

TEST DATA OF GHA500F-48

Regulated DC Power Supply
April 19, 2013

Approved by : *Yoshiaki Shimizu*
Yoshiaki Shimizu Design Manager

Prepared by : *Soshi Nakamura*
Soshi Nakamura Design Engineer

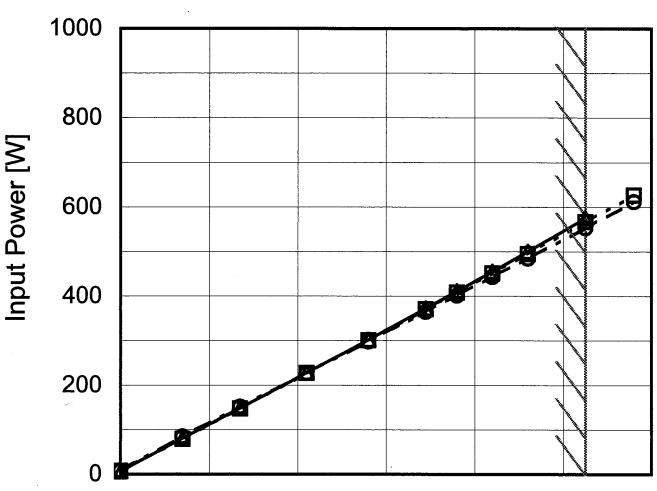
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Model		GHA500F-48		Temperature 25°C																																																						
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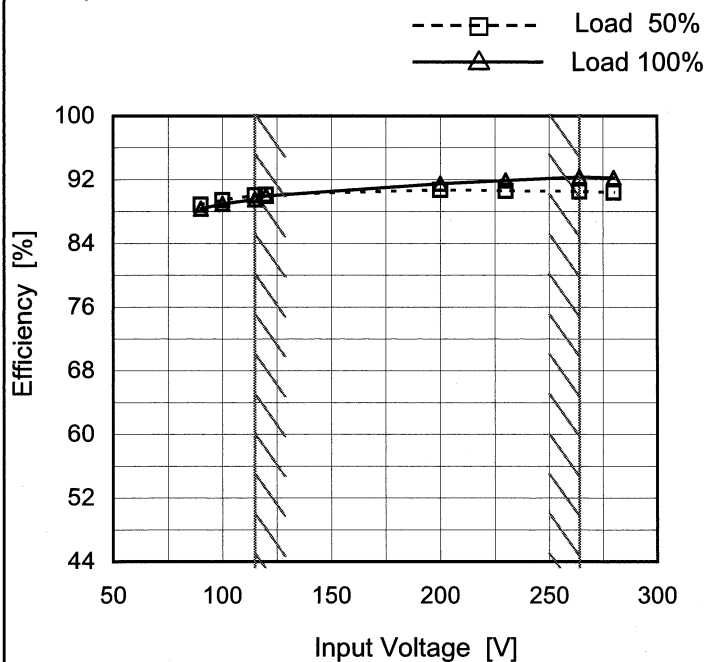
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Model	GHA500F-48
Item	Efficiency (by Input Voltage)
Object	

Temperature 25°C
Testing Circuitry Figure A

1. Graph



2. Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
90	88.9	88.4 ※1
100	89.4	89.0 ※2
115	90.0	89.5
120	90.1	90.0
200	90.7	91.5
230	90.6	91.9
264	90.5	92.4
280	90.4	92.2
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※1: Load 80%

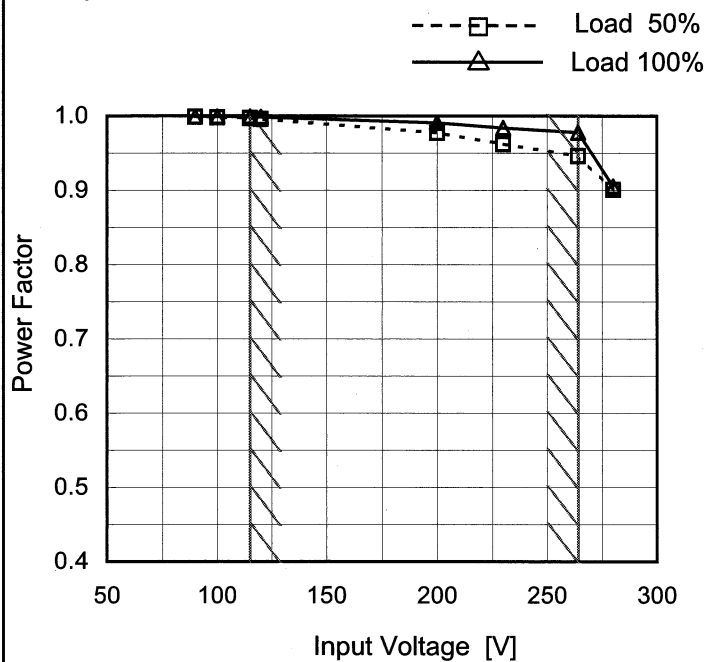
※2: Load 88%

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Model	GHA500F-48
Item	Power Factor (by Input Voltage)
Object	

