

TEST DATA OF GHA500F-56

Regulated DC Power Supply
September 30, 2015

Approved by : Kenji Shiho
Kenji Shiho Design Manager

Prepared by : Tomoyuki Sakuma
Tomoyuki Sakuma Design Engineer

COSEL CO.,LTD.

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(Final Page 24)

Model

GHA500F-56

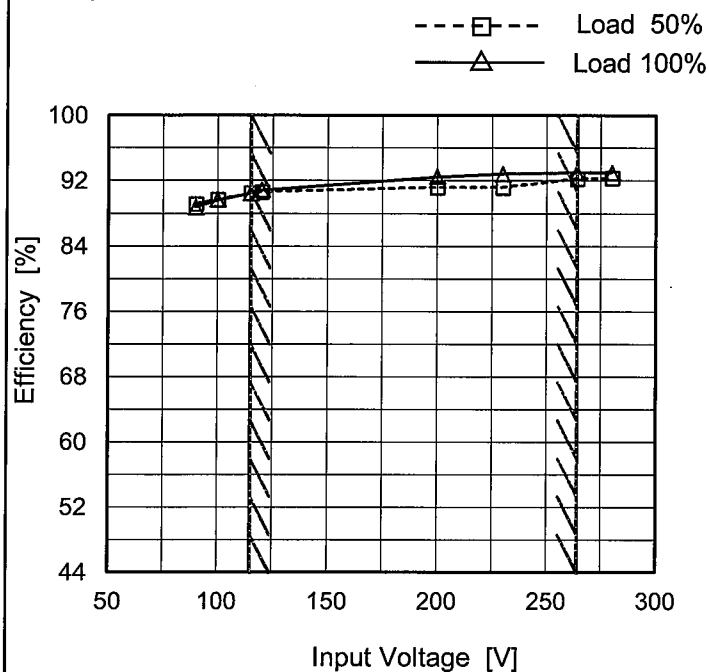
Item

Efficiency (by Input Voltage)

Object

 Temperature 25°C
 Testing Circuitry Figure A

1. Graph



2. Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
90	89.1	88.8 ※1
100	89.7	89.7 ※2
115	90.4	90.5
120	90.6	90.8
200	91.2	92.5
230	91.2	92.8
264	92.3	93.0
280	92.3	93.0
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※1 : Load 80%

※2 : Load 88%

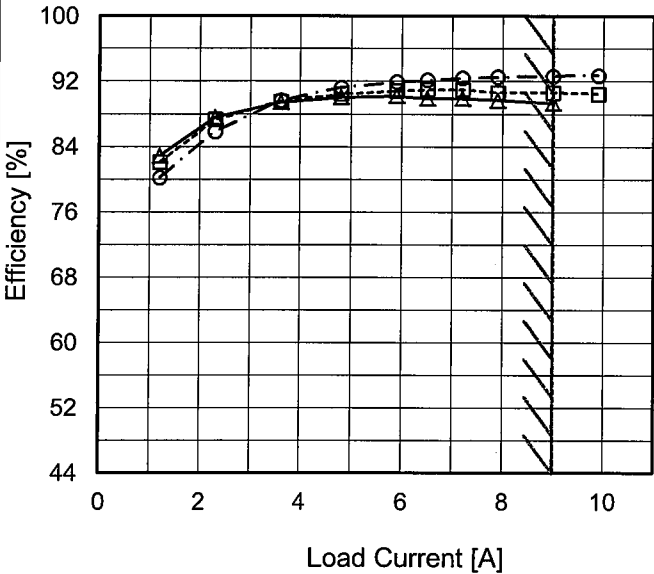


Model	GHA500F-56
Item	Efficiency (by Load Current)
Object	

Temperature 25°C
Testing Circuitry Figure A

1.Graph

—△— Input Volt. 100V
---□--- Input Volt. 120V
---○--- Input Volt. 230V



Note: Slanted line shows the range of the rated load current.

2.Values

Load Current [A]	Efficiency [%]		
	Input Volt. 100[V]	Input Volt. 120[V]	Input Volt. 230[V]
0.0	-	-	-
1.2	82.9	82.1	80.2
2.3	87.6	87.3	85.8
3.6	89.4	89.6	89.7
4.8	90.1	90.5	91.3
5.9	90.2	90.8	91.9
6.5	89.9	91.0	92.2
7.2	89.9	91.0	92.4
7.9	89.7	90.7	92.6
9.0	89.4	90.6	92.7
9.9	-	90.5	92.8

