

TEST DATA OF LHA30F-15

Regulated DC Power Supply
September 5, 2019

Approved by : Junya Kaneda
Junya Kaneda Design Manager

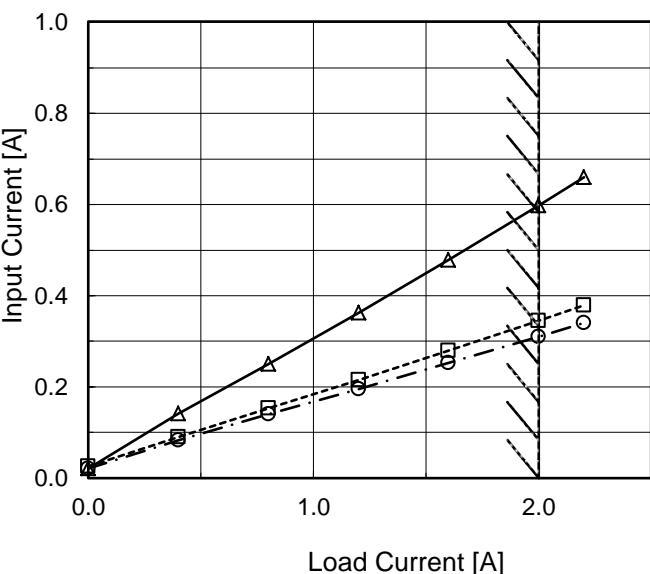
Prepared by : Yasushi Fukumura
Yasushi Fukumura Design Engineer

COSEL CO.,LTD.

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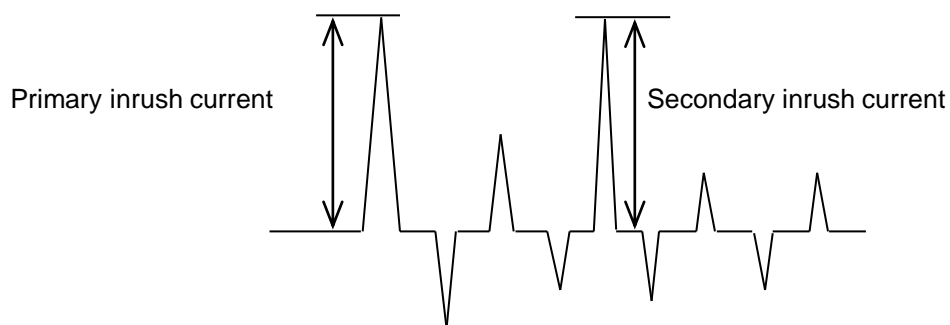
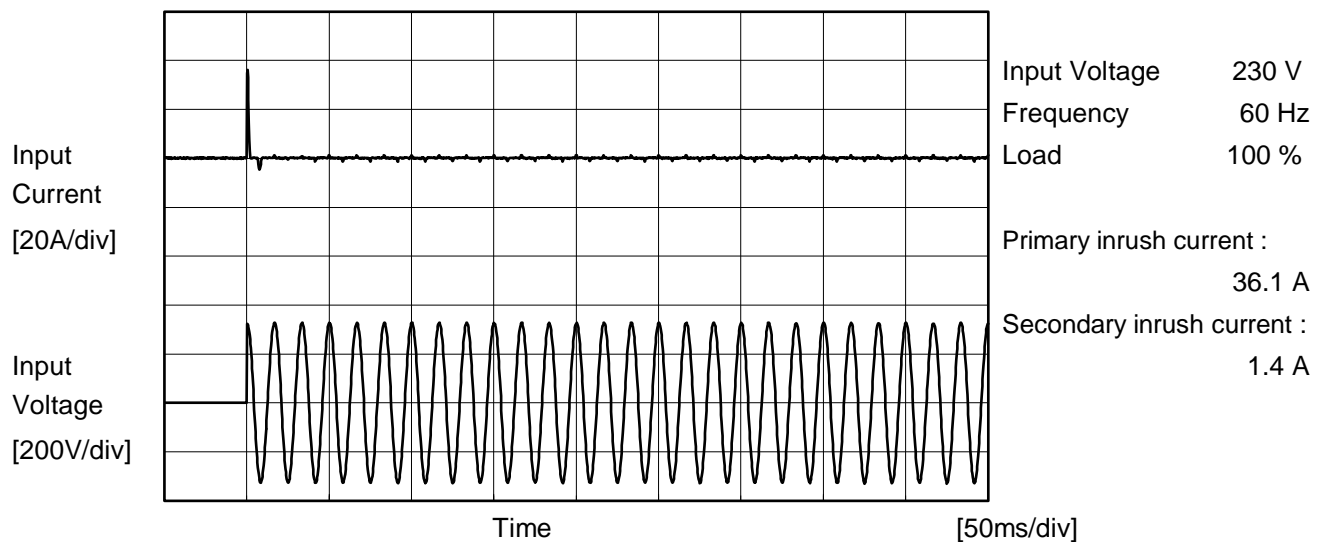
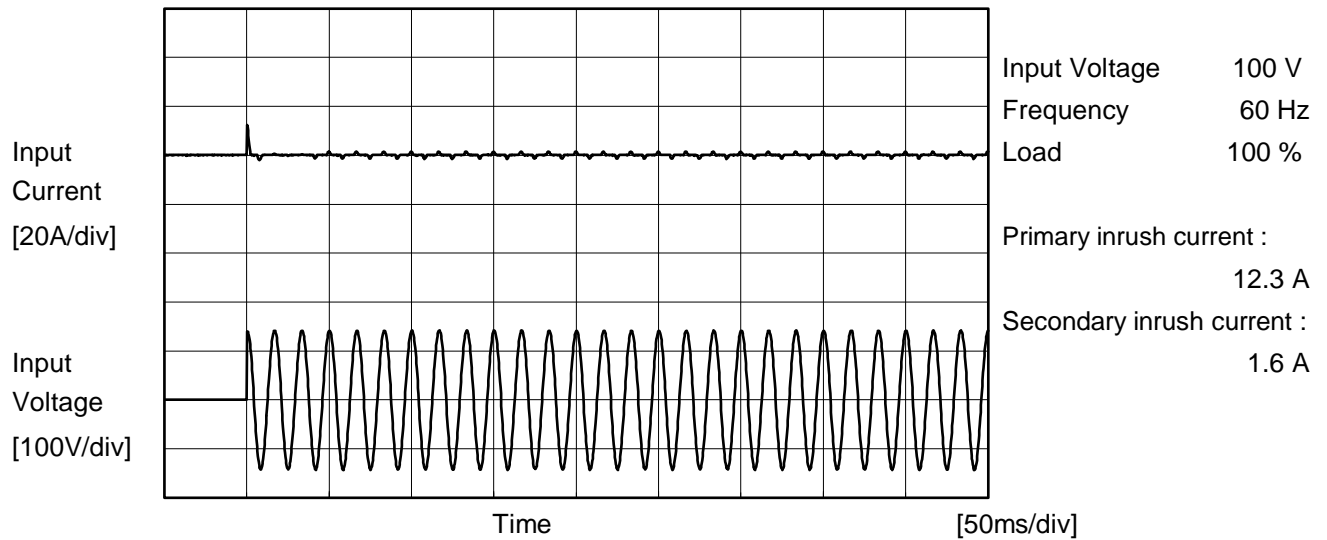
(Final Page 18)

