

TEST DATA OF LHA50F-5

Regulated DC Power Supply
September 19, 2019

Approved by : Junya Kaneda
Junya Kaneda Design Manager

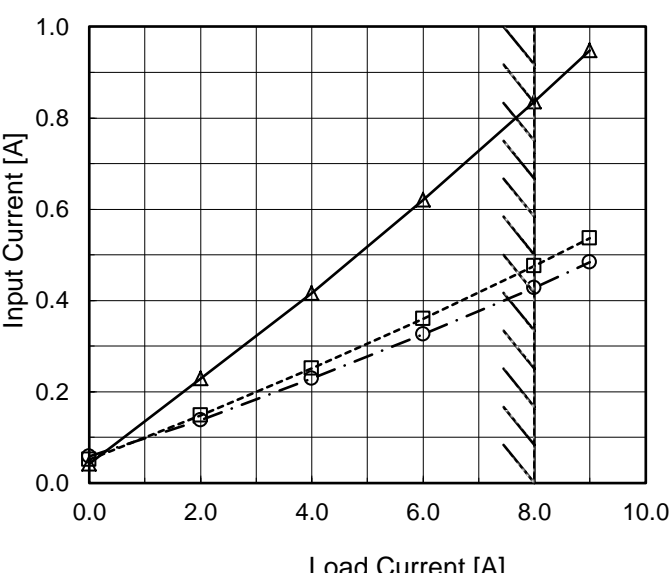
Prepared by : Yasushi Fukumura
Yasushi Fukumura Design Engineer

COSEL CO.,LTD.

CONTENTS

1.Input Current (by Load Current)	1
2.Efficiency (by Load Current)	2
3.Power Factor (by Load Current)	3
4.Inrush Current	4
5.Leakage Current	5
6.Line Regulation	6
7.Load Regulation	7
8.Dynamic Load Response	8
9.Ripple-Noise (by Load Current)	9
10.Ambient Temperature Drift	10
11.Rise and Fall Time	11
12.Hold-Up Time	12
13.Instantaneous Interruption Compensation	13
14.Minimum Input Voltage for Regulated Output Voltage	14
15.Overcurrent Protection	15
16.Overvoltage Protection	16
17.Figure of Testing Circuitry	17

(Final Page 18)