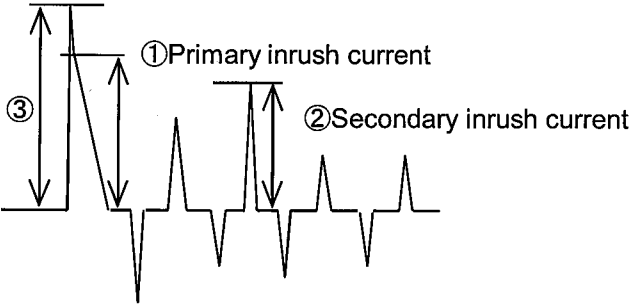
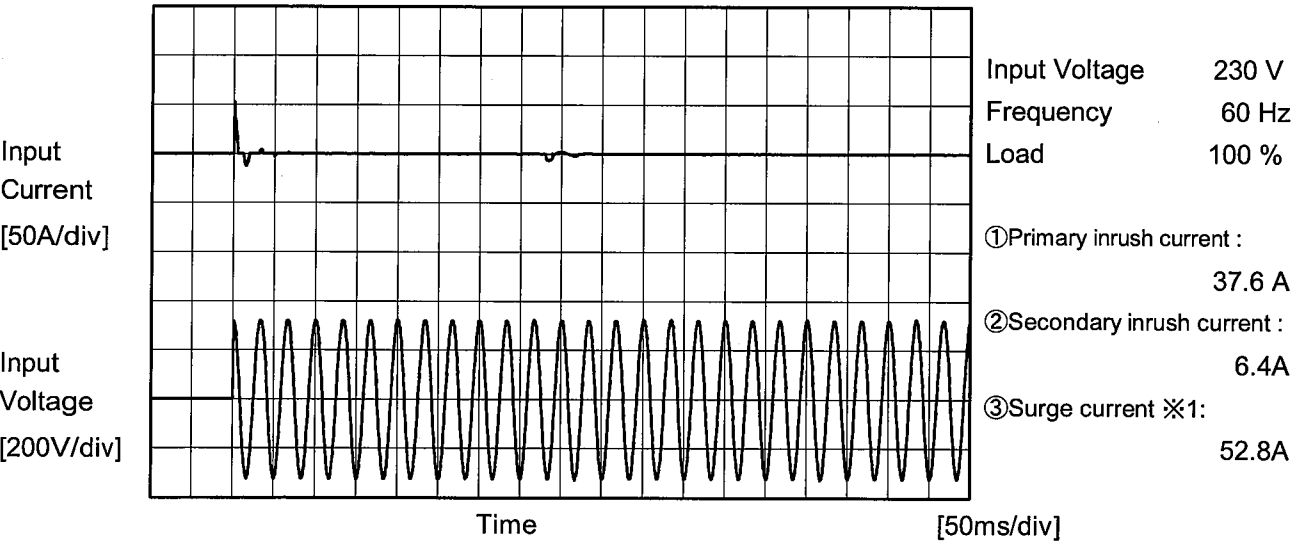
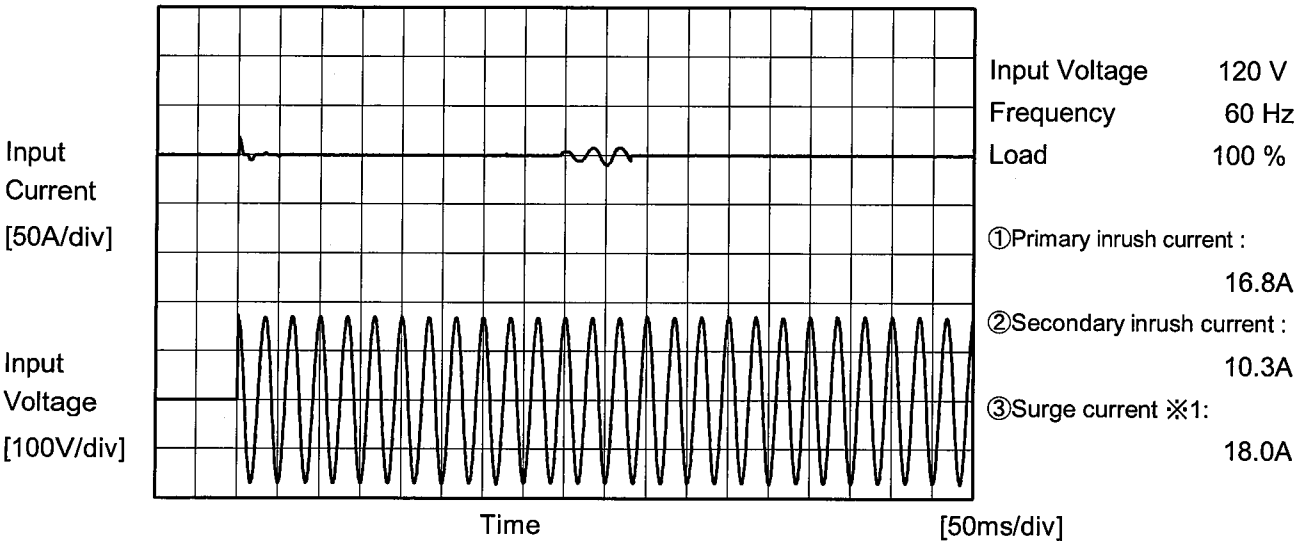


Model	GHA500F-56																																		
Item	Power Factor (by Input Voltage)	Temperature	25°C																																
Object		Testing Circuitry	Figure A																																
1.Graph		2.Values																																	
<div><div>---□--- Load 50%</div><div>—△— Load 100%</div><p>Power Factor</p><p>Input Voltage [V]</p></div> <p>Note: Slanted line shows the range of the rated input voltage.</p>		<table><tr><th rowspan="2">Input Voltage [V]</th><th colspan="2">Power Factor</th></tr><tr><th>Load 50%</th><th>Load 100%</th></tr><tr><td>90</td><td>0.999</td><td>0.999 ※1</td></tr><tr><td>100</td><td>0.999</td><td>0.999 ※2</td></tr><tr><td>115</td><td>0.999</td><td>0.999</td></tr><tr><td>120</td><td>0.999</td><td>0.999</td></tr><tr><td>200</td><td>0.981</td><td>0.993</td></tr><tr><td>230</td><td>0.967</td><td>0.985</td></tr><tr><td>264</td><td>0.951</td><td>0.974</td></tr><tr><td>280</td><td>0.895</td><td>0.937</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table> <div>※1 : Load 80%</div> <div>※2 : Load 88%</div>		Input Voltage [V]	Power Factor		Load 50%	Load 100%	90	0.999	0.999 ※1	100	0.999	0.999 ※2	115	0.999	0.999	120	0.999	0.999	200	0.981	0.993	230	0.967	0.985	264	0.951	0.974	280	0.895	0.937	--	-	-
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<div><div><div>—△—</div><div>---□---</div><div>---○---</div></div><div>Input Volt. 100V</div><div>Input Volt. 120V</div><div>Input Volt. 230V</div></div> <div><table><tr><th>Load Current [A]</th><th>100V</th><th>120V</th><th>230V</th></tr><tr><td>0.0</td><td>0.355</td><td>0.444</td><td>0.452</td></tr><tr><td>1.2</td><td>0.988</td><td>0.976</td><td>0.797</td></tr><tr><td>2.3</td><td>0.998</td><td>0.993</td><td>0.945</td></tr><tr><td>3.6</td><td>0.999</td><td>0.997</td><td>0.959</td></tr><tr><td>4.8</td><td>0.999</td><td>0.999</td><td>0.969</td></tr><tr><td>5.9</td><td>0.999</td><td>0.999</td><td>0.978</td></tr><tr><td>6.5</td><td>0.999</td><td>0.999</td><td>0.980</td></tr><tr><td>7.2</td><td>0.999</td><td>0.999</td><td>0.984</td></tr><tr><td>7.9</td><td>0.999</td><td>0.999</td><td>0.985</td></tr><tr><td>9.0</td><td>0.999</td><td>0.999</td><td>0.987</td></tr><tr><td>9.9</td><td>-</td><td>0.999</td><td>0.988</td></tr></table></div>		Load Current [A]	100V	120V	230V	0.0	0.355	0.444	0.452	1.2	0.988	0.976	0.797	2.3	0.998	0.993	0.945	3.6	0.999	0.997	0.959	4.8	0.999	0.999	0.969	5.9	0.999	0.999	0.978	6.5	0.999	0.999	0.980	7.2	0.999	0.999	0.984	7.9	0.999	0.999	0.985	9.0	0.999	0.999	0.987	9.9	-	0.999	0.988	<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Power Factor</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 120[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.0</td><td>0.355</td><td>0.444</td><td>0.452</td></tr><tr><td>1.2</td><td>0.988</td><td>0.976</td><td>0.797</td></tr><tr><td>2.3</td><td>0.998</td><td>0.993</td><td>0.945</td></tr><tr><td>3.6</td><td>0.999</td><td>0.997</td><td>0.959</td></tr><tr><td>4.8</td><td>0.999</td><td>0.999</td><td>0.969</td></tr><tr><td>5.9</td><td>0.999</td><td>0.999</td><td>0.978</td></tr><tr><td>6.5</td><td>0.999</td><td>0.999</td><td>0.980</td></tr><tr><td>7.2</td><td>0.999</td><td>0.999</td><td>0.984</td></tr><tr><td>7.9</td><td>0.999</td><td>0.999</td><td>0.985</td></tr><tr><td>9.0</td><td>0.999</td><td>0.999</td><td>0.987</td></tr><tr><td>9.9</td><td>-</td><td>0.999</td><td>0.988</td></tr></table>			Load Current [A]	Power Factor			Input Volt. 100[V]	Input Volt. 120[V]	Input Volt. 230[V]	0.0	0.355	0.444	0.452	1.2	0.988	0.976	0.797	2.3	0.998	0.993	0.945	3.6	0.999	0.997	0.959	4.8	0.999	0.999	0.969	5.9	0.999	0.999	0.978	6.5	0.999	0.999	0.980	7.2	0.999	0.999	0.984	7.9	0.999	0.999	0.985	9.0	0.999	0.999	0.987	9.9	-	0.999	0.988
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Note: Slanted line shows the range of the rated load current.																																																																																																							

