -12V, up to 1 Amp, 3 limitations jumper selectable
<b>Output Voltage Drop</b>	0.07 volts drop for every 1 Amp drawn for 5V, 3.3V; 0.1 volts drop for every 1 Amp drawn for VIO; 0.25 volts drop for every 1 Amp drawn for 12V; 0.15 volts drop for every 1 Amp drawn for -12V
<b>Propagation Delay</b>	Less than 500 pico-seconds from the PC BUS to the UUT. (Switch propagation delay is rated at 250 Pico-seconds)
<b>UUT ON-OFF Controls</b>	Via SPDT switch on-board
<b>Outputs</b>	Current draw by the UUT can be measured at connector J5 for 5V, 3.3V, 12V, -12V and VIO. Each volt represents 1 Amp.
<b>Current Sense Accuracy</b>	Typical below 10% for 5V, 3.3V, 12V, and VIO; below 15% for -12V
<b>Mechanical Dimensions</b>	100 x 220 mm (3U high)



# General Purpose Test Solution

<b>Thermal/Multi-function Data Logger</b>	<b>16-1</b>
<b>TEC Controller</b>	<b>16-4</b>
<b>6½ Digital Multimeter</b>	<b>16-7</b>
<b>Wi-Fi /Bluetooth /LTE Tester</b>	<b>16-9</b>
<b>RF ATE Test Equipment</b>	<b>16-10</b>
<b>Multi-Channel GPS Simulator</b>	<b>16-11</b>
<b>Single channel GPS/GLONASS Simulator</b>	<b>16-12</b>
<b>RF Recorder/Player</b>	<b>16-13</b>
<b>Wireless Communication Test System</b>	<b>16-14</b>



Thermal/Multi-function Data Logger



TEC Controller



**6½ Digital Multimeter**



**Wi-Fi /Bluetooth /LTE Tester  
RF ATE Test Equipment**



**Multi-Channel  
GPS Simulator**



**Single channel  
GPS/GLONASS Simulator**



**RF Recorder/Player**



**Wireless Communication Test System**





## 8/64 channels

### KEY FEATURES

- Models with 8 and 64 channels on-line data recording. Multi-sets linked to a PC for hundreds of channels are doable
- Support B, E, J, K, N, R, S, and T type thermal couples with ITS-90 defined temperature range
- Individual channel cold junction compensation with  $\pm 0.3^\circ\text{C}$  accuracy
- Temperature resolution up to  $0.01^\circ\text{C}$ , error down to  $\pm (0.01\% \text{ of reading} + 0.3^\circ\text{C})$
- VA-480 voltage adaptor :  
Voltage range  $\pm 480\text{VDC}$ ; Resolution  $1\text{mV}$ ; Accuracy  $0.1\% \text{ of reading} + 1\text{mV}$
- VA-10 voltage adaptor :  
Voltage range  $\pm 10\text{VDC}$ ; Resolution  $100\mu\text{V}$ ; Accuracy  $0.05\% \text{ of reading} + 500\mu\text{V}$
- 1000VDC channel to channel isolation, full protection for testing points with charge and guarantee for accurate measurements
- Thermal couple open circuit detection
- PC-based operation with powerful software for recording and analyzing data
- 8 channel model is USB powered. No battery or external power supply is required

It is a general requirement to record temperatures, voltages, currents, and many physics quantities during research, product development, productions, and quality assurance processes. The number of record channels can be a simple one to several complicated set of hundreds. Thermal/multi-function data loggers are perfect solutions to serve for these measurement and tracking needs.

There are several measurement products in the market to perform such a large-scale and extensive time varying recording. Some are expensive, some are limited in accuracy or resolution, and some have low immunity to interference. Chroma thermal/multi-function data loggers are by far the most cost-effective solutions for versatility, accuracy, stability, and interference immunity among this category.

Chroma thermal/multi-function data loggers measure temperatures, voltages, and currents with high accuracy and resolutions. For



8 channels

example, they support 8 types of thermal couples measurement with ITS-90 defined temperature range at  $0.5^\circ\text{C}$  accuracy and  $0.01^\circ\text{C}$  resolution\*, while most data loggers in the market are at  $1^\circ\text{C}$  accuracy and  $0.1^\circ\text{C}$  resolution\*. Chroma loggers are with 1000VDC channel to channel isolation, which means they can attach thermal couples to objects with high electricity, such as batteries, solar cells, working PCB, etc., and still get correct data. Many competitors are just malfunctioned or even damaged in those cases. Data retrieve in Chroma loggers are in a parallel architecture, while most of competitors use a sequential multiplexing method. This means data rate per channel is quick and constant for Chroma loggers, while others become much slower when number of channels is bigger.

Using Chroma thermal/multi-function data loggers, customers get confidence in measured data and high Performance/Cost ratio. Most of all, we can help in certain cases that our competitors fail, and only Chroma succeeds.

\* Thermocouple error excluded. Please see specification list for detail.

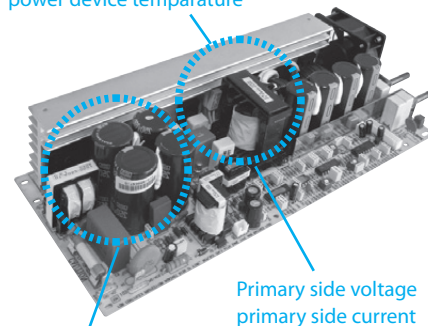
### 1000VDC channel to channel isolation

In developing or qualifying some electronic devices, tracking records of temperatures/voltages/currents are required. Many cases there can be high voltage difference between measured points. A switching power supply, for example, is required to measure the primary side voltage/current, secondary side voltage/current, and key component temperatures. Unfortunately, many data loggers including some leading brands are incapable to handle such a high voltage difference between both sides. Few hundred voltage difference can mess up their measurement totally, or even kills their loggers.

Chroma thermal/multifunction data loggers are perfect for the measurements in a situation with charge and high voltage difference. The feature of 1000VDC channel to channel isolation makes them immune to voltage difference between any two channels. One just attaches thermal couples or wires on the device or conducting pads and gets accurate data.

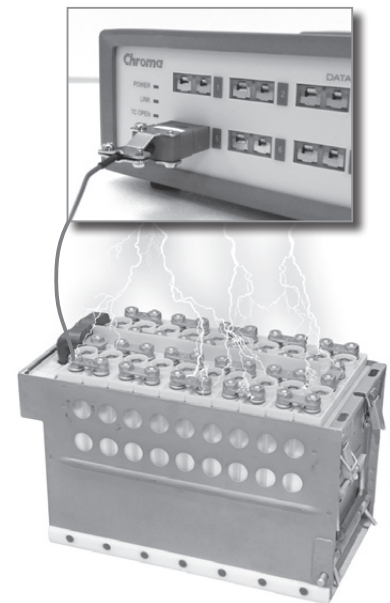
Another case can be battery system tests. One needs to know the voltage and temperature of each cell. For other data loggers, often the voltages cannot be measured properly in the cascade configuration. The thermal couple

### Coil temperature power device temperature



Secondary side voltage  
Secondary side current

### Multi-channel Data Logger



attachment is another issue needing special care. All these problems are easily solved using Chroma thermal/multi-function data loggers for the high channel to channel isolation.

### 0.5°C accuracy and 0.01°C resolution

For the same or even lower prices, Chroma thermal/multi-function data logger offers higher accuracy and better resolution than our competitors do. While most of data loggers are at  $1^\circ\text{C}$  accuracy and  $0.1^\circ\text{C}$  resolution, Chroma data loggers are 1 order better than theirs. It is always true the more accurate and seeing more details, the better for measurements.

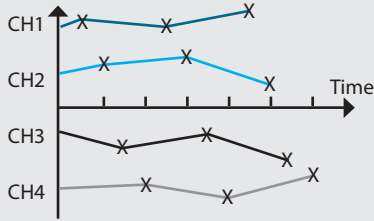
In order to achieve such high accuracy and resolution, Chroma implements individual CJC for each channel. High bit-count A-to-D converters and advanced noise suppression circuit makes outstanding performance for these data loggers. The best of all is that customers can enjoy better specifications without paying more.

Precise temperatures can be critical in thermal conductivity measurements, chemical processes, and biologic experiments. Testing a heat pipe, for example, often requires resolving  $<1^\circ\text{C}$  temperature difference between evaporation and condensing zones. Some liquid crystals can change their properties drastically with a very small temperature variation at critical temperatures.

### Constant data rate per channel

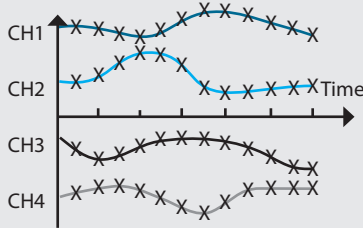
Most of data loggers in the market use a multiplexing circuit structure. All channels share a bandwidth which means the more active channels, the slower data rate per channel will be. Chroma data loggers use a parallel data retrieving circuit structure. No matter how many channels are active, the data rate can be as fast as 5 samples per second per channel.

The benefit of constant data rate can be profound for recording large number of channels. For tens of channels, total data bandwidth of Chroma data logger can be several times larger than that of other data loggers. Some other data loggers can become too slow and lose details. They can miss recording critical changes happen in a short time. Chroma data loggers greatly reduce this possibility.



What other data loggers see, more channels, slower rate each channel

$$\text{Sample rate per channel} = \frac{\text{bandwidth}}{\text{number of channels}}$$



What CHROMA data loggers see constant rate each channel.

$$\text{Sample rate per channel} = \text{constant}$$

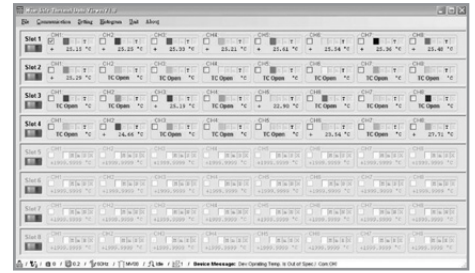
### Powerful data recording and analyzing through a PC

Personal computers and Notebooks are powerful for their fast calculation and data processing capability, friendly graphic user interface, and huge hard disk storage. While operation of many other data loggers are limited by their small display and memory, Chroma data loggers link to PCs or Notebooks for direct display, analyses, and storage.

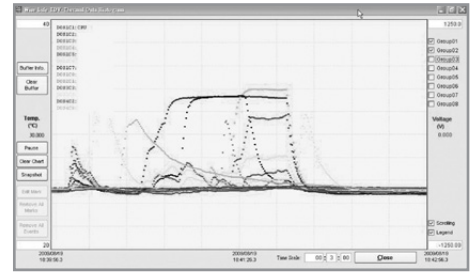
Using the PC software, one can see the detail of all the curves, change drawing time and range scales, create marks, zoom in selected sections, and perform difference calculations, all in few simple steps. The PC RAM is used as buffer to store every data since the logger is powered on, making data tracking back possible without opening the record file. Size of data recording is determined by hard disk free space, which is almost unlimited.



Main panel



Data panel



Data Histogram

### Applications

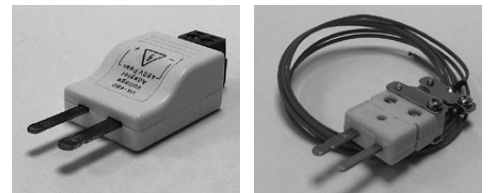
- Automotive & Aircraft
- Electrical & Electronics
- Solar Energy
- Power
- Machinery
- Iron & Steel
- Metals & Mining
- Oil & Gas
- Water & Waste
- Chemical
- Pharmaceutical & Food
- Others

SPECIFICATIONS		51101-8 51101C-8	51101-64 51101C-64
<b>Model</b>			
<b>Thermocouple</b>		51101 Series : ±(0.01% of reading +0.3) °C *1 51101C Series : ±(0.01% of reading +0.8) °C *1	
Thermocouple T-type	-200 to 400°C		
Thermocouple K-type	-200 to 1372°C		
Thermocouple B-type	250 to 1820°C		
Thermocouple E-type	-200 to 1000°C		
Thermocouple J-type	-210 to 1200°C		
Thermocouple N-type	-200 to 1300°C		
Thermocouple S-type	-50 to 1760°C		
Thermocouple R-type	-50 to 1760°C		
Thermocouple Jacks		B, E, J, K, N, R, S, or T mini-type	
Thermocouple Connector		B, E, J, K, N, R, S, or T mini-type	
<b>Temperature Reading</b>			
Number of Inputs		8	64
Temperature Sensor Type		Thermocouple : B, E, J, K, N, R, S, T	
Temperature Scale		ITS-90	
Temperature Resolution		± 0.01 °C	
Temperature Accuracy *1*2		51101 Series : ±(0.01% of reading +0.3) °C 51101C Series : ±(0.01% of reading +0.8) °C	
CJC Error		51101 Series : ± 0.3°C 51101C Series : ± 0.8°C	
Maximum Sample Rate		5 sample/sec.	
Channel to Channel Isolation		1000VDC/750 Vrms	
Input Resistance		5MΩ	
Thermocouple break detection current		100 nA	

Model	51101-8 51101C-8	51101-64 51101C-64
<b>Digital I/O</b>		
Number of Digital I/O	--	4 differential digital inputs and outputs
Digital Input	--	1 trigger input(DI0) and 3 general purpose inputs
Digital Input- High Input Voltage	--	3 ~ 30 V
Digital Input- Low Input Voltage	--	< 0.8 V
Digital Input- High Input Current	--	0.8 ~ 13.1 mA
Digital Input- Low Input Current	--	<10 $\mu$ A
Digital Input- Terminal Resistor	--	2.2K $\Omega$
Digital Output Configuration	--	transistor switch
Digital Output- External Supply Voltage	--	<30 V
Digital Output- ON-state Voltage	--	<1.5 V
Digital Output- ON-state Current	--	<400 mA
Digital Output- OFF-state Current	--	<2.1 $\mu$ A
Digital Output- Power Dissipation per Output	--	<0.6 W
Isolation Voltage	$\pm$ 250 V	
<b>Communication</b>		
RS-232	--	Half Duplex, DB-9 female connector
USB	USB2.0 (full speed device) ; USB B-type connector	
LAN	--	10/100 Mbps
<b>Power Specifications</b>		
Power Requirement	4.5~5.5 V	11.4~12.6 V
Maximum Power Consumption	1.2W	18 W
<b>Physical Specifications</b>		
Dimensions (WxDxH)	135.3 x 186 x 51.7 mm	277 x 200.7 x 233 mm
Weight for Main Frame	1.2 Kg	2.4 Kg
Weight per Sensor Card	--	0.15 Kg
Weight (Main Frame + 8 Sensor Card)	--	3.6 Kg
<b>Environmental specifications</b>		
Operating Temperature *1*2	0~50°C	
Humidity	< 80 %RH	
Power Adaptor Input Voltage	--	90 to 260 VAC
Power Adaptor Input Frequency	--	47 to 63 Hz
Main Frame DC Input	--	12.6 V/1.5 A
Thermocouple Differential Input Voltage Limit	$\pm$ 1.2 V	$\pm$ 1.2 V
Operating Temperature	0~50°C	
Storage Temperature	-20~60°C	
Storage Humidity	80 %RH	

<b>Voltage Reading</b>		
Voltage Input Type	VA-480 Voltage Adaptor	VA-10 Voltage Adaptor
Voltage Resolution	1mV	100 $\mu$ V
Voltage Input Range	$\pm$ 480VDC	$\pm$ 10VDC
Voltage Input Accuracy	$\pm$ (0.1% of reading + 1mV)*3	$\pm$ (0.05% of reading + 500 $\mu$ V)*3
Input Resistance	1M $\Omega$	300 K $\Omega$

<b>Current Reading</b>	
Current Input Type	IA-3 Current Adaptor
Current Resolution	1mA
Current Input Range	$\pm$ 3A
Current Input Accuracy	$\pm$ (1% of reading + 1mA)



Voltage/Current Adaptor      Thermocouple

**Note \*1 :** Measure after heat equilibrium is reached and the uncertainty of thermocouple itself is excluded. Operating temperature within 20°C to 30°C range.

**Note \*2 :** For operating temperature out of range from 20°C to 30°C, additional error  $\pm$  [ (0.01% of reading + 0.03°C) x (T-25°C) ] will be added. T is the ambient temperature.