Temperature 25°C
Testing Circuitry Figure A

1.Graph



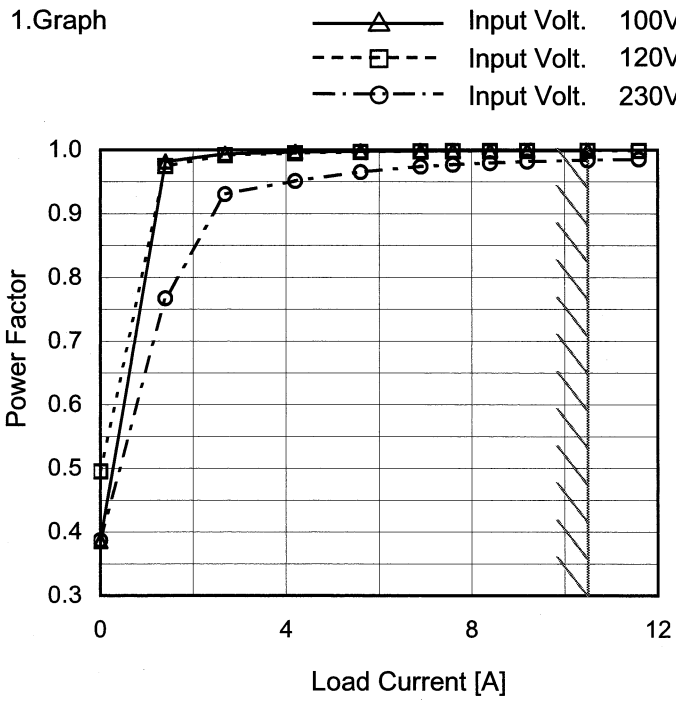
2.Values

Input Voltage [V]	Power Factor	
	Load 50%	Load 100%
90	0.999	0.999 ※1
100	0.998	0.999 ※2
115	0.997	0.999
120	0.996	0.999
200	0.977	0.991
230	0.962	0.984
264	0.946	0.978
280	0.901	0.905
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※1: Load 80%

※2: Load 88%

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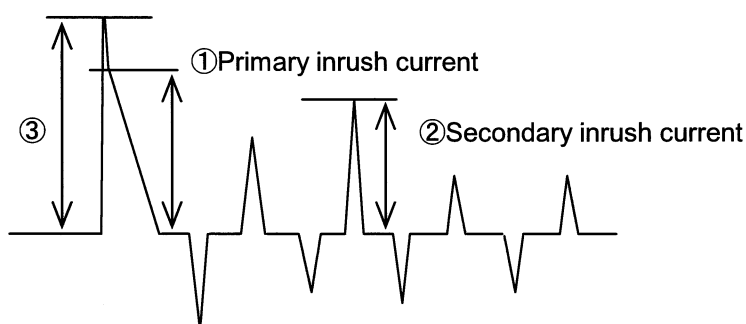
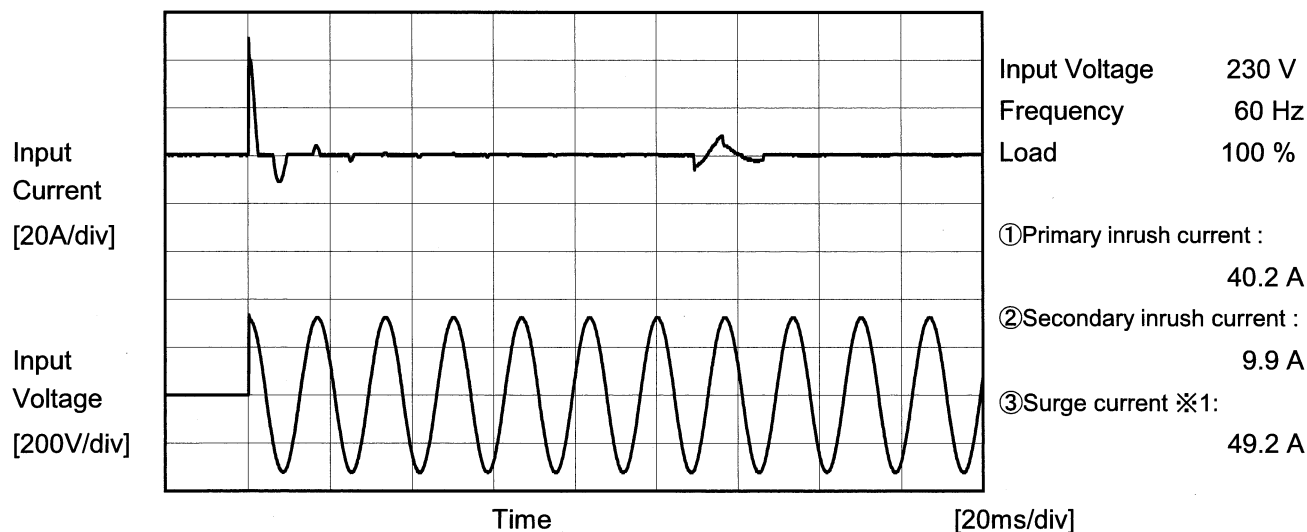
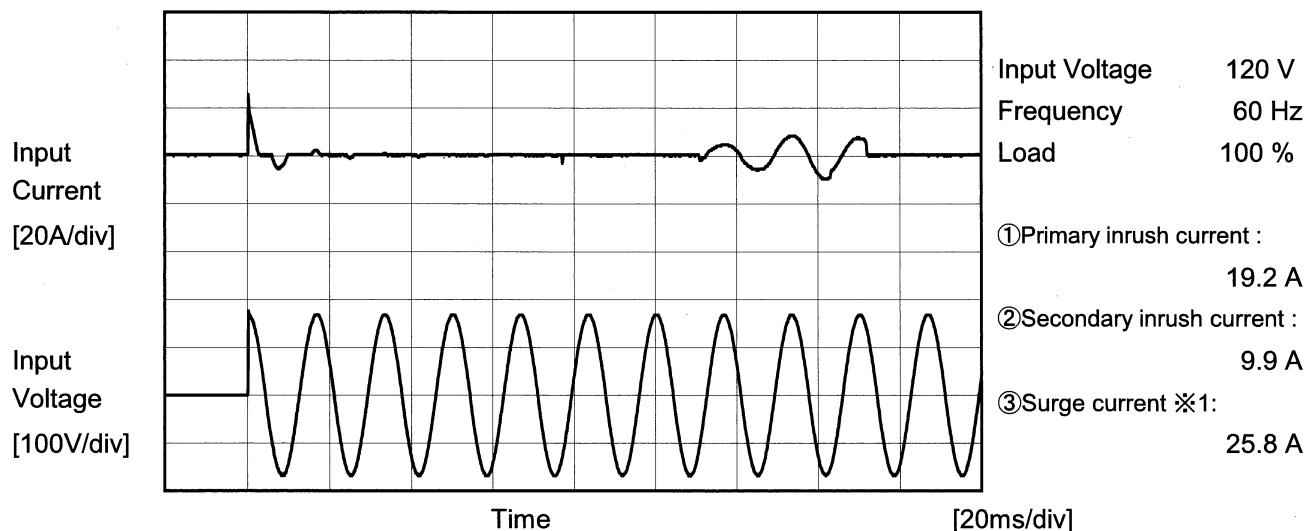
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Model	GHA500F-48	Temperature Testing Circuitry	25°C Figure A
Item	Inrush Current		
Object	_____		