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Model	GHA500F-56		
Item	Inrush Current	Temperature	25°C
Object		Testing Circuitry	Figure A



※1 The specification of the primary inrush current means that the surge current to a built-in noise filter (0.2msec or less: waveform ③) is excluded.

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		Temperature 25°C Testing Circuitry Figure B
Model	GHA500F-56	
Item	Leakage Current	
Object	_____	

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	120 [V]	240 [V]	
IEC60601	Both phases	0.08	0.09	0.17	Operation
	One of phases	0.14	0.15	0.31	Stand by

The value for "One of phases" is the reference value only.

2.Condition

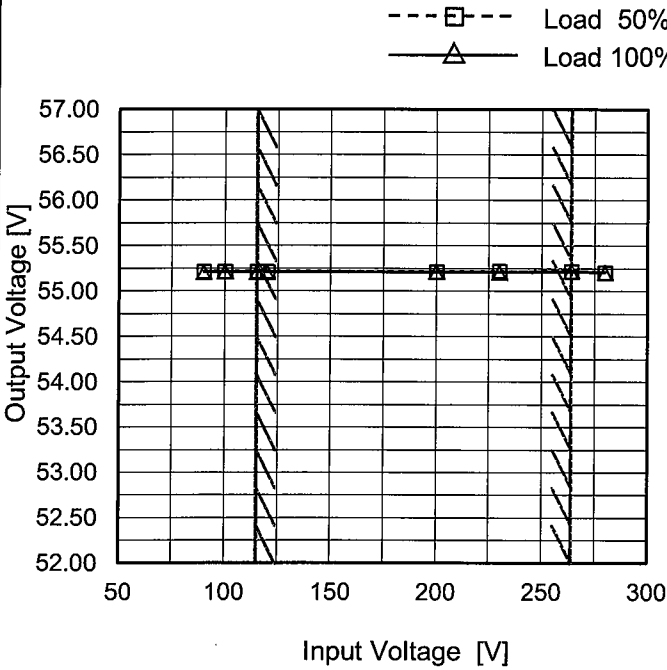
Leakage current value is concluded after measuring both phases of AC input and by choosing the larger one.



Model	GHA500F-56
Item	Line Regulation
Object	+56V9A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



Note: Slanted line shows the range of the rated input voltage.

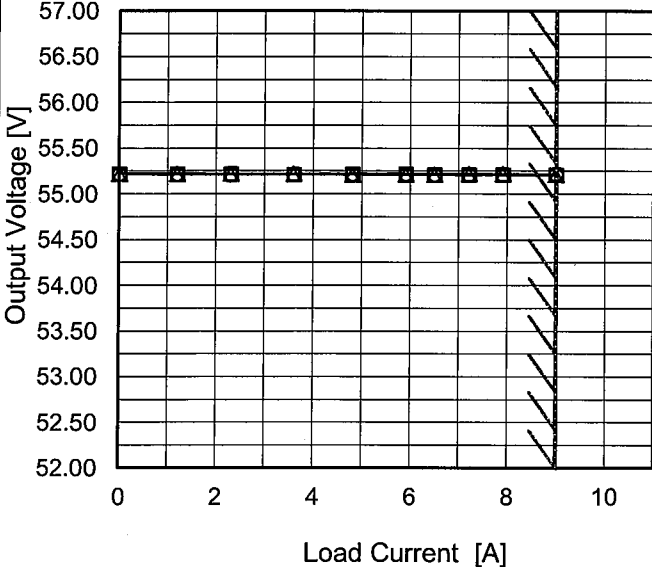
2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
90	55.216	55.208 ※1
100	55.215	55.211 ※2
115	55.215	55.208
120	55.216	55.207
200	55.216	55.213
230	55.219	55.207
264	55.222	55.218
280	55.208	55.207
--	-	-