Model		LHA50F-5		Temperature 25°C																																																				
Item		Input Current (by Load Current)		Testing Circuitry Figure A																																																				
Object		_____																																																						
1.Graph		<div><div><div>—△—</div><div>Input Volt.</div><div>100V</div></div><div><div>---□---</div><div>Input Volt.</div><div>200V</div></div><div><div>-·-○-·-</div><div>Input Volt.</div><div>230V</div></div></div>  <p>Note: Slanted line shows the range of the rated load current.</p>		2.Values																																																				
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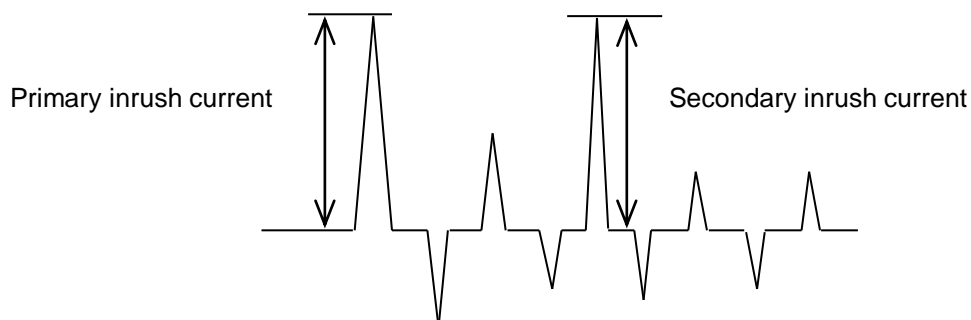
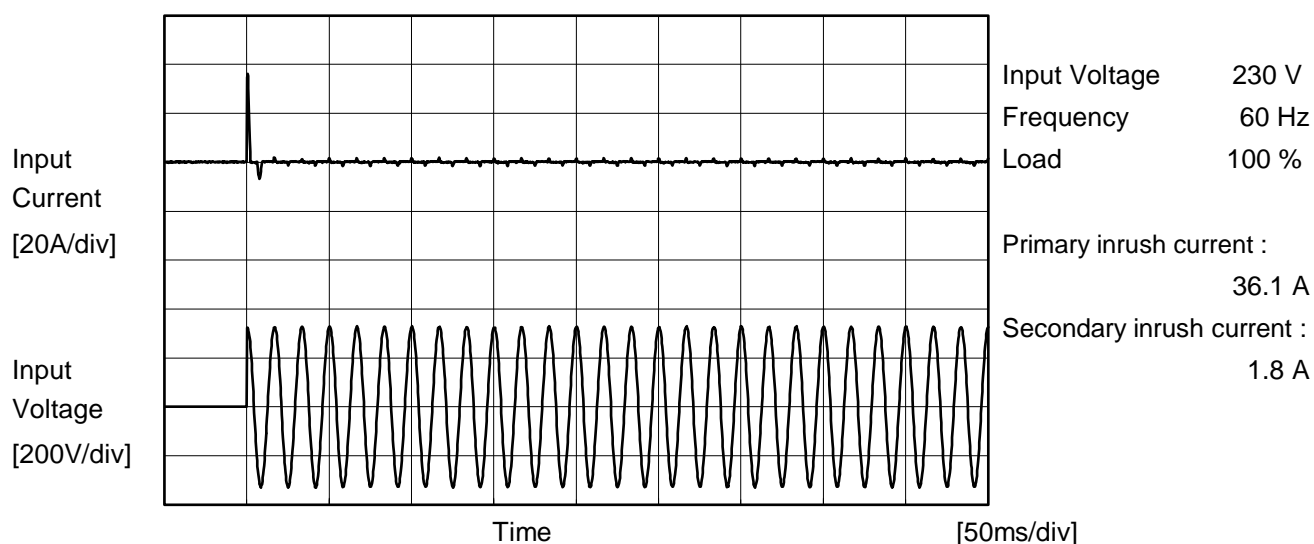
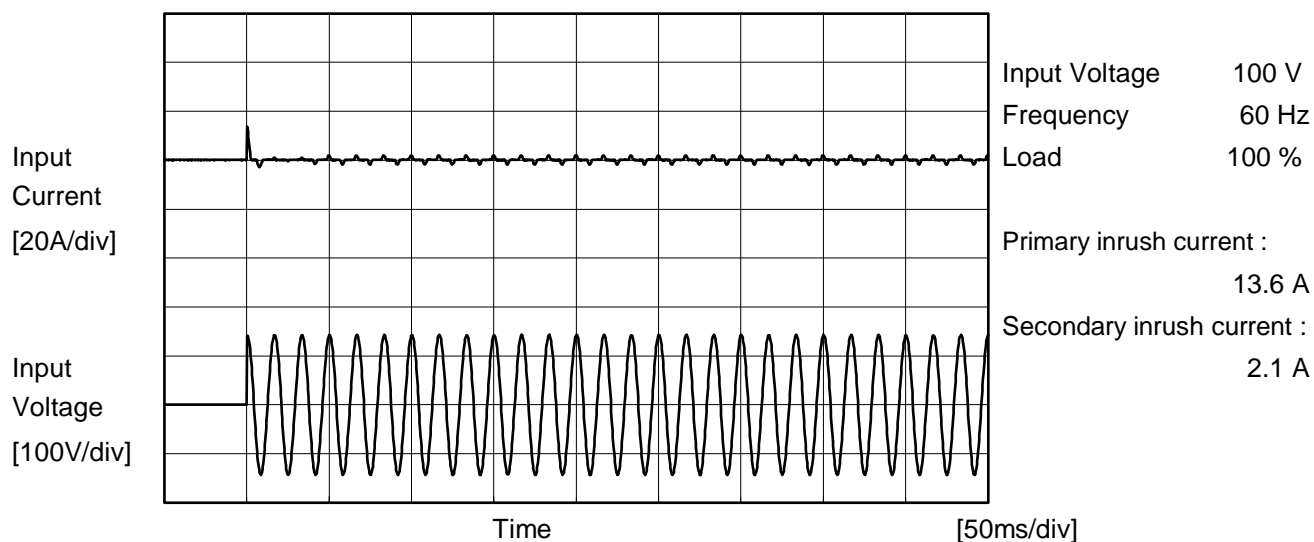
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<div><div><div>—△— Input Volt. 100V</div><div>---□--- Input Volt. 200V</div><div>-·-○-·- Input Volt. 230V</div></div><div>Efficiency [%]</div><div>Load Current [A]</div></div> <div>Note: Slanted line shows the range of the rated load current.</div>				<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Efficiency [%]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.0</td><td>-</td><td>-</td><td>-</td></tr><tr><td>2.0</td><td>84.8</td><td>84.3</td><td>83.9</td></tr><tr><td>4.0</td><td>85.4</td><td>86.9</td><td>86.8</td></tr><tr><td>6.0</td><td>83.8</td><td>86.7</td><td>86.8</td></tr><tr><td>8.0</td><td>82.4</td><td>86.1</td><td>86.3</td></tr><tr><td>9.0</td><td>81.6</td><td>85.6</td><td>85.9</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Efficiency [%]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.0	-	-	-	2.0	84.8	84.3	83.9	4.0	85.4	86.9	86.8	6.0	83.8	86.7	86.8	8.0	82.4	86.1	86.3	9.0	81.6	85.6	85.9	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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Model	LHA50F-5	Temperature	25°C
Item	Inrush Current	Testing Circuitry	Figure A
Object			