Model		LHA30F-15	Temperature Testing Circuitry	25°C Figure A																																																			
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<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>			<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Input Current [A]</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>0.020</td><td>0.025</td><td>0.021</td></tr><tr><td>0.4</td><td>0.141</td><td>0.090</td><td>0.083</td></tr><tr><td>0.8</td><td>0.250</td><td>0.153</td><td>0.140</td></tr><tr><td>1.2</td><td>0.362</td><td>0.215</td><td>0.195</td></tr><tr><td>1.6</td><td>0.479</td><td>0.279</td><td>0.252</td></tr><tr><td>2.0</td><td>0.598</td><td>0.345</td><td>0.310</td></tr><tr><td>2.2</td><td>0.660</td><td>0.379</td><td>0.341</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]	Input Current [A]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.0	0.020	0.025	0.021	0.4	0.141	0.090	0.083	0.8	0.250	0.153	0.140	1.2	0.362	0.215	0.195	1.6	0.479	0.279	0.252	2.0	0.598	0.345	0.310	2.2	0.660	0.379	0.341	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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			<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. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.0</td><td>0.321</td><td>0.241</td><td>0.116</td></tr><tr><td>0.4</td><td>0.501</td><td>0.401</td><td>0.383</td></tr><tr><td>0.8</td><td>0.547</td><td>0.446</td><td>0.428</td></tr><tr><td>1.2</td><td>0.567</td><td>0.468</td><td>0.450</td></tr><tr><td>1.6</td><td>0.577</td><td>0.480</td><td>0.463</td></tr><tr><td>2.0</td><td>0.585</td><td>0.488</td><td>0.471</td></tr><tr><td>2.2</td><td>0.588</td><td>0.490</td><td>0.473</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]	Power Factor			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.0	0.321	0.241	0.116	0.4	0.501	0.401	0.383	0.8	0.547	0.446	0.428	1.2	0.567	0.468	0.450	1.6	0.577	0.480	0.463	2.0	0.585	0.488	0.471	2.2	0.588	0.490	0.473	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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Model	LHA30F-15	Temperature	25°C
Item	Inrush Current	Testing Circuitry	Figure A
Object	_____		



