

# TEST DATA OF LHA100F-24

Regulated DC Power Supply  
September 5, 2019

Approved by : Junya Kaneda  
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Prepared by : Shuto Takai  
Shuto Takai Design Engineer

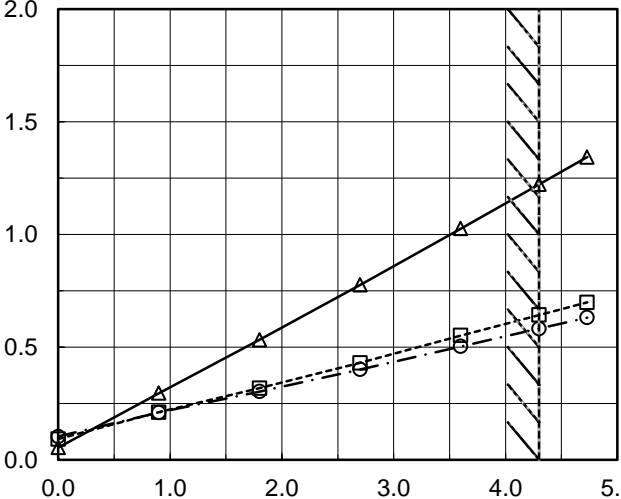
**COSEL CO.,LTD.**

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Item		Input Current (by Load Current)		Testing Circuitry Figure A																																																		
Object		_____																																																				
1.Graph		<div><div>—△—</div>Input Volt. 100V</div> <div><div>---□---</div>Input Volt. 200V</div> <div><div>-·-○-·-</div>Input Volt. 230V</div>		2.Values																																																		
<div><div><div>Input Current [A]</div><div></div><div>Load Current [A]</div></div></div>		<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>0.00</td><td>0.054</td><td>0.092</td><td>0.103</td></tr><tr><td>0.90</td><td>0.296</td><td>0.211</td><td>0.210</td></tr><tr><td>1.80</td><td>0.532</td><td>0.318</td><td>0.303</td></tr><tr><td>2.70</td><td>0.776</td><td>0.430</td><td>0.401</td></tr><tr><td>3.60</td><td>1.026</td><td>0.551</td><td>0.503</td></tr><tr><td>4.30</td><td>1.222</td><td>0.642</td><td>0.582</td></tr><tr><td>4.73</td><td>1.344</td><td>0.699</td><td>0.631</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]	0.00	0.054	0.092	0.103	0.90	0.296	0.211	0.210	1.80	0.532	0.318	0.303	2.70	0.776	0.430	0.401	3.60	1.026	0.551	0.503	4.30	1.222	0.642	0.582	4.73	1.344	0.699	0.631	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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Model

LHA100F-24

Item

Power Factor (by Load Current)

Object

1.Graph

—△—

Input Volt.

100V

---□---

Input Volt.

200V

-·-○-·-

Input Volt.

230V

Power Factor

1.0

0.8

0.6

0.4

0.2

0.0

0.0

1.0

2.0

3.0

4.0

5.0

Load Current [A]