		Temperature 25°C Testing Circuitry Figure B
Model	LHA50F-5	
Item	Leakage Current	
Object	_____	

1.Results

Standards	Testing Circuitry	Measuring Method	Input Volt.			Note
			100 [V]	230 [V]	240 [V]	
DEN-AN	Figure B-1	Both phases	0.08	0.21	0.22	Operation
		One of phases	0.16	0.42	0.45	Stand by
IEC62368-1	Figure B-2	Both phases	0.11	0.26	0.26	Operation
		One of phases	0.16	0.38	0.40	Stand by
	Figure B-3	Both phases	0.11	0.26	0.27	Operation
		One of phases	0.16	0.38	0.40	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		LHA50F-5	Temperature		25°C																																
Item		Line Regulation	Testing Circuitry		Figure A																																
Object		+5V8A																																			
1.Graph			2.Values																																		
<div><div><div><div><div></div><div></div></div><div><div></div><div></div></div></div><div><div></div><div></div></div><div>Load 50%</div></div><div><div><div><div></div><div></div></div><div><div></div><div></div></div></div><div><div></div><div></div></div><div>Load 100%</div></div></div> <div><div><div><div><div></div><div></div></div><div><div></div><div></div></div></div><div><div></div><div></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>Input 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>Note: Slanted line shows the range of the rated input voltage.</div></div>			<table><tr><th rowspan="2">Input Voltage [V]</th><th colspan="2">Output Voltage [V]</th></tr><tr><th>Load 50%</th><th>Load 100%</th></tr><tr><td>85</td><td>5.101</td><td>-</td></tr><tr><td>90</td><td>5.101</td><td>5.103</td></tr><tr><td>100</td><td>5.101</td><td>5.103</td></tr><tr><td>120</td><td>5.101</td><td>5.103</td></tr><tr><td>200</td><td>5.102</td><td>5.103</td></tr><tr><td>230</td><td>5.102</td><td>5.103</td></tr><tr><td>264</td><td>5.102</td><td>5.104</td></tr><tr><td>280</td><td>5.102</td><td>5.104</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>			Input Voltage [V]	Output Voltage [V]		Load 50%	Load 100%	85	5.101	-	90	5.101	5.103	100	5.101	5.103	120	5.101	5.103	200	5.102	5.103	230	5.102	5.103	264	5.102	5.104	280	5.102	5.104	--	-	-
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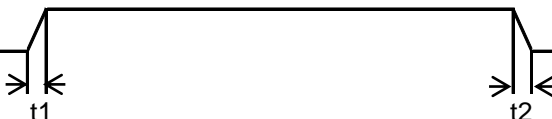


Model	LHA50F-5	Temperature 25°C Testing Circuitry Figure A
Item	Dynamic Load Response	
Object	+5V8A	

Input Volt. 230 V
Cycle 1000 ms

$t1, t2 = 50 \mu s$

Load Current



Min.Load (0A) \longleftrightarrow
Load 100% (8A)

200 mV/div

800 μs /div

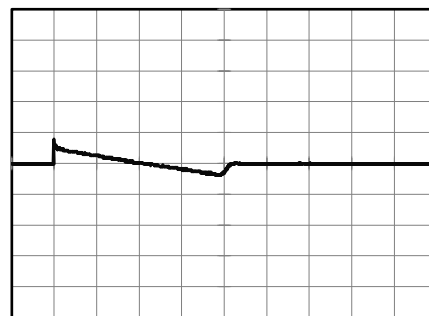
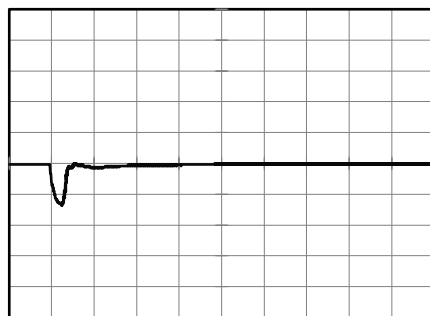