※1 : Load 80%

※2 : Load 88%




Model	GHA500F-56																																																						
Item	Load Regulation	Temperature	25°C																																																				
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1.Graph		2.Values																																																					
<div><div><div>—△—</div><div>Input Volt.</div><div>100V</div></div><div><div>---□---</div><div>Input Volt.</div><div>120V</div></div><div><div>---○---</div><div>Input Volt.</div><div>230V</div></div></div> 		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Output Voltage [V]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 120[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.0</td><td>55.221</td><td>55.221</td><td>55.219</td></tr><tr><td>1.2</td><td>55.220</td><td>55.218</td><td>55.215</td></tr><tr><td>2.3</td><td>55.216</td><td>55.216</td><td>55.215</td></tr><tr><td>3.6</td><td>55.215</td><td>55.214</td><td>55.213</td></tr><tr><td>4.8</td><td>55.214</td><td>55.216</td><td>55.220</td></tr><tr><td>5.9</td><td>55.215</td><td>55.216</td><td>55.220</td></tr><tr><td>6.5</td><td>55.213</td><td>55.212</td><td>55.212</td></tr><tr><td>7.2</td><td>55.217</td><td>55.211</td><td>55.212</td></tr><tr><td>7.9</td><td>55.217</td><td>55.211</td><td>55.212</td></tr><tr><td>9.0</td><td>55.211</td><td>55.212</td><td>55.218</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>			Load Current [A]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 120[V]	Input Volt. 230[V]	0.0	55.221	55.221	55.219	1.2	55.220	55.218	55.215	2.3	55.216	55.216	55.215	3.6	55.215	55.214	55.213	4.8	55.214	55.216	55.220	5.9	55.215	55.216	55.220	6.5	55.213	55.212	55.212	7.2	55.217	55.211	55.212	7.9	55.217	55.211	55.212	9.0	55.211	55.212	55.218	--	-	-	-
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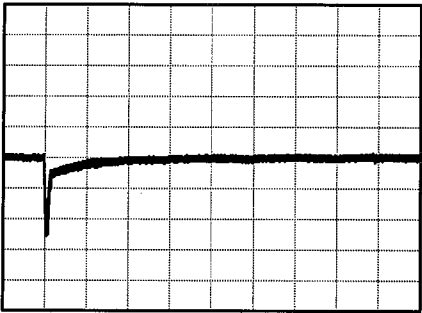
Model		GHA500F-56	
Item		Dynamic Load Response	Temperature 25°C Testing Circuitry Figure A
Object		+56V 9A	

Input Volt. 120V
Cycle 1000ms

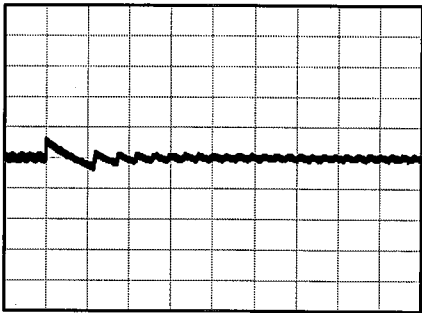
Load Current  9A / 50us

Min.Load (0A)←→
Load 100%(9A)

2 V/div



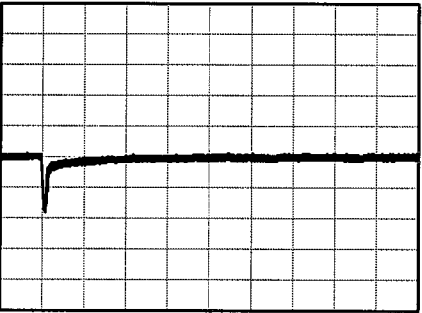
4 ms/div



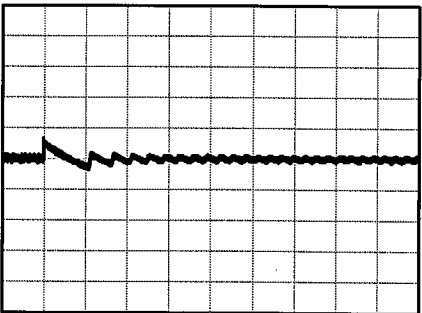
40 ms/div

Min.Load (0A)←→
Load 50%(4.5A)

2 V/div



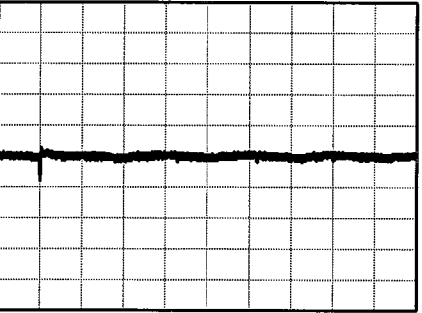
4 ms/div



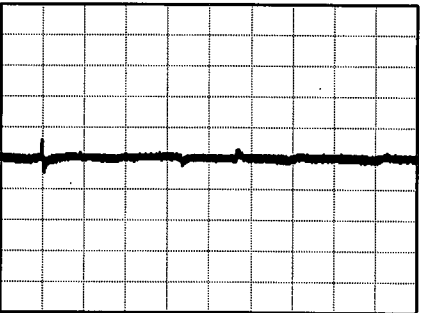
40 ms/div

Load 50% (4.5A)←→
Load 100% (9A)

1 V/div



4 ms/div



4 ms/div

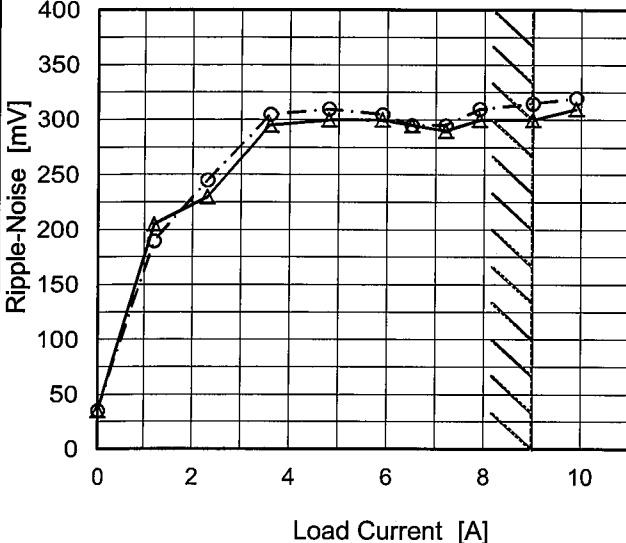
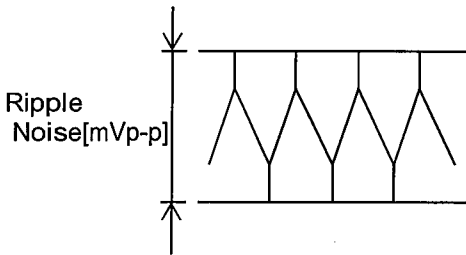
Note : With recommended external capacitor 120 μ F