**Note \*3 :** Under MV\_8 filtering mode

**Note \*4 :** Model 51101-64/51101C-64 with LAN module

### ORDERING INFORMATION

**51101-8 :** Thermal/Multi-Function Data Logger - 8 channel  
**51101C-8 :** Thermal/Multi-Function Data Logger - 8 channel  
**51101-64 :** Thermal/Multi-Function Data Logger - 64 channel  
**51101C-64 :** Thermal/Multi-Function Data Logger - 64 channel

**A511000 :** VA-480 Voltage Adaptor (option)  
**A511001 :** IA-3 Current Adaptor (option)  
**A511002 :** VA-10 Voltage Adaptor (option)  
**A511003 :** 8-port sensor card with package  
**A511004 :** C8-port sensor card with package





## 150W/300W/800W

### KEY FEATURES

- Bidirectional driving with 150W (24V/8A), 300W (27V/12A), or 800W (40V/20A) output
- Filtered PWM output with >90% driving power efficiency while maintaining linear modes driving with current ripples <20 mA
- Temperature reading and setting range -70 to 250°C with 0.01°C resolution and 0.3°C absolute accuracy
- Short term stability (1 hour)  $\pm 0.01^\circ\text{C}$  and long term stability  $\pm 0.05^\circ\text{C}$  with optimal PID control
- Feature true TEC large signal PID auto tune for best control performance
- 2 T-type thermal couple inputs, one for control feedback and the other for monitor and offset, providing versatile control modes
- RS232 serial communication port for PC remote operation and thermal data recording
- Powerful and user-friendly PC program available
- Perfect matching all Chroma designed temperature controlled platforms

A thermoelectric cooler (TEC) module is a solid state device which can control heat flux using current. First discovered in the 19th century and called the Peltier effect, TEC's operate by electrical current flow between two dissimilar conductors. Depending on the direction of the flow heat will be either absorbed or released. This technology is very useful for small scale temperature control; providing fast temperature response and ultra-high temperature stability. TEC temperature control equipment is also very compact and energy efficient in comparison to conventional thermal chambers. TECs have the added advantage of control case temperatures directly and have mechanical moving parts.

Chroma's Model 54100 series of advanced TEC Controllers provide an excellent temperature monitoring engine via two thermal couple inputs. The cold junction of the engine is internally stabilized to 0.001°C, providing 0.01°C temperature resolution. The TEC driver circuit within the 54100 uses a filtered PWM architecture which provides much higher drive currents over ordinary PWM drivers and provides smooth current modulation which is critical for electromagnetic sensitive measurements.

Another important feature of Chroma's 54100 TEC Controllers is its true auto tune function providing for optimum control and temperature response. Stability down to the temperature resolution of 0.01°C is regularly achieved regardless of the size and geometry of thermal platforms.

High TEC driving capability is another merit of Chroma's 54100 controllers. Currently two modles

are available (150W and 300W) with 800W under development. More TEC driving power means wider temperature range, faster temperature response, and larger platform applications. For comparable accuracy and stability, Chroma offers one of the best TEC driving power-to-price ratio in the market.

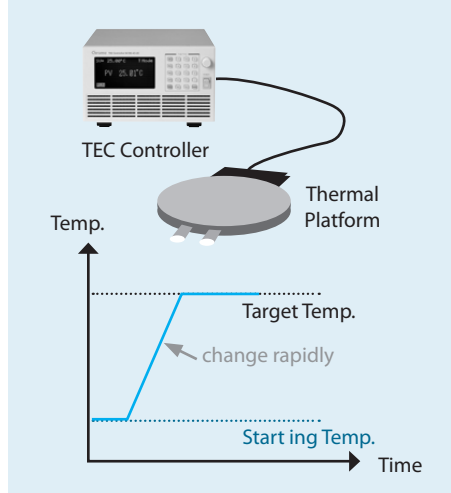
\* Operation temperature range of platform is independent with TEC controller range, and proper platform design should be considered to obtain certain temperature.

### Excellent Thermal response, temperature precision, and control stability

TEC module is a bi-directional heat pump controlled by current. So a temperature control system with TEC modules can reach temperatures higher or lower than ambient. Compared with traditional temperature control methods, the 54100 provides a compact, fast responding, solution to thermal control applications.

Chroma's Advanced TEC Controller is specially designed for optimal performance. Changing temperature from one value to another rapidly without overshoot are primary benefits of the 54100 series. Effects of thermal perturbations by the unit-under-test can even be minimized up to 100W on/off, by the 54100 and often reduces temperature variation to less than 1°C within few seconds. If temperature stability is concerned, Chroma's Advanced TEC Controllers offer 0.01°C stability in almost most applications.

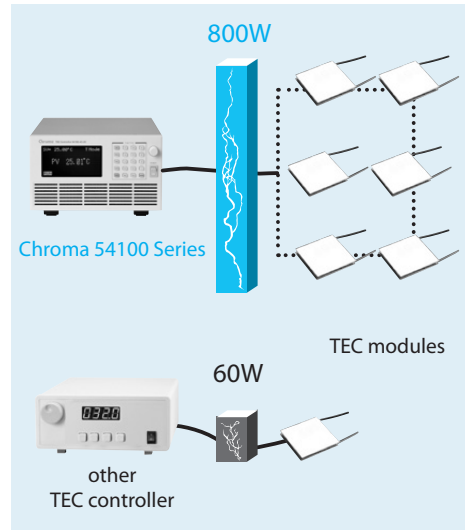
### Using Chroma's TEC method, speed of heating and cooling is about 5~60°C per minute.



### High Driving Capability

There were many low output power TEC controllers on the market mainly for small devices and small scale lab tests. As technologies grow, higher TEC driving power is required in many modern applications. For example, testing solar cells larger than 4 inch square from -20°C to 85°C requires more than 100W driving power and thermal loads of sunlight can add 30W or more. Designers of high power LEDs must have great concern about their thermal properties. 30 W-LED module testing from -20°C to 150°C also demands high driving power.

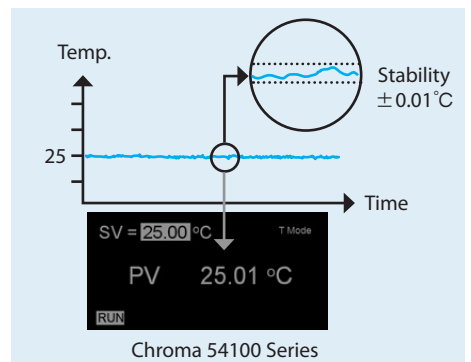
Chroma's Advanced TEC Controllers can deliver 150W, 300W, 800W driving power, satisfying needs of both small to large platforms. Another benefit of high driving power is that in many applications several units can be driven from a single TEC controller reducing costs and test times.



### High temperature accuracy and resolution

TEC controllers using thermal couples currently on the market usually have accuracy of only about 1°C and poor resolution (0.1°C). This is inadequate for many modern applications. For example, rating solar cell power efficiency requires temperature accuracy much better than 1°C since phase changes of some solar materials can occur within 0.1°C or less. Some biochemical process can be very sensitive to temperature variations as well. Thermal resistance measurements of heat pipes often results in a temperature deviation much less than 1°C. Some high resolution TEC controllers are using different types of temperature sensors, such as RTD, temperature IC, or thermistors. Unfortunately, these temperature control methods often cannot provide direct case temperate control/contact and can be too bulky for measuring at the point of interest.

Chroma's Advanced TEC Controllers are thermal couple based and with temperature accuracy\* 0.3°C and resolution down to 0.01°C. Users can take advantage of a wide range of thermal couple for easy measurement setup, while maintaining high accuracy and resolution. This means users can achieve test results with high repeatability, high accuracy, and therefore high confidence.



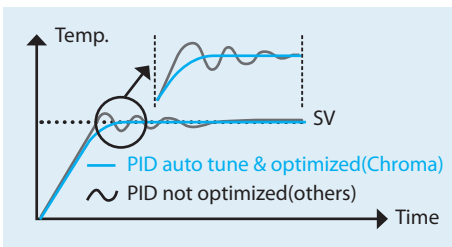
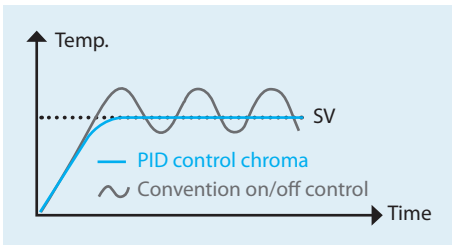
- Video & Color
- Flat Panel Display
- LED/ Lighting
- Optical Devices
- Photovoltaic test & Automation
- Optical Inspection
- Automated
- Electronics
- Power
- Battery Test & Automation
- Component
- Passive
- Electrical
- Semiconductor/ IC
- PXI Test & Measurement
- General Purpose
- Intelligent Manufacturing System
- Turnkey Test & Automation



## True large-signal PID / auto tune for TEC control

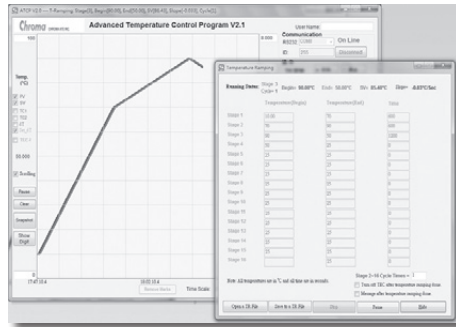
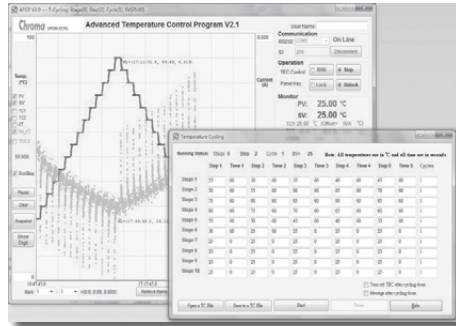
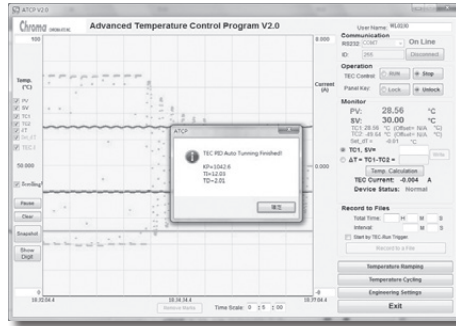
PID control is an important feature for a good controller. The PID parameters basically describe the dynamic response of a system and can be very different from one to another. A guarantee of successful control cannot be achieved without setting proper PID parameters and setting PID parameters manually is very time consuming. Chroma 54100 provides an advanced PID auto tune feature making PID setting fast, repeatable and easy.

Many other TEC controllers use a small signal and one-directional temperature transient to find PID parameters. This auto tune method is OK for heater only temperature control, but is not always successful for TEC control. In order to truly match the thermal response of a TEC control system, Chroma's Advanced TEC Controllers use a large-signal and bi-directional driving method for PID auto tune. This proprietary method results in the superb temperature control behavior which is fast, precise, and very stable. While some other TEC controllers require a set of PID parameters for every 20°C interval, Chroma's Advanced TEC Controllers need only a set of optimal PID parameters (usually auto tuned at 40~50°C) to cover all operation from -40 to 150°C.



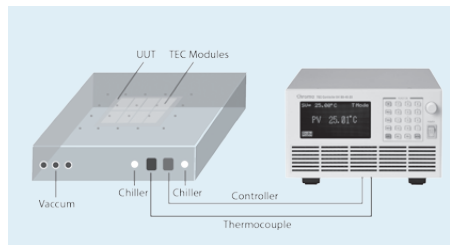
## Soft Panel

Available for Chroma's Advanced TEC Controller are graphical softpanels which allow for intuitive control and measurements. Viewing TEC current and temperature vs. time curves, recording data to a file, and running temperature cycling, ramping sub-programs, etc., are all provided. PID parameters, current limit, and other important settings can also be read and set from a pop-up setup windows.



## High Efficiency Standard Platforms

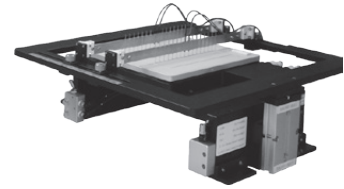
There are numerous TEC platforms be developed by Chroma for sue with the 54100 TEC Controllers. Such platforms include LEDs, solar cells, e-paper, burn-in, and many others. As shown below each are designs to provide a wide temperature range with typical temperature stability of 0.01°C.



TEC Platform Architecture



E-paper



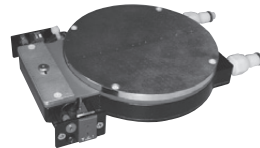
Solar Cell



LED Integrated Sphere



Micro Projector



Wafer Chuck



General Platform

SPECIFICATIONS			
Model	54115-24-8	54130-27-12	54180-40-20
TEC Output Voltage	24VDC	27VDC	40VDC
TEC Output Current	8A	12A	20A
TEC Driving Output Power	150W	300W	800W
<b>Temperature Control</b>			
Setting Temperature Range	-49 to 149°C		-70 to 250°C *1
Setting Temperature Resolution	0.01°C		
Temperature Control Stability	Short Term	≤ 0.01°C	
	Long Term	≤ 0.05°C	
<b>Temperature Monitoring</b>			
Monitoring Temperature Range	-49 to 149°C		-70 to 250°C *1
Temperature Sensor Type	T-type thermocouple		Standard : T-type thermocouple Optional : K-type thermocouple
Monitoring Temperature Resolution	0.01°C		
Monitoring Temperature Relative Accuracy	< ± 0.3°C		
Monitoring Temperature Absolute Accuracy	< ± (0.3+0.002 ×  T-25 ) °C		
<b>Environmental</b>			
Working Temperature	5~45°C		
Humidity	< 80 % RH		
Power Requirement	90 to 240 VAC, 50/60 Hz		
Maximum Power Consumption	330W	550W	1400W
Fuse	3A/250V	5A/250V	12A/250V
PC Communication Port	RS-232 Half Duplex		RS-232 Half Duplex ; USB2.0 ; LAN 10/100Mbps
Storage Temperature	-20~60°C		
Storage Humidity	80%RH		
Dimensions (WidthxDepthxHeight)	362 x 286 x 131.2 mm / 14.3 x 11.3 x 5.17 inch		241 x 441 x 135 mm / 9.5 x 17.4 x 5.3 inch
Weight	6.3 kg / 13.9 lbs	6.6 kg / 14.6 lbs	9.5 kg / 20.9 lbs

**Note \*1 :** Platform temperature range is highly relating to the structure and design and will need to apply external elements to reach extreme conditions. To reach below -30 degree, it will need extra coolant. To reach beyond 150 degree, other heating material will need to be considered.

**Note \*2 :** The temperature control stability depends on not only the controller but also platform and environment. The PID parameters must be optimized for the platform. Avoid any liquid or air turbulence around the platform. Attach the temperature feedback thermocouple firmly with good thermal conductivity. Shield for electromagnetic interference if necessary. Extremely high control temperature stability can be achieved with all these issue taken care.

**Note \*3 :** Monitoring Temperature Relative Accuracy is defined as the temperature difference between the two thermocouples reading the same thermal point. It is the working ambient temperature, which must be thermal balance within 20~30°C, and exclude thermocouples error for controller specifications to be guaranteed. If the operation temperature is out of 20~30°C, the specification will be modified to < ± (0.3+0.002 × |T-25|), where T here is the working ambient temperature.

## ORDERING INFORMATION

**54115-24-8 :** TEC Controller 150W

**54130-27-12 :** TEC Controller 300W

**54180-40-20 :** TEC Controller 800W

**A541151 :** TEC Thermal Platform for LED integrated sphere

**A541152 :** TEC Thermal Platform for LED burn-in

**A541153 :** TEC Thermal Platform for LED wafer

**A541154 :** TEC Thermal Platform for e-paper

**A541155 :** TEC Thermal Platform for solar cell



54115-24-8 / 54130-27-12



### Test System Application

For user's convenience Chroma supports various software and hardware for different control platforms.

- **Chroma 12061 TOOL** : It is a real-time display interface for value monitoring. It can log data and output in CSV format for analysis.

- **Chroma 12061 LINK** : It can send the data to PC directly in real time and save it to EXCEL or WORD format file as well as create the data pattern. Test engineers can use ActiveX components to control the 12061 using SCPI commands.

### KEY FEATURES

- 6½ digits resolution
- 11 types of measurement characteristics
  - DC voltage/current (1000V/3A max)
  - AC voltage/current (750V/3A max)
  - Resistance 2 or 4-wire ohms measurement
  - Period & frequency
  - Diode & continuity
  - Temperature (RTD)
- Various math functions
  - NULL
  - Max/Min/Avg
  - High/Low limit
  - Percentage/Ratio/ MX+B
  - dB/dBm
- DC voltage accuracy : 0.0015%
- AC voltage accuracy : 0.04%
- Optional Multi-point TC Scanner Card (10ch), multi-point scanner card (10/20ch)
- Measurement and data transmission up to 2000 readings/sec (4½)
- Up to 2000 readings memory storage
- Standard SCPI control
- Standard USB & GPIB interface, support USBTMC
- Software control support
  - Chroma 12061 software
  - LabView® Driver

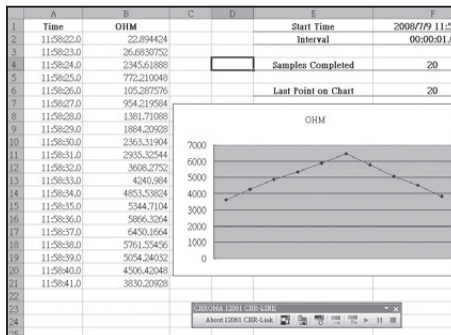
### Fast & High Performance

The 12061 6½ Digital Multimeter has assorted settings of resolution, integration time and ranges that allow users to optimize the configuration of measurement speed, resolution and accuracy when in individual measurement test mode.

