

TEST DATA OF LFA150F-24

Regulated DC Power Supply
November 8, 2010

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Yoshiaki Shimizu Design Manager

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Daisuke Sumiwa Design Engineer

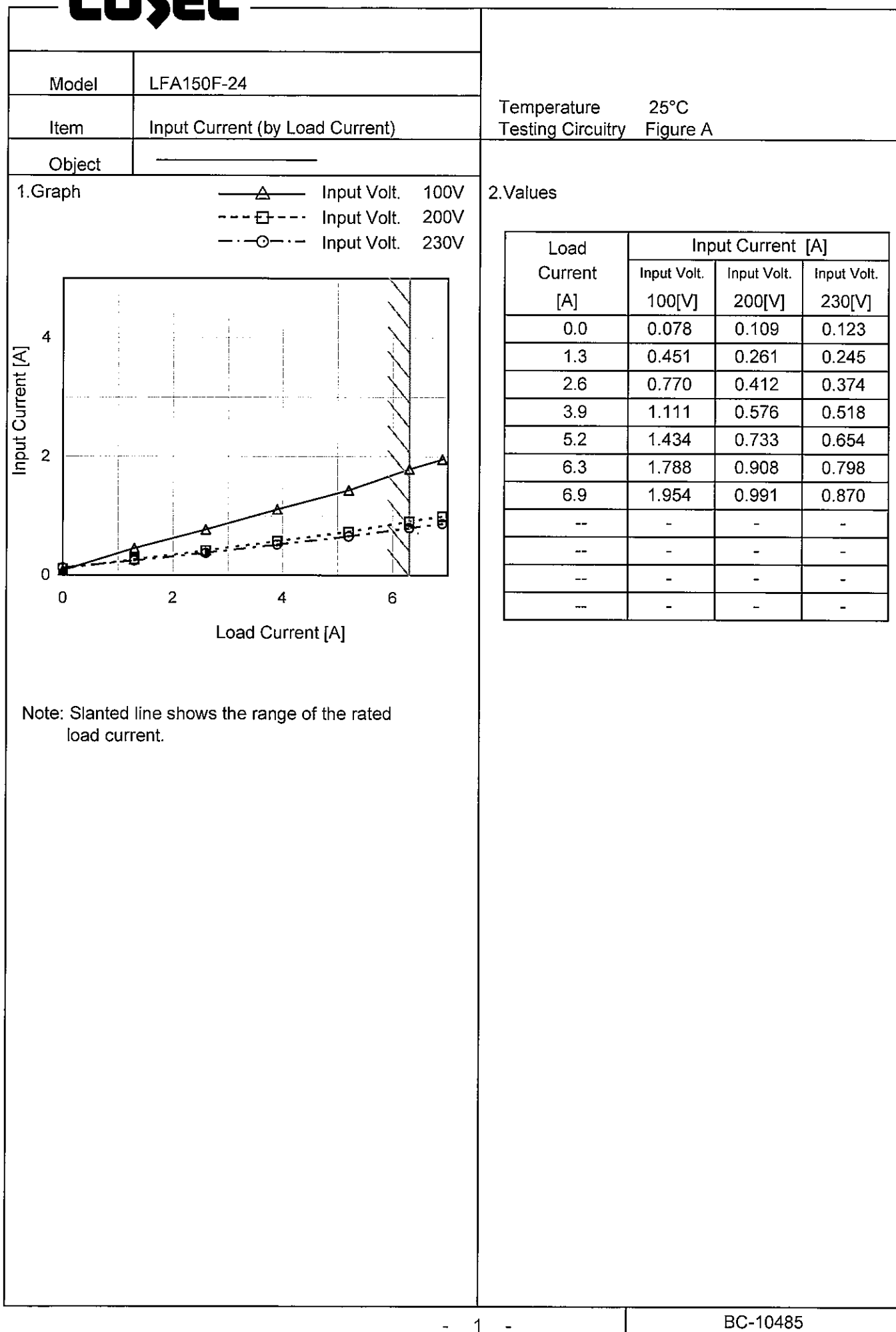
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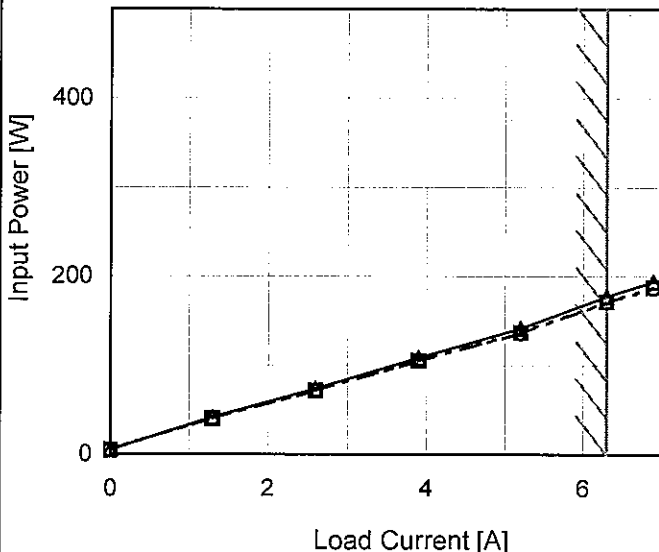
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Model		LFA150F-24																																																				
Item		Input Power (by Load Current)																																																				
Object																																																						
1. Graph		2. Values																																																				
<div><div><div><div><div></div><div></div></div><div>—△—</div><div>Input Volt.</div><div>100V</div></div><div><div><div></div><div></div></div><div>---□---</div><div>Input Volt.</div><div>200V</div></div><div><div><div></div><div></div></div><div>-·-○-·-</div><div>Input Volt.</div><div>230V</div></div></div><div></div></div>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Input Power [W]</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>4.6</td><td>4.7</td><td>4.8</td></tr><tr><td>1.3</td><td>41.5</td><td>40.4</td><td>40.4</td></tr><tr><td>2.6</td><td>73.7</td><td>71.4</td><td>71.3</td></tr><tr><td>3.9</td><td>108.6</td><td>105.2</td><td>104.9</td></tr><tr><td>5.2</td><td>141.4</td><td>136.9</td><td>136.3</td></tr><tr><td>6.3</td><td>177.6</td><td>171.6</td><td>170.9</td></tr><tr><td>6.9</td><td>194.4</td><td>187.7</td><td>186.7</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 Power [W]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.0	4.6	4.7	4.8	1.3	41.5	40.4	40.4	2.6	73.7	71.4	71.3	3.9	108.6	105.2	104.9	5.2	141.4	136.9	136.3	6.3	177.6	171.6	170.9	6.9	194.4	187.7	186.7	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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Item		Efficiency (by Input Voltage)	
Object			
1.Graph		2.Values	
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Model

LFA150F-24

Item

Efficiency (by Load Current)

Object

1.Graph

—△—

Input Volt.

100V

---□---

Input Volt.

200V

---○---

Input Volt.