4 ms/div

Min.Load (0A) \longleftrightarrow
Load 50% (4A)

200 mV/div

800 μs /div

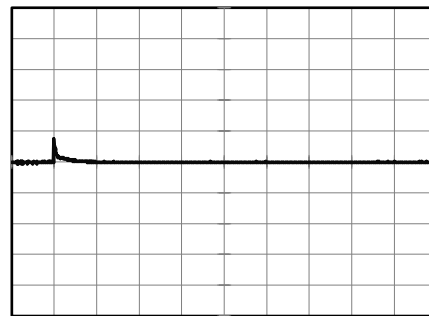
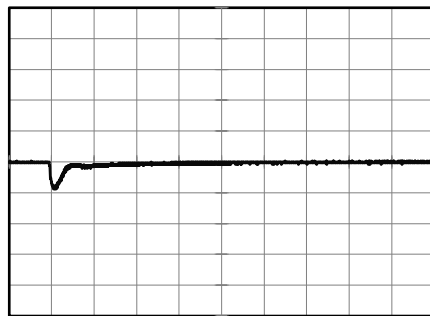


4 ms/div

Load 50% (4A) \longleftrightarrow
Load 100% (8A)

200 mV/div

800 μs /div



4 ms/div

Model		LHA50F-5																																							
Item		Ripple-Noise(by Load Current)																																							
Object		+5V8A																																							
1.Graph		2.Values																																							
<div><div><div>—△— Input Volt. 100V</div><div>- -○- - Input Volt. 230V</div></div><p>Measured by 20 MHz Oscilloscope. Ripple-Noise is shown as p-p in the figure below. Note: Slanted line shows the range of the rated load current.</p></div>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple-Noise [mV]</th></tr><tr><th>Input Volt. 100 [V]</th><th>Input Volt. 230 [V]</th></tr><tr><td>0.0</td><td>15</td><td>14</td></tr><tr><td>2.0</td><td>15</td><td>16</td></tr><tr><td>4.0</td><td>36</td><td>25</td></tr><tr><td>6.0</td><td>58</td><td>30</td></tr><tr><td>8.0</td><td>75</td><td>37</td></tr><tr><td>9.0</td><td>88</td><td>48</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>		Load Current [A]	Ripple-Noise [mV]		Input Volt. 100 [V]	Input Volt. 230 [V]	0.0	15	14	2.0	15	16	4.0	36	25	6.0	58	30	8.0	75	37	9.0	88	48	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-
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<div><div><div>T1: Due to AC Input Line</div><div>T2: Due to Switching</div></div><p>Fig. Complex Ripple Wave Form</p></div>																																									