※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.



		Temperature 25°C Testing Circuitry Figure B
Model	GHA500F-48	
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-48																																		
Item	Line Regulation	Temperature	25°C																																
		Testing Circuitry	Figure A																																
Object	+48V10.5A																																		
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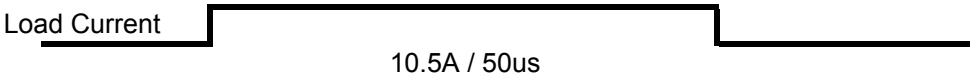
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<div><div>—△— Input Volt. 100V</div><div>---□--- Input Volt. 120V</div><div>-·-○-·- Input Volt. 230V</div></div> <p>Output Voltage [V]</p> <p>Load Current [A]</p> <p>Note: Slanted line shows the range of the rated load current.</p>		<table><tr><th 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>48.492</td><td>48.494</td><td>48.497</td></tr><tr><td>1.4</td><td>48.486</td><td>48.489</td><td>48.493</td></tr><tr><td>2.7</td><td>48.485</td><td>48.488</td><td>48.491</td></tr><tr><td>4.2</td><td>48.484</td><td>48.487</td><td>48.490</td></tr><tr><td>5.6</td><td>48.483</td><td>48.486</td><td>48.489</td></tr><tr><td>6.9</td><td>48.482</td><td>48.485</td><td>48.488</td></tr><tr><td>7.6</td><td>48.481</td><td>48.485</td><td>48.487</td></tr><tr><td>8.4</td><td>48.481</td><td>48.483</td><td>48.487</td></tr><tr><td>9.2</td><td>48.480</td><td>48.484</td><td>48.486</td></tr><tr><td>10.5</td><td>48.467</td><td>48.482</td><td>48.486</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	48.492	48.494	48.497	1.4	48.486	48.489	48.493	2.7	48.485	48.488	48.491	4.2	48.484	48.487	48.490	5.6	48.483	48.486	48.489	6.9	48.482	48.485	48.488	7.6	48.481	48.485	48.487	8.4	48.481	48.483	48.487	9.2	48.480	48.484	48.486	10.5	48.467	48.482	48.486	--	-	-	-
Load Current [A]	Output Voltage [V]																																																					
	Input Volt. 100[V]	Input Volt. 120[V]	Input Volt. 230[V]																																																			
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1.4	48.486	48.489	48.493																																																			
2.7	48.485	48.488	48.491																																																			
4.2	48.484	48.487	48.490																																																			
5.6	48.483	48.486	48.489																																																			
6.9	48.482	48.485	48.488																																																			
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10.5	48.467	48.482	48.486																																																			
--	-	-	-																																																			