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

2.Values

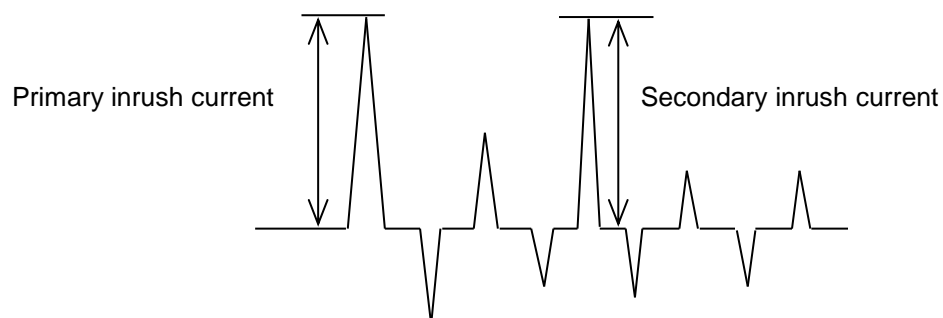
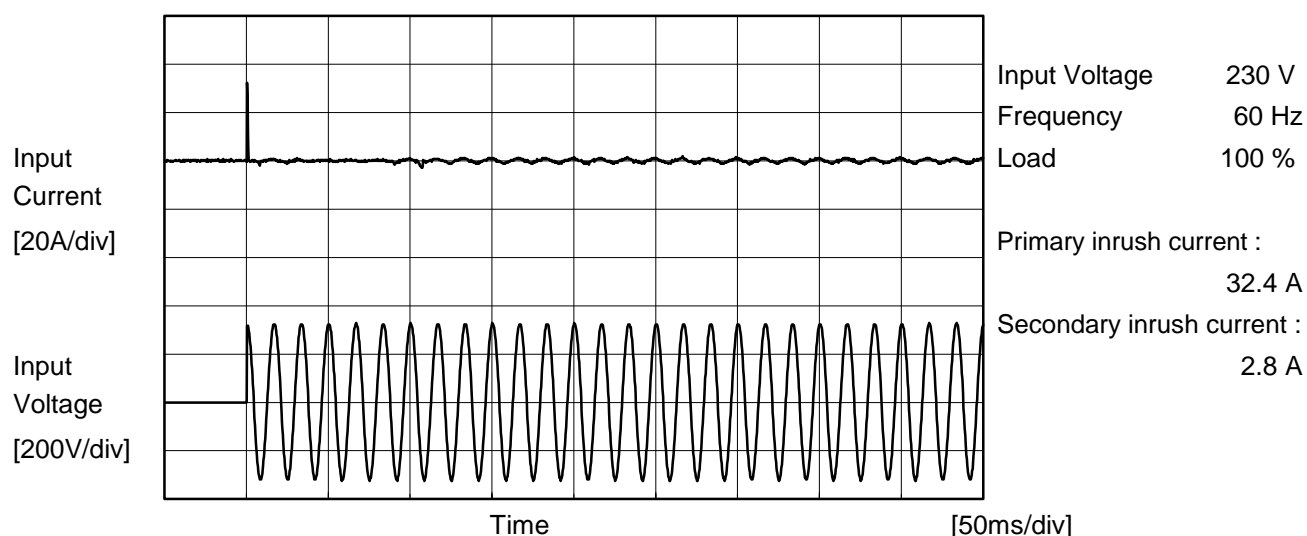
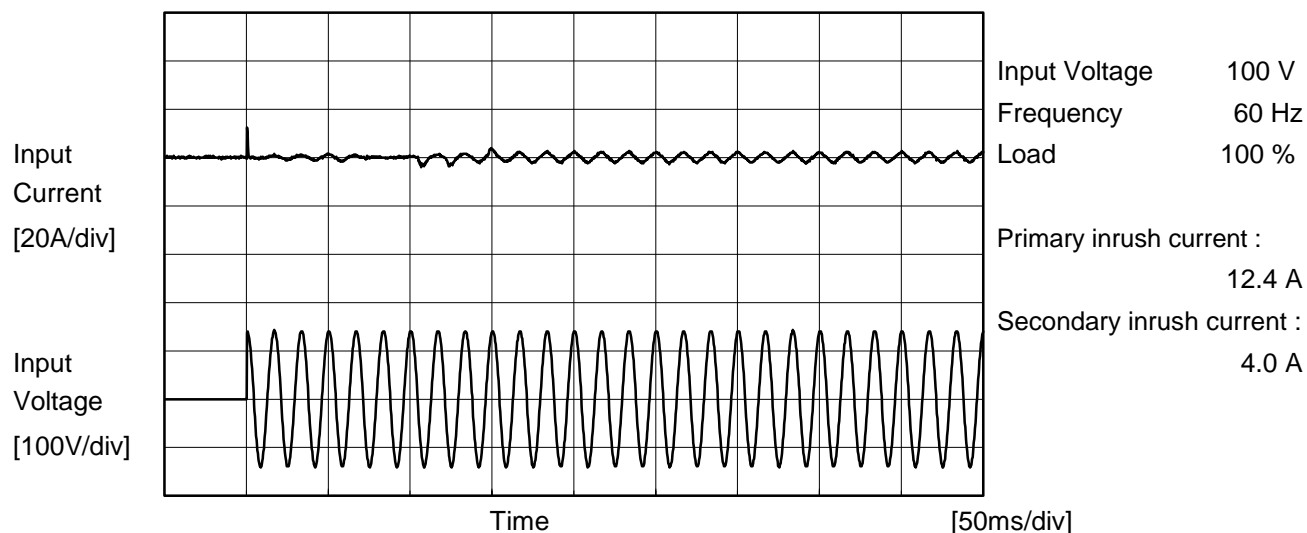
Load Current [A]	Power Factor		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	0.272	0.078	0.066
0.90	0.919	0.648	0.575
1.80	0.955	0.790	0.723
2.70	0.970	0.859	0.802
3.60	0.974	0.889	0.846
4.30	0.977	0.908	0.871
4.73	0.979	0.917	0.882
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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Model	LHA100F-24	Temperature     25°C Testing Circuitry   Figure A	
Item	Inrush Current		
Object	_____		