230V

Efficiency [%]

90

80

70

60

50

40

0

2

4

6

Load Current [A]

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

2.Values

Load Current [A]	Efficiency [%]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	-	-	-
1.3	74.7	76.8	76.8
2.5	81.0	83.6	83.8
3.8	83.6	86.3	86.5
5.0	84.5	87.2	87.6
6.3	85.0	87.7	88.2
6.9	85.0	87.8	88.3
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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Model	LFA150F-24
Item	Power Factor (by Input Voltage)
Object	_____

1.Graph

□

Load 50%

△

Load 100%

Power Factor

1.0

0.9

0.8

0.7

0.6

0.5

0.4

50

100

150

200

250

300

Input Voltage [V]

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

Temperature

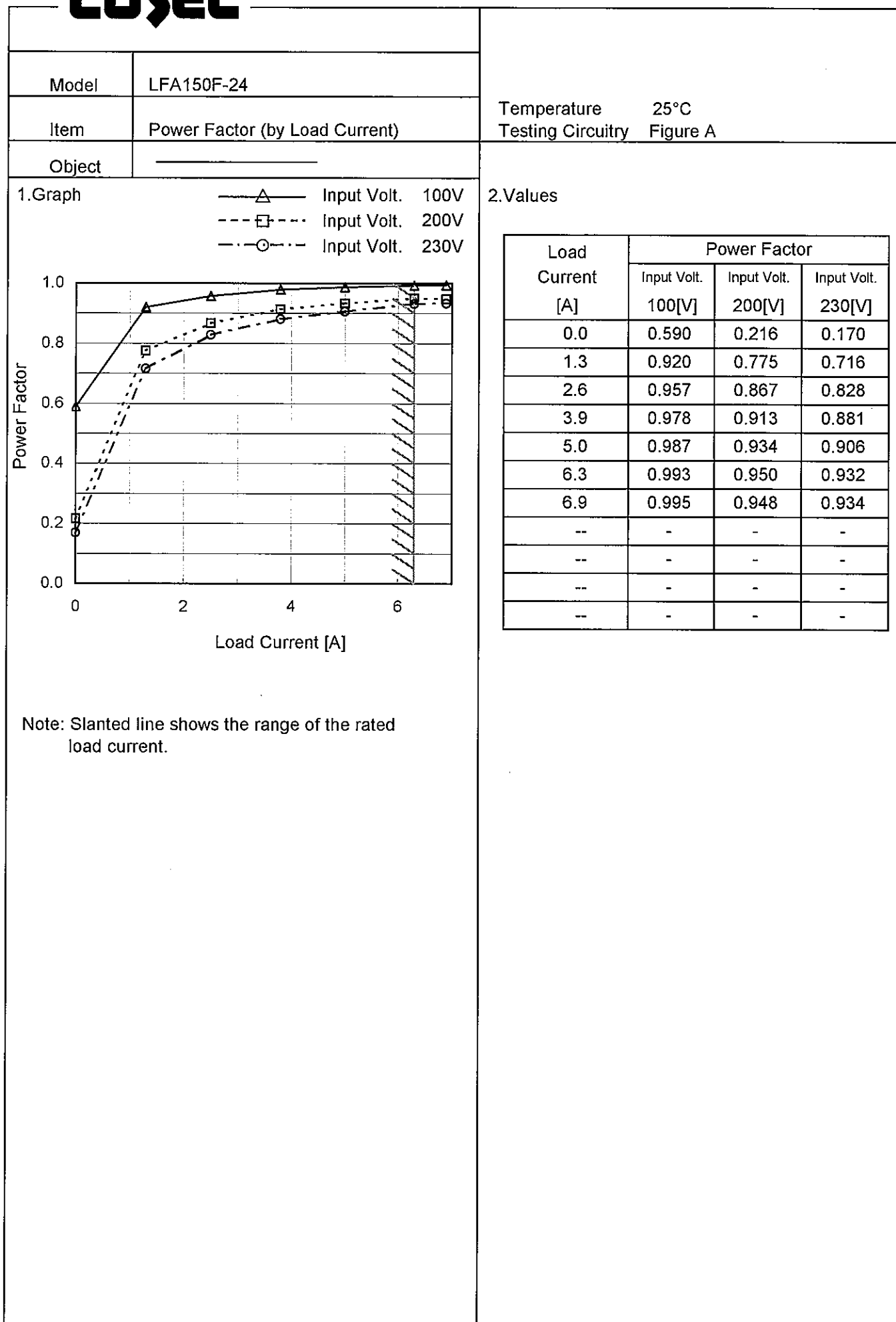
25°C

Testing Circuitry

Figure A

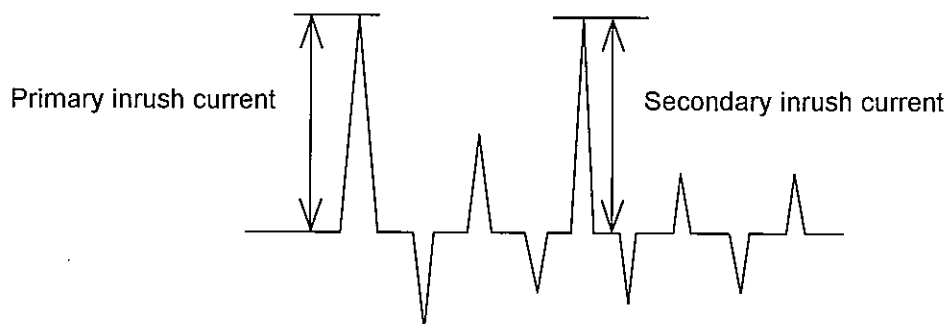
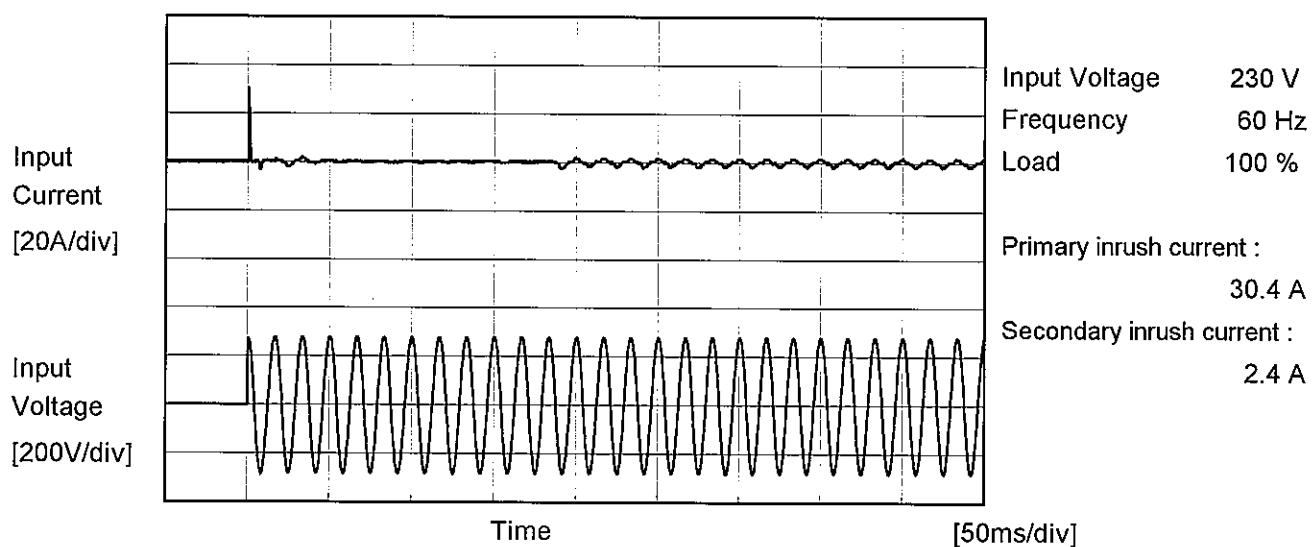
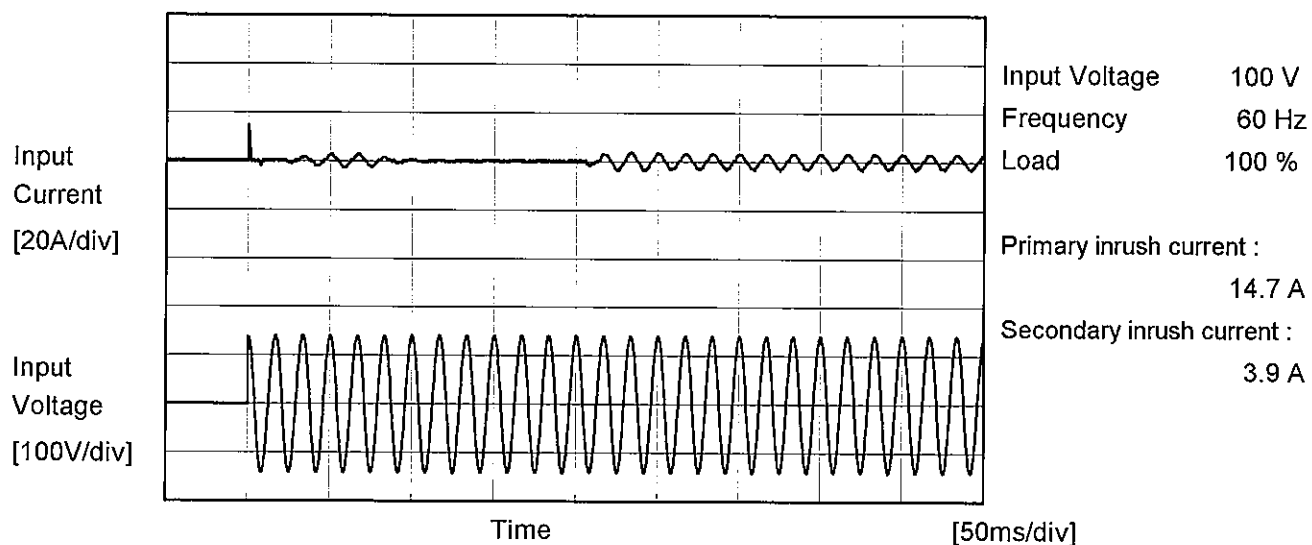
2.Values

Input Voltage [V]	Power Factor	
	Load 50%	Load 100%
75	0.985	0.996
85	0.980	0.994
100	0.970	0.993
120	0.953	0.986
200	0.891	0.950