Model	GHA500F-48
Item	Dynamic Load Response
Object	+48V 10.5A

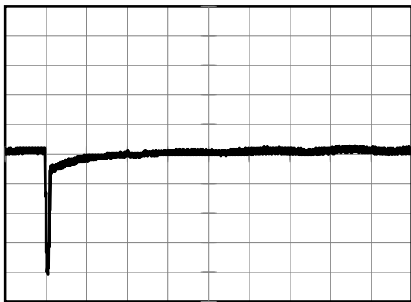
Temperature 25°C
Testing Circuitry Figure A

Input Volt. 120V
Cycle 1000ms

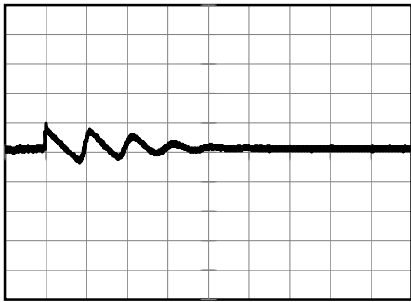


Min.Load (0A)←→
Load 100%(10.5A)

1 V/div



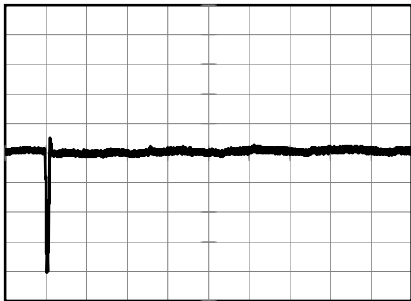
4 ms/div



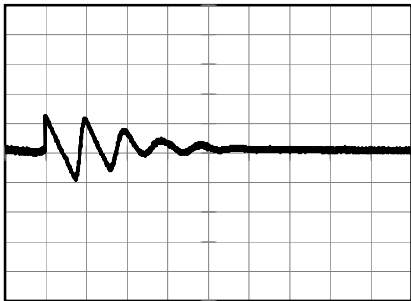
4 ms/div

Min.Load (0A)←→
Load 50%(5.25A)

500 mV/div



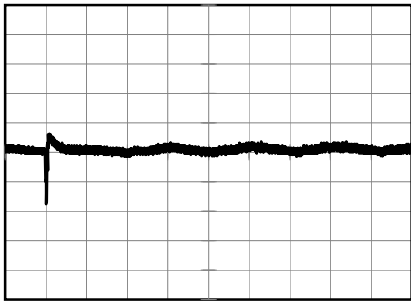
4 ms/div



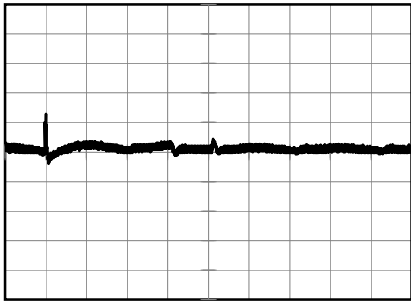
4 ms/div

Load 10% (1.05A)←→
Load 100% (10.5A)

500 mV/div



4 ms/div



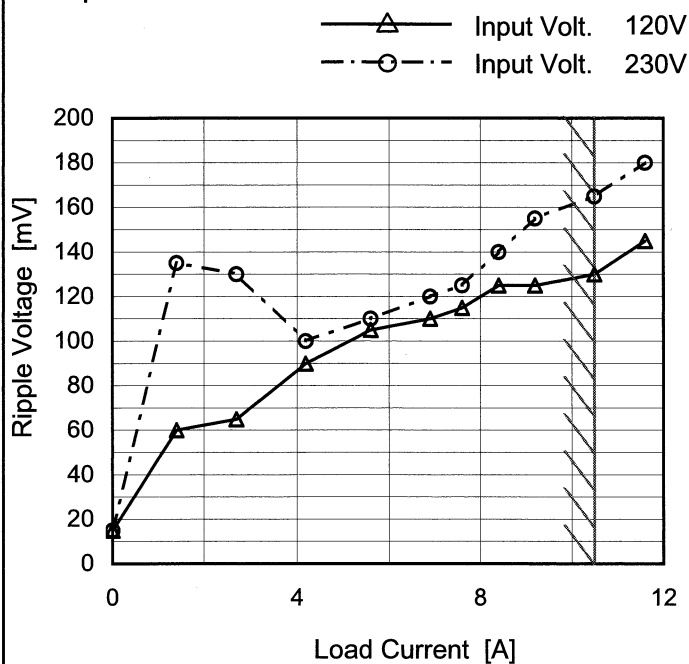
4 ms/div

COSEL

Model	GHA500F-48
Item	Ripple Voltage (by Load Current)
Object	+48V10.5A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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.