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		Temperature 25°C Testing Circuitry Figure B
Model	LHA100F-24	
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	0.16	0.33	0.34	Operation
		One of phases	0.25	0.65	0.67	Stand by
IEC62368-1	Figure B-2	Both phases	0.11	0.26	0.27	Operation
		One of phases	0.20	0.52	0.54	Stand by
	Figure B-3	Both phases	0.10	0.26	0.27	Operation
		One of phases	0.20	0.52	0.55	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		LHA100F-24	Temperature		25°C
Item		Line Regulation	Testing Circuitry		Figure A
Object		+24V4.3A			
1.Graph			2.Values		
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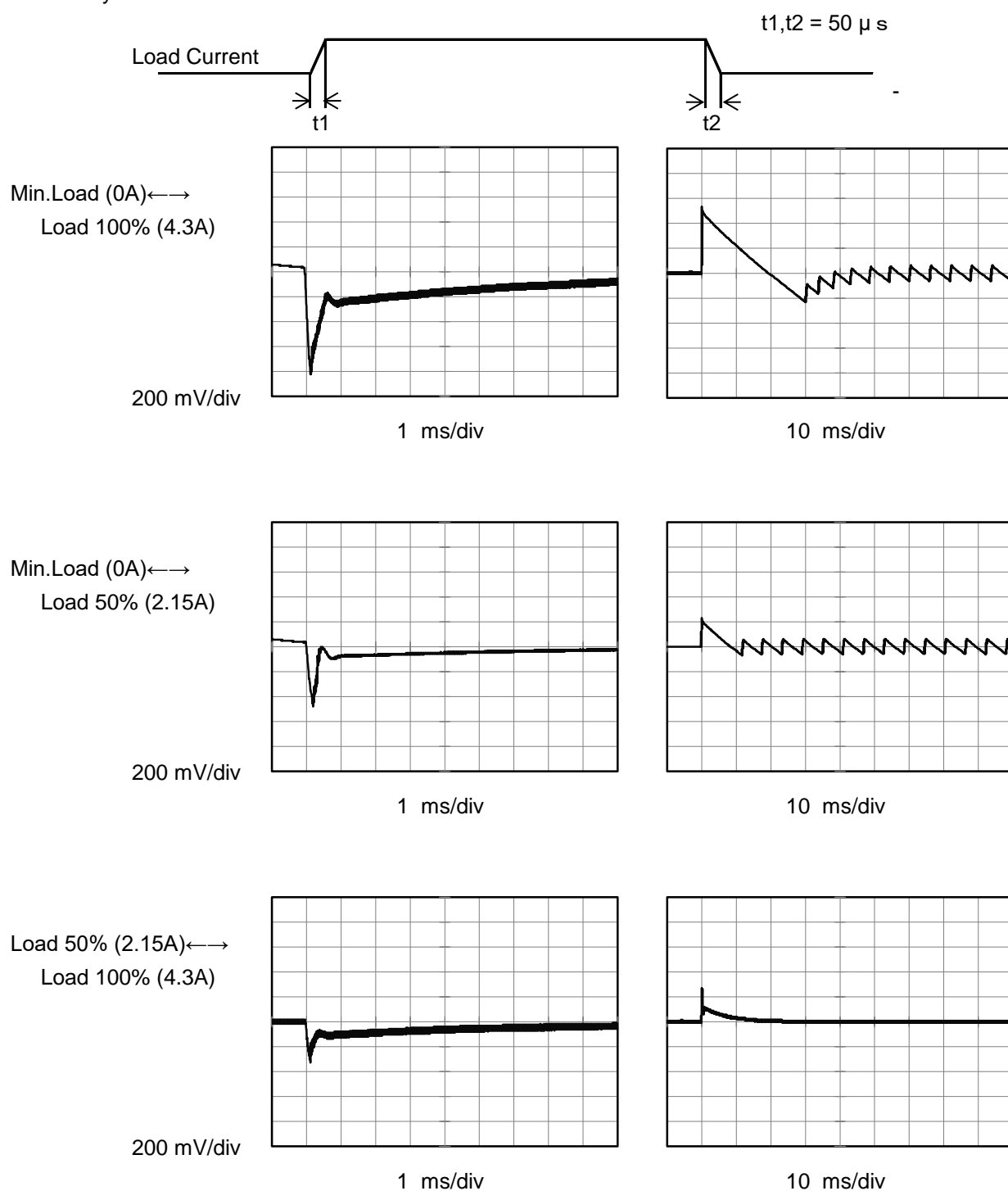