The 12061 has built-in a high speed, low interference A/D converter with a maximum speed of 2000 rdgs/s it is the best solution for high speed measurement.

### Individual Application

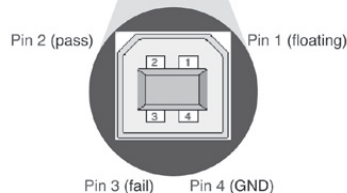
Chroma 12061 equipped with 11 types of measurement functions containing DC voltage/current, AC voltage/current, resistance 2/4-wire ohms, period, frequency, diode, continuity and temperature as well as diverse math functions of NULL, Max/Min/Avg, High/Low limit, High/Low limit, Percentage/Ratio/MX+B, dB/dBm and etc. Along with trigger and memory function, Chroma 12061 is the right tool for you to perform the basic measurement.



Application Softpanel - CHROMA 12061 LINK

### PASS/FAIL signal output

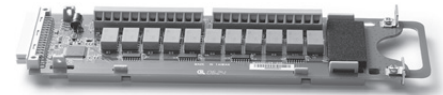
Chroma 12061 can provide PASS/FAIL signal to system by USB port (either communication or PASS/FAIL signal) with high/low limit set. USB type B female connect to system with signal (1 floating/ 2 PSS/ 3 FAIL/ 4 GND) in 2ms low and please disable USB interface. If result over the high/low limit, the beeper will alarm and signal output. (Beeper can be off)



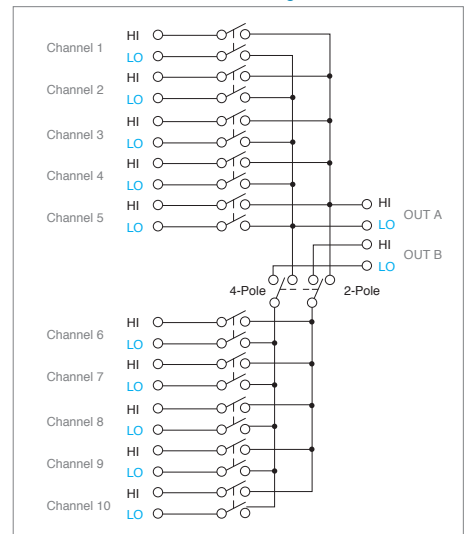
### Multi-Point Scanner Card (10CH/20CH)

Chroma 6½ Digital Multimeter supports Multi-point Scanner Card which is a scanning measurement tool not supported by most of the 6½ Digital Multimeters in the field.

Multi-point Scanner Card offers multiplexing ten two poles (ACV, ACI, DCV, DCI, Resistance, Period, Frequency) that can be installed to the extension card option directly on the rear panel.



### Scanner Card Configuration



### Multi-Point TC Scanner Card (10ch)

The multi-point temperature scanning card has multiple functions including 2-wire/4-wire resistance, AC/DC voltage/current, frequency, period and temperature measurements. As cold junction compensation is equipped for temperature measurement, it increases the measurement accuracy greatly. In addition, it can scan the temperature of 10 different channels that can be applied extensively to electronic devices and industrial studies for temperature measurement

### ORDERING INFORMATION

- 12061** : 6½ Digital Multimeter
- A120000** : Multi-point Scanner Card (10ch)
- A120001** : Thermal-measurement Adapter
- A120002** : Multi-point Scanner Card (20ch)
- A120003** : HV Probe (1000:1)
- A120004** : Multi-point TC Scanner Card (10ch)

## SPECIFICATIONS

Model 12061			
DC Voltage			
Range	Resolution	Input Resistance	1 year accuracy ± (reading%+range%) (23°C ± 5°C)
100.000mV	0.1µV	>10GΩ	0.0050 + 0.0035
1.000000V	1.0 µV		0.0040 + 0.0007
10.00000V	10 µV		0.0035 + 0.0005
100.0000V	100 µV	10MΩ	0.0045 + 0.0006
1000.000V	1mV		0.0045 + 0.0010
DC Current			
Range	Resolution	Shunt Resistance	1 year accuracy ± (reading%+range%) (23°C ± 5°C)
10.00000mA	10nA	5.1Ω	0.050 + 0.020
100.0000mA	100nA		0.050 + 0.005
1.000000A	1µA	0.1Ω	0.100 + 0.010
3.00000A	10µA		0.120 + 0.020
AC RMS Voltage			
Range	Resolution	Frequency (Hz)	1 year accuracy ± (reading%+range%) (23°C ± 5°C)
100.0000mV	0.1µV	3 ~ 5	1.00 + 0.04
		5 ~ 10	0.35 + 0.04
		10 ~ 20K	0.06 + 0.04
		20K ~ 50K	0.12 + 0.05
		50K ~ 100K	0.60 + 0.08
1.000000V ~ 750.000V	1.0µV ~ 1mV	100K ~ 300K	4.00 + 0.50
		3 ~ 5	1.00 + 0.03
		5 ~ 10	0.35 + 0.03
		10 ~ 20K	0.06 + 0.03
		20K ~ 50K	0.12 + 0.05
50K ~ 100K	0.60 + 0.08		
100K ~ 300K	4.00 + 0.50		
AC RMS Current			
Range	Resolution	Frequency (Hz)	1 year accuracy ± (reading%+range%) (23°C ± 5°C)
1.000000A	1µA	3 ~ 5	1.00 + 0.04
		5 ~ 10	0.30 + 0.04
		10 ~ 5K	0.10 + 0.04
3.000000A	1.0µA	3 ~ 5	1.10 + 0.06
		5 ~ 10	0.35 + 0.06
		10 ~ 5K	0.15 + 0.06
Resistance (4W Measurement)			
Range	Resolution	Test Current	1 year accuracy ± (reading%+range%) (23°C ± 5°C)
100.0000Ω	100µΩ	1mA	0.010 + 0.004
1.000000kΩ	1mΩ	1mA	0.010 + 0.001
10.00000kΩ	10mΩ	100µA	0.010 + 0.001
100.0000kΩ	100mΩ	10µA	0.010 + 0.001
1.000000MΩ	1Ω	5µA	0.010 + 0.001
10.00000MΩ	10Ω	500nA	0.040 + 0.001
100.0000MΩ	100Ω	500nA	0.800 + 0.010
Diode Test			
Range	Resolution	Test Current	1 year accuracy ± (reading%+range%) (23°C ± 5°C)
1.00000V	10 µV	1mA	0.010 + 0.020

Continuity Test			
Range	Resolution	Shunt Resistance	1 year accuracy ± (reading%+range%) (23°C ± 5°C)
1000.00Ω	100mΩ	1mA	0.010 + 0.030

Frequency and Period		
Range	Frequency (Hz)	1 year accuracy ± (reading%+range%) (23°C ± 5°C)
100mV ~ 750V	3 ~ 5	0.1
	5 ~ 10	0.05
	10 ~ 40	0.03
	40 ~ 300K	0.01

Measurement Characteristics	
Math Functions	NULL, min / max / average, dBm, dB, MX+B, RATIO, %, limit test (with TTL output)
Measurement Noise Rejection 60Hz(50Hz)	DC CMRR: 140 dB; AC CMRR: 70 dB
Integration Time & Normal Mode Rejection NMRR	10 plc/167 ms (200 ms) : 60 dB 1 plc/16.7 ms (20 ms) : 60 dB
DC Voltage	Input bias current : 25°C < 30pA Input protection : 1000V
DC Current	Input protection: External 3 A 250V fuse
AC Voltage	Input impedance: 1 MΩ parallel with 100 pF Input protection: 750Vrms all ranges
AC Current	Input protection: External 3 A 250V fuse
Resistance	Maximum lead resistance (4-wire): 10% of range per lead for 100Ω and 1kΩ ranges. 1kΩ per lead on all other ranges. Input protection: 1000 V all ranges
Continuity/Diode	With audible tone Continuity threshold: Selectable from 1Ω to 1000Ω
Temperature	RTD: 2-wire, 3-wire and 4-wire measurement Temperature Conversion: IEC751, Callendar-Van Dusen

External Control	
Samples/Trigger	1 ~ 50,000
Trigger Delay	0 ~ 3600 sec.
Memory	2000 readings
Standard Complier	SCPI (IEEE-488.2), Agilent 34401
Interface	USB, GPIB

General	
Power Consumption	25VA max.
Power Requirements	100 V/120 V/220 V/240 V, 45 Hz ~ 440 Hz
Dimensions (HxWxD)	88.6 x 213.6 x 346.9 mm
Operating Temperature	0°C to 50°C
Weight	Approx. 4.36 kgs

Multi-point TC Scanner Card A120004	
Maximum AC Voltage	110V rms or 155V peak, 100kHz, 1A switched, 30VA (resistive load)
Maximum DC Voltage	110V, 1A switched, 30VA (resistive load)
Connector Type	Screw terminal, #22 AWG wire size
Common Mode Voltage	200V peak btw any terminal and earth
Max. Voltage btw Any Two Terminals	160V peak
Thermocouple	K type (-200°C ~ 1372° ) ± 1.5°C (Other type refer to the detailed specifications)

Video & Color  
Flat Panel Display  
Lighting  
LED/Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation





MP5000

### KEY FEATURES

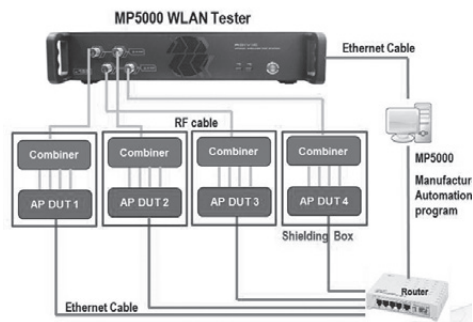
- 4-port, parallel, high speed test
- Supports FDD LTE cellular test standard
- Supports Wi-Fi 802.11ac, 802.11a/b/g/n standards
- Supports Bluetooth V1.x/V2.x/V3.x EDR/V4.x BLE
- Software Defined Radio(SDR) architecture with Wideband VSG/VSA in one box
- Software upgradable for future RF test standards
- User friendly GUI for R&D/QA applications
- API available for production automation programming
- Turn-key production automation software support upon request



MP5010

### KEY FEATURES

- Wi-Fi, Bluetooth, GPS test capabilities in one box
- Supports Wi-Fi 802.11ac, 802.11a/b/g/n standards
- Supports Bluetooth V1.x/V2.x/V3.x EDR/V4.x BLE
- Supports GPS 1-8 Channel simulator
- Optional LTE test package
- 4-port multi-site parallel test
- API available for production automation programming
- Turn-key production automation software support upon request



### APPLICATIONS

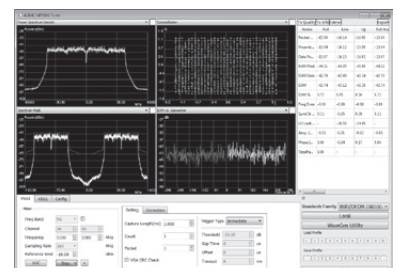
- Consumer Mobile
- Tablet
- IoT (i.e. Automotive)

SPECIFICATIONS	
<b>RF Analyzer (Note *1)</b>	
Input Frequency Range	2150~2600 MHz, 4900~6000 MHz Option : 10 MHz ~ 6 GHz
RF Port number	2 or 4 Ports
IF bandwidth	120 MHz
Max input power	+30 dBm peak, +20 dBm average
Input power accuracy @(+20 to -75 dBm)	±0.75 dB (±0.5 dB Typ) ±1.0 dB@ 0 °C ~ 50 °C
Phase Noise	< -100dBc: 1 KHz offset @2.4 GHz < -9 5dBc: 1 KHz offset @5.8 GHz
LO Leakage (after self-c alibration)	<-50 dBc
sideband image (IQ-imbalance) @after self-calibration	<-50dBc @ 2.4GHz, -10dBm <-50dBc @ 5.8GHz, -10dBm
Third order input inter-modulation distortion(IMD3)	< -70dBc@-10 dBm
Input Return loss	> 10 dB 2150~2600 MH z > 12 dB 4900~6000 MH z
ADC resolution	16 Bits
Sample rate	160 MS/s
Initial achievable accuracy	± 50 ppb maximum (OCXO)@25 °C, after 60 minutes warm up
Temperature stability	±20 ppb maximum(OCXO) @0 °C ~ 50 °C
Aging	± 1 ppb / day maximum (OCXO) ± 100 ppb / yr maximum (OCXO)
Operating Temperature	0 °C to 50 °C
Operating Voltage	100 V to 240 V
Warm - up time	> 30 minute
<b>RF Generator (Note *1)</b>	
Output Frequency Range	4900~6000 MHz , 2150~2600 MHz Option : 10 MHz ~ 6 GHz
IF bandwidth	120 MHz
Max Output power@ CW	+10 dBm @ 2150~2600 MHz +7 dBm @ 4900 ~ 6000 MHz
Power Accuracy@(0 to -95 dBm)	±0.75 dB (± 0.5 dB Typ ) ±1.0 dB @ 0 °C ~ 50 °C
Phase Noise	Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz Phase noise < -95 dBc: 1 KHz offset @ 5.8 GHz
LO leakage(DC offset) @after self-calibration	< -50 dBc @ 2.4 GHz, -10 dB m < -50 dBc @ 5.8 GHz, -10 dB m
sideband image (IQ-imbalance) @after self-calibration	< -50 dBc @ 2.4 GHz, -10 dB m < -50 dBc @ 5.8 GHz, -10 dB m
Third order inter -modulation distortion(IMD3)	<-60dBc@-10dBm(two -13dBm Tone)
Return loss	> 10 dB 2150 ~ 2600 M Hz > 12 dB 4900 ~ 6000 M Hz
DAC resolution	16 Bits
Sample rate	960 MS/s
Initial achievable accuracy @ 25 °C, after 60 minutes warm up	± 50 ppb maximum (OCXO)
Temperature stability @ 0 °C ~ 50 °C	± 20 ppb maximum (OCXO)
Aging	± 1 ppb / day maximum (OCXO) ± 100 ppb / yr maximum (OCXO)
Operating Temperature	0 °C to 50 °C
Operating Voltage	100 V to 240 V
Warm-up time	> 30 minute

**Note \*1 :** Test condition Temperature : 15 °C ~ 35°C, Voltage : 100 V to 240 V

### ORDERING INFORMATION

**ADIVIC MP5000 :** Wi-Fi /Bluetooth /LTE Tester  
**ADIVIC MP5010 :** Wi-Fi /Bluetooth / GPS Mobile Connectivity Tester



R&D, QA applications

All specifications are subject to change without notice.



MP5800

### KEY FEATURES

- Software Defined Radio(SDR) architecture with VSG/VSA in one Box
- RF port support Bi-Directional & TX broadcast function
- Support Wi-Fi/BT/GPS standard & general purpose modulation
- Build-in arbitrary waveform generator & debug tools
- Support calibration box for auto cable loss test & power meter function
- User friendly GUI for R&D/QA applications
- API for production automation programming
- Integrated Chroma 3380/3650 to build full RF/Digital ATE turnkey solution

The MP5800 deploys state-of-the-art Software Designed Radio (SDR) architecture that consists of full extendibility to all current and future Wi-Fi / Bluetooth standards. By upgrading firmware and hardware, it will be capable to support LTE and other wireless standards in the future.

The MP5800 contains high quality VSA (Vector Signal Analyzer) & VSG (Vector Signal Generator) to provide a complete and versatile test environment. A highly integrated GUI is both intuitive and user-friendly which can run simple test of Wi-Fi/Bluetooth signal within few clicks & full test items.

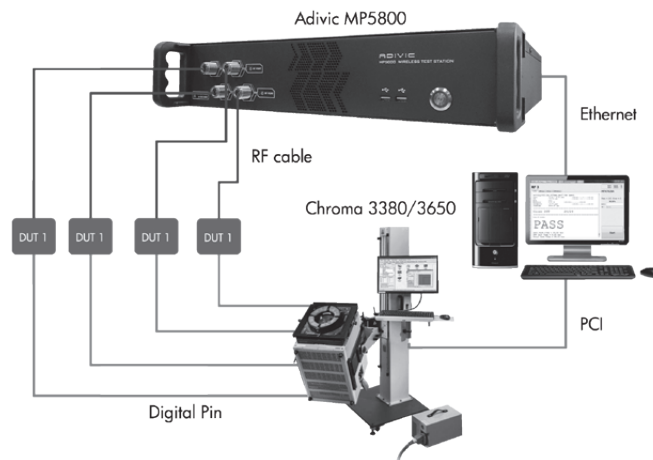
The MP5800 comes fully programmed test waveforms for Wi-Fi 802.11a/b/g/n/ac & Bluetooth V.1.x/2.x/3.x/EDR/4.x BLE which allows immediate testing for DUTs. Moreover, a built-in waveform generator utility lets users being able to create arbitrary Wi-Fi/Bluetooth testing signals. Automatic mass production turnkey software is also available upon request.