Ripple [mVp-p]

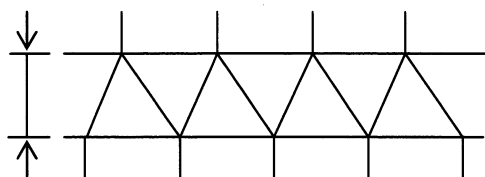


Fig.Complex Ripple Wave Form

2.Values

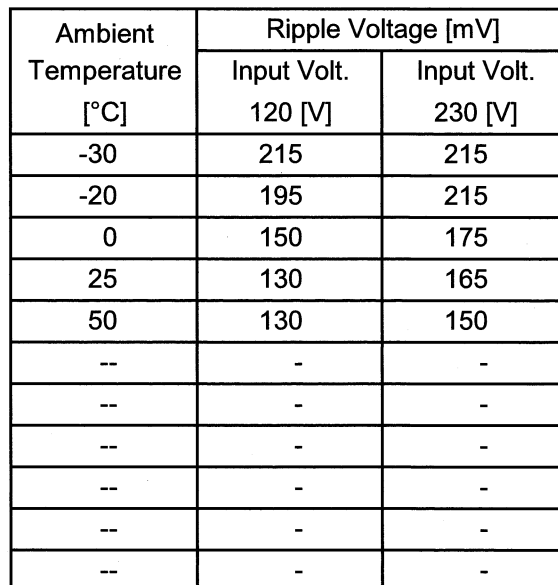
Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 120 [V]	Input Volt. 230 [V]
0.0	15	15
1.4	60	135
2.7	65	130
4.2	90	100
5.6	105	110
6.9	110	120
7.6	115	125
8.4	125	140
9.2	125	155
10.5	130	165
11.6	145	180

COSEL

COSEL																																																																													
Model	GHA500F-48	Temperature	25°C																																																																										
Item	Ripple-Noise	Testing Circuitry	Figure A																																																																										
Object	+48V10.5A																																																																												
1.Graph		2.Values																																																																											
<div><div><div><div><div></div><div>—△—</div><div>Input Volt. 120V</div></div><div><div>- -○- -</div><div>Input Volt. 230V</div></div></div><div><table><thead><tr><th>Load Current [A]</th><th>Input Volt. 120 [V] [mV]</th><th>Input Volt. 230 [V] [mV]</th></tr></thead><tbody><tr><td>0.0</td><td>40</td><td>30</td></tr><tr><td>1.4</td><td>65</td><td>140</td></tr><tr><td>2.7</td><td>85</td><td>135</td></tr><tr><td>4.2</td><td>105</td><td>115</td></tr><tr><td>5.6</td><td>115</td><td>120</td></tr><tr><td>6.9</td><td>125</td><td>140</td></tr><tr><td>7.6</td><td>155</td><td>150</td></tr><tr><td>8.4</td><td>155</td><td>155</td></tr><tr><td>9.2</td><td>160</td><td>170</td></tr><tr><td>10.5</td><td>165</td><td>180</td></tr><tr><td>11.6</td><td>185</td><td>200</td></tr></tbody></table></div></div><div><p>Measured by 20 MHz Oscilloscope.</p><p>Ripple-Noise is shown as p-p in the figure below.</p><p>Note: Slanted line shows the range of the rated load current.</p></div><div><div><div><div></div><div>Ripple Noise[mVp-p]</div><div></div></div><div></div></div><div>Fig.Complex Ripple Noise Wave Form</div></div></div>		Load Current [A]	Input Volt. 120 [V] [mV]	Input Volt. 230 [V] [mV]	0.0	40	30	1.4	65	140	2.7	85	135	4.2	105	115	5.6	115	120	6.9	125	140	7.6	155	150	8.4	155	155	9.2	160	170	10.5	165	180	11.6	185	200	<table><thead><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></thead><tbody><tr><td>0.0</td><td>40</td><td>30</td></tr><tr><td>1.4</td><td>65</td><td>140</td></tr><tr><td>2.7</td><td>85</td><td>135</td></tr><tr><td>4.2</td><td>105</td><td>115</td></tr><tr><td>5.6</td><td>115</td><td>120</td></tr><tr><td>6.9</td><td>125</td><td>140</td></tr><tr><td>7.6</td><td>155</td><td>150</td></tr><tr><td>8.4</td><td>155</td><td>155</td></tr><tr><td>9.2</td><td>160</td><td>170</td></tr><tr><td>10.5</td><td>165</td><td>180</td></tr><tr><td>11.6</td><td>185</td><td>200</td></tr></tbody></table>		Load Current [A]	Ripple-Noise [mV]		Input Volt. 120 [V]	Input Volt. 230 [V]	0.0	40	30	1.4	65	140	2.7	85	135	4.2	105	115	5.6	115	120	6.9	125	140	7.6	155	150	8.4	155	155	9.2	160	170	10.5	165	180	11.6	185	200
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Testing Circuitry Figure A

2.Values



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

Model		GHA500F-48	
Item		Ambient Temperature Drift	
Object		+48V10.5A	
1.Graph		<div><div><div><div></div></div><div></div></div> Input Volt. 100V</div> <div><div><div></div></div><div></div></div> Input Volt. 120V <div><div><div></div></div><div></div></div> Input Volt. 230V	
<div><div><div>Output Voltage 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COSEL

		Testing Circuitry Figure A
Model	GHA500F-48	
Item	Output Voltage Accuracy	
Object	+48V10.5A	