		Temperature 25°C Testing Circuitry Figure B
Model	LHA30F-15	
Item	Leakage Current	
Object	_____	

1.Results

[mA]

Standards	Testing Circuitry	Measuring Method	Input Volt.			Note
			100 [V]	230 [V]	240 [V]	
DEN-AN	Figure B-1	Both phases	0.10	0.17	0.17	Operation
		One of phases	0.16	0.44	0.45	Stand by
IEC62368-1	Figure B-2	Both phases	0.11	0.29	0.30	Operation
		One of phases	0.17	0.43	0.46	Stand by
	Figure B-3	Both phases	0.11	0.29	0.30	Operation
		One of phases	0.17	0.43	0.46	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		LHA30F-15	Temperature		25°C																																
Item		Line Regulation	Testing Circuitry		Figure A																																
Object		+15V2A																																			
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<div><div><div><div>Output Voltage [V]</div><div><div><div><div>15.30</div><div>15.20</div><div>15.10</div><div>15.00</div><div>14.90</div><div>14.80</div><div>14.70</div><div>14.60</div></div></div><div><div><div>0.0</div><div>1.0</div><div>2.0</div></div></div></div><div><div>Load Current [A]</div><div><div><div>15.017</div><div>15.016</div><div>15.018</div><div>15.018</div><div>15.018</div><div>15.018</div><div>15.018</div><div>15.018</div><div>-</div><div>-</div><div>-</div><div>-</div></div><div><div>0.0</div><div>0.4</div><div>0.8</div><div>1.2</div><div>1.6</div><div>2.0</div><div>2.2</div><div>--</div><div>--</div><div>--</div><div>--</div></div></div></div></div></div></div>																																																							
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Model	LHA30F-15	Temperature 25°C Testing Circuitry Figure A
Item	Dynamic Load Response	
Object	+15V2A	

Input Volt. 230 V
Cycle 1000 ms

$t_1, t_2 = 50 \mu s$

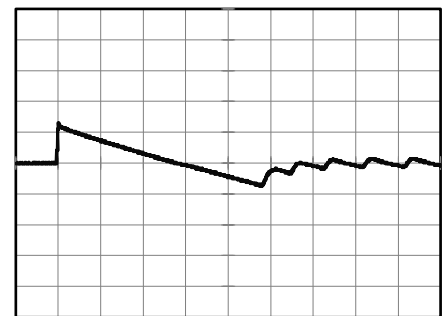
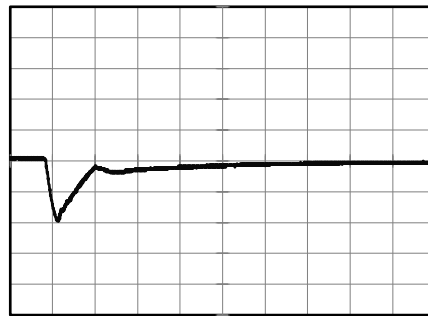
Load Current



Min.Load (0A) ←→
Load 100% (2A)

200 mV/div

800 μs /div

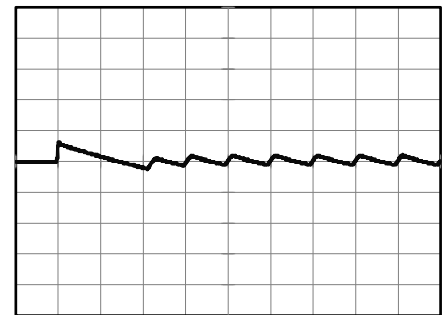
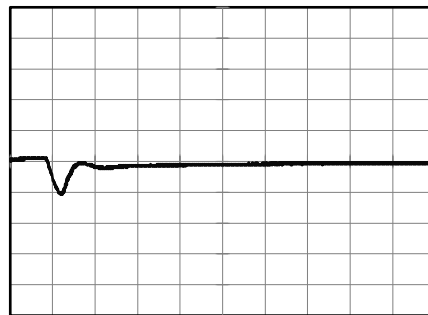


4 ms/div

Min.Load (0A) ←→
Load 50% (1A)