230	0.861	0.932
264	0.814	0.898
280	0.787	0.884
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Model	LFA150F-24	Temperature	25°C
Item	Inrush Current	Testing Circuitry	Figure A
Object	_____		





Model		LFA150F-24	Temperature 25°C Testing Circuitry Figure B
Item		Leakage Current	
Object		_____	

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	200 [V]	230 [V]	
DEN-AN	Both phases	0.27	0.40	0.44	Operation
	One of phases	0.23	0.51	0.60	Stand by
IEC60950-1	Both phases	0.16	0.35	0.41	Operation
	One of phases	0.24	0.52	0.61	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		LFA150F-24	
Item		Line Regulation	
Object		+24V6.3A	
1.Graph		2.Values	

□

Load 50%

—

△

—

Load 100%

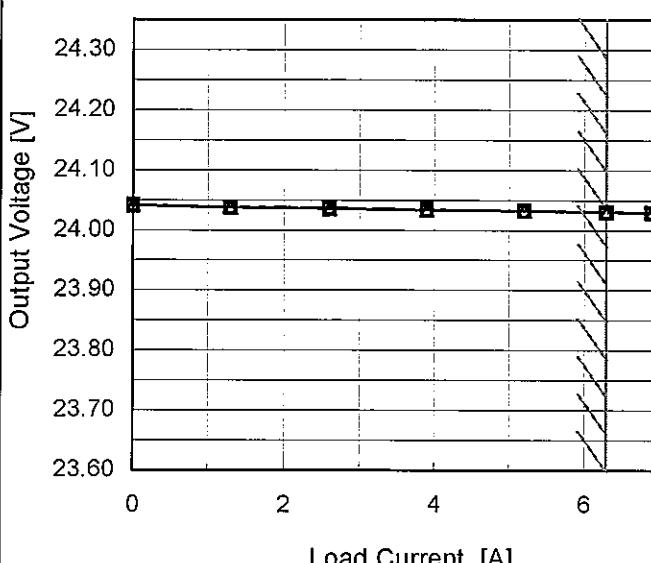
Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
75	24.036	24.031
85	24.036	24.031
100	24.036	24.031
120	24.035	24.030
200	24.035	24.030
230	24.035	24.030
264	24.034	24.029
280	24.034	24.029
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Note: Slanted line shows the range of the rated input voltage.