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 - 10.5A

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

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

2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	50	264	0	48.543	±107	±0.2
Minimum Voltage	-20	115	10.5	48.330		

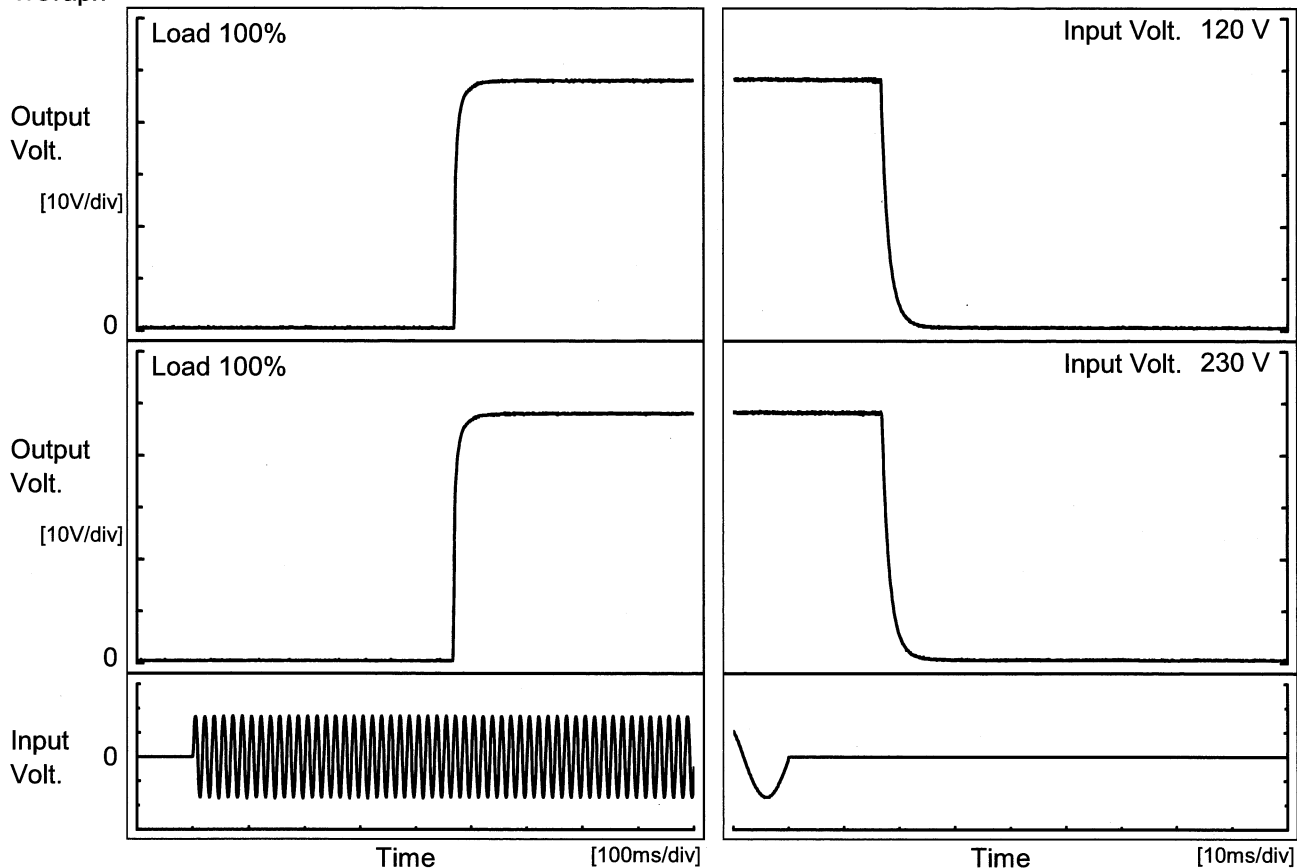


Model	GHA500F-48		
Item	Time Lapse Drift	Temperature	25°C
Object	+48V10.5A	Testing Circuitry	Figure A
1.Graph		2.Values	
<div><div><div>Output Voltage [V]</div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></di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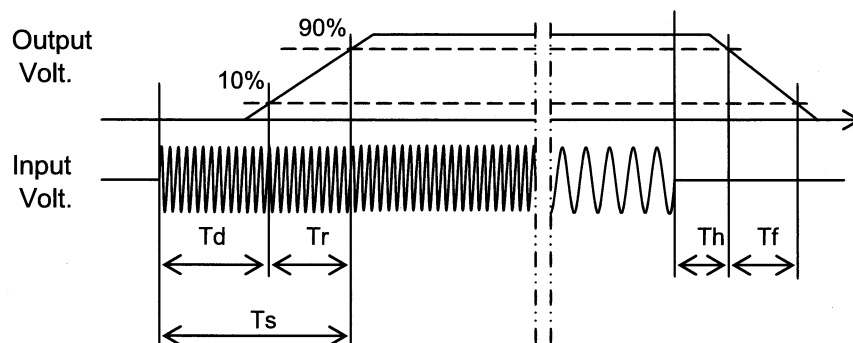
Model	GHA500F-48	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+48V10.5A		