Model		LHA100F-24	Temperature 25°C Testing Circuitry Figure A																																																				
Item		Load Regulation																																																					
Object		+24V4.3A																																																					
1.Graph		<div><div><div>—△—</div><div>---□---</div><div>---○---</div></div><div><div>Input Volt. 100V</div><div>Input Volt. 200V</div><div>Input Volt. 230V</div></div></div> <div><div>Output Voltage [V]</div><div>Load Current [A]</div></div>	2.Values																																																				
		<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. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.00</td><td>24.125</td><td>24.129</td><td>24.131</td></tr><tr><td>0.90</td><td>24.122</td><td>24.122</td><td>24.122</td></tr><tr><td>1.80</td><td>24.121</td><td>24.121</td><td>24.121</td></tr><tr><td>2.70</td><td>24.120</td><td>24.120</td><td>24.120</td></tr><tr><td>3.60</td><td>24.118</td><td>24.119</td><td>24.119</td></tr><tr><td>4.30</td><td>24.118</td><td>24.118</td><td>24.118</td></tr><tr><td>4.73</td><td>24.117</td><td>24.117</td><td>24.117</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]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.00	24.125	24.129	24.131	0.90	24.122	24.122	24.122	1.80	24.121	24.121	24.121	2.70	24.120	24.120	24.120	3.60	24.118	24.119	24.119	4.30	24.118	24.118	24.118	4.73	24.117	24.117	24.117	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-		
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Note: Slanted line shows the range of the rated load current.																																																							

# COSEL

Model	LHA100F-24	Temperature	25°C
Item	Dynamic Load Response	Testing Circuitry	Figure A
Object	+24V4.3A		

Input Volt. 230 V  
Cycle 1000 ms



Model		LHA100F-24		Temperature 25°C																																																																											
Item		Ripple-Noise (by Load Current)		Testing Circuitry Figure C																																																																											
Object		+24V4.3A																																																																													
1.Graph				2.Values																																																																											
<div><div><div><div></div><div>—△—</div><div>Input Volt. 100V</div></div><div><div></div><div>-○-</div><div>Input Volt. 230V</div></div></div><div><table border="1"><thead><tr><th>Load Current [A]</th><th>Input Volt. 100 [V]</th><th>Input Volt. 230 [V]</th></tr></thead><tbody><tr><td>0.000</td><td>150</td><td>150</td></tr><tr><td>0.900</td><td>40</td><td>40</td></tr><tr><td>1.800</td><td>55</td><td>55</td></tr><tr><td>2.700</td><td>70</td><td>70</td></tr><tr><td>3.600</td><td>55</td><td>50</td></tr><tr><td>4.300</td><td>65</td><td>65</td></tr><tr><td>4.730</td><td>80</td><td>75</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></tbody></table></div></div> <div><div>Measured by 20 MHz Oscilloscope.</div><div>Ripple-Noise is shown as p-p in the figure below.</div><div>Note: Slanted line shows the range of the rated load current.</div></div> <div><div><div>T1: Due to AC Input Line</div><div>T2: Due to Switching</div></div><div></div></div> <div>Fig. Complex Ripple Wave Form</div>				Load Current [A]	Input Volt. 100 [V]	Input Volt. 230 [V]	0.000	150	150	0.900	40	40	1.800	55	55	2.700	70	70	3.600	55	50	4.300	65	65	4.730	80	75	--	-	-	--	-	-	--	-	-	--	-	-	<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>0.000</td><td>150</td><td>150</td></tr><tr><td>0.900</td><td>40</td><td>40</td></tr><tr><td>1.800</td><td>55</td><td>55</td></tr><tr><td>2.700</td><td>70</td><td>70</td></tr><tr><td>3.600</td><td>55</td><td>50</td></tr><tr><td>4.300</td><td>65</td><td>65</td></tr><tr><td>4.730</td><td>80</td><td>75</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]	0.000	150	150	0.900	40	40	1.800	55	55	2.700	70	70	3.600	55	50	4.300	65	65	4.730	80	75	--	-	-	--	-	-	--	-	-	--	-	-
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Model		LHA100F-24
Item		Ambient Temperature Drift
Object		+24V4.3A

1.Graph

—△—

Input Volt. 100V

---□---

Input Volt. 200V

---○---

Input Volt. 230V

Output Voltage [V]

Ambient Temperature [°C]