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
75	24.036	24.031
85	24.036	24.031
100	24.036	24.031
120	24.035	24.030
200	24.035	24.030
230	24.035	24.030
264	24.034	24.029
280	24.034	24.029
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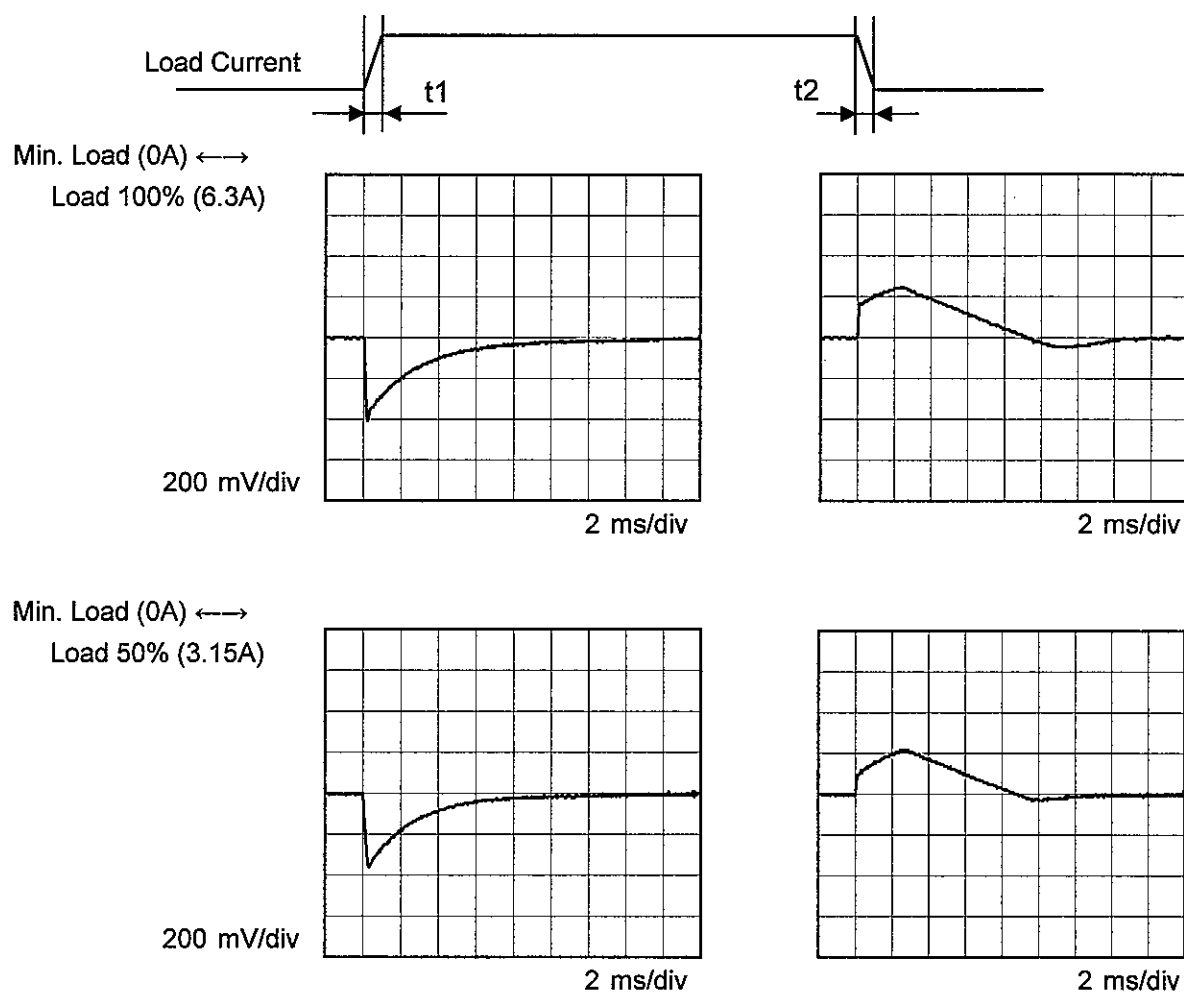
Model	LFA150F-24																																																					
Item	Load Regulation	Temperature	25°C																																																			
Object	+24V6.3A	Testing Circuitry	Figure A																																																			
1.Graph		2.Values																																																				
<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> 		<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>0.0</td><td>24.041</td><td>24.042</td><td>24.042</td></tr><tr><td>1.3</td><td>24.038</td><td>24.038</td><td>24.038</td></tr><tr><td>2.6</td><td>24.036</td><td>24.036</td><td>24.036</td></tr><tr><td>3.9</td><td>24.034</td><td>24.034</td><td>24.034</td></tr><tr><td>5.2</td><td>24.032</td><td>24.033</td><td>24.032</td></tr><tr><td>6.3</td><td>24.031</td><td>24.030</td><td>24.030</td></tr><tr><td>6.9</td><td>24.030</td><td>24.030</td><td>24.030</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]	0.0	24.041	24.042	24.042	1.3	24.038	24.038	24.038	2.6	24.036	24.036	24.036	3.9	24.034	24.034	24.034	5.2	24.032	24.033	24.032	6.3	24.031	24.030	24.030	6.9	24.030	24.030	24.030	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Output Voltage [V]																																																					
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]																																																			
0.0	24.041	24.042	24.042																																																			
1.3	24.038	24.038	24.038																																																			
2.6	24.036	24.036	24.036																																																			
3.9	24.034	24.034	24.034																																																			
5.2	24.032	24.033	24.032																																																			
6.3	24.031	24.030	24.030																																																			
6.9	24.030	24.030	24.030																																																			
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Note: Slanted line shows the range of the rated load current.																																																						

COSEL

Model	LFA150F-24	Temperature	25°C
Item	Dynamic Load Response	Testing Circuitry	Figure A
Object	+24V6.3A		

Input Volt. 100 V
Cycle 1000 ms

Response. $t_1=t_2=50\mu\text{s}$. Typ



COSEL

Model		LFA150F-24	Temperature Testing Circuitry	25°C Figure C
Item		Ripple Voltage (by Load Current)		
Object		+24V6.3A		

1.Graph

—△—

Input Volt.

100V

-·-○-·-

Input Volt.

230V

200

180

160

140

120

100

80

60

40

20

0

Ripple Voltage [mV]

0

2

4

6

8

Load Current [A]

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.

T1: Due to AC Input Line

T2: Due to Switching

Ripple [mVp-p]