1.Graph



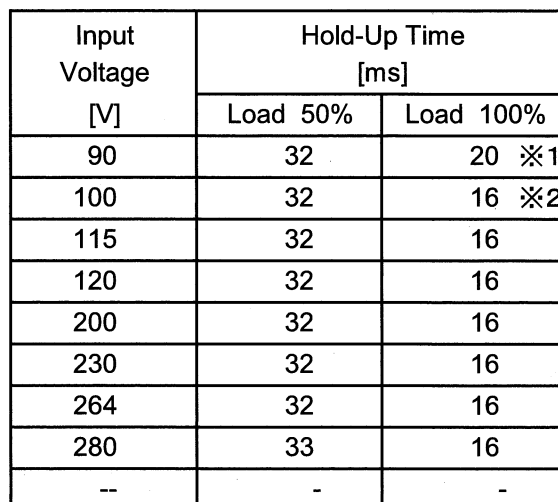
2.Values

Input Volt.	Time	Td	Tr	Ts	Th	Tf
120 V		470.0	14.0	484.0	16.8	3.1
230 V		468.5	13.0	481.5	17.0	3.0



Temperature 25°C
Testing Circuitry Figure A


2.Values



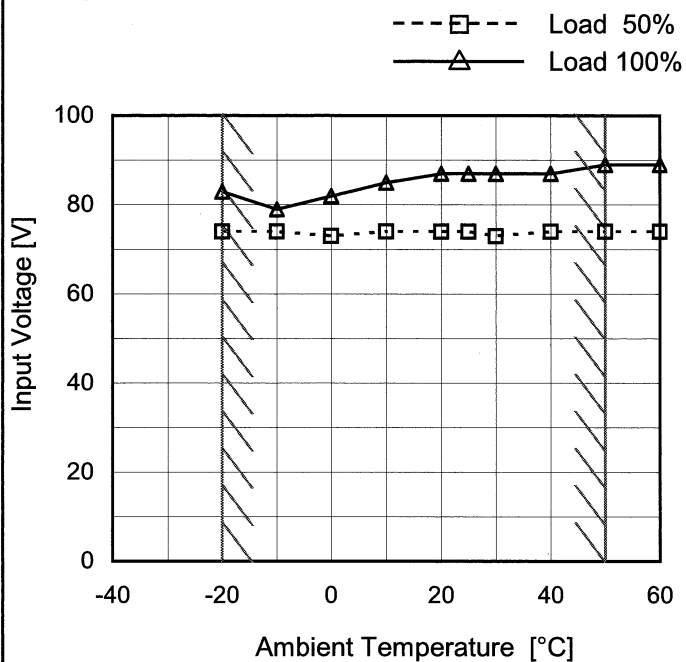
※2: Load 88%

- 19 -

Model	GHA500F-48																																																					
Item	Instantaneous Interruption Compensation	Temperature	25°C																																																			
Object	+48V10.5A	Testing Circuitry	Figure A																																																			
1.Graph		2.Values																																																				
<div><div>—△— Input Volt. 100V</div><div>---□--- Input Volt. 120V</div><div>-·-○-·- Input Volt. 230V</div></div> <p>Instantaneous Compensation Time [ms]</p> <p>Load Current [A]</p>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Time [ms]</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>-</td><td>-</td><td>-</td></tr><tr><td>1.4</td><td>115</td><td>115</td><td>119</td></tr><tr><td>2.7</td><td>60</td><td>60</td><td>61</td></tr><tr><td>4.2</td><td>39</td><td>39</td><td>39</td></tr><tr><td>5.6</td><td>30</td><td>30</td><td>30</td></tr><tr><td>6.9</td><td>22</td><td>22</td><td>23</td></tr><tr><td>7.6</td><td>21</td><td>22</td><td>22</td></tr><tr><td>8.4</td><td>17</td><td>20</td><td>20</td></tr><tr><td>9.2</td><td>16</td><td>18</td><td>17</td></tr><tr><td>10.5</td><td>13</td><td>16</td><td>16</td></tr><tr><td>11.6</td><td>-</td><td>14</td><td>14</td></tr></table>		Load Current [A]	Time [ms]			Input Volt. 100[V]	Input Volt. 120[V]	Input Volt. 230[V]	0.0	-	-	-	1.4	115	115	119	2.7	60	60	61	4.2	39	39	39	5.6	30	30	30	6.9	22	22	23	7.6	21	22	22	8.4	17	20	20	9.2	16	18	17	10.5	13	16	16	11.6	-	14	14
Load Current [A]	Time [ms]																																																					
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6.9	22	22	23																																																			
7.6	21	22	22																																																			
8.4	17	20	20																																																			
9.2	16	18	17																																																			
10.5	13	16	16																																																			
11.6	-	14	14																																																			
Note: Slanted line shows the range of the rated load current.																																																						