The MP5800 supports up to 8 channel GPS simulator and allows users create arbitrary GPS location signal. Furthermore, it provides adjustable output power level for each satellite.

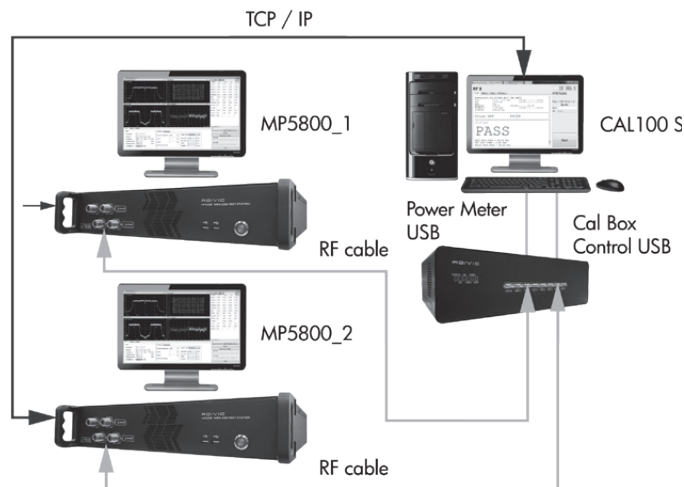
The MP5800 has integrated Chroma 3380/3650 to provide complete RF/Digital ATE turnkey solution. The RF port of MP5800 supports TX broadcast function is being able to reduce massive time on testing. The calibration box has auto cable loss function to increase the accuracy of testing and simplify the operation.

### VSA/VSG RF SPECIFICATIONS

Description	Specification	Remark
Number of RF Port	4 or 8 RF Port	8 Port (option)
RF Port	Source & Measurement Capacity	Bi-Direction Rf Port
Signal Generator	Parallel or Series Source Output	Parallel or Series Sites Test
Signal Analyzer	Series Measurement	Series Sites Test
Frequency Range	✓ 2400MHz ~ 2484MHz & 5000MHz ~ 6000MHz Option : 10MHz ~ 6GHz	MP5800
Max input power	+25 dBm peak +20 dBm average	RF Input Maximum Level
Max Output level	>+7 dBm	RF Output Maximum Level
Level Accuracy	<+/-1.0dB(0.5dB Typ.)	15°C ~ 35°C
VSA Bandwidth	120MHz	16 Bits 160MSPS ADC 16 Bits 960MSPS DAC
Temperature Stability	+/-20ppb maximum@ 0°C ~ 50°C	10MHz OCXO



RF SOC (RF + Digital) Integrated ATE Test



Calibration Box for Auto Cable loss Function

### ORDERING INFORMATION

**ADIVIC MP5800** : RF ATE Test Equipment



MP6220

**KEY FEATURES**

- Capable of position fix tests for 8 satellites
- Single channel mode selectable
- Multi-channel GPS simulator for GPS receiver position fix test
- Individual channel is power adjustable
- Single channel mode for receiver S/N ratio test
- Tunable power output level from -160dBm to -55dBm

SPECIFICATIONS	
<b>Model</b>	<b>ADIVIC MP6220</b>
<b>Frequency Characteristics</b>	
Frequency Range	1575.42 MHz
Warm-up time (typical)	30 minutes
Frequency Accuracy	± 100 ppb maximum
Temperature stability	± 100 ppb maximum
Aging (Per year)	± 100ppb maximum ; ± 1 ppb maximum (Per day)
<b>Channels</b>	
Number	1 CH, 8 CH
Navigation data	GPS C/A @ 1.023 MHz with 50 bps
Modulation	BPSK
<b>RF Output Characteristics</b>	
High power normal output level	-55 dBm to -90 dBm
Low power normal output level	-90 dBm to -160 dBm
Individual Channel Attenuation setting range	-31.5 dB to 0 dB
Doppler Shift	± 30 KHz (1 CH option)

**ORDERING INFORMATION**

**ADIVIC MP6220** : Multi-Channel GPS Simulator





### KEY FEATURES

- Selectable GPS/GLONASS Satellite Vehicle and Navigation Data
- Adjustable RF levels from -85dBm to -145dBm in 0.1dB steps
- Provides calibration output level from -25dBm to -85dBm
- Embedded OCXO for accurate clock
- Embedded Doppler function
- Industry-leading stability, quality and reliability
- Verifies operational integrity of GPS/GLONASS receivers quickly
- Small form factor, easy to operate

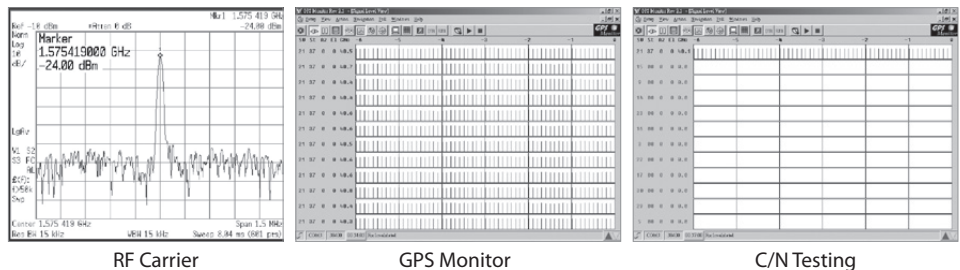
### APPLICATIONS

- Evaluation of GPS products quality / accuracy
- Evaluation of GPS receiver sensitivity
- Mobile phone GPS function test
- Performance evaluation of receiver and module design
- Verify operational integrity of GPS receivers and module

ADIVIC MP6230 with its high accuracy (resolution within 0.1dB) output power, built-in highly stable 10.22MHz OCXO (GLONASS) and 10.23 MHz OCXO (GPS) provides the best signal quality for the testing requirements of R&D, QA and Manufacturing line.

ADIVIC MP6230 incorporates an easy to use front-panel operation with all of the advantages of traditional instruments without the need for an external PC.

SPECIFICATIONS	
Model	ADIVIC MP6230C
<b>RF Signal</b>	
Output Center Frequency	GPS Signal Module : 1575.42MHz (L1 band), optional GLONASS Signal Module : 1598.0625MHz-1605.375MHz (L1 band), optional
RF output level	-85 to -145dBm
Calibration RF output level	-25 to -85dBm
Resolution	0.1dB
Power Accuracy	± 1dB
RF Output impedance	50 Ω
Spurious (in GPS/GLONASS band)	Less than -30dBc
Carrier phase noise	0.1 rad RMS@10 to 10KHz
<b>Baseband Signal</b>	
Modulation method	BPSK
Oven crystal oscillator frequency accuracy	Less than 5X10 <sup>-10</sup> per day
OCXO Stability	Less than 5X10 <sup>-9</sup> -20 to +70°C
C/A Code	GPS Signal Module : 1.023 MHz (1023 bit gold code), optional GLONASS Signal Module : 0.511MHz (3135.029354 cycles/chip), optional
Channels	GPS Signal Module : SV1~SV32, optional GLONASS Signal Module : SV1~SV24, optional
Navigation Data	50BPS
RF Output Connectors	N-Type female RF out & Cal. out
Other signals available	LCD keypad RS-232
<b>General</b>	
Power supply	AC Input Voltage: 90V to 265V, 47 to 63 Hz Input line Current: 0.2A Max. Max. Output Rating: 250W
Weight	5.5 Kg
Dimensions	318mm (W) x 320mm (D) x 100mm (H)
Operating Temperature	0 to 45°C
Operating Humidity	20 to 90%



### ORDERING INFORMATION

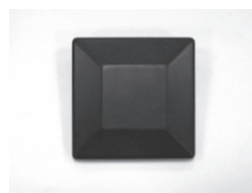
**ADIVIC MP6230C** : Single channel GPS/GLONASS Simulator

#### Additional Options and Accessories

- A490030** : GPS Flat Antenna
- A490031** : RF Coaxial Cable
- A490032** : GPS / GLONASS Dual Mode Flat Antenna
- A490033** : 50 ohm Terminator (N Type)
- A490034** : GPS Signal Module
- A490035** : GLONASS Signal Module



A490031



A490030/A490032



A490033

Video & Color  
Flat Panel Display  
LED/ Lighting  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/ IC  
Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation

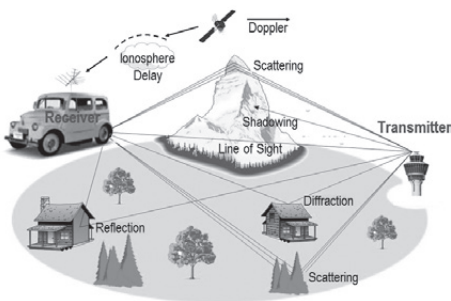




MP7600

### Test your product with the Real-World signals

- Eventually your Receiver has to receive the real-world signal, yet...
- None of the existing signal generators can 100% emulate the real world signals,
- Only the RF recorder/player can bring back repeatable real world RF signals to your lab



Different location    Various weather    Critical condition



Geography    Construction

### When will you need a RF recorder?

- Your DTV/DAB/GPS receiver chip can't decode properly in certain location
- Your receiver works fine in some locations, however doesn't in some other locations.
- Virtual signal source, can be any signal generator

既有訊號

錄製 儲存 分析 回放

研發運用

實地場訊號

產線運用

不明加密訊號

MATLAB後製 解密解調解碼

訊號中心運用

### KEY FEATURES - MP7600

- Ultra-high frequency coverage from 300 KHz to 6.0 GHz
- Pre-trigger function to keep your valuable record data even before the trigger event
- 100MHz super wide bandwidth capable of simultaneously record/playback of 16 NTSC TV channels
- MP7600 can have a maximum of 7 sets, synchronized in parallel, RF record/playback
- 16-bit high resolution of the ADC/DAC
- Smart AGC to extend usable dynamic range to greater than 150dB
- High linearity to accommodate strong & weak signals
- Additional traces for maximum/minimum holds
- 20+ markers for easy signal identification
- Baseband IQ data formats compatible to MATLAB
- Software utility support including I/Q data extractor and file segmentation
- 2.5 inches SSD x4 internal drive bays (4 X 480 GB by default, 1 TB x4 upgradable)
- 1PPS, IIRIG-B support (Optional)

### KEY FEATURES - MP7200

- Adjustable bandwidth from 1 MHz to 25MHz, capable of recording and playback of the entire FM stereo broadcasting band 88MHz~108MHz
- Frequency coverage from 25 MHz to 2.7 GHz
- RF connector with programmable DC output to power the external active antenna

- 100 MS/s sampling rate for recording and playback path respectively
- Supports GPS NMEA data recording for route playback on Google Maps
- Remote control available
- Baseband IQ Data formats compatible to MATLAB
- Software utility support including I/Q data extractor and File segmentation

### KEY FEATURES - MP7300

- Dual Channel for Antenna Diversity signal record/playback, used for car DTV receiver test
- Adjustable bandwidth from 1 MHz to 45 MHz
- Frequency coverage from 300 KHz to 3.0 GHz
- Programmable DC output for the external active antenna
- 250 MS/s sampling rate in recording and playback
- 16-bit resolution for Rx and 14-bit resolution for Tx
- High linearity to accommodate strong & weak signals
- Supports GPS NMEA data recording for route playback on Google Maps, along with RF playback
- Remote control available
- Pre-trigger recording function
- Data formats compatible to MATLAB analyzer
- Software utility support including I/Q data extractor and File segment

### SPECIFICATIONS

Model	ADIVIC MP7200 RF Recorder/Player	ADIVIC MP7300 RF Recorder/Player	ADIVIC MP7600 RF Recorder/Player
TFT Touch Screen	Capacity	Capacity	--
Frequency	25MHz~2.7GHz	300KHz~3.0GHz	300KHz~6GHz
Bandwidth	25MHz (20MHz Guaranty BW)	45MHz	100MHz
Sample Rate	100MS/s	250MS/s	250MS/s
Resolution RX/TX	14/14 bit	16/14 bit	16 bit
Recorder Channel	1	1/2	1
Playback Channel	1	1/2	1
Diversity function	No	Yes (Diversity option)	No
Trigger function	Yes	Yes	Yes
10MHz Clock In/Out	No	Yes	Yes
SWAP Hard Disk	Yes	Yes	Yes
SSD	Standard	Standard	Standard
Power	AC 100~250V	AC 100~250V	12V
Size	L : 36 x W : 34 x H : 22.9 cm	L : 45 x W : 44 x H : 26.4 cm	35.6 x 30.2 x 10.2 cm
Weight	14.3 kg	depends on configuration	9 kg

### ORDERING INFORMATION

- ADIVIC MP7200 : RF Recorder/Player 25MHz~2.7GHz
- ADIVIC MP7300 : RF Recorder/Player 25MHz~3.0GHz
- ADIVIC MP7600 : RF Recorder/Player 300KHz~6.0GHz



MP7200



MP7300

All specifications are subject to change without notice.



MP9000

## APPLICATIONS

### Multi-Standards RF Communication Testing

- GPS
  - 6CH, 8CH GPS Model
  - RF Level -55dBm to -160 dBm
  - Global City Library
  - Location editor
  - Almanac upgradeable
  - 1 Channel GPS Model
  - RF Level -55dBm to -160dBm
  - Almanac data
  - Doppler Control  $\pm$  30KHz
- RF Player
  - Perfect solution for DTV, GPS, Radio and many RF communications
  - Field testing signal source
  - Performance testing signal source
  - Supports Frequency ranged from 300K-2.7GHz
  - Adjustable bandwidth 25MHz
- DTV
  - DVB-T/H
  - ATSC
  - DTMB
  - ISDB-T
  - RF level +10dBm to -110dBm
  - Noise Generator
- FM RDS
  - FM 76 to 108MHz
  - RF level -10 to -120dBm
  - FM Mono
  - FM Stereo
  - RDS
  - RBDS
  - RDS TMC / RBDS TMC
  - RDS Feature - Alternative Frequency / Enhance Other Network / Radio Text Plus
- Audio Analyzer
  - RX : AC Level, Noise, Distortion, S/N, Frequency response, Total Harmonic Distortion THD+N, SINAD
  - TX : CW mode, Multi Tone, 20Hz-20KHz Sweepmode

## Introduction

ADIVIC proudly introduces the new model - MP9000 RF Station. MP9000 provides a platform that adopts different wireless communication modules into variety of combinations for different purposes & standard requirements of tests including GPS, FM RDS/TMC, DTV, Audio Analyzer and all one way communication standard.

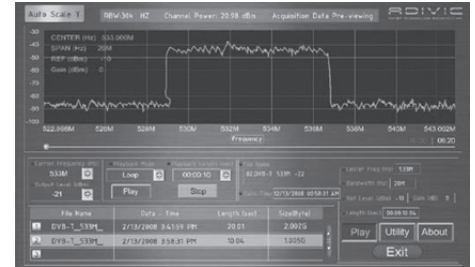
The MP9000 allows the users to implement single or multiple standards testing, such as concurrent parallel testing and sequence-based testing. MP9000 is sophisticated for R&D applications, and the user friendly GUI also makes it ideal for production line applications. By bringing in the concept of one does all, MP9000 would greatly benefit the customers with dramatic time saving and high-level of cost-effectiveness.

## Operation

An easy-to use GUI and an integrated 10.2" Touch panel fully conform with one of its designations to provide a user-friendly environment which allows the users to easily control the MP9000 functionalities. Speaking of compatibility, the USB and Ethernet ports are implemented to allow the users to easily integrate the MP9000 into the production-line ATE for production test purpose covering the semi-product (PCBA) and end product test.

## RF Player Option

ADIVIC RF PLAYER is an exquisite RF- engineering tool for both field testing and performance testing. It has the capability of replacing many expensive instruments from one RF communication to another. It is by far the only instrument which crosses over RF communication standards from the past, the present and the future. RF PLAYER is meant for all existing RF communications, for all modulation schemes, for analogue and digital. MP9000 plays the streams recorded from the ADIVIC's RF Recorders.