Model

LHA50F-5

Item

Ambient Temperature Drift

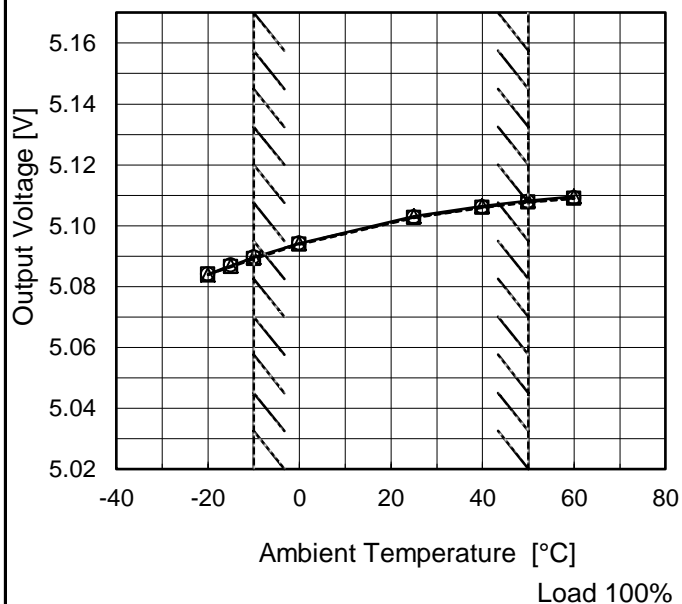
Object

+5V8A

Testing Circuitry Figure A

1.Graph

—△— Input Volt. 100V
 ---□--- Input Volt. 200V
 ---○--- Input Volt. 230V



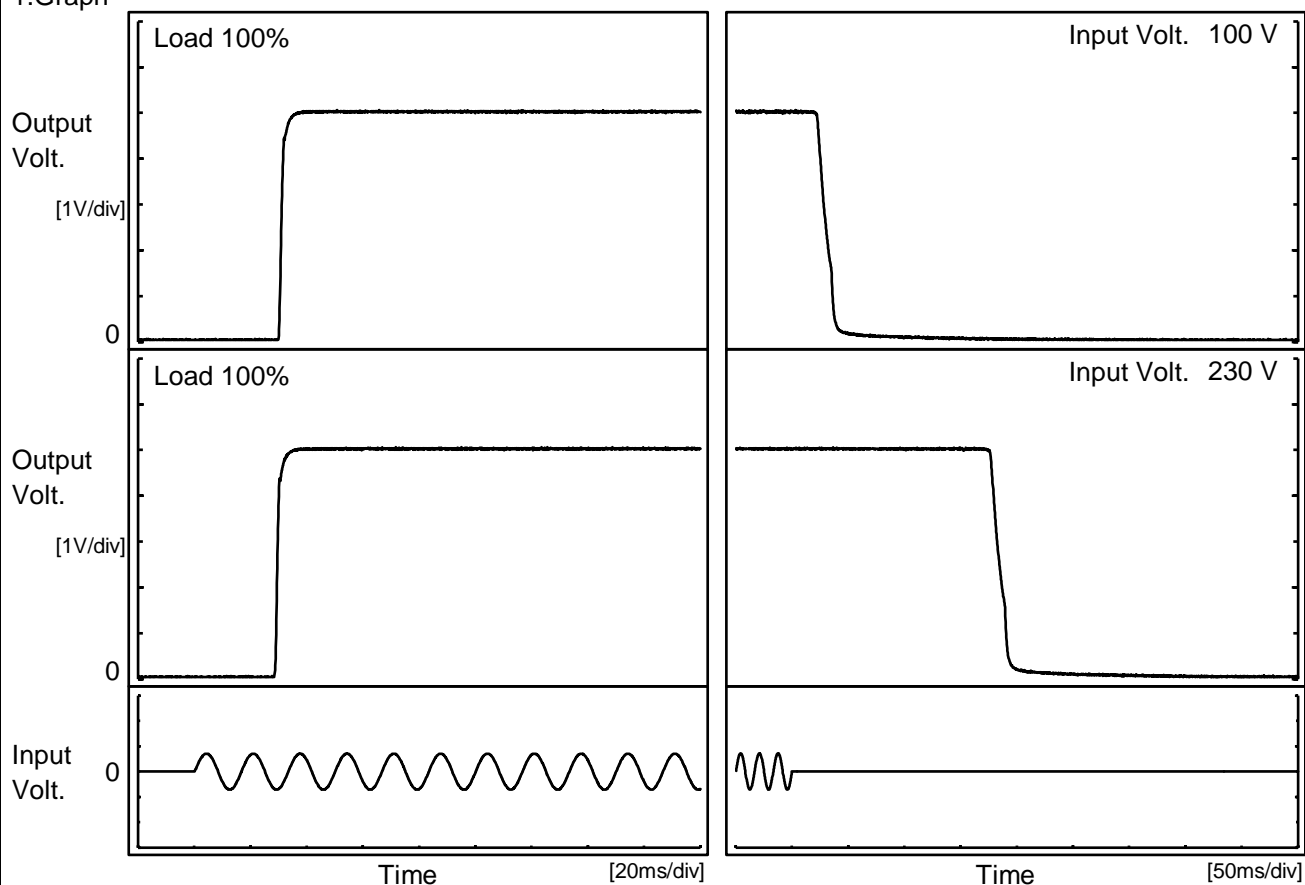
Note: Slanted line shows the range of the rated ambient temperature.

