

TEST DATA OF PCA600F-5

Regulated DC Power Supply
March 14, 2018

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Koji Todo Design Manager

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Masanobu Shima Design Engineer

COSEL CO.,LTD.

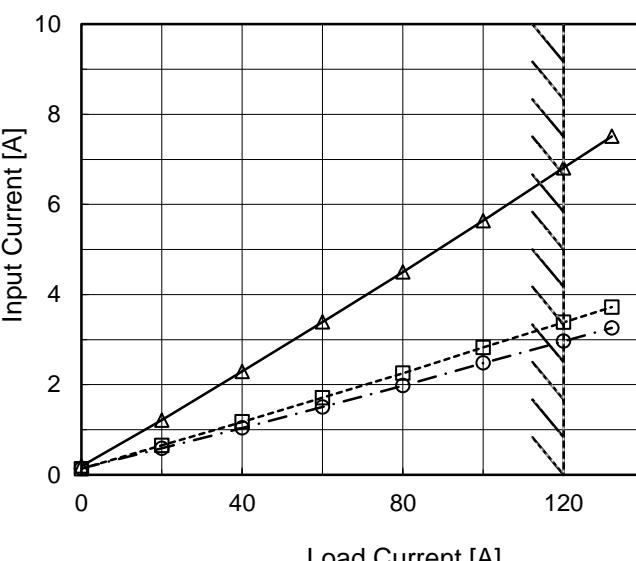


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Model	PCA600F-5		
Item	Input Current (by Load Current)	Temperature 25°C	Testing Circuitry Figure A
Object	_____	_____	_____
1.Graph	<p style="text-align: center;"> —△— Input Volt. 100V - - □ - - Input Volt. 200V —○— Input Volt. 230V </p>  <p>The graph shows that as input voltage increases, the required load current to maintain a constant input current also increases. For example, at 100V, a 10A input current requires a 40A load current, while at 230V, it requires approximately 13A.</p>	2.Values	
Load Current [A]	Input Current [A]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0	0.192	0.133	0.139
20	1.212	0.649	0.586
40	2.292	1.174	1.039
60	3.389	1.710	1.505
80	4.500	2.254	1.975
100	5.640	2.826	2.480
120	6.810	3.382	2.963
132	7.510	3.720	3.257
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Note: Slanted line shows the range of the rated load current.

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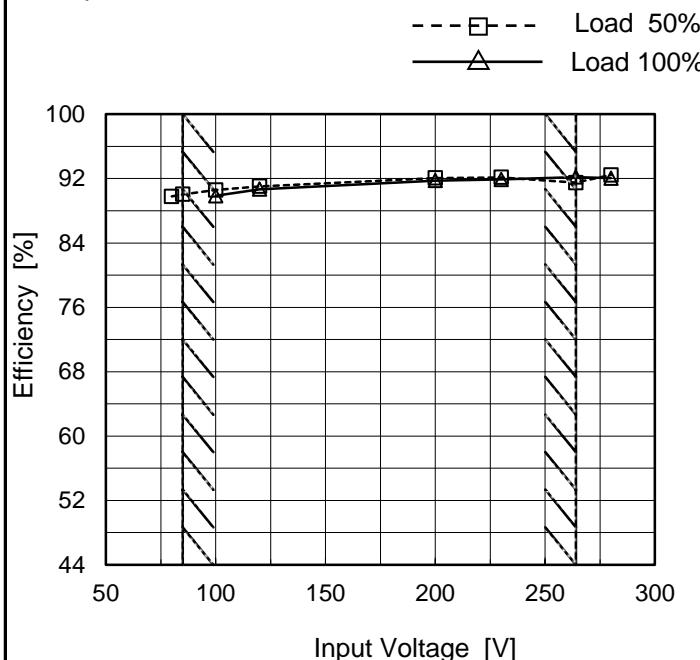
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Model	PCA600F-5
Item	Efficiency (by Input Voltage)
Object	_____

 Temperature 25°C
 Testing Circuitry Figure A

1.Graph



2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
80	89.8	-
85	90.0	-
100	90.6	89.9
120	91.0	90.7
200	92.1	91.7
230	92.2	91.9
264	91.5	92.2
280	92.4	92.0
--	-	-