## SPECIFICATIONS

Model	ADIVIC MP9000
<b>System</b>	
Processor	Intel Core 2 Duo Series
Memory	DDRII 667 2GB
System storage	SATAII 320G HDD or above
Power supply	AC 100 to 240V, 50/60Hz
Operating temperature	0 to 50°C
Operating humidity	0% to 95% RH (Non Condensation)
Storage temperature	-20 to +80°C
Dimensions	360(L) x 340(W) x 200(H) mm
Weight	Approx.17Kg
<b>OS system</b>	
Windows XP Professional User interface	
10.2 inch TFT color LCD	
Touch Screen	
<b>External Interface</b>	
USB 2.0 Port x 4	
eSATA x 1	
Ethernet LAN Port (10BASE-T / 100BASE-TX / 1000BASE-T) x 1	

## ORDERING INFORMATION

**ADIVIC MP9000** : Wireless Communication Test System

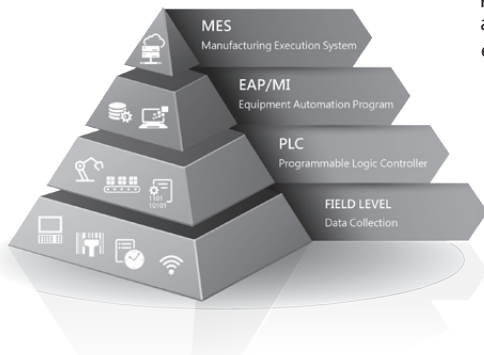
# Intelligent Manufacturing System (IMS) Solution

<b>Manufacturing Execution System (MES)</b>	<b>17-1</b>
<b>Hemodialysis Management System (HDMS)</b>	<b>17-3</b>
<b>Fast Easy Player</b>	<b>17-4</b>





## Industry 4.0



### KEY FEATURES

- Complete Production Process (Traceability)
- Full Production Information Monitoring (WIP Control)
- Equipment /PLC Automatic Connectivity
  - Computer Integrated Manufacturing : CIM
  - Equipment Automation Program: EAP
- Expert Quality Control System
  - Statistical Process Control : SPC
  - Corrective Action Report : CAR
  - Out of Control Action Plan : OCAP
- Manufacturing Equipment Management
  - Equipment Management System : EMS
  - Overall Equipment Effectiveness : OEE
- Real-Time Report
  - Yield Rate Report
  - WIP Report
- Mobile App Real-Time Queries and Notifications, supported types :
  - Smartwatch
  - Smartphone
  - Tablet Computer

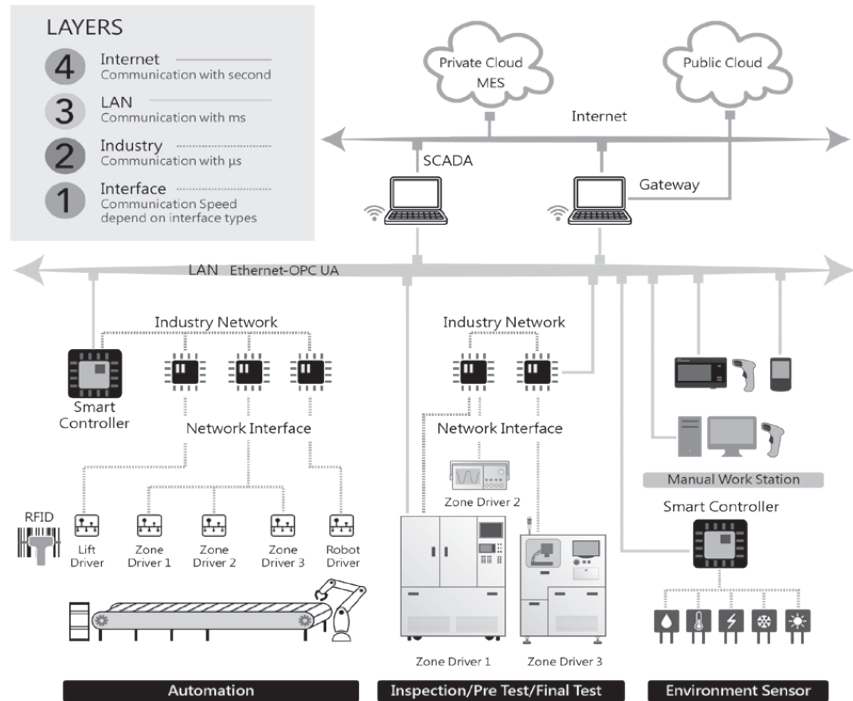
### The New Generation of MES - The Core System of Automated Factories

An Intelligent Manufacturing System (IMS) is the key for the integration of automation. As modern factories trend toward automated production, traditional IMS (which focuses on only collecting data and report analysis) cannot meet the emerging requirements of the automation era. A new generation of IMS is the core system of automated factories that not only retains the traditional scope but also covers the functions of CIM, EAP, equipment connectively, and integrating robotics. As a comprehensive tool, IMS now meets the objectives of factory automation by real time control, data acquisition and data analysis to improve product quality while reducing production cost through maximizing the benefits of enterprise.



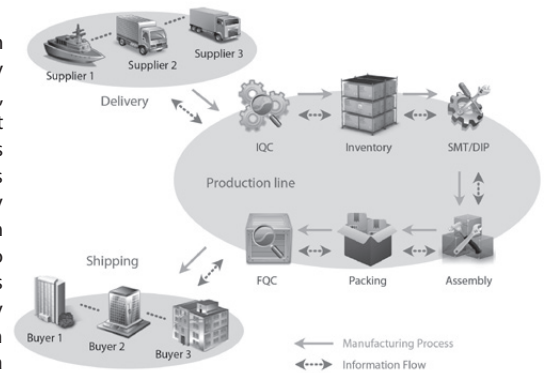
### Sajat MES - The Best Choice of Smart Factory System

Chroma not only specializes in IMS Systems but is also a world-class test, measurement and automated production line equipment manufacturer, has abundant technology and experiences in IMS and automated equipment integration that can provide you the best next generation manufacturing execution system solution..



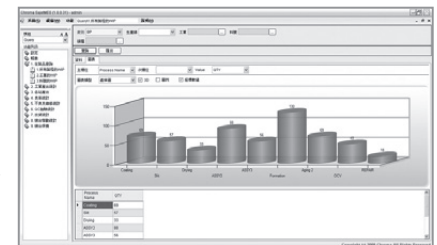
### Complete Production Process Trace - Traceability

The manufacturing process information contained in Chroma IMS can assist the factory to process work orders, monitor workstations, track and manage inventory as well as to conduct quality inspection and exception conditions management. The detail provided allows users to find lot number, delivery date and quantity of passive components used in a product from the supplier. It can also use the lot number to trace back the shipped products for locations and quantities to reduce the loss caused by defect components. The traceability features can rapidly highlight material or process problems, a necessary tool for factory management.



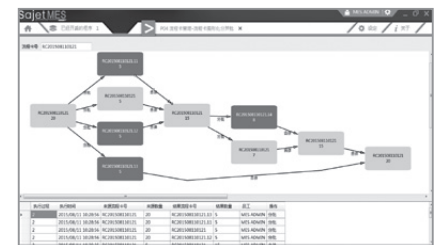
### Full Production Information Monitoring-WIP Control

The IMS provides flexible routing management that allows users to plan different routes based on the products, control the quantity of yield and defective goods, manage reworked products and calculate the pass-through rate. The complete traceability data collection and production line information is fully controlled by Chroma IMS to increase the production efficiency and reduce production costs.



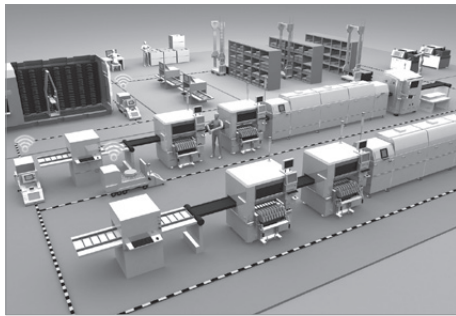
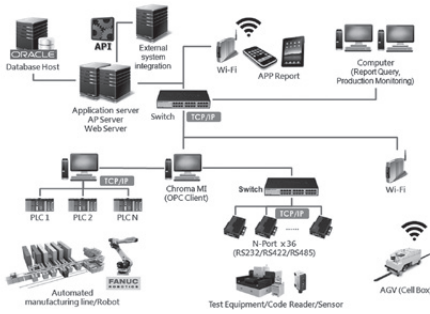
### Flexible Routing Management - LOT Control

Chroma IMS also provides the function of flexible routing control. Users can do different route management per different products, at the same time support different demands of controlling products, work orders, and lots as the management objectives. Users can easily structure production types on diverse operation interfaces from different industries, providing prediction and abnormality handling system, to control abnormality efficiently.



## Industrial Automated integration platform, Equipment Automation Program (EAP) / ATE

Chroma IMS collects production data, reads RFID to identify product identity and quantity, and through the OPC connects machine connection (EAP) including equipment PLC, automatic arm, automated production lines, automated guided vehicle and other automation equipment. Chroma IMS provides an API interface for testing program integration to meet a variety of data communication and equipment integration, including SECS / MQ / RV / OPC and so on.

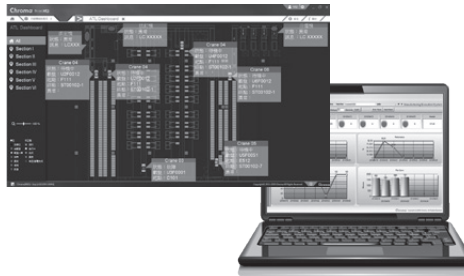


## Manufacturing Equipment Management - EMS, OEE

Chroma IMS is capable of collecting the workstation status to give the supervisor and on-site personnel the ability to monitor the workstation status in real time, log its maintenance status and query the information of device, including :

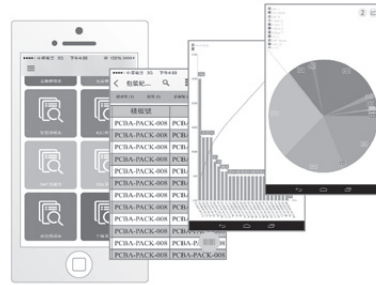
- Device failure analysis,
- Device utilization rate,
- Failure frequency analysis,
- Device maintenance time analysis, etc.

Users can use PCs or display devices to manage the processing workstation easily.



## Real-time Report - Yield Rate Report, WIP Report

Chroma IMS has powerful IMS database technology in the industry that can be online in real time to administer every work item precisely. The report generator developed by Chroma is applicable for complete report query and real time report generation. Various mobile devices like smart phone, PDA and Tablets can be used to query the report and get an immediate snapshot of the factory status. It can also be integrated into BI (Business Intelligence) system so enterprise managers can view thorough reports of production line.



## 完整硬體設備整合解決方案，滿足各類需求

- Integration of Various Devices
  - Various test equipment of Chroma
  - Manufacturing database online control program development and implementation
- Barcode Printing Device and Sensor Switch
  - Long/short range optical switching system
  - Various industrial barcode printer
- Mobile Application Management Device
  - PDA, Tablet Computer, smart watch (iOS/Windows/Android)
  - Wireless Scanner, wireless Terminal, etc.
- Other Electromechanics and Factory Devices
  - Temperature controller, electronic scale
  - PLC, connectable device (Scanner), etc.
- Optical Scanning
  - Various handheld 1 & 2 dimension gun type barcode scanner
  - RFID Reader, fixed barcode scanner system
- Industrial Network Peripherals
  - Data collector, IPC
  - TCP/IP, RS232, USB signal converter, etc.



- Display Device Management
  - Various production efficiency kanban
  - Factory notice kanban, Pick To Light, etc.
- Automatic Equipment
  - Automatic labeling machine, laser engraving machine, etc.
  - Fully automatic test equipment solution

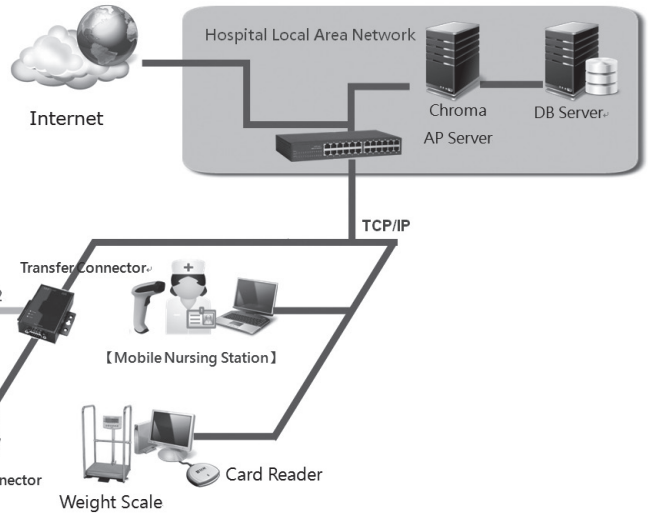
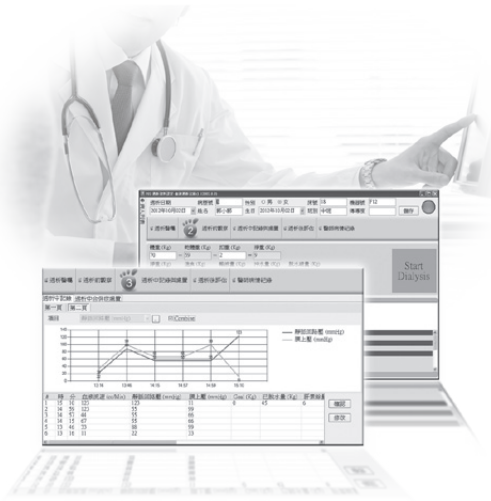


## ORDERING INFORMATION

### List of Systems and Functional Modules

Basic Modules	Other Systems	Smary Factory Modules	Optional Modules
Data Center	Real-time SPC	App Report	ERP/MES Interface
Work Order Manager	Work Hour System	Computer Integrated Manufacturing, PLC Handshaking Centre (CIM/PHC)	Automated Test Equipment (ATE)
Barcode Center	Global RMA System	Equipment Automation Program (EAP)	Incoming Quality Control (IQC)
TGS Server (Data Collection)	Computer Numerical Control (CNC)	Equipment Management System (EMS/OEE)	Tooling Manager
Repair	Warehouse Management System	Formation Measurement System (FMS)	Alarm System
Rework	Material and Pull System (MMPS)	Fast Easy Player (FEP)	SMT Feeding System
Quality Control	ANDON System	Recipe Management System (RMS)	Shipping
Packing	<b>Note :</b> Independent modules		Material Warehouse
Run Card Manager (R/C)		<b>Note :</b> Independent modules	Return Merchandise Authorization (RMA)
WIP IN/OUT Tracking			e-Kanban (Real-time Display Board)
Report			<b>Note :</b> Subsidiaries of basic modules

Video & Color  
Flat Panel Display  
Lighting LED/  
Optical Devices  
Photovoltaic Test & Automation  
Automated Optical Inspection  
Power Electronics  
Battery Test & Automation  
Passive Component  
Electrical Safety  
Semiconductor/IC  
PXI Test & Measurement  
General Purpose  
Intelligent Manufacturing System  
Turnkey Test & Automation



### KEY FEATURES

- Digital Sickbed Arrangement Management
- e-Hemodialysis Record
- Accurate Weight Scale Management
- HOPE Auto-Uploading Management
- Digitalize Medical Records Management
- HD Visualized Data Analysis

### Chroma HDMS is Your Best Choice

HemoDialysis Management system integrates related software and hardware, saving medical personnels' time on organizing all the paper work. Also, it helps to decrease the possible error that might be happened during the process of hand-writing document. Through the automatic process on the system, we can get more completed data, at the same time, enhancing medical and nursing data integration.

### HD Visualized Data Analysis

The system can also produce short, medium, and long term related hemodialysis data and reports, so as to be the analysis of medical and nursing research, providing a basis to improve medical quality.



### Digital Sickbed Arrangement Management

Through digital sickbed arrangement, it's easier to manage all the sickbed arrangement. The user interface is clear and useful for the administrator to control the entire situation, without spending lots of time on complicated paper work.



### e-Hemodialysis Record

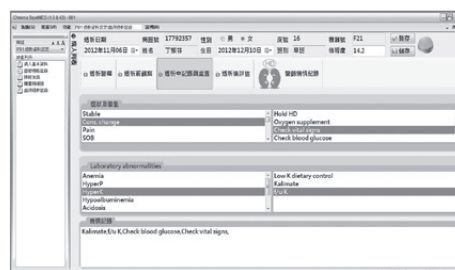
All the data on dialysis machine will be automatically uploaded to the Chroma AP Server. The system will automatically help to fill in related reports. Not only nursing staffs can save lots of time doing complicated hand-writing document but also keep the complete data for the future references and inquiry.

### Accurate Weight Scale Management

In order to decrease inconvenience and possible error of hand-writing process, the number of weight scale can be automatically uploaded to the system, which reaches the goal of "PAPERLESS".

### HOPE Auto-Uploading Management

So as to reduce repeatedly key-in data, users can conduct the doctors' orders and upload it to HOPE on HDMS. Any computers that connect to the hospital local area network can inquire the medical records and conduct doctors' orders through the authorized permission.



### Digitalize Medical Records Management

Digital medical records gradually replace the traditional paper medical records, including eyesight, hearing, and past medical history. It becomes more convenient to inquire patients' medical records.



### Lists of Systems and Functional Modules

#### Basic Modules

- Data Center
- Medical Records
- Dialysis Machine
- HemoDialysis
- Sickbed Arrangement
- Report

#### Optional Modules

- Weight Scale
- HOPE Uploading
- HIS Connection
- Doctor Patrol
- Peritoneal Dialysis
- NIS Connection
- PACS Management

### Complete Hardware Integrated Solution Satisfies Various Needs

- HemoDialysis Device
- Dialysis Machine Connection NPort
- Various Handheld 1&2 Dimension Gun-Type Barcode Scanner
- Mobile Application Management Device: PDA, Tablet Computer, and etc.