2.Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-20	5.084	5.084	5.084
-15	5.087	5.087	5.087
-10	5.090	5.089	5.090
0	5.094	5.094	5.094
25	5.103	5.103	5.103
40	5.107	5.106	5.106
50	5.108	5.108	5.108
60	5.110	5.109	5.109
--	-	-	-
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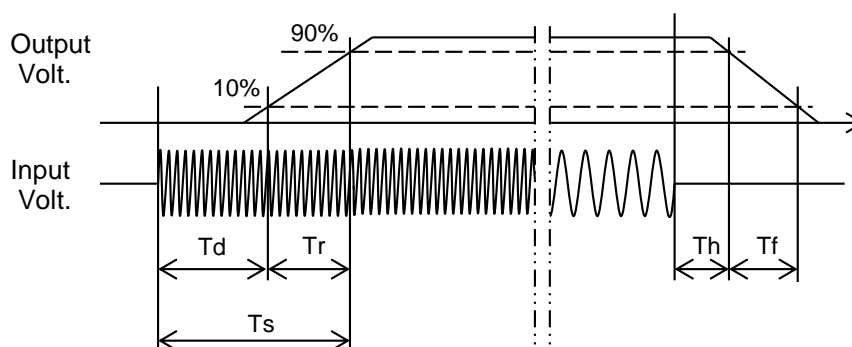
Model	LHA50F-5		
Item	Rise and Fall Time	Temperature	25°C
Object	+5V8A	Testing Circuitry	Figure A

1.Graph



2.Values

		[ms]				
Input Volt.	Time	Td	Tr	Ts	Th	Tf
100 V		30.4	2.1	32.5	23.8	14.0
230 V		29.0	2.1	31.1	177.8	14.3



Model		LHA50F-5	Temperature		25°C																																																			
Item		Instantaneous Interruption Compensation	Testing Circuitry		Figure A																																																			
Object		+5V8A																																																						
1.Graph			2.Values																																																					
<div><div><div>—△—</div><div>Input Volt.</div><div>100V</div></div><div><div>---□---</div><div>Input Volt.</div><div>200V</div></div><div><div>-·-○-·-</div><div>Input Volt.</div><div>230V</div></div></div> <div>Instantaneous Compensation Time [ms]</div> <div>Load Current [A]</div>			<table><thead><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. 200[V]</th><th>Input Volt. 230[V]</th></tr></thead><tbody><tr><td>0.0</td><td>-</td><td>-</td><td>-</td></tr><tr><td>2.0</td><td>125</td><td>532</td><td>723</td></tr><tr><td>4.0</td><td>58</td><td>282</td><td>381</td></tr><tr><td>6.0</td><td>36</td><td>181</td><td>247</td></tr><tr><td>8.0</td><td>22</td><td>131</td><td>178</td></tr><tr><td>9.0</td><td>16</td><td>112</td><td>121</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></tbody></table>			Load Current [A]	Time [ms]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.0	-	-	-	2.0	125	532	723	4.0	58	282	381	6.0	36	181	247	8.0	22	131	178	9.0	16	112	121	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Time [ms]																																																							
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Note: Slanted line shows the range of the rated load current.																																																								

Model		LHA50F-5
Item		Minimum Input Voltage for Regulated Output Voltage
Object		+5V8A

1.Graph

□

Load 50%

—

△

—

Load 100%

Input Voltage [V]

</



Model		LHA50F-5		Temperature Testing Circuitry	25°C Figure A																																												
Item		Overcurrent Protection																																															
Object		+5V8A																																															
1.Graph				2.Values																																													
<div><div><div></div><div>Input Volt. 100V</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>				<table><tr><th rowspan="2">Output Voltage [V]</th><th colspan="2">Load Current [A]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>5.00</td><td>10.22</td><td>9.69</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. 100[V]	Input Volt. 230[V]	5.00	10.22	9.69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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Model		LHA50F-5
Item		Overvoltage Protection
Object		+5V8A

1.Graph

—△—

Input Volt. 100V

---□---

Input Volt. 230V

Operating Point [V]

Ambient Temperature [°C]

Load 0%

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

2.Values

Ambient Temperature [°C]	Operating Point [V]	
	Input Volt. 100[V]	Input Volt. 230[V]
-20	6.42	6.35
-15	6.42	6.35
-10	6.42	6.35
0	6.42	6.35
25	6.35	6.28
40	6.35	6.28
50	6.35	6.28
60	6.35	6.28
--	-	-
--	-	-
--	-	-