T1

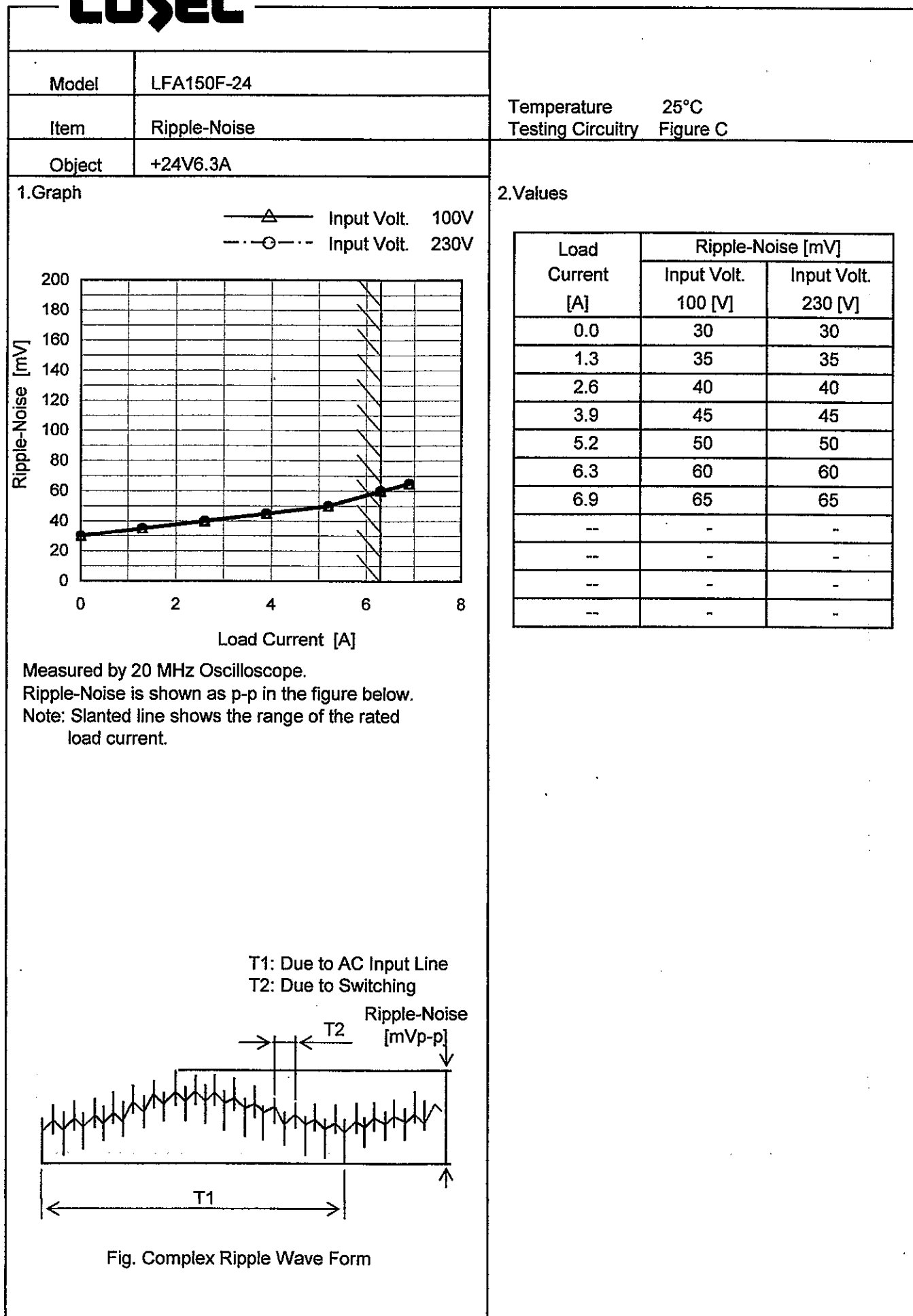
T2

Fig. Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0.0	10	10
1.3	15	15
2.6	20	20
3.9	25	25
5.2	30	30
6.3	30	30
6.9	35	35
--	-	-
--	-	-
--	-	-
--	-	-

COSEL



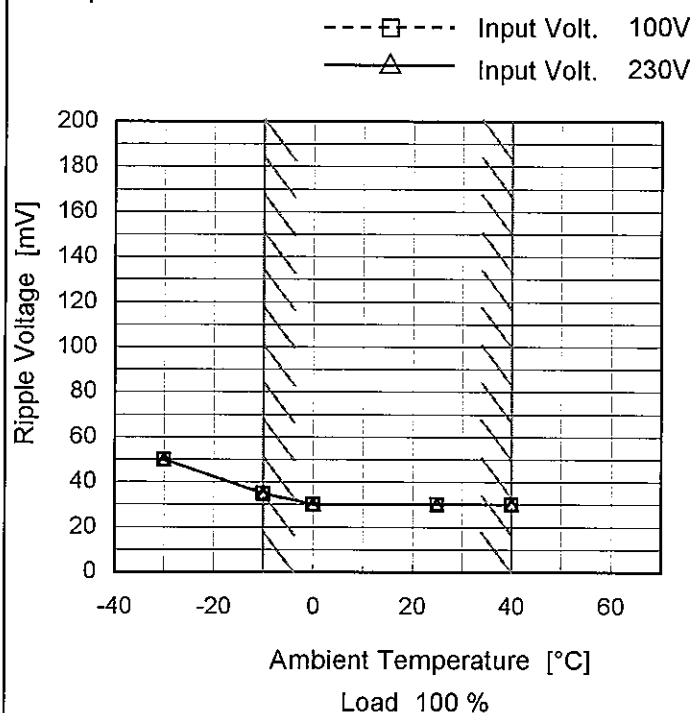
Model LFA150F-24

Item Ripple Voltage (by Ambient Temp.)

Object +24V6.3A

Testing Circuitry Figure A

1. Graph



Measured by 20 MHz Oscilloscope.

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

2. Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
-30	50	50
-10	35	35
0	30	30
25	30	30
40	30	30
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

Model		LFA150F-24	
Item		Ambient Temperature Drift	
Object		+24V6.3A	

1.Graph

△

Input Volt. 100V

□

Input Volt. 200V

○

Input Volt. 230V

Output Voltage [V]

Model		LFA150F-24	Testing Circuitry Figure A
Item		Output Voltage Accuracy	
Object		+24V6.3A	

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 : -10 - 40°C

Input Voltage : 85 - 264V

Load Current : 0 - 6.3A

* 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	-10	85	0	24.036	±18	±0.1
Minimum Voltage	40	264	6.3	24.001		

COSEL

Model

LFA150F-24

Item

Time Lapse Drift

Object

+24V6.3A

Temperature

25°C

Testing Circuitry

Figure A

1.Graph

Output Voltage [V]

24.30

24.20

24.10

24.00

23.90

23.80

23.70

23.60

0

2

4

6

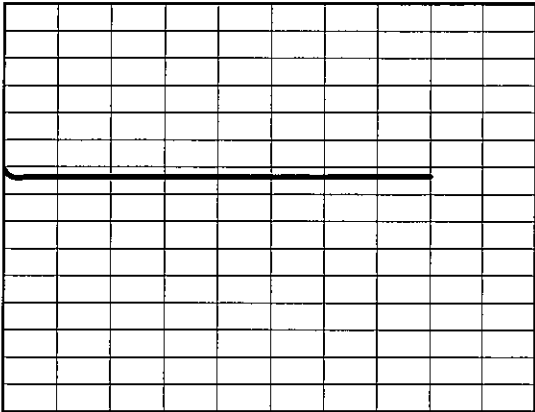
8

10

Time [H]

Input Volt. 100V

Load 100%



2.Values

Time since start [H]	Output Voltage [V]
0.0	24.045
0.5	24.032
1.0	24.032
2.0	24.032
3.0	24.032
4.0	24.032
5.0	24.032
6.0	24.032
7.0	24.032
8.0	24.033

* The characteristic of AC230V is equal.