### KEY FEATURES

- Broadcast through Wi-Fi
- Log in on web browser
- Modularize interface setting / Flexibly adjust layout
- Integrate multiple ways to connect external database
- Voluntarily define the chart and diagram
- Platform controls the area and setting of each screen

### APPLICATIONS

- Real-time information broadcast through Wi-Fi in hospitals, retail stores, and public environments
- Real-time broadcast of factory production efficiency kanban through Wi-Fi
- Real-time broadcast of factory eSOP through Wi-Fi
- Real-time broadcast of above messages on mobiles and tablets through Wi-Fi

### Setting Up & Installment

- Connect the display devices through HDMI
- Internal Android platform on AP
- Fast hardware setup
- Setup can be finished under environment with Wi-Fi Connect to SQL server easily



### User Interface

- With function of display of dashboard, scrolling text, bulletin board, pictures rotator, date, time, weather, embedded web page and etc
- Voluntarily adjust the layout according to actual needs
- Multiple templates can be set at the same time, and display on different monitors



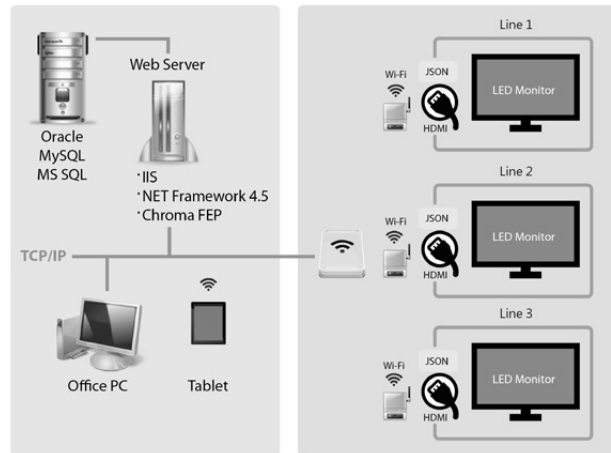
### Picture Files Maintenance

- User can easily upload pictures by dragging
- Create a group upon existed folders
- Support different formats of pictures
- Set pictures display order and time interval



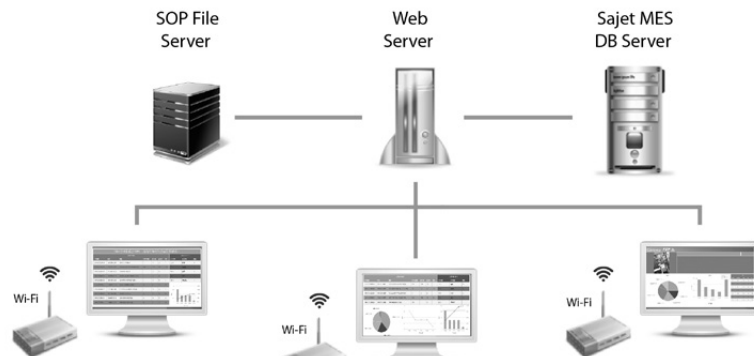
### System Architecture- Establish eKanban through Wi-Fi

The new generation of Chroma eKanban solution integrates HDMI interface and different kinds of digital display monitors under Android platform. It helps to deliver real-time information to display monitors through Wi-Fi in factories. Moreover, it is easy to set up the layout configuration on Web interface so as to upload and broadcast real-time kanban information to factories, hospitals, retail stores, and public environments, providing the best choice of visual management solution.



### Factory Layout- One platform can manage all the kanbans

Chroma FEP can establish new kanban according to different area configurations, setting up template through one single managing platform. Each functional module can be configured by dragging. The configurable functions include picture files, weather information, clock, scrolling text, dashboard, chart and diagram, bulletin board, table, and embedded web page, providing managers integrated kanban information.

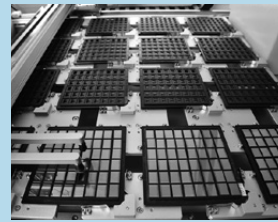
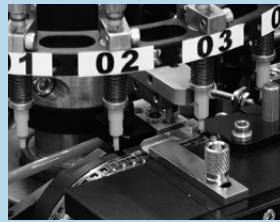


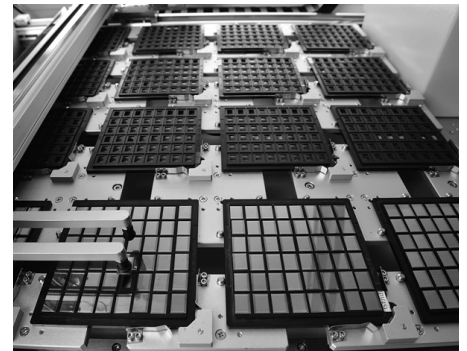
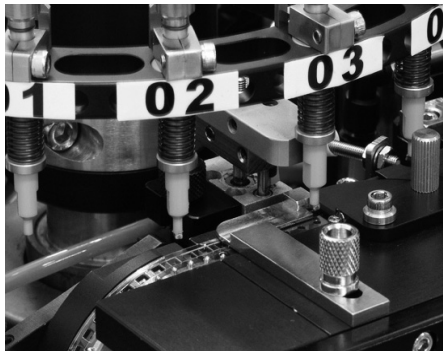
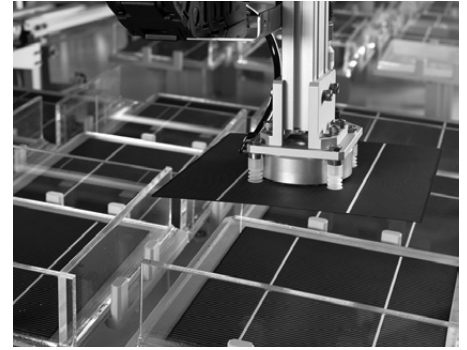


# Turnkey Test & Automation Solution

<b>Assembly &amp; Test Automation Solutions</b>	<b>18-1</b>
<b>Smart Conveyor</b>	<b>18-2</b>

<b>Selection Guide</b>		
<b>Assembly &amp; Test Automation</b>	<b>Applications</b>	<b>Page</b>
Flat Panel Display Burn-in & Testing	LCM, LCD & other flat panel displays	<b>5-13</b>
LED Lighting Automatic Assembly & Testing	LED light bulbs & tubes	<b>6-9</b>
Photovoltaic Automatic Testing & Sorting	Solar wafers & cells	<b>8-3</b>
Battery Cell Formation & Assembly	Lithium Ion & lithium polymer secondary batteries	<b>11-1</b>
Passive Component Test & Packing	Inductors	<b>12-25</b>
IC Automatic Testing & Sorting	especially for CIS Testing (CMOS Image Sensor), capable of handling devices of a large variety of package types including QFP, TQFP, BGA, PGA, etc.	<b>14-16</b>
Smart Conveyor	Manufacturing transportation	<b>18-2</b>





## APPLICATIONS

- Flat Panel Display Burn-in & Testing
- LED Lighting Automatic Assembly & Testing
- Photovoltaic Automatic Testing & Sorting
- Battery Cell Formation & Assembly
- Passive Component Testing & Packing
- IC Automatic Testing & Sorting
- 3C Device Automatic Assembly

Chroma is a world leading supplier of precision Test and Measurement instrumentation.

Utilizing in-house automated handling and manufacturing execution system (MES) expertise, Chroma specializes in integrated and fully automated turn-key electronic test and manufacturing solutions for technologies including FPD (Flat Panel Display), video and color, LED/lighting, photovoltaic, Li-battery, passive components, semiconductor/IC, etc.

## ORDERING INFORMATION

\* Call for customized availability



Inquire Now !



### KEY FEATURES

- Modular architecture
- Hybrid Operating mode
- Reconfigurable line layout
- Intelligent lifter
- High speed pick and place
- Autonomous material routing

To fulfill the need of complete test solutions from the market, Chroma not only provides test and measurement instruments, but also integrates with automated systems and manufacturing execution systems as turnkey solutions, which bring more value and service to customers and help customers in terms of time saving, cost saving, and one-stop full service.

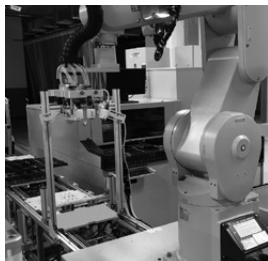
### ORDERING INFORMATION

**5703** : Smart Conveyor

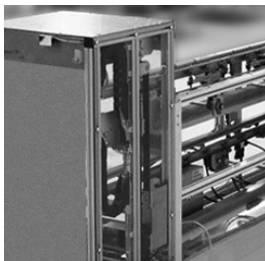
\* Call for customized availability



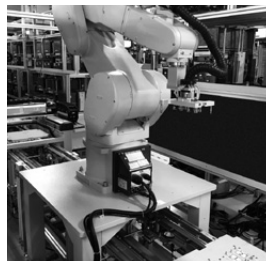
Inquire Now !



Barcode binding



Lift up and lift down



Pick and place



Sorting





*Chroma offers total solutions in selling the highest quality instrumentation available and service. That begins with the first call to Chroma and continues after the sale through long-term product support. Our sales and service personnel work closely to help you make the best selections for your applications. Then we help you maximize your investment by ensuring optimum equipment performance. All this is accomplished through customer support programs ranging from training to product installations and a variety of maintenance plans.*

## WARRANTY SERVICE

CHROMA ATE INC. warrants its instruments against all defects in workmanship and material. If you should experience a problem with your instrument, our technicians are available to help you over the phone, or find the nearest service support for timely repair.

## CALIBRATION AND REPAIR SERVICE

Whatever your test and measurement hardware support needs, Chroma can provide a reliable, cost-effective support selection that you can trust to reduce downtime and get you back to Business swiftly.



**HALT & HASS System**

### • Instrument Calibration

Keep your equipment operating with maximum precision: Chroma's calibration services are all traceable to national and international standards.

- On-site Calibration for All Major Instrument Brands
- Service Center Instrument Calibration

### • Instrument Repair

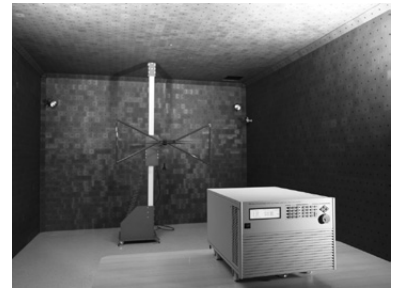
Chroma offers a variety of flexible choices to maximize instrument uptime, with just the coverage you need for repair.

- Instrument Repair Agreements
- Instrument Standard Repair

### • Test System Calibration and Repair

Maximize test system uptime. Chroma has flexible, custom-configurable service and support package, available on select solutions for your specific needs.

- On-site System Calibration
- On-site System Repair



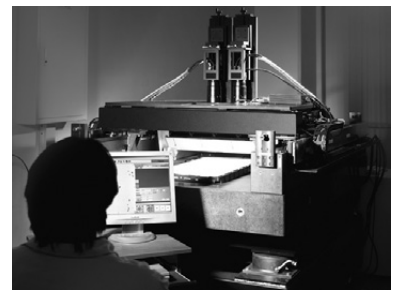
**Radiation Test**



**Conduction Test**



**ESD Test**



**Optical Laboratory**



**Programmable Temperature & Humidity Chamber**

### • Service Warranty

Chroma's service is unconditionally warranted for 90 days, except for disposables such as batteries and lamps, abuse and damage. All calibrations are traceable to National Standards like CNLA.

### CUSTOMER-SITE INSTALLATIONS

Chroma provides on-site installations for most Chroma-configured systems. Your Chroma service person will set up your product to meet all operating specifications. Contact your local sales and service office or sales agency for more information.



### PRODUCT UPGRADE

Older instruments may be upgraded in order to extend the life of the product on your bench or in your system. Upgrades include adding options or new functions, and/or updating firmware.

### REPLACEMENT PARTS

Reduce your inventory and free up your technical staff by taking advantage of our repair exchange modules and board assemblies. Simply call or FAX in your purchase order and Chroma will send you a replacement part.

### TRAINING

Chroma provides formal training courses to help you get up to speed and make the most of our products.



### TECHNICAL SUPPORT

Chroma provides high quality technical support on applications, operation, measurement specification, hardware, and software, by expert Application engineers. Contact us for more information.

### LONG TERM PRODUCT SUPPORT

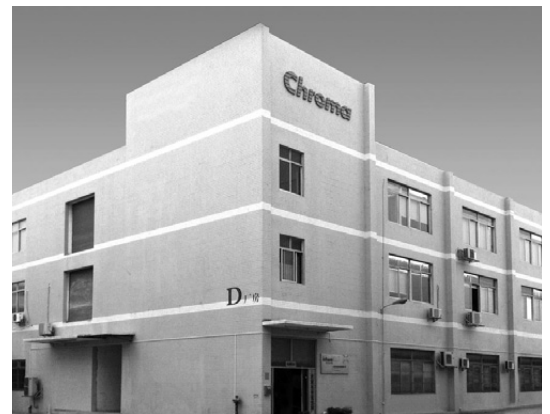
Chroma supports its instruments for a period of five to ten years beyond the end of production (depending upon the instrument), and wherever possible, we make an effort to support our instruments for much longer time.

### CUSTOMIZED SERVICES

In addition to Taiwan headquarters, we not only distribute overseas branch offices but also supply customized services to meet various customs and cultures. In Europe, our customers can inspect instruments' demonstrations easily on the CBC (Chroma Business Coach) which works as a dynamic show-room instead of taking long Business trips. If you are interested in this service, please contact our Europe branch office directly.



Chroma Service Center - Germany



Chroma Service Center - Dongguan, China



China Online Service on WeChat media

# Global Service Network

## HEADQUARTERS

### Chroma ATE Inc.

66 Huaya 1st Road, Guishan,  
Taoyuan 33383, Taiwan  
Tel: +886-3-327-9999  
Fax: +886-3-327-8898  
E-mail: info@chromaate.com  
www.chromaate.com

## HSINCHU

### Chroma ATE Inc.

**Hsinchu Branch Office**  
6F, No. 5, Technology Rd.,  
Science Park, Hsinchu City  
30078, Taiwan  
Tel: +886-3-563-5788  
Fax: +886-3-563-5758

## KAOHSIUNG

### Chroma ATE Inc.

#### Kaohsiung Branch Office

No.1, Beineihuan E. Rd.,  
Nanzi Dist., Kaohsiung City  
81170, Taiwan  
Tel: +886-7-365-6188  
Fax: +886-7-364-9500

## OVERSEAS BRANCH OFFICES

### U.S.A.

#### Chroma ATE, Inc. (U.S.A.)

7 Chrysler, Irvine, CA 92618  
Tel: +1-949-421-0355  
Fax: +1-949-421-0353  
Toll Free: +1-800-478-2026  
E-mail: info@chromaus.com  
www.chromaus.com

#### Chroma Systems Solutions, Inc.

19772 Pauling, Foothill Ranch,  
CA 92610  
Tel: +1-949-600-6400  
Fax: +1-949-600-6401  
E-mail: sales@chromausa.com  
www.chromausa.com

## EUROPE

#### Chroma ATE Europe B.V.

Morsestraat 32, 6716 AH Ede,  
The Netherlands  
Tel: +31-318-648282  
Fax: +31-318-648288  
E-mail: sales@chromaeu.com  
www.chromaeu.com

## Chroma ATE Germany

Südtiroler Str. 9, 86165  
Augsburg, Germany  
Tel: +49-821-790967-0  
Fax: +49-821-790967-600  
E-mail: support-germany@chromaeu.com  
www.chromaeu.com

## JAPAN 日本

### Chroma Japan Corp.

888 Nippa-cho, Kouhoku-ku,  
Yokohama-shi, Kanagawa,  
223-0057 Japan  
Tel: +81-45-542-1118  
Fax: +81-45-542-1080  
E-mail: info@chroma.co.jp  
www.chroma.co.jp

## SOUTHEAST ASIA

### Quantel Pte Ltd.

#### (A Company of Chroma Group)

46 Lorong 17 Geylang # 05-02 Enterprise  
Industrial Building, Singapore 388568  
Tel: +65-6745-3200  
Fax: +65-6745-9764  
E-mail: sales@sg.quantel-global.com  
www.quantel-global.com

## HONG KONG

### Newworld Electronics Ltd.

Unit 6, 6F, Shui Hing Centre, No. 13,  
Sheung Yuet Rd., Kowloon Bay,  
Kowloon, Hong Kong  
Tel: +852-2331-9350  
Fax: +852-2331-9406  
E-mail: newworld\_nwd94@newworld.com.hk