200 mV/div

800 μs /div

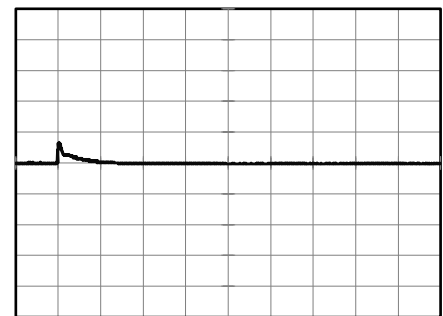
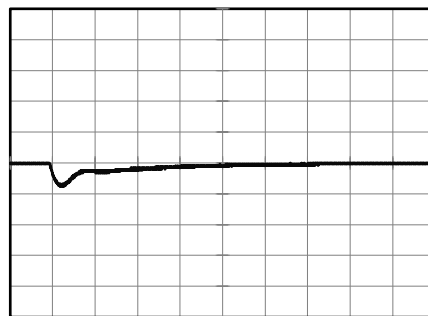


4 ms/div

Load 50% (1A) ←→
Load 100% (2A)

200 mV/div

800 μs /div



4 ms/div

Model		LHA30F-15	Temperature Testing Circuitry	25°C Figure C																																						
Item		Ripple-Noise(by Load Current)																																								
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<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>																																										
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<div><div><div>T1: Due to AC Input Line</div><div>T2: Due to Switching</div></div><p>Ripple-Noise [mVp-p]</p><p>T1</p><p>T2</p></div> <p>Fig. Complex Ripple Wave Form</p>																																										

Model		LHA30F-15
Item		Ambient Temperature Drift
Object		+15V2A

1.Graph

—△—

Input Volt.

100V

---□---

Input Volt.

200V

---○---

Input Volt.

230V

Output Voltage [V]

Ambient Temperature [°C]