COSEL

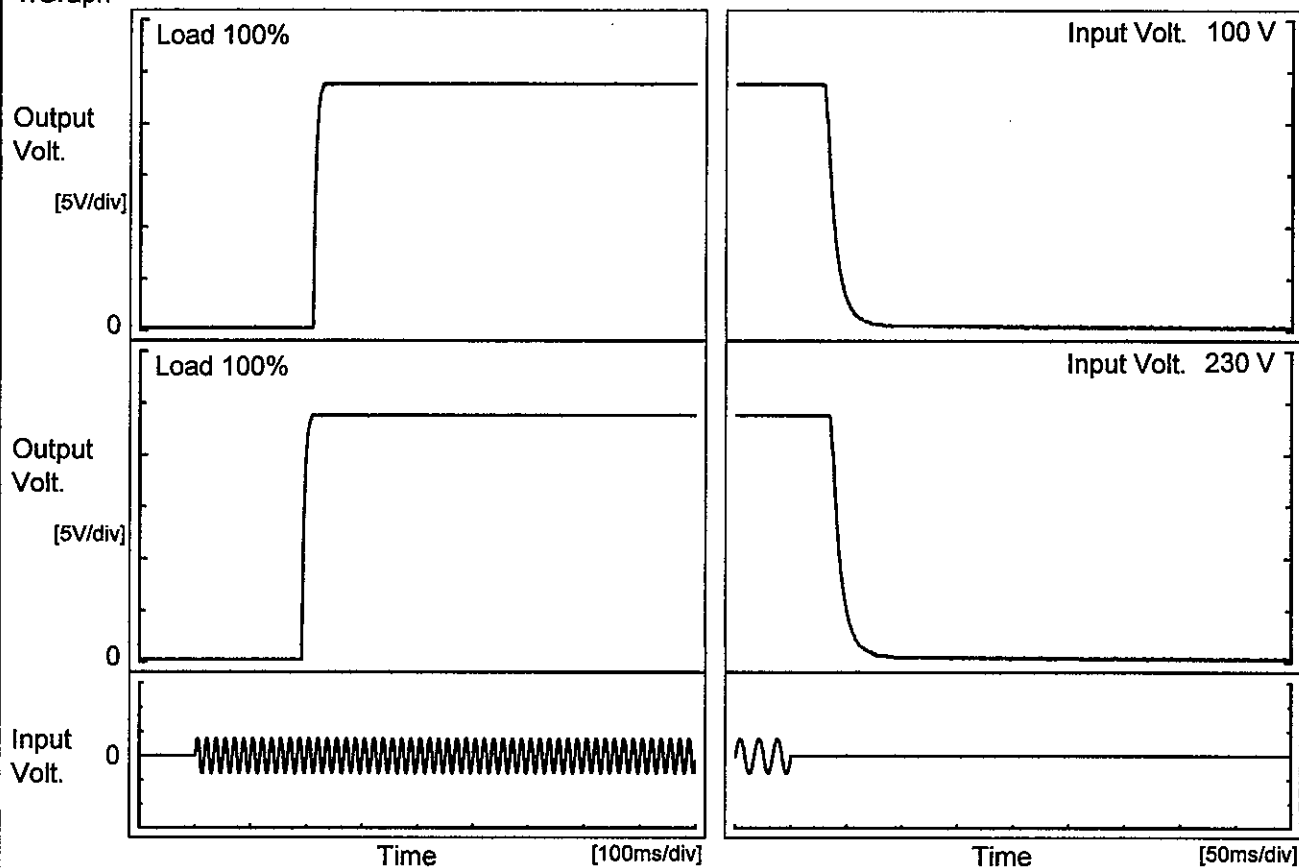
Model LFA150F-24

Item Rise and Fall Time

Object +24V6.3A

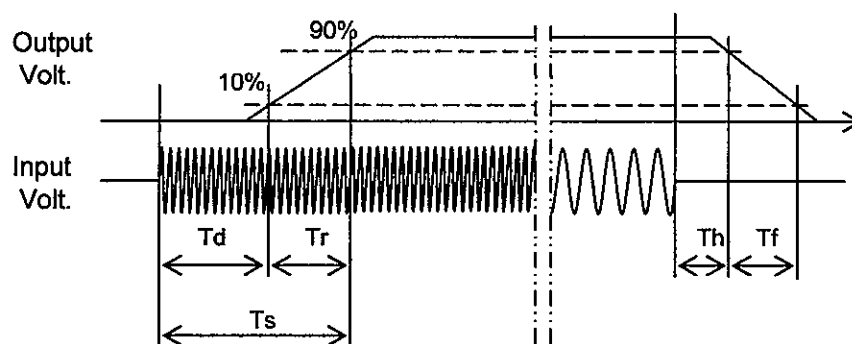
Temperature 25°C
Testing Circuitry Figure A

1. Graph



2. Values

Input Volt.	Time	Td	Tr	Ts	Th	Tf
100 V		212.0	9.5	221.5	30.5	20.8
230 V		192.5	9.5	202.0	36.3	21.0



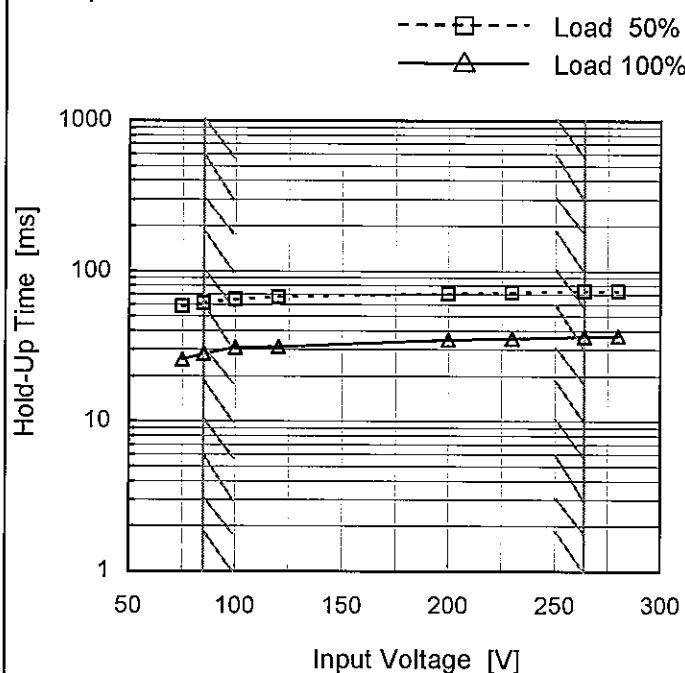
Model LFA150F-24

Item Hold-Up Time

Object +24V6.3A

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%
75	58	26
85	61	28
100	65	31
120	67	31
200	71	35
230	72	36
264	73	37
280	74	37
--	-	-