## CHINA

### BEIJING

#### Chroma Electronics (Shenzhen) Co., Ltd.

**Beijing Branch Office**  
8F, Building 7, No.18 Feng Chuang  
Technology Park, 13th Ke Chuang Street,  
Economic Technological Development  
Area, Yizhuang, Beijing, China  
Tel: +86-10-5764-9600, 5764-9601  
Fax: +86-10-5764-9609  
E-mail: info@chromaate.com  
www.chroma.com.cn

### SHANGHAI

#### Chroma Electronics (Shanghai) Co., Ltd.

3F Building 40, No. 333, Qin Jiang Rd.,  
Shanghai, China  
Tel: +86-21-6495-9900  
Fax: +86-21-6495-3964  
E-mail: info@chromaate.com  
www.chroma.com.cn

## SUZHOU

### Chroma ATE (Suzhou) Co., Ltd.

Building 7, Shi Shan Industrial Gallery,  
No. 855, Zhu Jiang Rd., Suzhou  
New District, Jiang Su, China  
Tel: +86-512-6824-5425  
Fax: +86-512-6824-0732  
E-mail: info@chromaate.com  
www.chroma.com.cn

### Chroma System Technology (Suzhou) Co., Ltd.

503-1, 4th Floor Genway LOHASTOWN,  
88 Building, 999 Xinghu Road,  
SIP Suzhou  
Tel: +86-512-6807-1889  
Fax: +86-512-6807-1886  
E-mail: info@chromaate.com  
www.chroma.com.cn

## CHONGQING

### Chroma Electronics (Shenzhen) Co., Ltd.

#### Chongqing Branch Office

Building 4 Longfor MOCO, No. 13-8,  
No.166, XinNan Rd, YuBei District,  
Chongqing, China  
Tel: +86-23-6703-4924 / 6764-4839  
Fax: +86-23-6311-5376  
E-mail: info@chromaate.com  
www.chroma.com.cn

## XIAMEN

### Chroma ATE (Suzhou) Co., Ltd.

#### Xiamen Branch Office

Unit 705-706, No.55 Building B,  
Wanghai Road, Software Park,  
Xiamen, Fujian, China  
Tel: +86-592-8262-055  
Fax: +86-592-5182-152  
E-mail: info@chromaate.com  
www.chroma.com.cn

## SHENZHEN

### Chroma Electronics (Shenzhen) Co., Ltd.

8F, No.4, Nanyou Tian An Industrial Estate,  
Shenzhen, China  
Tel: +86-755-2664-4598  
Fax: +86-755-2641-9620  
E-mail: info@chromaate.com  
www.chroma.com.cn

## DONGGUAN

### Chroma Electronics (Shenzhen) Co., Ltd.

#### Dongguan Branch Office

3F, Building YD3-4, Guancheng  
Technology Park, Shi Long Road,  
Guancheng District, Dongguan City,  
Guangdong, China  
Tel: +86-769-8663-9376  
Fax: +86-769-8631-0896  
E-mail: info@chromaate.com  
www.chroma.com.cn

## DISTRIBUTORS

### AUSTRALIA

Power Parameters Pty Ltd.  
(Test & Measurement Instruments)  
83 Northern Road, Heidelberg West 3081  
Victoria, Australia  
Tel: +61-3-9450-1500  
Fax: +61-3-9457-6327  
E-mail: power@parameters.com.au  
www.parameters.com.au

### AUSTRIA

DataTec GmbH  
(Test & Measurement Instruments)  
Ferdinand-Lassalle-Str. 52 D-72770  
Reutlingen, Germany  
Tel: +49-7121 / 51 50 50  
E-mail: info@datatec.de  
www.datatec.de

### Universal Elektronik Import GmbH

(Test & Measurement Instruments)  
Anton-Freunschlaggasse  
49 AT-1230 Wien, Austria  
Tel: +43-1-5451-588  
Fax: +43-1-5451-464  
E-mail: sales@uei-vienna.com  
www.uei-vienna.com

## BAHRAIN

Didactic Systems & Technology  
(Test & Measurement Instruments)  
M:03, Bldng No:P/09, Etihad,  
Muroor Road, Abu Dhabi,  
P.O.Box NO: 73260  
Tel: +971-2-4918981  
Fax: +971-2-4918982  
E-mail: info@dsat.me  
www.dsat.me

## BALKANS

### (Montenegro/Serbia/Croatia/Slovenia)

ALL DATA EE d.o.o.  
(Test & Measurement Instruments)  
C. Zore Perello Godina 2 Sl-6000 Koper  
Tel: +386-5-9072606  
Fax: +386-5-9072601  
E-mail: chiara@alldataee-doo.com  
www.alldataee-doo.com

## BELARUS

Profcon  
(Test & Measurement Instruments)  
Kropotkina Str. 91 A/ 4, Office 3A,  
220002 Minsk, Belarus  
Tel: +375-17 237 4211  
Fax: +375-17 283 1799  
E-mail: 420@tkc.by  
www.ate-lab.com

**BENELUX**

C.N. Rood N.V./S.A.  
(Test & Measurement/PXI Instruments, Semiconductor ATE)  
Z.1. Researchpark 40, B-1731 Zellik, Belgium  
Tel: +32-2-467-03-50  
Email: info@cnrood.com

**TT&MS BV.**

(Test & Measurement Instruments)  
Frankweg 25, 2153 PD Nieuw - Vennep, The Netherlands  
Tel: +31-252-621080  
Fax: +31-252-620702  
E-mail: info@ttms.nl  
www.ttms.nl

**BRAZIL**

T&M Instruments Repres. Ltda  
(Test & Measurement Instruments)  
Rua Princesa Isabel, 1750-Brooklin-CEP, 04601-003, Sao Paulo-SP-Brazil  
Tel: +55-11-5092-5229  
Fax: +55-11-5044-2414  
E-mail: info@tminstruments.com.br  
www.tminstruments.com.br

**BULGARIA**

GIGA ELECTRONICS EOOD  
(Test & Measurement Instruments)  
17, Manastirska Street 1111 Sofia, Bulgaria  
Tel: +359 2971 4919  
Fax: +359 2971 4919  
E-mail: danail@gigatest.net  
www.gigatest.net

**CZECH REPUBLIC**

H TEST a.s.  
(Test & Measurement Instruments)  
Šafránkova 3, 15500 Praha 5. Czech republic  
Tel: +420-2-3536-5207  
E-mail: info@hstest.cz  
www.hstest.cz

**Meatest s.r.o**

(Test & Measurement Instruments)  
Ksirova 118A, CZ-619 00 Brno, Czech Republic  
Tel: +420-5-4325-0886  
Fax: +420-5-4325-0890  
E-mail: vomela@meatest.cz  
www.meatest.cz

**DENMARK**

Atimco AS  
(Test & Measurement Instruments)  
BØgekildevej 7B DK-8361 Hasselager, Denmark  
Tel: +45-86-258899  
Fax: +45-86-255889  
E-mail: mj@atimco.dk  
www.atimco.dk

Nortelco Electronics Danmark  
(Test & Measurement Instruments)  
Værkstedsgården 14, 1 DK-2620 Albertslund, Denmark  
Tel: +45-48 17 75 00  
Fax: +45-48 17 75 10  
E-mail: elektronik@nortelco.dk  
www.nortelcoelectronics.dk

**EGYPT**

Technical Solution Engineering Co.  
(Test & Measurement Instruments)  
57 Hosny Ahmed Khalaf St., Aprt. 3, Nasr City, Egypt  
Tel: +202-670-6599  
Fax: +202-670-6183  
E-mail: tsec@tsec.com.eg  
www.tsec.com.eg

**FINLAND**

YE International  
(Test & Measurement Instruments)  
Luomannotko 6, FIN 02200 Espoo, Finland  
Tel: +35 810 289 1200  
Fax: +35 810 289 1270  
E-mail: sales@yeint.fi  
www.yeint.fi

**FRANCE**

ACQUISYS  
(PXI Instruments)  
30 av Robert Surcouf 78960 Voisins le Bretonneux, France  
Tel: +33-1-3452-4090  
Email: info@acquisys.fr

**MB Electronique**

(Test & Measurement Instruments)  
106, rue des frères Farman ZI - BP 31 F-78533 Buc Cedex, France  
Tel: +33-139-676-767  
Fax: +33-139-565-344  
E-mail: info@mbelectronique.fr  
www.mbelectronique.fr

QUALITYSOURCE Groupe Sphera  
(Test & Measurement Instruments)  
Parc de l'Envol-2 rue du Marechal de lattre de Tassigny-78990 elancourt, France  
Tel: +33-130-489-966  
Fax: +33-130-432-846  
E-mail: contact@qualitysource.fr  
www.qualitysource.fr

**GERMANY**

CompuMess Elektronik GmbH  
(Test & Measurement Instruments)  
Lise-Meitner-Strasse 4 D-85716 Unterschleißheim, Germany  
Tel: +49-89 321 50 10  
Fax: +49-89 321 50 11  
E-mail: info@compumess.de  
www.compumess.de

DataTec GmbH  
(Test & Measurement Instruments)  
Ferdinand-Lassalle-Str. 52 D-72770 Reutlingen, Germany  
Tel: +49-7121 / 51 50 50  
E-mail: info@datatec.de  
www.datatec.de

StanTronic Instruments GmbH  
(PXI Instruments)  
Keuper Weg 6, D-71083 Herrenberg, Germany  
Tel: +49-7031-4100-8914  
Fax: +49-7031-4100-8918  
www.stantronic.de  
E-Mail: h.honecker@stantronic.com

Schubert Technologies  
(Semiconductor ATE & Handler)  
Saentisstrasse 43, D-81825 Munich, Germany  
Tel: +49 89-4513-9633  
Fax: +49 89-4513-9628  
E-mail: info@schubert-technologies.eu  
www.schubert-technologies.eu

**GREECE**

NetScope Solutions S.A.  
(Test & Measurement Instruments)  
4, Lachana St., New Filadelfia 143 42 Athens, Greece  
Tel: +30-210-272-4107  
Fax: +30-210-271-1999  
E-mail: info@netscope.gr  
www.netscope.gr

Vector Technologies LTD  
(Test & Measurement Instruments)  
Diogenous 40 Str. 152 34 Chalandri, Athens, Greece  
Tel: +30-210-6858-008  
Fax: +30-210-6858-118  
E-mail: info@vectortechologies.gr  
www.vectortechologies.gr

**HUNGARY**

Eltest Ltd.  
(Test & Measurement Instruments)  
H-1015 Budapest, Hattyu u. 16, Hungary  
Tel: +36-1-202-1873  
Fax: +36-1-225-0031  
E-mail: redai@eltest.hu  
www.eltest.hu

H TEST Hungary Kft.  
(Test & Measurement Instruments)  
Gyori Nemzetkozi Ipari Park, Gesztenyefa u. 4, H-9027 Gyor, Hungary  
Tel: +36-96 999 262  
E-mail: info@hstest.hu  
www.hstest.hu

Kora BT.  
(Test & Measurement Instruments)  
Torokor st. 31 H-1145 Budapest, Hungary  
Tel: +36-1-223-1045  
Fax: +36-1-221-2541  
E-mail: info@kora.hu  
www.kora.hu

**INDIA**

Quantel Technologies India Private Limited (New Delhi)  
(Test & Measurement Instruments)  
K-13 Ground Floor, Lajpat Nagar-II, New Delhi-110024  
Tel: +91-11-4132-5052  
Fax: +91-22-4015-6221  
E-mail: sales@sg.quantel-global.com  
www.quantel-global.com

Quantel Technologies India Private Limited (Mumbai)  
(Test & Measurement Instruments)  
Unit No. 3134/3135, D Wing, 3rd Floor, Oberoi Garden Estate, Off Chandivali Farms Rd., Chandivali, Andheri(East), Mumbai-400072  
Tel: +91-22-4229-1008/4229-1002  
Fax: +91-22-4015-6221  
E-mail: sales@sg.quantel-global.com  
www.quantel-global.com



Quantel Technologies India Private Limited (Bangalore)  
(Test & Measurement Instruments)  
No. 301, #130 Prestige Infantry Court Infantry Rd., Bangalore-560001  
Tel: +91-80-4094-1520/1507  
Fax: +91-80-4093-6673  
E-mail: sales@sg.quantel-global.com  
www.quantel-global.com

MEL Systems & Services Ltd.  
(Head Office)  
(Test & Measurement Instruments)  
Plot # 173, Developed Plots Estate for Electrical, Electronic & Instrument Industries, Perungudi, Chennai - 600 096, India  
Tel: +91-44-2496-1903/04  
Fax: +91-44-2496-0488  
E-mail: sales@melss.com  
www.melss.com

MELSS Branch Office (Bangalore)  
(Test & Measurement Instruments)  
203, 2nd Floor, 'MOTA CHAMBERS', No.9, Millers Road, Bangalore - 560 052  
Tel: +91-8-2226-6546  
Fax: +91-8-2226-8205  
E-mail: melssblr@melss.com, emsblr@melss.com

MELSS Branch Office (Mumbai)  
(Test & Measurement Instruments)  
C/216A, Kailash Industrial Complex, Behind Godrej Residential Colony, Park Site, Vikhroli (West), Mumbai - 400079  
Tel: +91-22-2518-0915/16  
Telefax: +91-22-2518-0915  
E-mail: melssbom@melss.com, emsblr@melss.com

MELSS Branch Office (New Delhi)  
(Test & Measurement Instruments)  
C-52, 1st Floor, Shashi Garden (Opp, Dena Bank) Mayur Vihar Phase-I, Delhi-110091  
Tel: +91-11-2275-8261  
Telefax: +91-11-2275-8254/61  
E-mail: melssdel@melss.com, emsblr@melss.com

**INDONESIA**  
PT Quantel  
(Test & Measurement Instruments)  
Ruko Easton Blok D No. 10, Lippo Cikarang, Kelurahan Cibatu, Kecamatan Cikarang Selatan, Kabupaten Bekasi, Indonesia  
Tel: +62 813 2529 7885  
sales@sg.quantel-global.com  
www.quantel-global.com

**IRAN**  
Arvin Afzar Co.  
(Test & Measurement Instruments)  
No. 22 Sarmad St., North Sohrevardi Ave., Tehran 15539 Iran  
Tel: +98-21-8852-9254~5  
Fax: +98-21-8874-5984  
E-mail: contact@arvinafzar.com

Didactic Systems & Technology  
(Test & Measurement Instruments)  
M:03, Bldng No:P/09, Etihad, Muroor Road, Abu Dhab, P.O.Box NO: 73260  
Tel: +971-2-4918981  
Fax: +971-2-4918982  
E-mail: info@dsat.me  
www.dsat.me

**IRAQ**  
Didactic Systems & Technology  
(Test & Measurement Instruments)  
M:03, Bldng No:P/09, Etihad, Muroor Road, Abu Dhab, P.O.Box NO: 73260  
Tel: +971-2-4918981  
Fax: +971-2-4918982  
E-mail: info@dsat.me  
www.dsat.me

**IRELAND**  
MDL Technologies Ltd.  
(Test & Measurement Instruments)  
Unit 11 Devonshire Business Centre Works Road Letchworth Herts SG61GJ, United Kingdom  
Tel: +44-146-243-1981  
Fax: +44-560-315-2515  
E-mail: sales@mdltechnologies.co.uk  
www.mdltechnologies.co.uk

**ISRAEL**  
Meltronics  
(Test & Measurement Instruments)  
132 Menachem Begin Road St. 1 Azrieli Center Round Tower, 34th Floor Tel Aviv, Israel  
Tel: +972-03-644-4492  
Fax: +972-77-345-0470  
E-mail: Sales@meltronics.co.il  
www.meltronics.co.il

**ITALY**  
All Data S.r.l.  
(Test & Measurement Instruments)  
Via Volontari dle Sangue 11  
20092 Cinisello Balsamo (MI), Italy  
Tel: +39-0266 0155 66  
Fax: +39-0266 0155 77  
E-mail: claudio.manenti@alldata.it  
www.alldata.it

Barletta Apparacchi Scientifici  
(Test & Measurement Instruments)  
VIA Prestinari 2-20158 Milano, Italy  
Tel: +39-02-3931-2000  
Fax: +39-02-3931-1616  
E-mail: barlett@tin.it  
www.barletta-as.com

**JAPAN**  
Combex Co.,Ltd  
(Test & Measurement Instruments)  
5-12,Kiyohara-cho,Ohta-shi, 373-8567 Gunma  
Tel: +81-276-37-8521  
Fax: +81-276-37-8507  
www.combex.co.jp

Hodaka Denshi Co.,Ltd.  
(Test & Measurement Instruments)  
834-2, Bukko-cho,Hodogaya-ku, Yokohama 240-0044  
Tel: +81-45-331-9302  
Fax: +81-45-333-9257  
www.hodaka.co.jp

KOKKA ELECTRIC CO., LTD.  
(Test & Measurement Instruments)  
6-14,Tenman 1-chome, Kitaku,Osaka, 530-0043 Japan  
Tel: +81-6-6353-5551  
Fax: +81-6-6354-0173  
www.kokka-e.co.jp