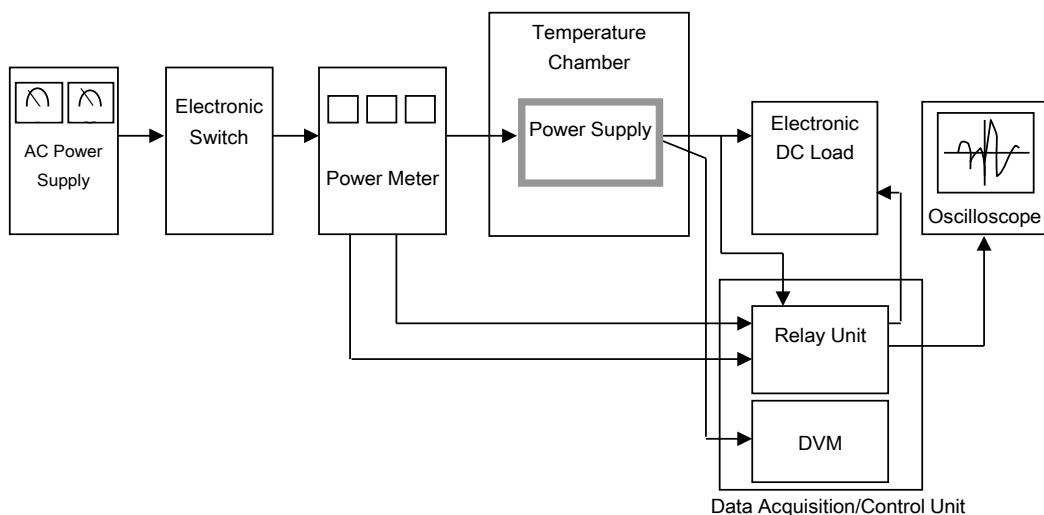


Figure A

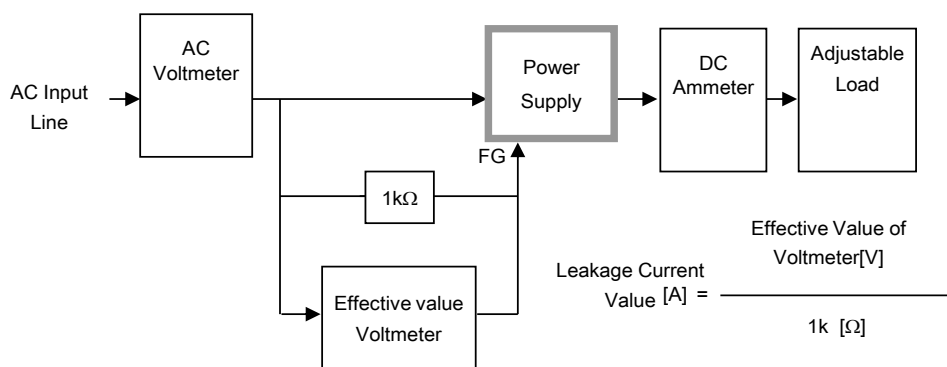


Figure B-1 (DEN-AN)

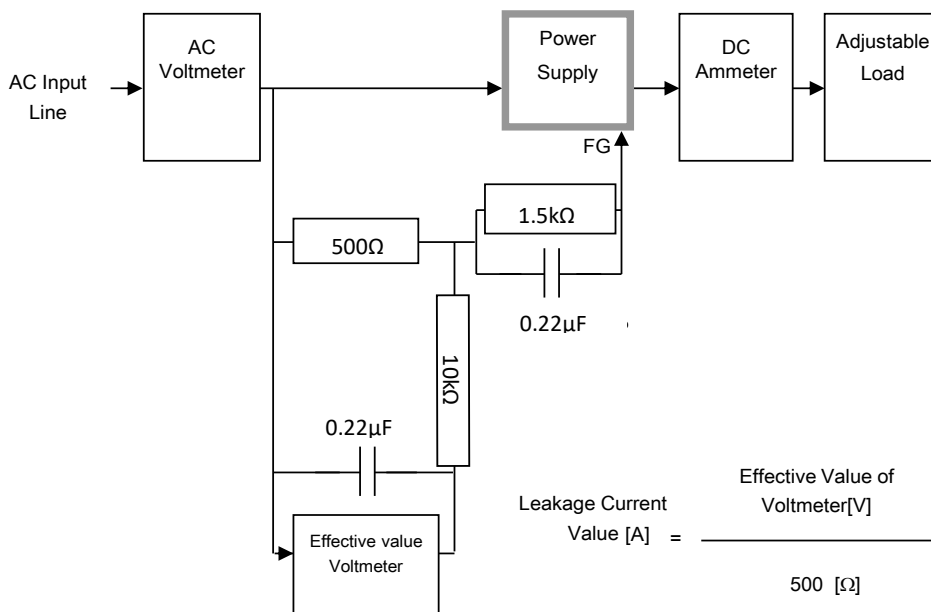


Figure B-2 (IEC62368-1 refer to IEC60990 Fig.4)