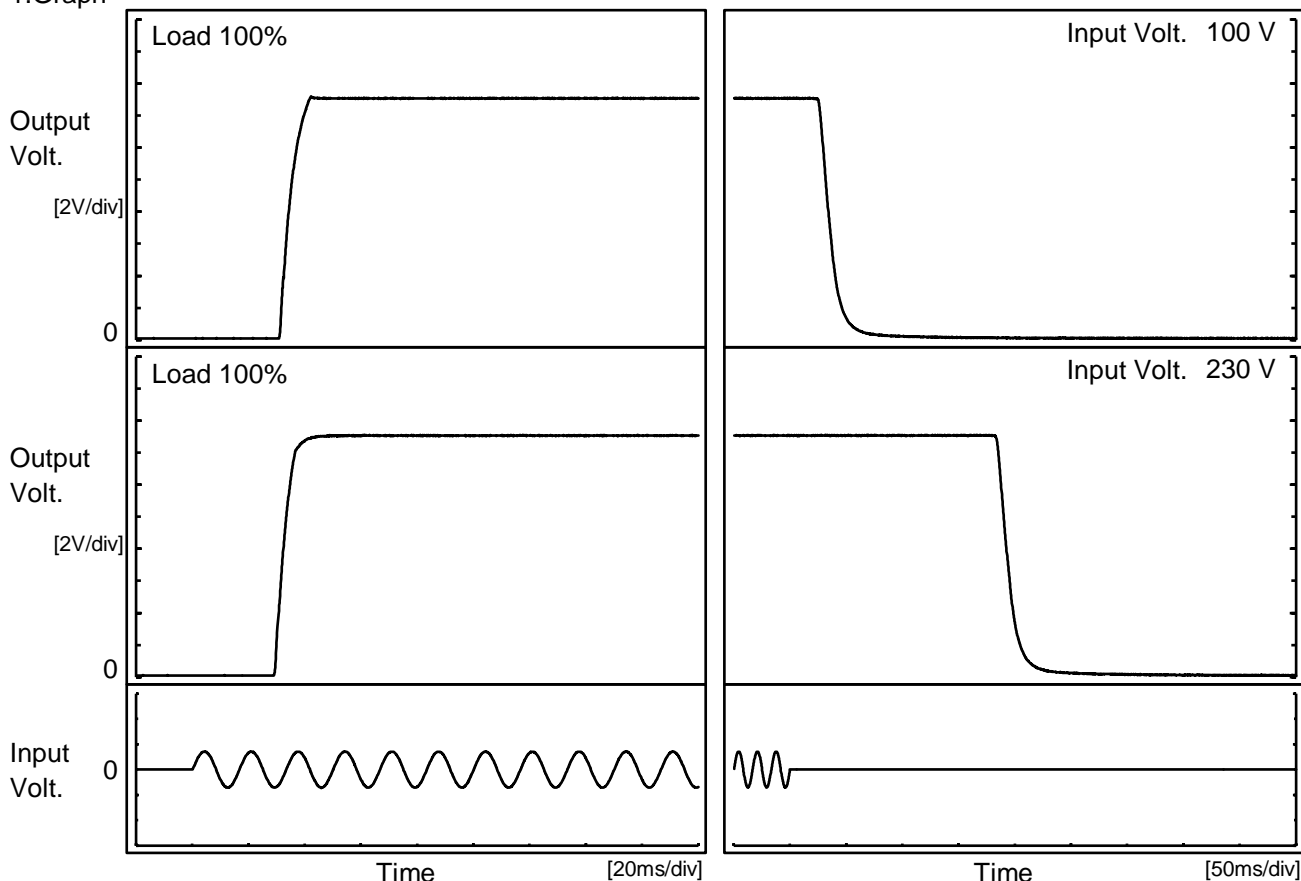
Load 100%

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

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-20	14.987	14.984	14.982
-15	14.993	14.990	14.988
-10	14.999	14.995	14.993
0	15.008	15.004	15.002
25	15.020	15.016	15.014
40	15.022	15.019	15.016
50	15.023	15.019	15.017
60	15.020	15.016	15.014
--	-	-	-
--	-	-	-
--	-	-	-

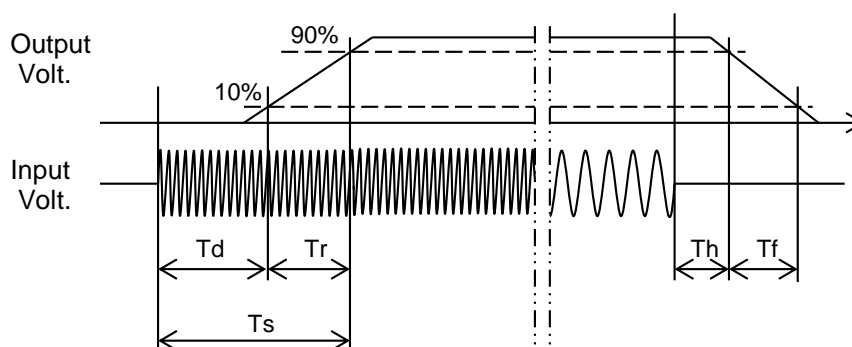
Model	LHA30F-15		
Item	Rise and Fall Time	Temperature	25°C
Object	+15V2A	Testing Circuitry	Figure A

1.Graph




2.Values

		[ms]				
Input Volt.	Time	Td	Tr	Ts	Th	Tf
100 V		31.6	7.5	39.1	27.5	21.0
230 V		29.9	6.2	36.1	185.8	21.3