Model	LFA150F-24																																																					
Item	Instantaneous Interruption Compensation	Temperature	25°C																																																			
Object	+24V6.3A	Testing Circuitry	Figure A																																																			
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> <p>Instantaneous Compensation Time [ms]</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">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>1.3</td><td>136</td><td>165</td><td>164</td></tr><tr><td>2.6</td><td>78</td><td>90</td><td>89</td></tr><tr><td>3.9</td><td>52</td><td>62</td><td>63</td></tr><tr><td>5.2</td><td>37</td><td>47</td><td>47</td></tr><tr><td>6.3</td><td>30</td><td>35</td><td>36</td></tr><tr><td>6.9</td><td>23</td><td>31</td><td>31</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	-	-	-	1.3	136	165	164	2.6	78	90	89	3.9	52	62	63	5.2	37	47	47	6.3	30	35	36	6.9	23	31	31	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Time [ms]																																																					
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]																																																			
0.0	-	-	-																																																			
1.3	136	165	164																																																			
2.6	78	90	89																																																			
3.9	52	62	63																																																			
5.2	37	47	47																																																			
6.3	30	35	36																																																			
6.9	23	31	31																																																			
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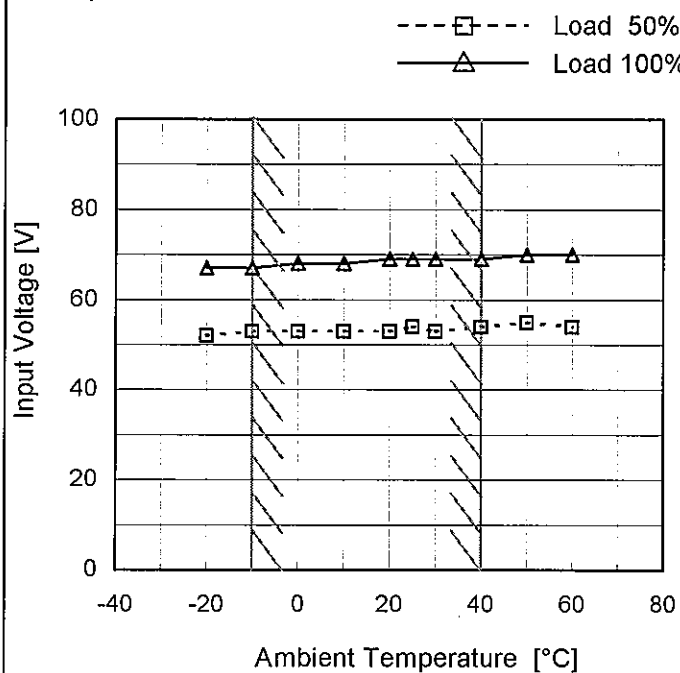
Model LFA150F-24

Item Minimum Input Voltage
for Regulated Output Voltage

Object +24V6.3A

Testing Circuitry Figure A

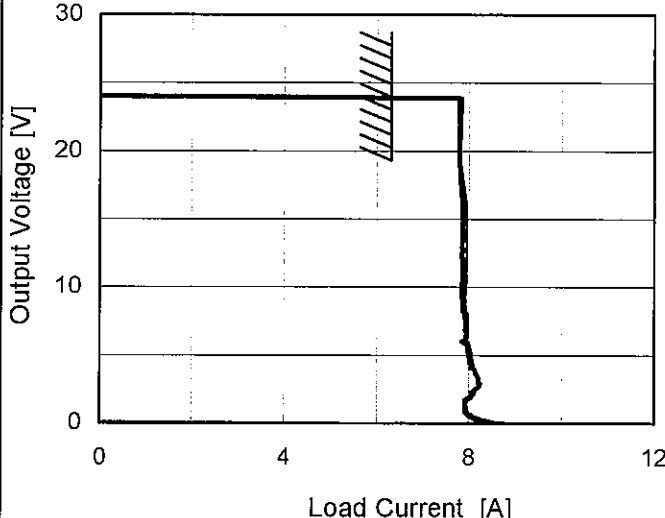
1. Graph



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

2. Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-20	52	67
-10	53	67
0	53	68
10	53	68
20	53	69
25	54	69
30	53	69
40	54	69
50	55	70
60	54	70
--	-	-

Model	LFA150F-24																																											
Item	Overcurrent Protection	Temperature	25°C																																									
Object	+24V6.3A	Testing Circuitry	Figure A																																									
1.Graph		2.Values																																										
<div><div><div></div>Input Volt. 100V</div><div><div></div>Input Volt. 230V</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>24.0</td><td>7.86</td><td>7.78</td></tr><tr><td>22.8</td><td>7.85</td><td>7.79</td></tr><tr><td>21.6</td><td>7.84</td><td>7.79</td></tr><tr><td>19.2</td><td>7.82</td><td>7.78</td></tr><tr><td>16.8</td><td>7.91</td><td>7.84</td></tr><tr><td>14.4</td><td>7.95</td><td>7.86</td></tr><tr><td>12.0</td><td>7.95</td><td>7.86</td></tr><tr><td>9.6</td><td>7.92</td><td>7.85</td></tr><tr><td>7.2</td><td>7.96</td><td>7.93</td></tr><tr><td>4.8</td><td>8.07</td><td>8.01</td></tr><tr><td>2.4</td><td>8.15</td><td>8.13</td></tr><tr><td>0.0</td><td>9.04</td><td>9.28</td></tr></table>		Output Voltage [V]	Load Current [A]		Input Volt. 100[V]	Input Volt. 230[V]	24.0	7.86	7.78	22.8	7.85	7.79	21.6	7.84	7.79	19.2	7.82	7.78	16.8	7.91	7.84	14.4	7.95	7.86	12.0	7.95	7.86	9.6	7.92	7.85	7.2	7.96	7.93	4.8	8.07	8.01	2.4	8.15	8.13	0.0	9.04	9.28
Output Voltage [V]	Load Current [A]																																											
	Input Volt. 100[V]	Input Volt. 230[V]																																										
24.0	7.86	7.78																																										
22.8	7.85	7.79																																										
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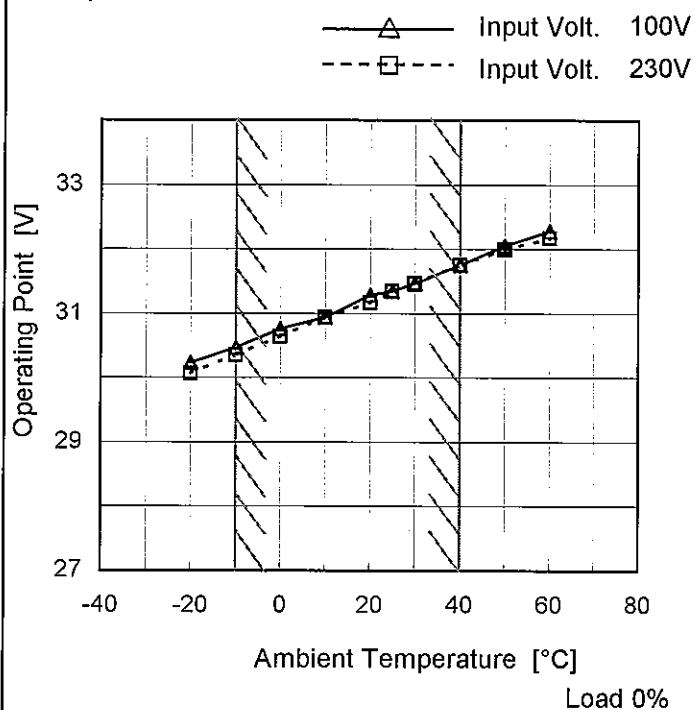
Model LFA150F-24

Item Overvoltage Protection

Object +24V6.3A

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	30.23	30.06
-10	30.47	30.35
0	30.76	30.64
10	30.94	30.94
20	31.29	31.17
25	31.35	31.35
30	31.46	31.46
40	31.75	31.75
50	32.05	31.99
60	32.28	32.17
--	-	-