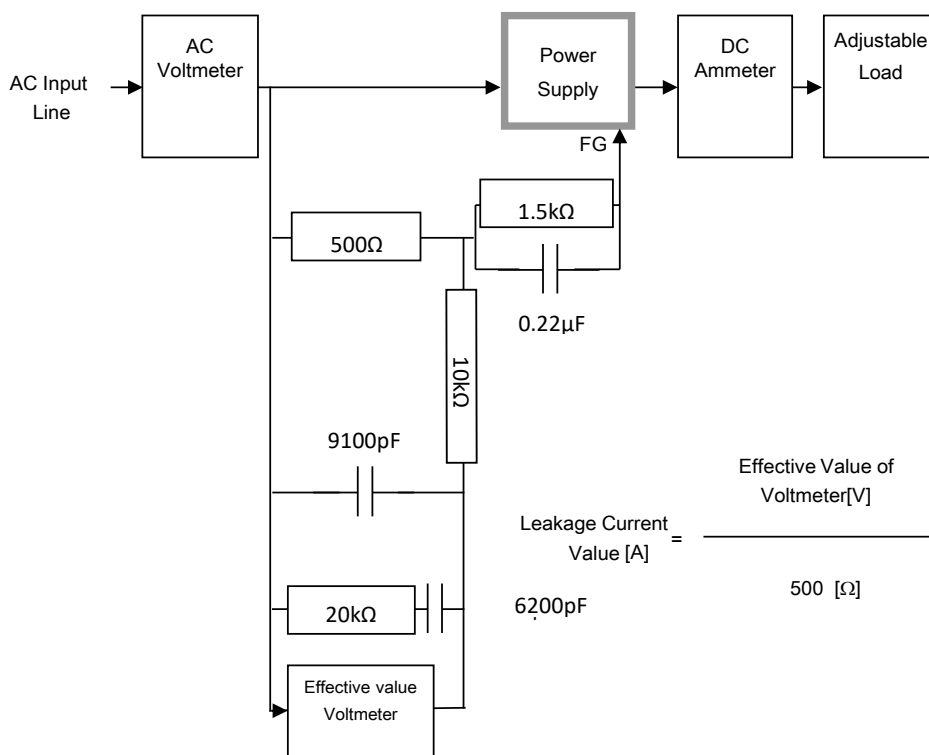


Figure B-3 (IEC62368-1 refer to IEC60990 Fig.5)

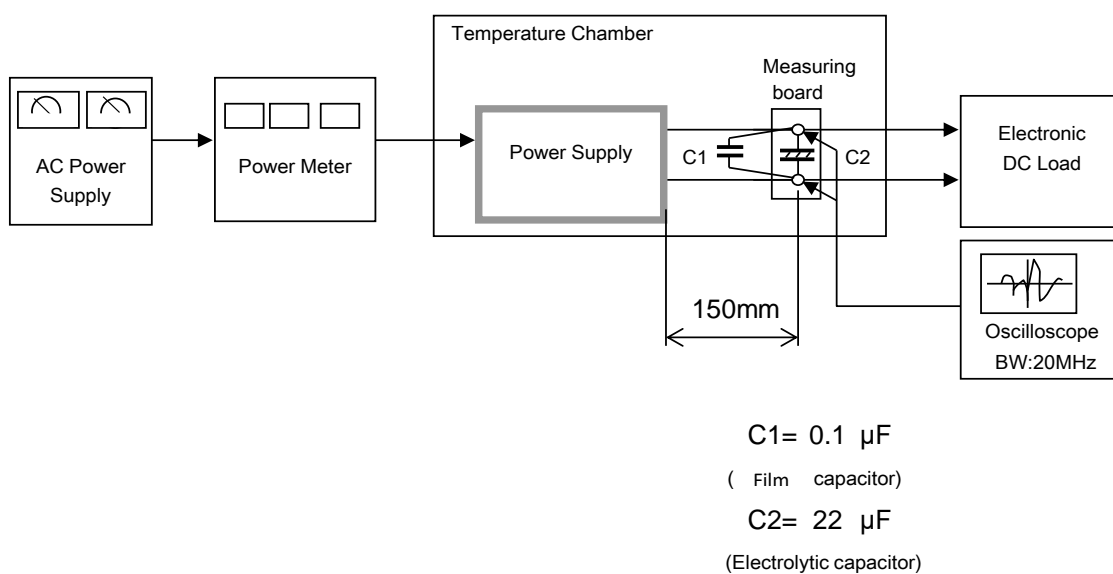


Figure C