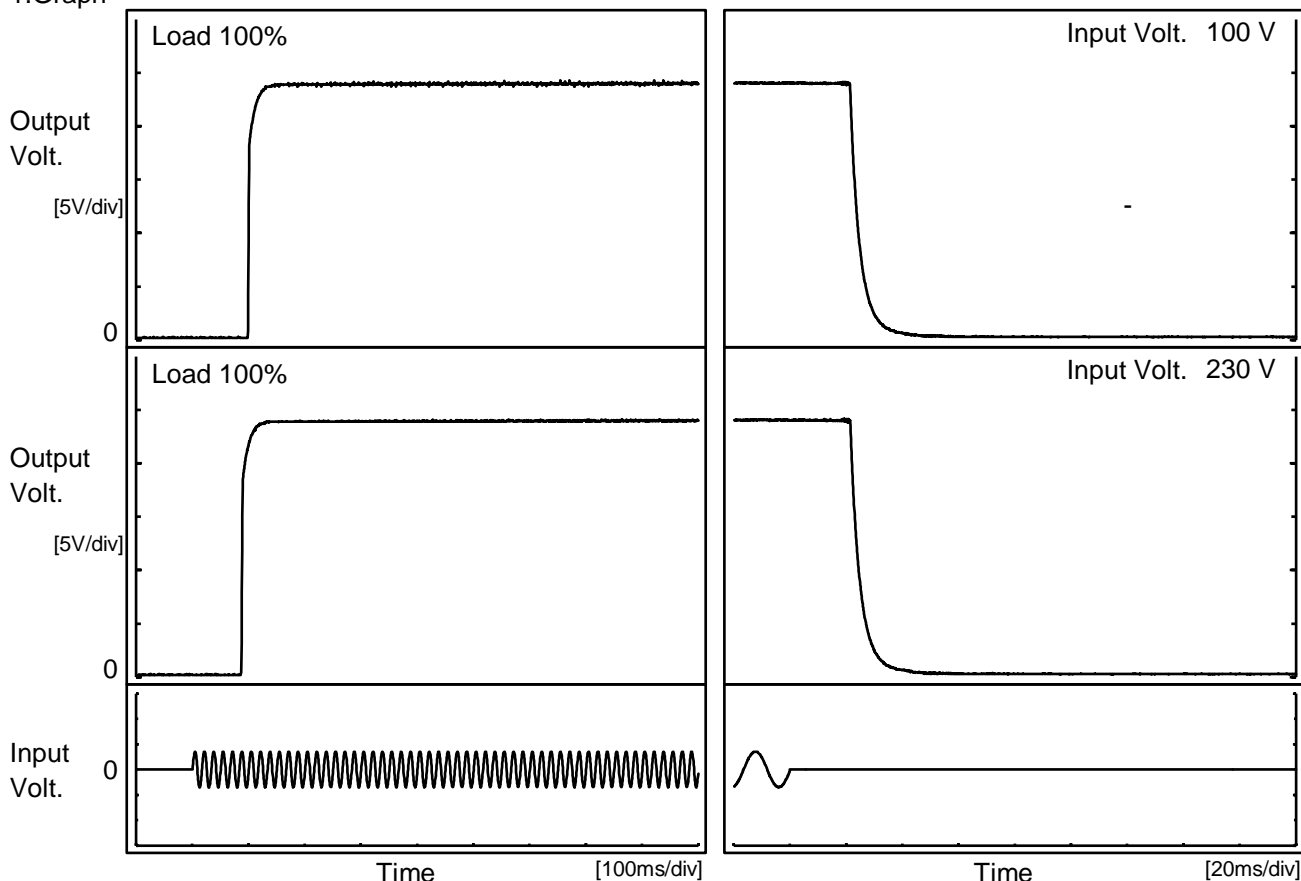
Load 100%

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	24.061	24.062	24.062
-15	24.070	24.071	24.071
-10	24.079	24.079	24.079
0	24.094	24.095	24.095
25	24.119	24.120	24.120
40	24.121	24.122	24.122
50	24.124	24.124	24.124
60	24.118	24.118	24.118
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--	-	-	-
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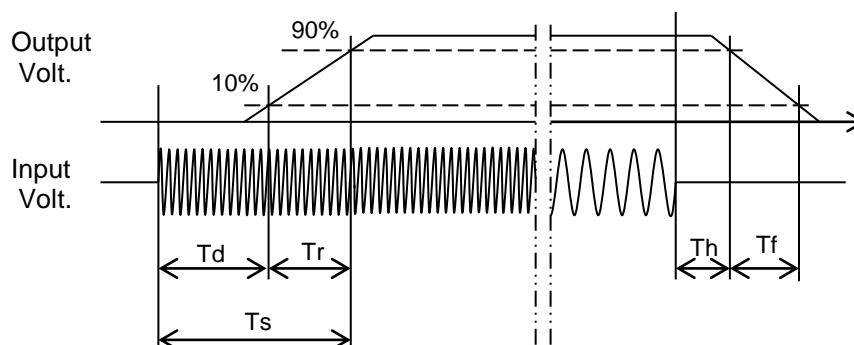
Model	LHA100F-24		
Item	Rise and Fall Time	Temperature	25°C
Object	+24V4.3A	Testing Circuitry	Figure A

# 1.Graph



# 2.Values

		[ms]				
Input Volt.	Time	Td	Tr	Ts	Th	Tf
100 V		99.5	13.0	112.5	21.6	8.0
230 V		87.5	13.0	100.5	21.7	8.0