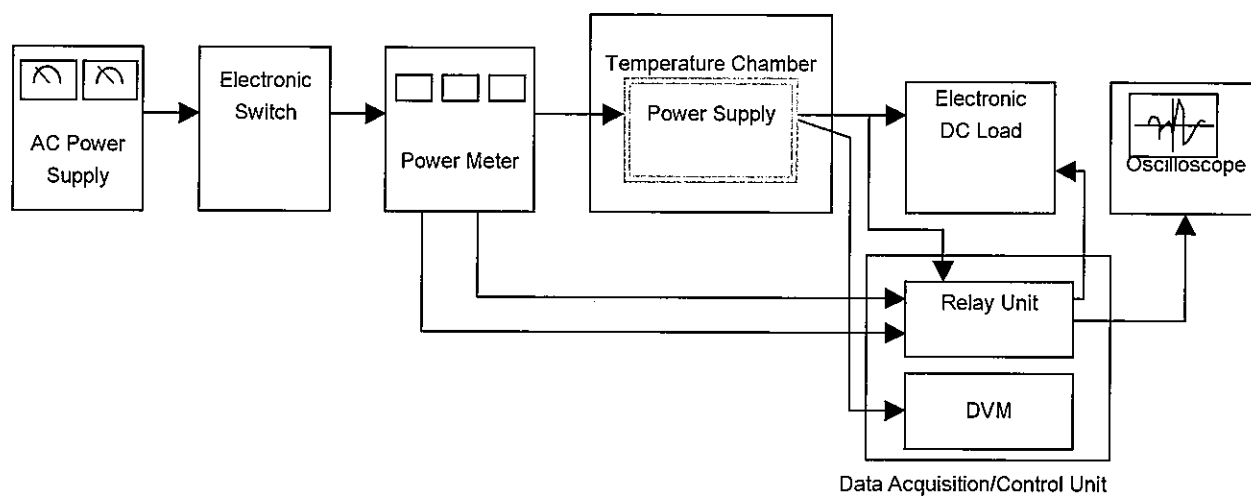


Figure A

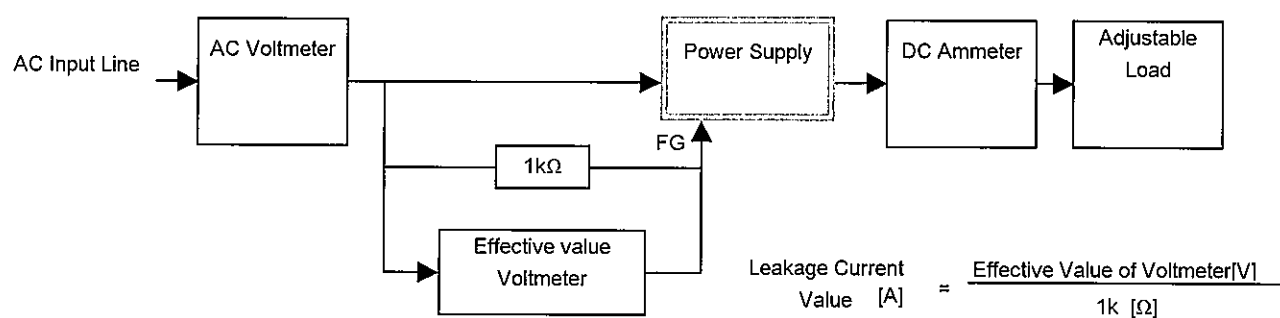


Figure B (DEN-AN)

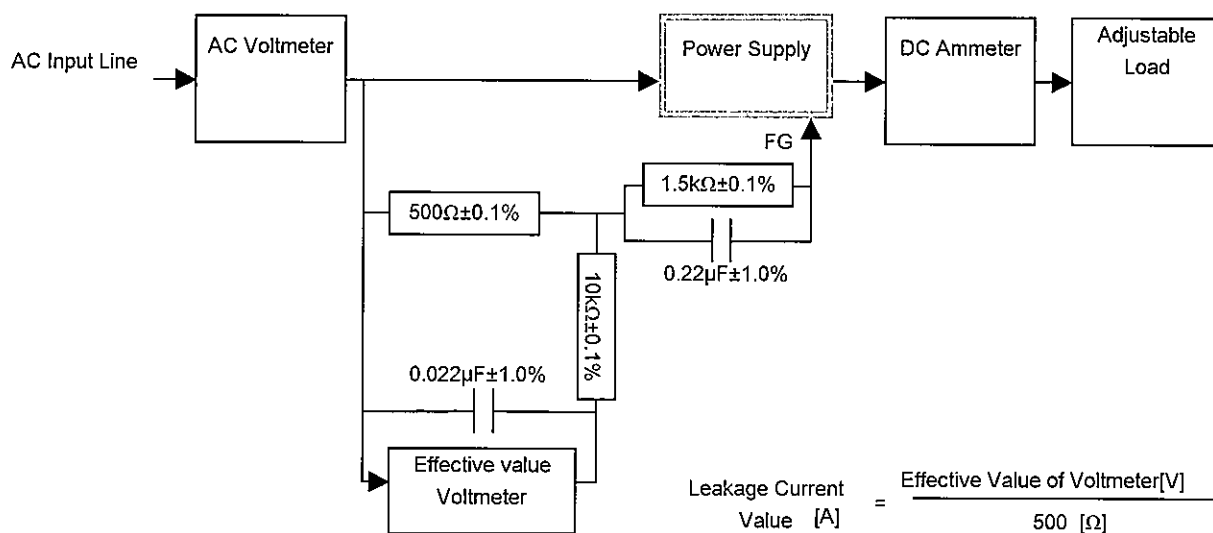


Figure B (IEC60950-1)

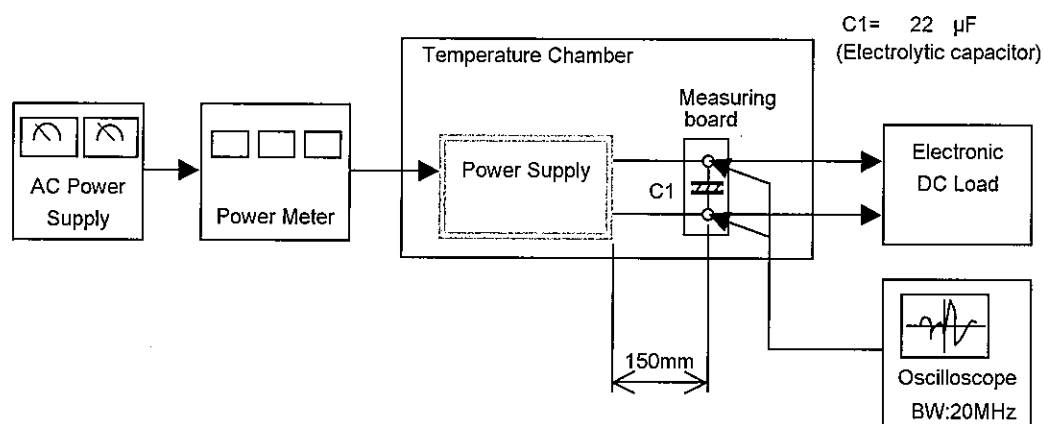


Figure C