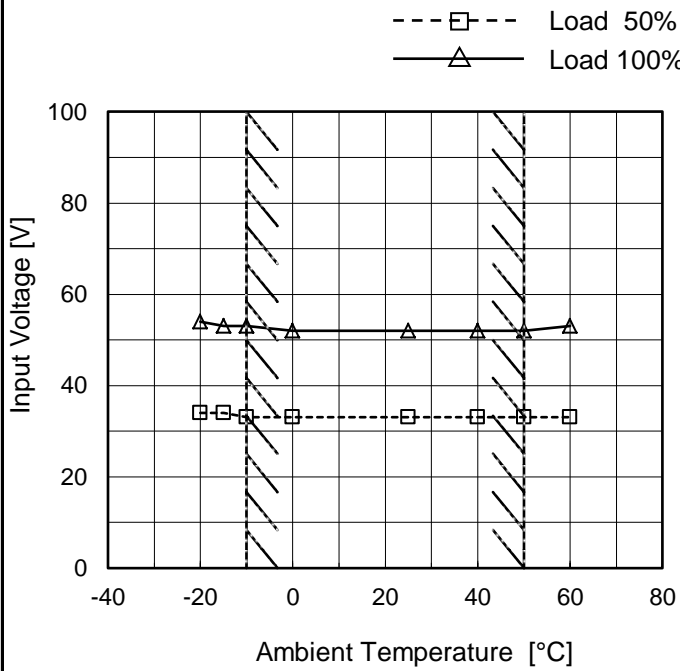


Model		LHA30F-15	Temperature 25°C Testing Circuitry Figure A
Item		Hold-Up Time	
Object		+15V2A	
1.Graph			2.Values
<div><div><div><div><div></div><div></div></div><div><div></div><div></div></div></div><div><div></div><div></div></div><div><div></div><div></div></div></div><div><div></div><div></div></div><div><div></div><div></div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> 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Model		LHA30F-15	Temperature Testing Circuitry	25°C Figure A																																																		
Item		Instantaneous Interruption Compensation																																																				
Object		+15V2A																																																				
1.Graph		<div><div><div>—△—</div>Input Volt. 100V</div><div><div>---□---</div>Input Volt. 200V</div><div><div>---○---</div>Input Volt. 230V</div></div> <p>Instantaneous Compensation Time [ms]</p> <p>Load Current [A]</p>	2.Values																																																			
		<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. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.0</td><td>-</td><td>-</td><td>-</td></tr><tr><td>0.4</td><td>159</td><td>700</td><td>930</td></tr><tr><td>0.8</td><td>81</td><td>357</td><td>481</td></tr><tr><td>1.2</td><td>51</td><td>238</td><td>320</td></tr><tr><td>1.6</td><td>37</td><td>174</td><td>239</td></tr><tr><td>2.0</td><td>27</td><td>138</td><td>188</td></tr><tr><td>2.2</td><td>22</td><td>122</td><td>167</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]	Time [ms]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.0	-	-	-	0.4	159	700	930	0.8	81	357	481	1.2	51	238	320	1.6	37	174	239	2.0	27	138	188	2.2	22	122	167	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Time [ms]																																																					
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Note: Slanted line shows the range of the rated load current.																																																						

	
Model	LHA30F-15
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+15V2A

1.Graph



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

2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-20	34	54
-15	34	53
-10	33	53
0	33	52
25	33	52
40	33	52
50	33	52
60	33	53
--	-	-
--	-	-
--	-	-

Model	LHA30F-15																																														
Item	Overcurrent Protection	Temperature	25°C																																												
Object	+15V2A	Testing Circuitry	Figure A																																												
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> <p>Overcurrent protection is Hiccup mode.</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>15.00</td><td>2.40</td><td>2.39</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]	15.00	2.40	2.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Output Voltage [V]	Load Current [A]																																														
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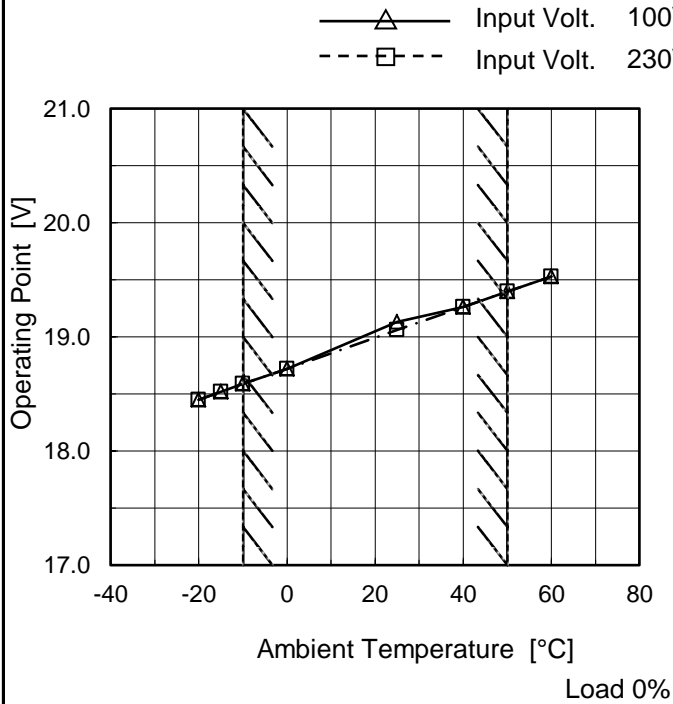
Model LHA30F-15

Item Overvoltage Protection

Object +15V2A

Testing Circuitry Figure A

1.Graph



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	18.45	18.45
-15	18.52	18.52
-10	18.59	18.59
0	18.72	18.72
25	19.13	19.06
40	19.26	19.26
50	19.40	19.40
60	19.53	19.53
--	-	-
--	-	-
--	-	-