# COSEL

Model	LHA100F-24																																		
Item	Hold-Up Time	Temperature	25°C																																
		Testing Circuitry	Figure A																																
Object	+24V4.3A																																		
1.Graph		2.Values																																	
<div><div><div>---</div><div>□</div><div>---</div></div><div>Load 50%</div></div> <div><div>—</div><div>△</div><div>—</div></div> <div>Load 100%</div> <div><div>Hold-Up Time [ms]</div><div><div>1000</div><div>100</div><div>10</div><div>1</div></div><div><div>50</div><div>100</div><div>150</div><div>200</div><div>250</div><div>300</div></div><div>Input Voltage [V]</div></div> <div><div>This duration covers from Shut-off of input voltage to the moment when output voltage descends to the rated range of voltage accuracy.</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">Hold-Up Time [ms]</th></tr><tr><th>Load 50%</th><th>Load 100%</th></tr><tr><td>85</td><td>43</td><td>-</td></tr><tr><td>90</td><td>43</td><td>22</td></tr><tr><td>100</td><td>43</td><td>22</td></tr><tr><td>120</td><td>43</td><td>22</td></tr><tr><td>200</td><td>43</td><td>22</td></tr><tr><td>230</td><td>43</td><td>22</td></tr><tr><td>264</td><td>43</td><td>22</td></tr><tr><td>280</td><td>43</td><td>22</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Input Voltage [V]	Hold-Up Time [ms]		Load 50%	Load 100%	85	43	-	90	43	22	100	43	22	120	43	22	200	43	22	230	43	22	264	43	22	280	43	22	--	-	-
Input Voltage [V]	Hold-Up Time [ms]																																		
	Load 50%	Load 100%																																	
85	43	-																																	
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200	43	22																																	
230	43	22																																	
264	43	22																																	
280	43	22																																	
--	-	-																																	

- 12 -

BC-11416

Model	LHA100F-24																																																					
Item	Instantaneous Interruption Compensation	Temperature	25°C																																																			
Object	+24V4.3A	Testing Circuitry	Figure A																																																			
1.Graph	<p>—△— Input Volt. 100V            ---□--- Input Volt. 200V            -·○-·- Input Volt. 230V</p> <p>Note: Slanted line shows the range of the rated load current.</p>																																																					
2.Values	<table border="1"> <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>0.00</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>0.90</td><td>91</td><td>97</td><td>97</td></tr> <tr><td>1.80</td><td>31</td><td>47</td><td>47</td></tr> <tr><td>2.70</td><td>31</td><td>35</td><td>35</td></tr> <tr><td>3.60</td><td>23</td><td>26</td><td>26</td></tr> <tr><td>4.30</td><td>21</td><td>21</td><td>22</td></tr> <tr><td>4.73</td><td>14</td><td>14</td><td>14</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]	0.00	-	-	-	0.90	91	97	97	1.80	31	47	47	2.70	31	35	35	3.60	23	26	26	4.30	21	21	22	4.73	14	14	14	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Time [ms]																																																					
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]																																																			
0.00	-	-	-																																																			
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4.73	14	14	14																																																			
--	-	-	-																																																			
--	-	-	-																																																			
--	-	-	-																																																			
--	-	-	-																																																			

Model		LHA100F-24
Item		Minimum Input Voltage for Regulated Output Voltage
Object		+24V4.3A

1.Graph

Load 50%

Load 100%

Input Voltage [V]

100

80

60

40

20

0

-40

-20

0

20

40

60

80

Ambient Temperature [°C]

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

2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-20	63	-
-15	63	64
-10	63	64
0	63	64
25	63	64
40	63	64
50	63	64
60	63	64
--	-	-
--	-	-
--	-	-



Model		LHA100F-24	
Item		Overcurrent Protection	
Object		+24V4.3A	
1.Graph		2.Values	

Input Volt. 100V

Input Volt. 230V

Output Voltage [V]

</

Model		LHA100F-24
Item		Overvoltage Protection
Object		+24V4.3A

1.Graph

—△—

Input Volt. 100V

---□---

Input Volt. 230V

Ambient Temperature [°C]	Operating Point [V] (100V)	Operating Point [V] (230V)
-20	29.89	-
-15	29.95	29.95
-10	30.03	30.03
0	30.31	30.31
25	30.87	30.87
40	31.15	31.15
50	31.43	31.43
60	31.71	31.71
--	-	-
--	-	-
--	-	-

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	29.89	-
-15	29.95	29.95
-10	30.03	30.03
0	30.31	30.31
25	30.87	30.87
40	31.15	31.15
50	31.43	31.43
60	31.71	31.71
--	-	-
--	-	-
--	-	-