Model		GHA500F-56																																					
Item		Ripple Voltage (by Load Current)																																					
Object		+56V9A																																					
1.Graph		Temperature 25°C Testing Circuitry Figure A																																					
<div>—△— Input Volt. 120V - -○- - Input Volt. 230V</div> <div>Ripple Voltage [mV]</div> <div>Load Current [A]</div>		2.Values																																					
		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple Voltage [mV]</th></tr><tr><th>Input Volt. 120 [V]</th><th>Input Volt. 230 [V]</th></tr><tr><td>0.0</td><td>30</td><td>30</td></tr><tr><td>1.2</td><td>185</td><td>175</td></tr><tr><td>2.3</td><td>240</td><td>240</td></tr><tr><td>3.6</td><td>260</td><td>260</td></tr><tr><td>4.8</td><td>260</td><td>260</td></tr><tr><td>5.9</td><td>265</td><td>265</td></tr><tr><td>6.5</td><td>270</td><td>270</td></tr><tr><td>7.2</td><td>280</td><td>280</td></tr><tr><td>7.9</td><td>270</td><td>280</td></tr><tr><td>9.0</td><td>275</td><td>280</td></tr><tr><td>9.9</td><td>275</td><td>285</td></tr></table>		Load Current [A]	Ripple Voltage [mV]		Input Volt. 120 [V]	Input Volt. 230 [V]	0.0	30	30	1.2	185	175	2.3	240	240	3.6	260	260	4.8	260	260	5.9	265	265	6.5	270	270	7.2	280	280	7.9	270	280	9.0	275	280	9.9
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9.0	275	280																																					
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<div>Measured by 20 MHz Oscilloscope. Ripple Voltage is shown as p-p in the figure below. Note: Slanted line shows the range of the rated load current.</div> <div>Ripple [mVp-p]</div> <div>Fig.Complex Ripple Wave Form</div>																																							

- 12 -

BC-10931

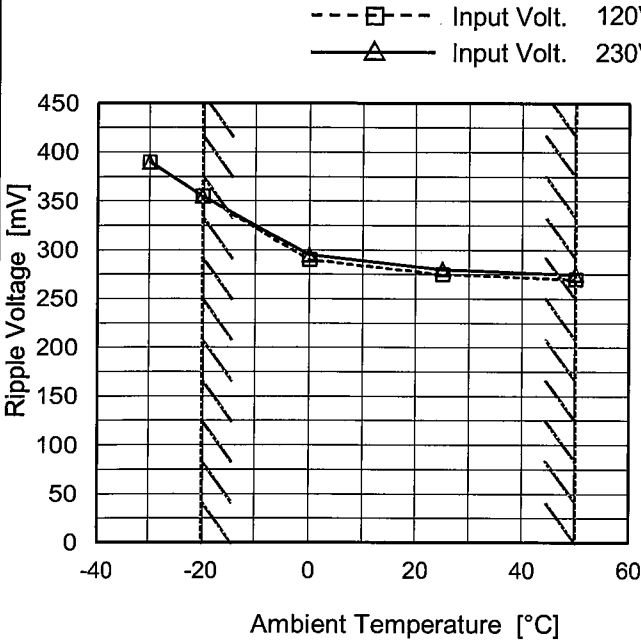
COSEL

Model		GHA500F-56	Temperature 25°C Testing Circuitry Figure A																																						
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<div></div> <div>Fig.Complex Ripple Noise Wave Form</div>			<table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple-Noise [mV]</th></tr><tr><th>Input Volt. 120 [V]</th><th>Input Volt. 230 [V]</th></tr><tr><td>0.0</td><td>35</td><td>35</td></tr><tr><td>1.2</td><td>205</td><td>190</td></tr><tr><td>2.3</td><td>230</td><td>245</td></tr><tr><td>3.6</td><td>295</td><td>305</td></tr><tr><td>4.8</td><td>300</td><td>310</td></tr><tr><td>5.9</td><td>300</td><td>305</td></tr><tr><td>6.5</td><td>295</td><td>295</td></tr><tr><td>7.2</td><td>290</td><td>295</td></tr><tr><td>7.9</td><td>300</td><td>310</td></tr><tr><td>9.0</td><td>300</td><td>315</td></tr><tr><td>9.9</td><td>310</td><td>320</td></tr></table>	Load Current [A]	Ripple-Noise [mV]		Input Volt. 120 [V]	Input Volt. 230 [V]	0.0	35	35	1.2	205	190	2.3	230	245	3.6	295	305	4.8	300	310	5.9	300	305	6.5	295	295	7.2	290	295	7.9	300	310	9.0	300	315	9.9	310	320
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9.9	310	320																																							



Model	GHA500F-56
Item	Ripple Voltage (by Ambient Temp.)
Object	+56V9A

1.Graph

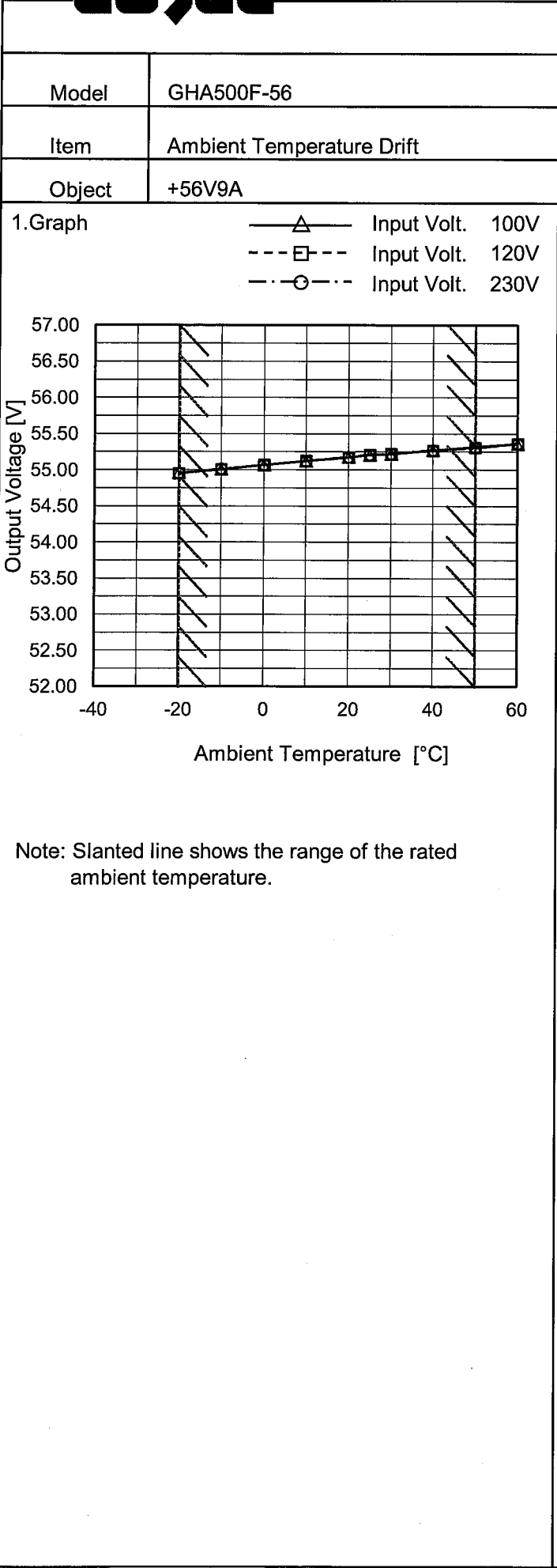


Measured by 20 MHz Oscilloscope.
Note: Slanted line shows the range of the rated ambient temperature.