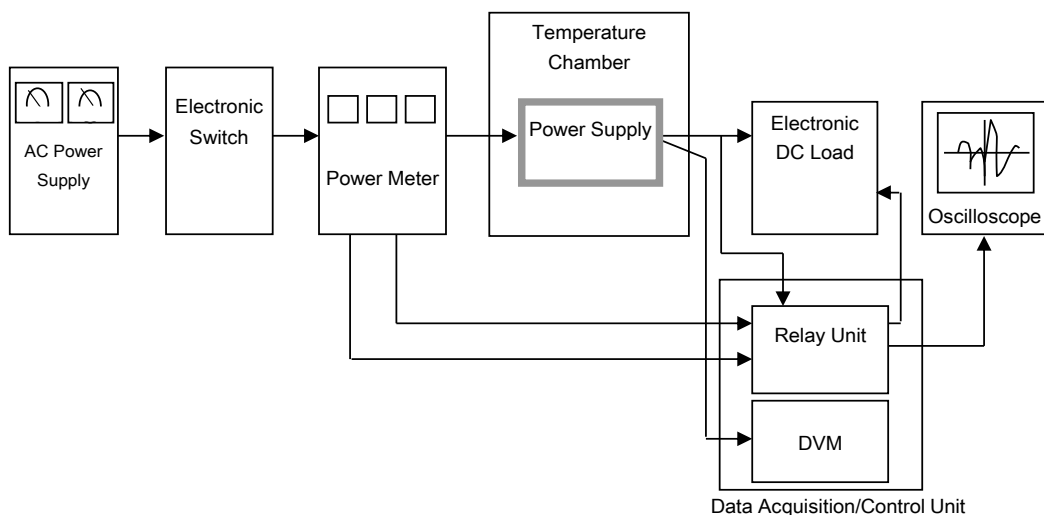


Figure A

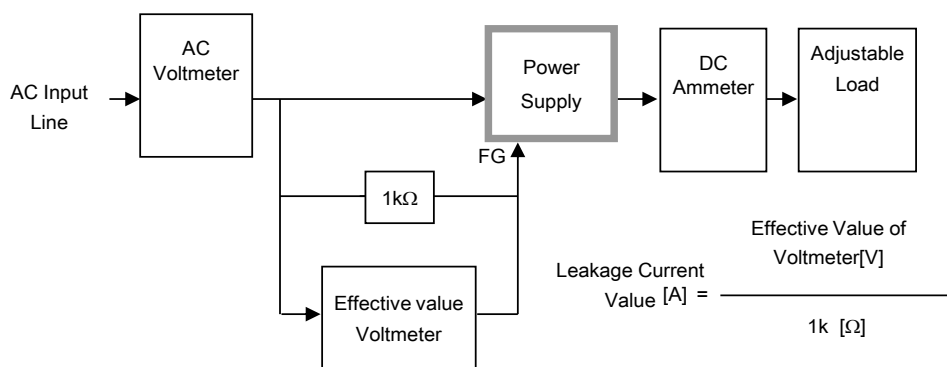


Figure B-1 (DEN-AN)

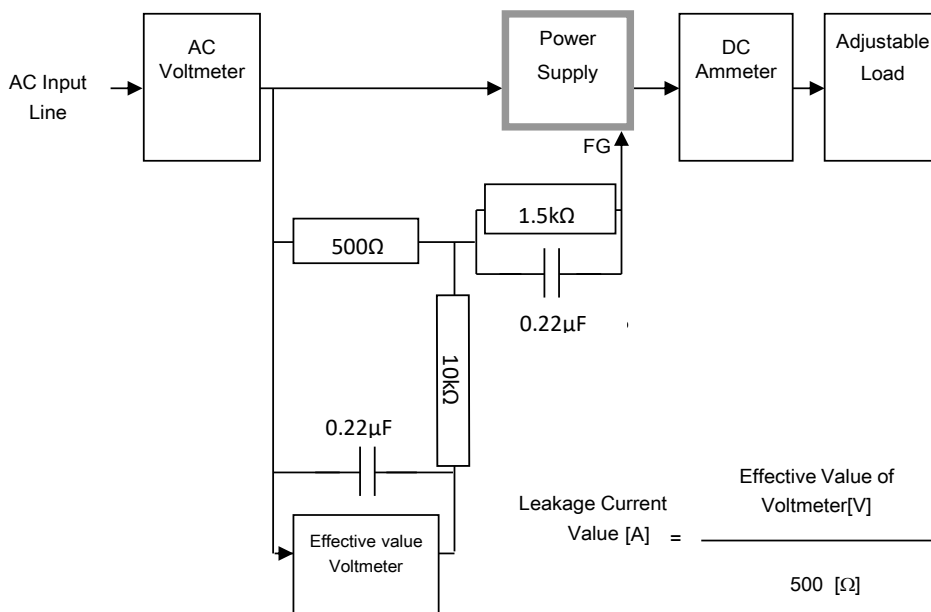


Figure B-2 (IEC62368-1 refer to IEC60990 Fig.4)