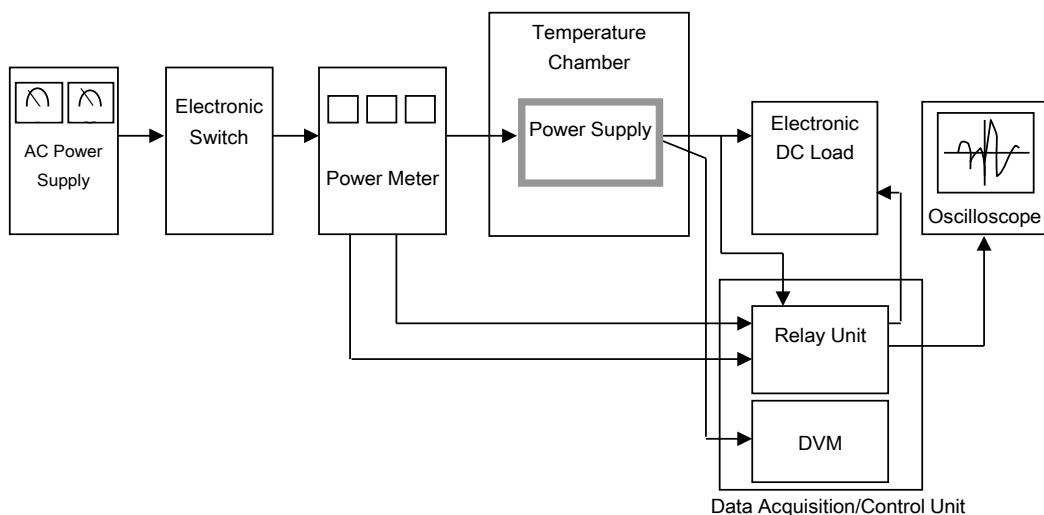


Figure A

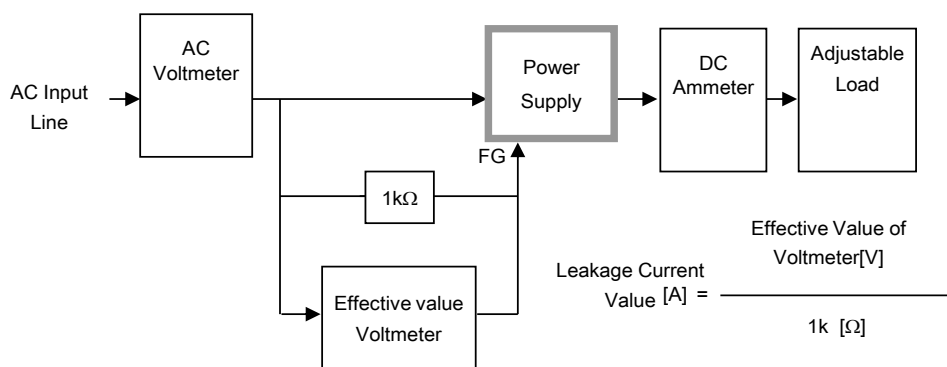


Figure B-1 ( DEN-AN )

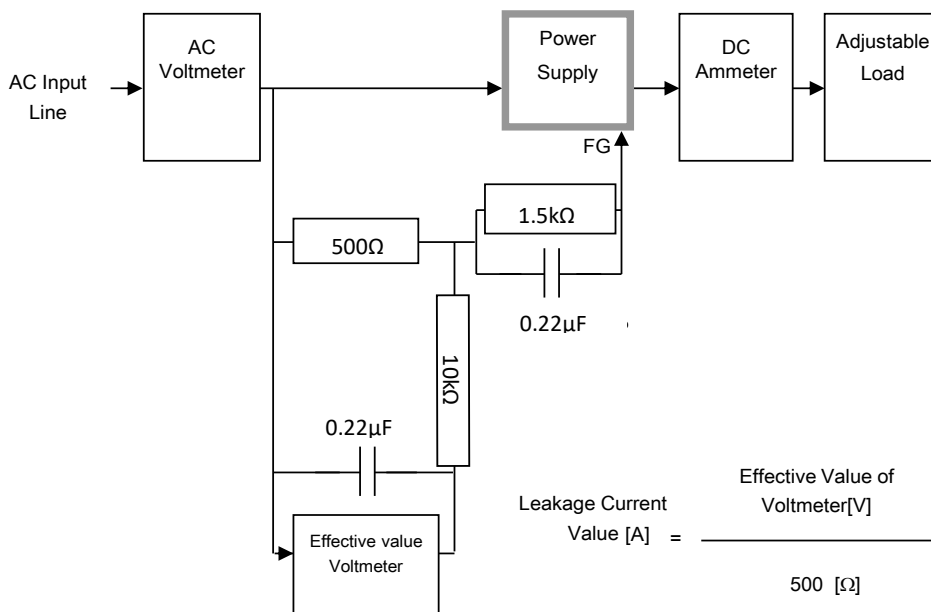


Figure B-2 ( IEC62368-1 refer to IEC60990 Fig.4 )