Testing Circuitry Figure A

2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 120 [V]	Input Volt. 230 [V]
-30	390	390
-20	355	355
0	290	295
25	275	280
50	270	275
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-



Testing Circuitry Figure A			
2.Values			
Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 120[V]	Input Volt. 230[V]
-20	54.958	54.951	54.954
-10	55.006	55.011	55.012
0	55.067	55.069	55.069
10	55.124	55.125	55.124
20	55.173	55.176	55.177
25	55.206	55.209	55.214
30	55.221	55.225	55.228
40	55.274	55.270	55.275
50	55.322	55.307	55.307
60	55.362	55.365	55.366
--	-	-	-

Note: In case of Input Volt. 100V, Load 88%.
Other case Load 100%.

		Testing Circuitry Figure A
Model	GHA500F-56	
Item	Output Voltage Accuracy	
Object	+56V9A	

1. Output Voltage Accuracy

This is defined as the value of the output voltage, regulation load, ambient temperature and input voltage varied at random in the range as specified below.

Temperature : -20 - 50°C

Input Voltage : 115 - 264V

Load Current : 0 - 9A

* Output Voltage Accuracy = $\pm(\text{Maximum of Output Voltage} - \text{Minimum of Output Voltage}) / 2$

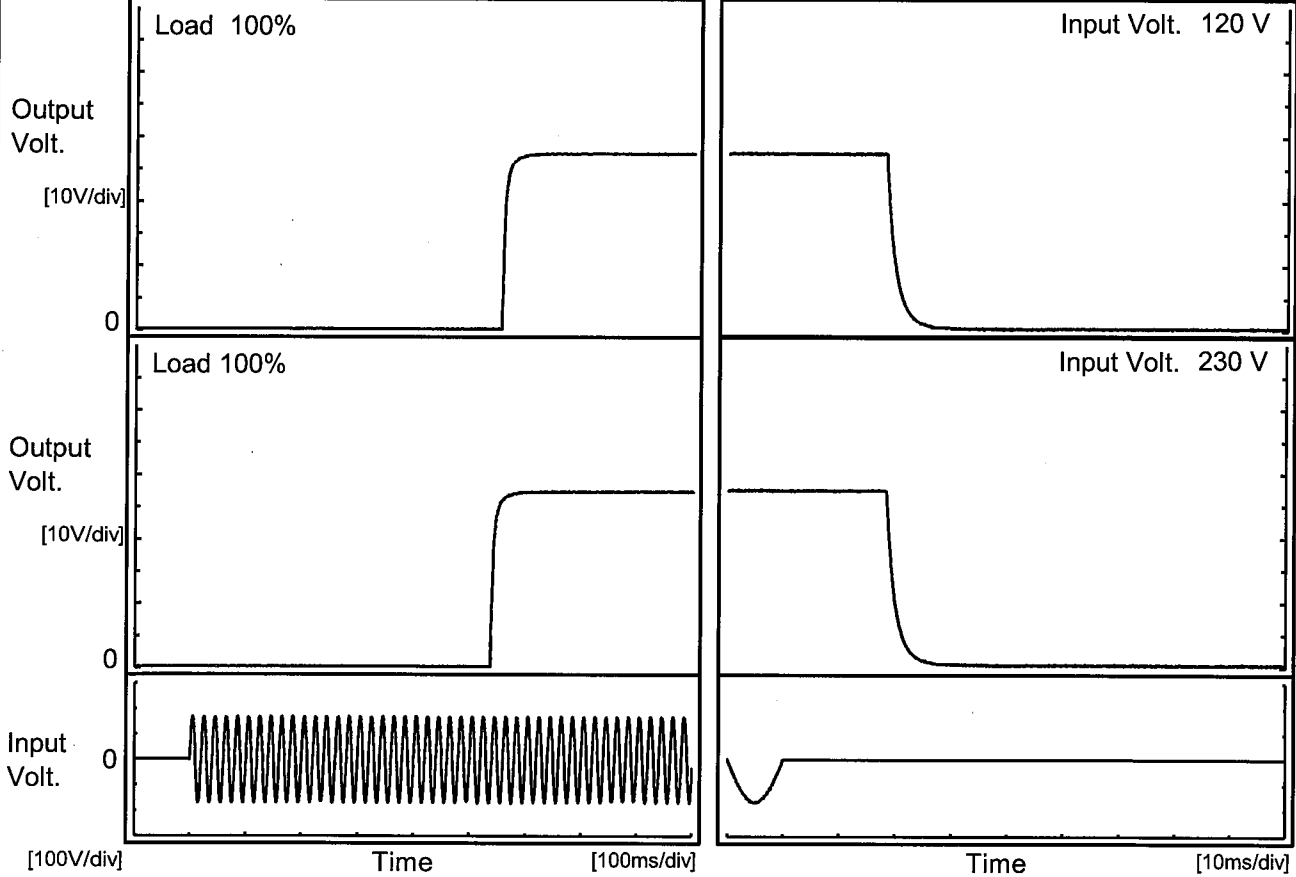
* Output Voltage Accuracy (Ration) = $\frac{\text{Output Voltage Accuracy}}{\text{Rated Output Voltage}} \times 100$

2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	50	264	0	55.317	±183	±0.3
Minimum Voltage	-20	120	9	54.951		

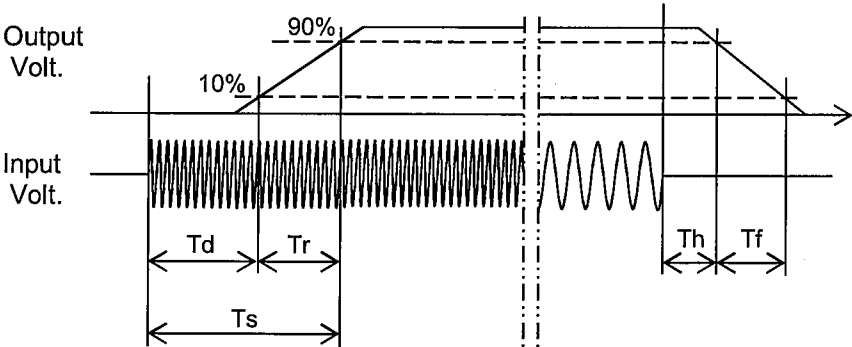
Model	GHA500F-56		
Item	Rise and Fall Time	Temperature	25°C
		Testing Circuitry	Figure A
Object	+56V9A		