Kyoritsu Electric Corporation  
(Test & Measurement Instruments)  
61-1, Nakadahoncho,Suruga-ku, Shizuoka-shi, 422-8686 Japan  
Tel: +81-54-288-8888  
Fax: +81-54-285-1105  
www.kdwan.co.jp

MAC SYSTEMS CORPORATION  
(Test & Measurement Instruments)  
Kusumoto 15 Building 6F,1-7-2, Nishiki, Naka-ku, Nagoya-shi, 460-0003, Japan  
Tel: +81-52-223-2811  
Fax: +81-52-223-2810  
www.macsystems.co.jp

MEIJI ELECTRIC INDUSTRIES CO, LTD.  
(Test & Measurement Instruments)  
13-8,Kameshima2-chome, Nakamura-ku, Nagoya, 453-8580 Japan  
Tel: +81-52-451-7661  
Fax: +81-52-451-7659  
www.meijidenki.co.jp

Miwa Electric Industrial Corporation  
(Test & Measurement Instruments)  
Shinjuku Seven Bldg, 8-1, Shinjyuku 2-chome, Shinjyuku-ku, 160-0022, Tokyo  
Tel: +81-3-3341-2101  
Fax: +81-3-3341-4426  
www.miwadenki.co.jp

Nihon Denkei Co., Ltd.  
(Test & Measurement Instruments)  
Seikoukai kanda Building 5-12, 3-chome, sotokanda, chiyoda-ku, Tokyo, 101-0021 Japan  
Tel: +81-3-3251-5731  
Fax: +81-3-3251-5730  
www.n-denkei.co.jp

SANYU ELECTRONIC INDUSTRIAL CO., LTD  
(Test & Measurement Instruments)  
2F,ALPS LOGISTIC #1 BUILD 1756 NIPPA-CHO,KOHOKU-KU, YOKOHAMA, KANAGAWA 223-0057 Japan  
Tel: +81-45-545-7771  
Fax: +81-45-545-7778  
www.sanyu-ele.co.jp

TOKYO DENKI SANGYO CO., LTD.  
(Test & Measurement Instruments)  
1-18-12, Hatagaya, Shibuya-ku, Tokyo,151-0072 Japan  
Tel: +81-3-3481-1111  
Fax: +81-3-3481-1125  
www.tokyo-densan.co.jp

TOYO Corporation  
(Power Testing Equipment)  
1-6, Yaesu 1-chome, Chuo-ku, Tokyo, 103-8284, Japan  
Tel: +81-3-3279-0771  
Fax: +81-3-3246-0645  
E-mail: psst@toyo.co.jp  
www.toyo.co.jp

<p><b>KOREA</b> BRIDGE Corporation (Semiconductor ATE) 901 ho, Byucksan Technopia, 434-6, Sangdaewon-dong, Jungwon-gu, Sungnam-si, Kyongki-do, Korea Tel: +82-31-747-4011 Fax: +82-31-747-4022 E-mail: scarlet@bridgeitc.com www.bridgeitc.com</p>	<p>WE Corporation (Test &amp; Measurement Instruments) 2F, 85 Nambusunhwanno315gil, Seocho-gu, Seoul, Korea Tel: +82-2-585-8253 Fax: +82-2-585-8254 E-mail: sales@weco.co.kr www.weco.co.kr</p>	<p><b>NEW ZEALAND</b> Electrotest Ltd. (Test &amp; Measurement Instruments) PO Box 300 475 , 12A Te Kea Place Albany, Auckland, New Zealand Tel: +64-9-448-2600 Fax: +64-9-448-2611 E-mail: info@electrotest.co.nz www.electrotest.co.nz</p>	<p><b>PORTUGAL</b> Instrumentos de Medida, S.L. (Test &amp; Measurement Instruments) Septiembre 31, E28022 Madrid Tel: +34-91-300-0191 Fax: +34-91-388-5433 E-mail: jvaca@idm-instrumentos.es www.idm-instrumentos.es</p>
<p>JEILMI Co., Ltd. (Test &amp; Measurement Instruments) 9th FL, 401, Simin-daero, Dongan-gu, Anyang-si, Gyeonggi-do, Korea, Zip:14057 Tel: +82-31-463-3700 Fax: +82-31-463-3701 E-mail: jeil@jeilmi.com, kmn@jeilmi.com www.jeilmi.com</p>	<p><b>KUWAIT</b> Didactic Systems &amp; Technology (Test &amp; Measurement Instruments) M:03, Bldg No:P/09, Etihad, Muroor Road, Abu Dhab, P.O.Box NO: 73260 Tel: +971-2-4918981 Fax: +971-2-4918982 E-mail: info@dsat.me www.dsat.me</p>	<p><b>NORWAY</b> IKM Instrutek AS (Test &amp; Measurement Instruments) Elveveien 28, N-3262 Larvik, Norway Tel: +47-33-165700 Fax: +47-33-165701 E-mail: IKMinstrutek@ikm.no www.ikmwebshop.no</p>	<p>Lenave Lda (Test &amp; Measurement Instruments) R. de S. Paulo 228-232 1200-430 Lisboa, Portugal Tel: +351-213-223-190 Fax: +351-213-420-968 E-mail: ppedro@lenave.pt www.lenave.pt</p>
<p>LEEBESTECH (Test &amp; Measurement Instruments) Room #520, Shinhan Deview Officetel 1132-19, Guwol-dong, Namdong-gu, Incheon, South Korea #405-220 Tel: +82-32-437-0367 Fax: +82-32-437-0368 E-mail: leebestech@kornet.net bhlee6011@hanafos.com</p>	<p><b>MALAYSIA</b> Quantel Global Sdn Bhd. (Kuala Lumpur) (Test &amp; Measurement Instruments) Unit 802, 8F, Blk A Damansara Intan, No. 1, Jalan SS20/27, 47400 Petaling Jaya, Selangor, Malaysia Tel: +60-3-7726-7435 Fax: +60-3-7726-1961 E-mail: sales@sg.quantel-global.com www.quantel-global.com</p>	<p>Nortelco Electronics AS (Test &amp; Measurement Instruments) Johan Scharffenbergs vei 95, 0694 Oslo, Norway Tel: +47 2257 6100 Fax: +47 2257 6130 E-mail: elektronikk@nortelco.no www.nortelcoelectronics.no</p>	<p><b>QATAR</b> Didactic Systems &amp; Technology (Test &amp; Measurement Instruments) M:03, Bldg No:P/09, Etihad, Muroor Road, Abu Dhab, P.O.Box NO: 73260 Tel: +971-2-4918981 Fax: +971-2-4918982 E-mail: info@dsat.me www.dsat.me</p>
<p>NOISE Technology Co., Ltd. (AC Source, Load, Power Analyzer) Science Bldg, 3, Pangyo-ro 715 beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea Tel: +82-31-781-7816 Fax: +82-31-703-7175 E-mail: jskim@noisetech.co.kr www.noisetech.co.kr</p>	<p>Quantel Global Sdn Bhd. (Penang) (Test &amp; Measurement Instruments) 2-3-9 One Square, Tingkat Mahsuri 1 Bayan Lepas, 11950 Penang Malaysia Tel: +60-4-646-5110/0780 Fax: +60-4-644-2878 E-mail: sales@sg.quantel-global.com www.quantel-global.com</p>	<p><b>OMAN</b> Didactic Systems &amp; Technology (Test &amp; Measurement Instruments) Wadi Al Udhaiba St., Azaiba- Muscat., Sultanate of Oman Tel: +968-24615120 Fax: +968-24615117 E-mail: info@dsat.me www.dsat.me</p>	<p><b>ROMANIA</b> EE TEST S.A. (Test &amp; Measurement Instruments) Bldv. Industriilor no. 4 ROM-300 714 Timisoara, Romania Tel: +40-256-491-154 Fax: +40-256-493-468 E-mail: eetest@eetest.ro www.eee.ro</p>
<p>TF EastPost Technologies Inc. (Semiconductor Handler) Science Bldg, #149-9, Yatap-dong, Bundang-gu, Seongnam-si, Kyunggi-do, 463-816, Korea Tel: +82-31-206-0541 Fax: +82-31-206-0543 E-mail: kevin@eastpost.co.kr</p>	<p>QTEC Technologies Sdn Bhd. (Head Office) (PV/LED/Semiconductor ATE &amp; Handler) 3637, Jalan Angkasa Nuri 1, Taman Angkasa Nuri, 76100 Durian Tunggal, Melaka, Malaysia Tel: +60-6-334-2918/2919 Fax: +60-6-334-2920 E-mail: tlteh@qtec.com.my jesphertay@qtec.com.my www.qtec.com.my</p>	<p><b>PHILIPPINES</b> Quantel Global Philippines Corporation (Manila &amp; Cebu) (Test &amp; Measurement Instruments) Units 2401 and 2402 The Orient Square, F. Ortigas Jr. Road, Ortigas Center, Psig City, Philippines Tel: +63-2638-6942/6918 (Manila) Fax: +63-2638-6946 (Manila) Tel: +63-32-495-9210 (Cebu) Fax: +63-32-511-0071 (Cebu) E-mail: sales@sg.quantel-global.com www.quantel-global.com</p>	<p>TECHNO VOLT s.r.l. (Test &amp; Measurement Instruments) Bd. Constructorilor 20A, sector 6, 060512 Bucharest, Romania Tel: +40-21-220-1302 Fax: +40-21-221-0925 E-mail: office@technovolt.ro www.test-expert.ru/en</p>
		<p><b>POLAND</b> NDN Test &amp; Measurement instruments (Test &amp; Measurement Instruments) Janowskiego Str. 15 PL 02-784 Warsaw, Poland Tel: +48-22-641-1547 Fax: +48-22-644-4250 E-mail: ndn@ndn.com.pl www.ndn.com.pl</p>	<p><b>RUSSIA</b> TESTPRIBOR, JSC (Test &amp; Measurement Instruments) Office 718 24 Geroev Panfilovtsev Street, Moscow 125480, Russian Federation Tel: +7-495-225-67-37 Fax: +7-495-496-95-55 E-mail: vetoshkina@escltd.ru www.test-expert.ru/en</p>

# Global Service Network

## YE International

(Test & Measurement Instruments)  
Pr. Obukhovskoy Oborony, Block 70,  
Building 3A, 192029,  
Saint-Petersburg, Russia  
Tel: +78-123 133 440  
Fax: +78-123 133 441  
E-mail: yesupport@yeint.ru  
www.yeint.ru

## SAUDI ARABIA

Didactic Systems & Technology  
(Test & Measurement Instruments)  
M:03, Bldng No:P/09, Etihad,  
Muroor Road, Abu Dhab,  
P.O.Box NO: 73260  
Tel: +971-2-4918981  
Fax: +971-2-4918982  
E-mail: info@dsat.me  
www.dsat.me

## SINGAPORE

Quantel Pte Ltd. (Head Office)  
(Test & Measurement Instruments,  
PV/LED/Semiconductor ATE & Handler)  
46 Lorong 17 Geylang # 05-02  
Enterprise Industrial Building,  
Singapore 388568  
Tel: +65-6745-3200  
Fax: +65-6745-9764  
E-mail: sales@sg.quantel-global.com  
www.quantel-global.com

## SLOVAKIA

H TEST Slovakia spol. s r.o.  
(Test & Measurement Instruments)  
Zvolenská cesta 20, 97405 Banska  
Bystrica, Slovensko  
Tel: +421-905-785550  
E-mail: info@hstest.sk  
www.hstest.sk

## SOUTH AFRICA

Intercal cc  
(Test & Measurement Instruments)  
Labotec Park 21 Bavaria Road  
Randjespark Midrand,  
South Africa  
Tel: +27-11-315-4321  
Fax: +27-11-312-1322  
E-mail: intercal@intercal.co.za  
www.intercal.co.za

## SPAIN

Enelec S.L.  
(Test & Measurement Instruments)  
Avda. Francesc Macià, 39, 6° 2a  
08206 Sabadell (Barcelona), Spain  
Tel: +34-93-723-0270  
Fax: +34-93-723-4717  
E-mail: enelec@enelec.com  
www.enelec.com

## Instrumentos de Medida, S.L.

(Test & Measurement Instruments)  
Septiembre 31, E28022 Madrid,  
Spain  
Tel: +34-91-300-0191  
Fax: +34-91-388-5433  
E-mail: jvaca@idm-instrumentos.es  
www.idm-instrumentos.es

## SWEDEN

Combinova AB  
(Test & Measurement Instruments)  
Domkraftsv. 1, SE-197 40 Bro,  
Sweden  
Tel: +46-8-627-9310  
Fax: +46-8-295-985  
E-mail: sales@combinova.se  
www.combinova.se

Nortelco Electronics  
(Test & Measurement Instruments)  
Sverige, Kanalvägen 1A, SE-194 61,  
Upplands Väsby, Sweden  
Tel: +46 8 446 0100  
Fax: +47 2257 6130  
E-mail: elektronik@nortelco.se  
www.nortelcoelectronics.se

## SWITZERLAND

MESATEC technische Produkte AG  
(Test & Measurement Instruments)  
Sumpfstrasse 3, CH-6300 Zug, Switzerland  
Tel: +41-41-740-5833  
Fax: +41-41-740-5834  
E-mail: info@mesatec.ch  
www.mesatec.ch

## THAILAND

Quantel Global Co., Ltd  
(Test & Measurement Instruments)  
2170 Bangkok Tower, 5th Floor,  
Room No. 502, New Petchaburi Road,  
Bangkapi, Huay Kwang Bangkok,  
10310, Thailand  
Tel: +66-2-308-0881-3  
Fax: +66-2-308-0884  
E-mail: sales@sg.quantel-global.com  
www.quantel-global.com

## TUNESIA

Resonance Automation  
(Test & Measurement Instruments)  
08 Rue El Aghlab, Borj El Ouzir,  
Ariana, Tunisia  
Tel: +216-507-903-37  
E-mail: info@resonance-  
automation.com  
www.resonance-automation.com

## TURKEY

Yıldırım Elektronik Tic. Ve San. Ltd. Sti  
(Test & Measurement Instruments)  
Maresal Fevzi Cakmak Caddesi No:29  
06500 Besevler Cankaya/ANKARA  
Tel: +90-312-221-1000  
Fax: +90-312-212-3535  
E-mail: yildirim@yildirimlab.com  
www.yildirimlab.com  
www.yildirimelektronik.com

## UNITED ARAB EMIRATES

Didactic Systems & Technology (Abudhabi)  
(Test & Measurement Instruments)  
M:03, Bldng No:P/09, Etihad,  
Muroor Road, Abu Dhab,  
P.O.Box NO: 73260  
Tel: +971-2-4918981  
Fax: +971-2-4918982  
E-mail: info@dsat.me  
www.dsat.me

Didactic Systems & Technology  
(Al Ain)  
(Test & Measurement Instruments)  
Hele, Rumaila  
Tel: +971-3-7662230  
Fax: +971-3-7631047  
E-mail: info@dsat.me  
www.dsat.me

Didactic Systems & Technology  
(Dubai)  
(Test & Measurement Instruments)  
114, Saleh Bin Lahej (Chilis Building), Al  
Garhoud, Dubai, P.O Box:233658  
Tel: +971-4-2525160  
Fax: +971-4-2525161  
E-mail: info@dsat.me  
www.dsat.me

## UNITED KINGDOM

MDL Technologies Ltd.  
(Test & Measurement Instruments)  
Unit 11 Devonshire Business Centre Works  
Road Letchworth Herts SG61GJ,  
United Kingdom  
Tel: +44-146-243-1981  
Fax: +44-560-315-2515  
E-mail: sales@mdltechnologies.co.uk  
www.mdltechnologies.co.uk

## UKRAINE

SEA Electronics Ukraine LLC  
(Test & Measurement Instruments)  
Building 2, 13-B, Krakovskaya  
Str. 02094 Kyiv, Ukraine  
Tel: +38-44-291-00-41  
Fax: +38-44-291-00-41  
www.sea.com.ua

## VIETNAM

Quantel Global Vietnam Co. Ltd. (Hanoi)  
(Test & Measurement Instruments)  
Floor 6th, HL Tower, Lot A2B, Lane 82,  
Duy Tan Road, Dich Vong Hau Ward,  
Cau Giay district, Hanoi, Vietnam  
Tel: +84 4 3226 2510  
Fax: +84 4 3226 2511  
E-mail: sales@sg.quantel-global.com  
www.quantel-global.com

Quantel Global Vietnam Co. Ltd. (HCM)  
(Test & Measurement Instruments)  
4.14-4.15, The Prince Residence,  
17-19-21 Nguyen Van Troi,  
Phu Nhuan, Ho Chi Minh,  
Vietnam  
Tel: +84-4-3226-2510  
Fax: +84-4-3226-2511  
E-mail: sales@sg.quantel-global.com  
www.quantel-global.com





turnkey **Test** and **Automation**  
**Auto** **Solution** provider™

[www.chromaate.com](http://www.chromaate.com)

Distributed by:



Worldwide Distribution and Service Network  
201703-3570