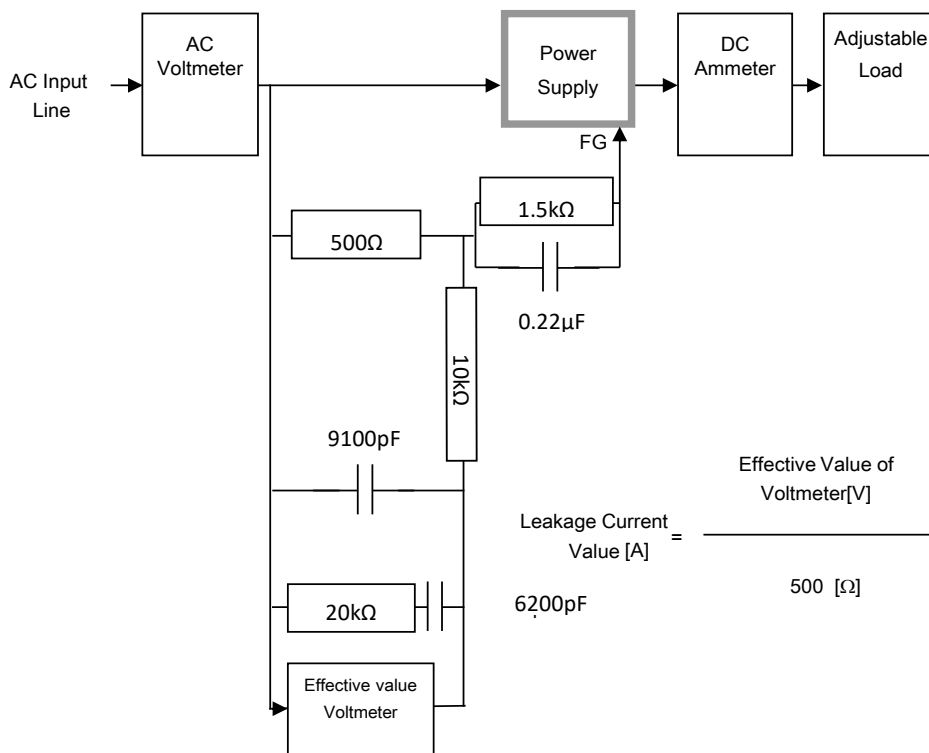


Figure B-3 ( IEC62368-1 refer to IEC60990 Fig.5 )

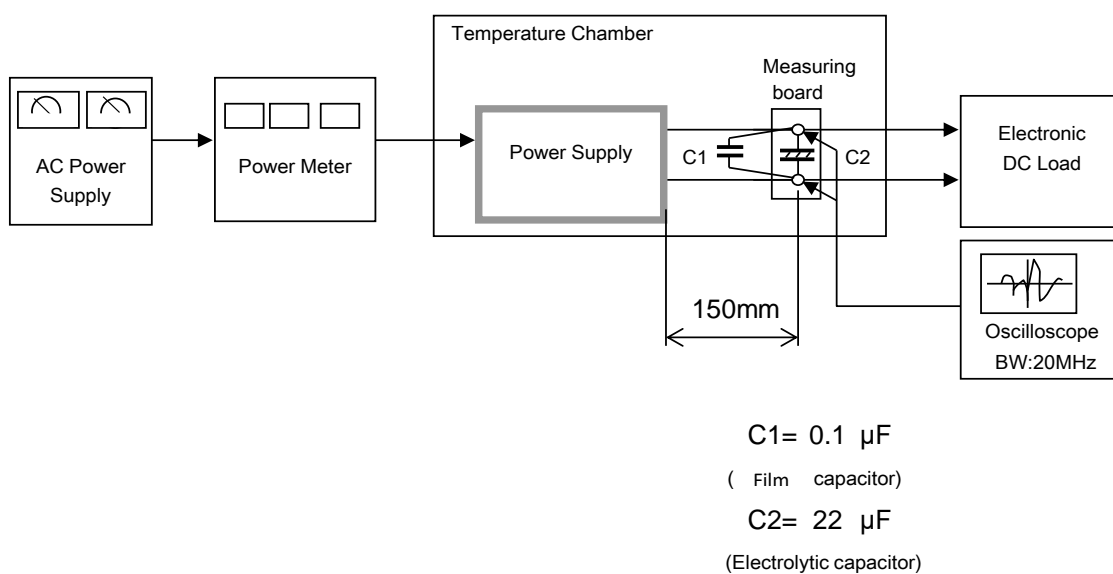


Figure C