1.Graph



2.Values

		[ms]				
Input Volt.	Time	Td	Tr	Ts	Th	Tf
120 V		555.5	15.5	571.0	18.4	3.8
230 V		537.0	15.5	552.5	18.5	3.7

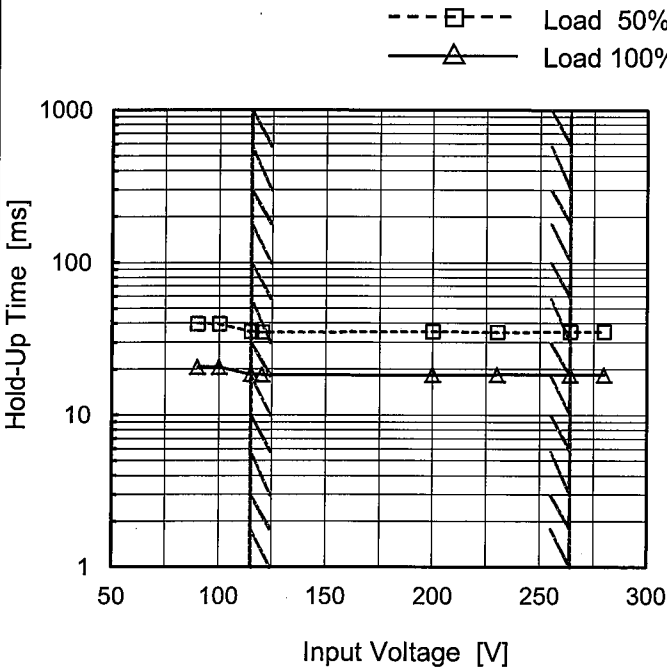




Model	GHA500F-56
Item	Hold-Up Time
Object	+56V9A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



This duration covers from Shut-off of input voltage to the moment when output voltage descends to the rated range of voltage accuracy.
Note: Slanted line shows the range of the rated input voltage.

2.Values

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
90	40	21 ※1
100	40	21 ※2
115	35	19
120	35	18
200	35	18
230	35	18
264	35	18
280	35	18
--	0	0

※1 : Load 80%
※2 : Load 88%

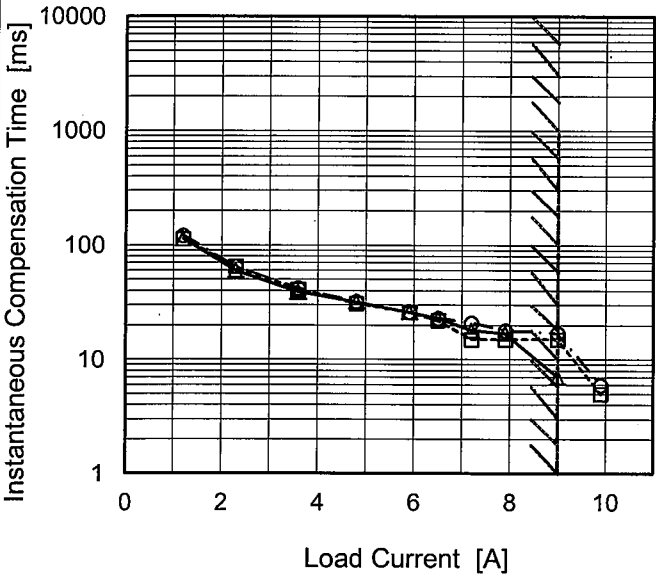


Model	GHA500F-56
Item	Instantaneous Interruption Compensation
Object	+56V9A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

—△— Input Volt. 100V
---□--- Input Volt. 120V
---○--- Input Volt. 230V



Note: Slanted line shows the range of the rated load current.

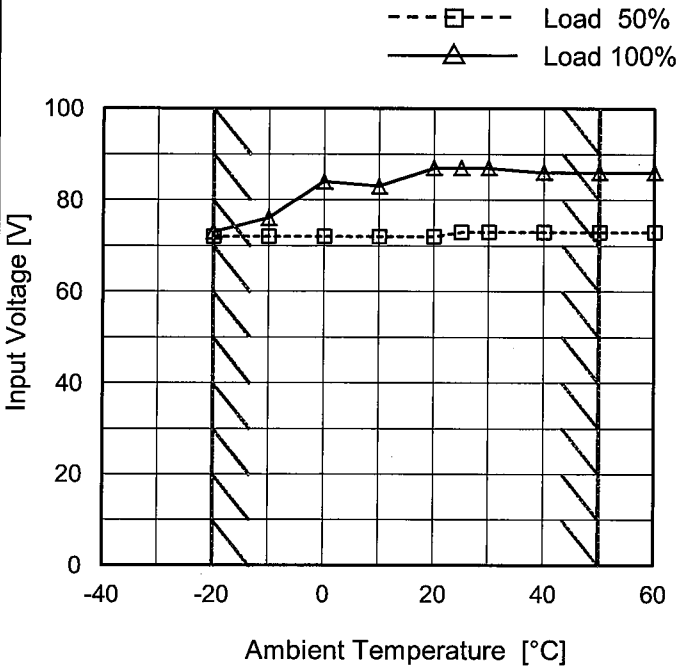
2.Values

Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 120[V]	Input Volt. 230[V]
0.0	-	-	-
1.2	114	114	121
2.3	60	65	65
3.6	39	41	42
4.8	32	31	32
5.9	26	26	26
6.5	23	22	23
7.2	18	15	21
7.9	17	15	18
9.0	7	15	17
9.9	-	5	6



Model	GHA500F-56
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+56V9A

1.Graph



Note: Slanted line shows the range of the rated ambient temperature.