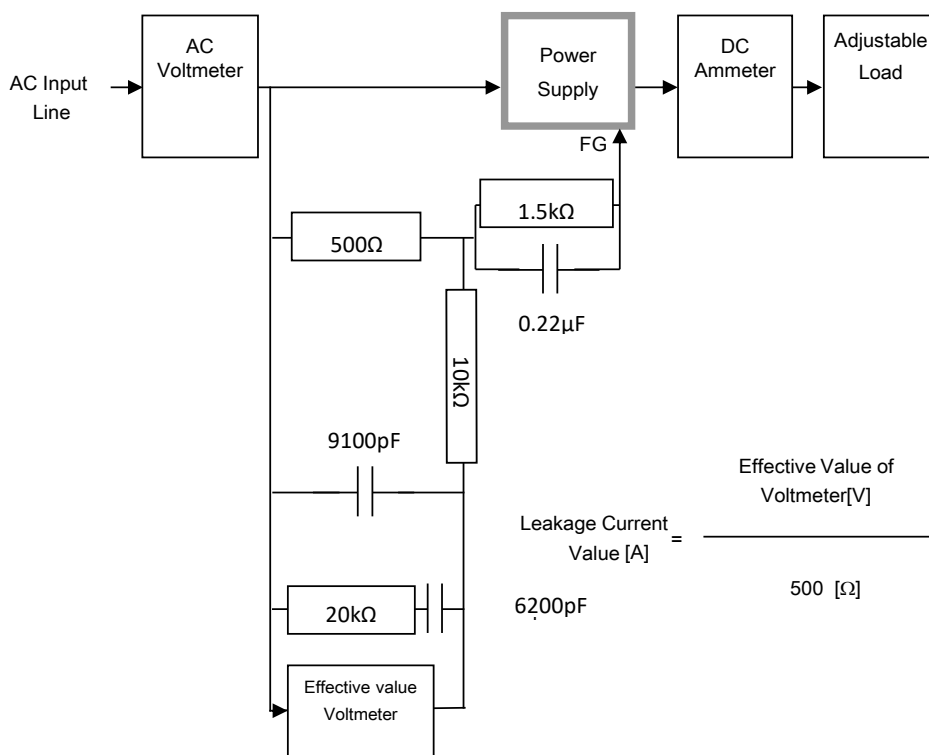


Figure B-3 (IEC62368-1 refer to IEC60990 Fig.5)

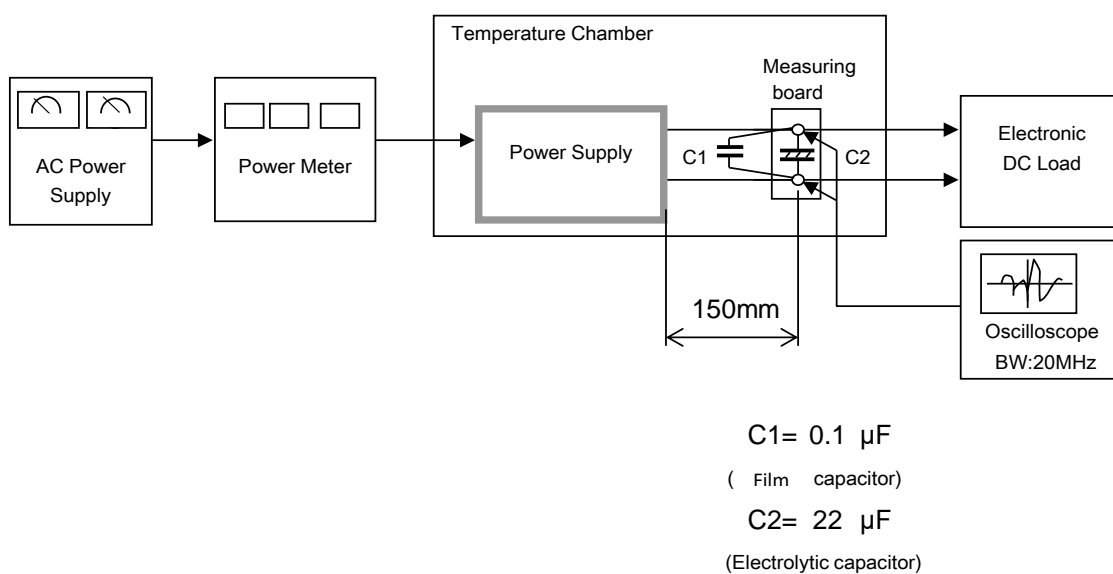


Figure C