	
Model	GHA500F-48
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+48V10.5A

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	74	83
-10	74	79
0	73	82
10	74	85
20	74	87
25	74	87
30	73	87
40	74	87
50	74	89
60	74	89
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Model	GHA500F-48																																																	
Item	Overcurrent Protection	Temperature	25°C																																															
Object	+48V10.5A	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>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>48</td><td>12.08</td><td>12.07</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]	48	12.08	12.07	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-
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Model		GHA500F-48
Item		Overvoltage Protection
Object		+48V10.5A
1.Graph		2.Values

—△—

Input Volt. 120V

---□---

Input Volt. 230V

Operating Point [V]

Ambient Temperature [°C]

Load 0%

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

Ambient Temperature [°C]	Operating Point [V]	
	Input Volt. 120[V]	Input Volt. 230[V]
-20	56.15	56.15
-10	56.79	56.79
0	57.37	57.37
10	58.37	58.37
20	58.84	58.84
25	59.08	59.08
30	59.25	59.25
40	59.95	59.95
50	60.56	60.56
60	61.26	61.26
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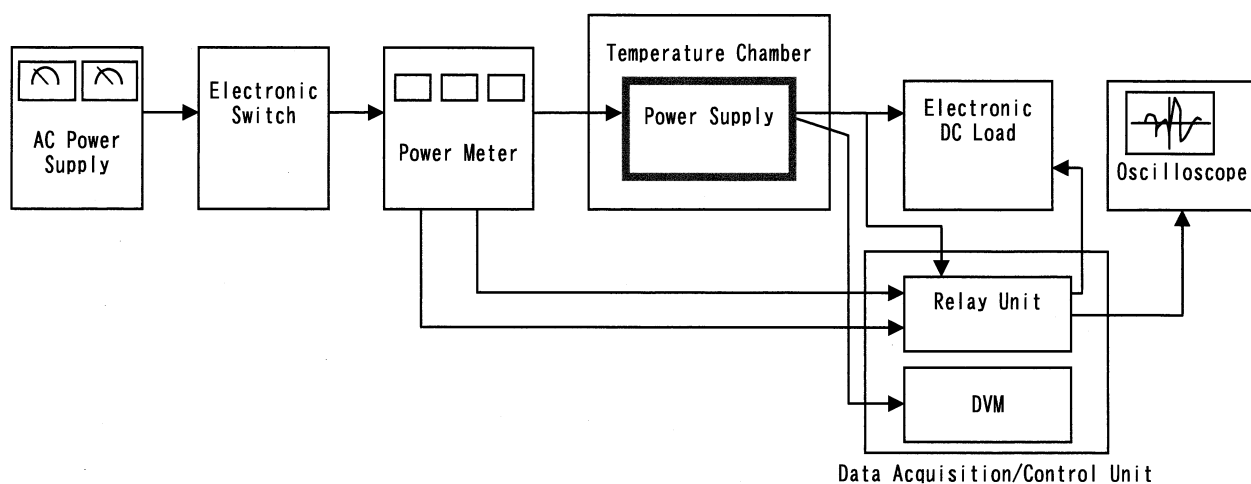


Figure A

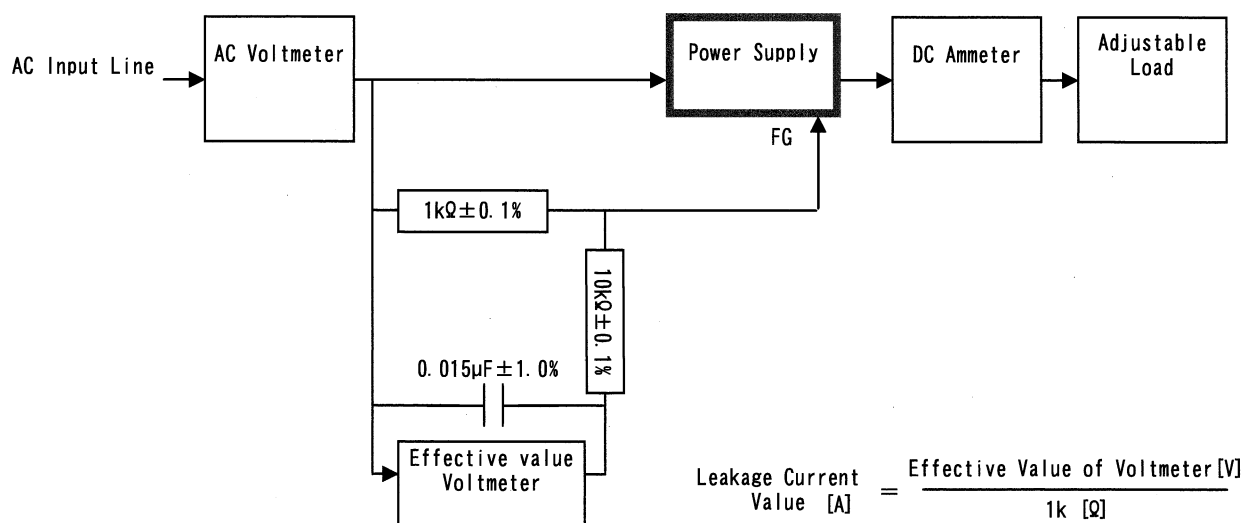


Figure B (IEC60601-1)