Testing Circuitry Figure A

2.Values

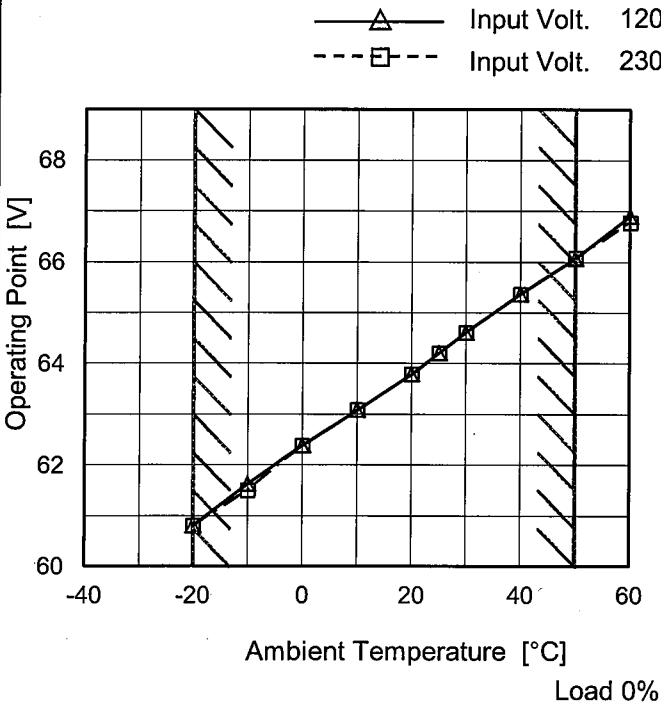
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-20	72	73
-10	72	76
0	72	84
10	72	83
20	72	87
25	73	87
30	73	87
40	73	86
50	73	86
60	73	86
--	-	-

Model	GHA500F-56																																																	
Item	Overcurrent Protection	Temperature	25°C																																															
Object	+56V9A	Testing Circuitry	Figure A																																															
1.Graph		2.Values																																																
<div><div><div></div><div>Input Volt. 120V</div></div><div><div></div><div>Input Volt. 230V</div></div></div> <p>Output Voltage [V]</p> <p>Load Current [A]</p> <p>Note: Slanted line shows the range of the rated load current.</p> <p>Intermittent operation occurs when overcurrent protection is activated.</p>		<table><tr><th rowspan="2">Output Voltage [V]</th><th colspan="2">Load Current [A]</th></tr><tr><th>Input Volt. 120[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>56.0</td><td>10.56</td><td>10.56</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Output Voltage [V]	Load Current [A]		Input Volt. 120[V]	Input Volt. 230[V]	56.0	10.56	10.56	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-
Output Voltage [V]	Load Current [A]																																																	
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Model	GHA500F-56
Item	Overvoltage Protection
Object	+56V9A

1.Graph



Note: Slanted line shows the range of the rated ambient temperature.

Testing Circuitry Figure A

2.Values

Ambient Temperature [°C]	Operating Point [V]	
	Input Volt. 120[V]	Input Volt. 230[V]
-20	60.80	60.80
-10	61.62	61.50
0	62.38	62.38
10	63.08	63.08
20	63.79	63.79
25	64.20	64.20
30	64.61	64.61
40	65.37	65.37
50	66.07	66.08
60	66.90	66.78
--	-	-

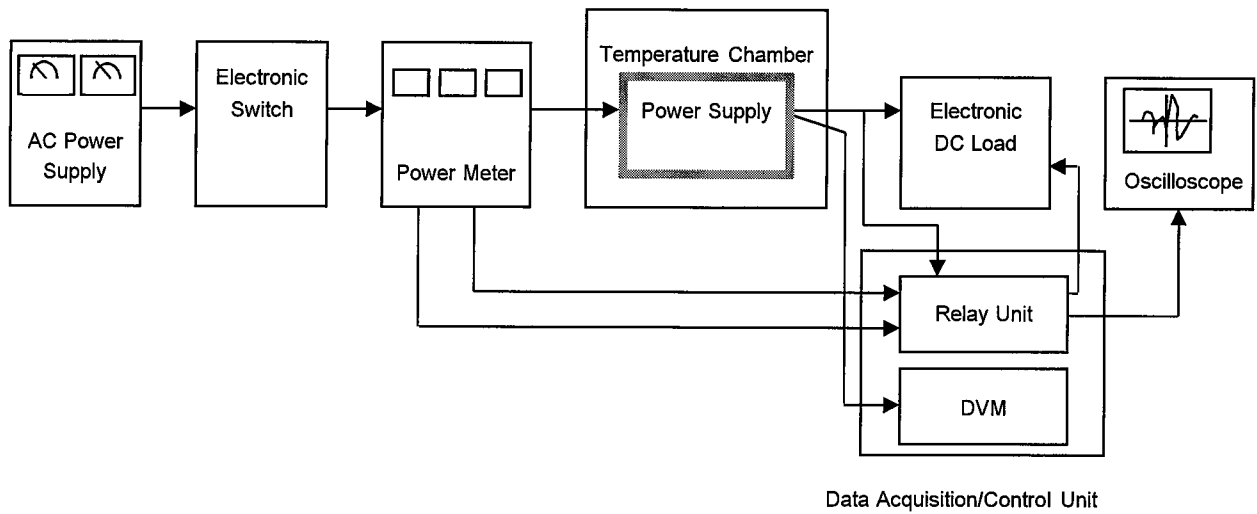


Figure A

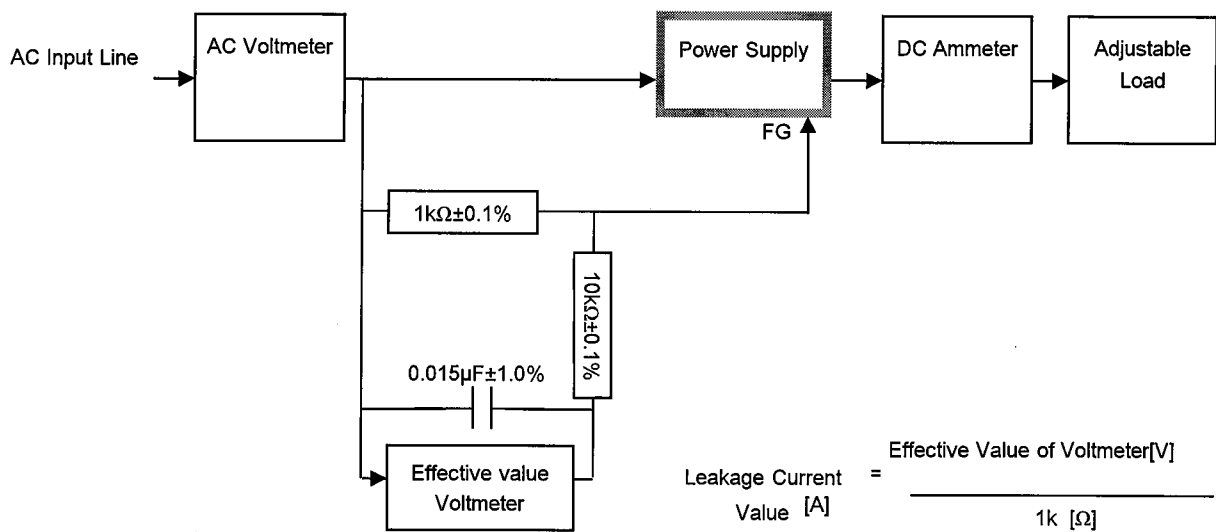


Figure B (IEC60601-1)