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

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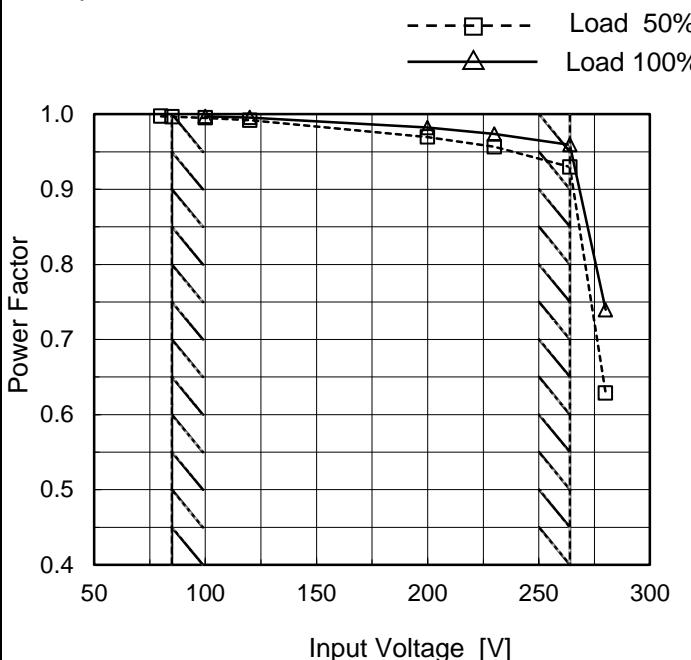
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1.Graph																																																						
<p>The graph plots Efficiency [%] on the Y-axis (44 to 100) against Load Current [A] on the X-axis (0 to 120). Three data series are shown for different input voltages: 100V (solid line with open triangle markers), 200V (dashed line with open square markers), and 230V (dash-dot line with open circle markers). All curves show efficiency increasing with load current, peaking around 80-100A and then slightly decreasing. A slanted line on the right side of the graph indicates the rated load current range.</p>			2.Values																																																			
<table border="1"> <thead> <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> </thead> <tbody> <tr> <td>0</td><td>-</td><td>-</td><td>-</td></tr> <tr> <td>20</td><td>86.0</td><td>87.3</td><td>87.0</td></tr> <tr> <td>40</td><td>89.6</td><td>91.2</td><td>91.3</td></tr> <tr> <td>60</td><td>90.6</td><td>92.1</td><td>92.2</td></tr> <tr> <td>80</td><td>90.7</td><td>92.3</td><td>92.6</td></tr> <tr> <td>100</td><td>90.4</td><td>91.9</td><td>92.0</td></tr> <tr> <td>120</td><td>89.9</td><td>91.8</td><td>91.9</td></tr> <tr> <td>132</td><td>89.5</td><td>91.6</td><td>91.8</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]	Efficiency [%]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0	-	-	-	20	86.0	87.3	87.0	40	89.6	91.2	91.3	60	90.6	92.1	92.2	80	90.7	92.3	92.6	100	90.4	91.9	92.0	120	89.9	91.8	91.9	132	89.5	91.6	91.8	--	-	-	-	--	-	-	-	--	-	-	-
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Model	PCA600F-5
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%
80	0.997	-
85	0.997	-
100	0.995	0.997
120	0.992	0.996
200	0.970	0.982
230	0.957	0.974
264	0.930	0.959
280	0.629	0.740
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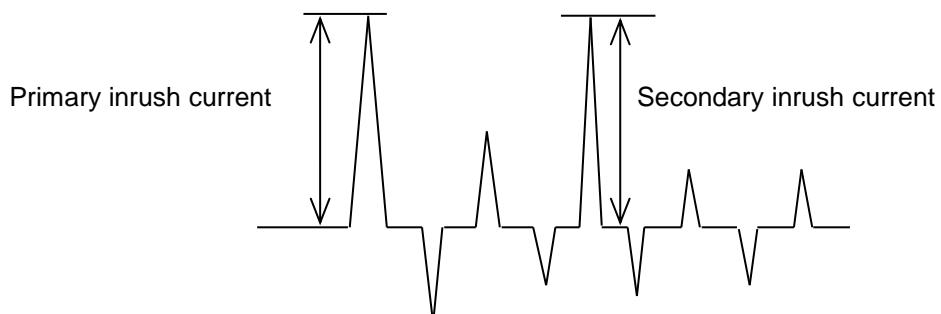
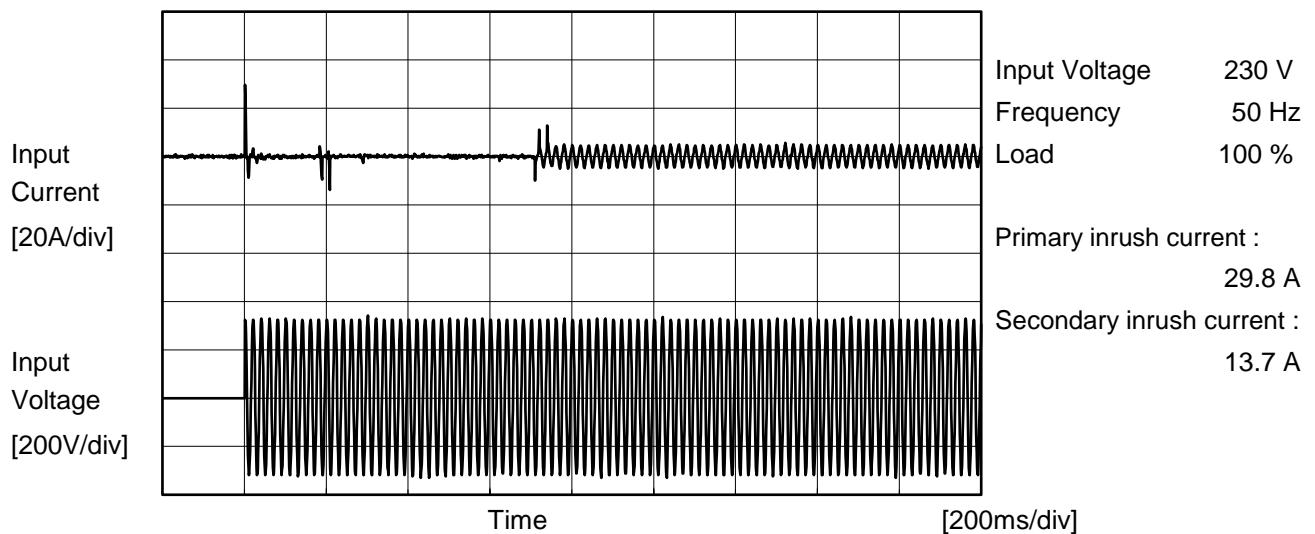
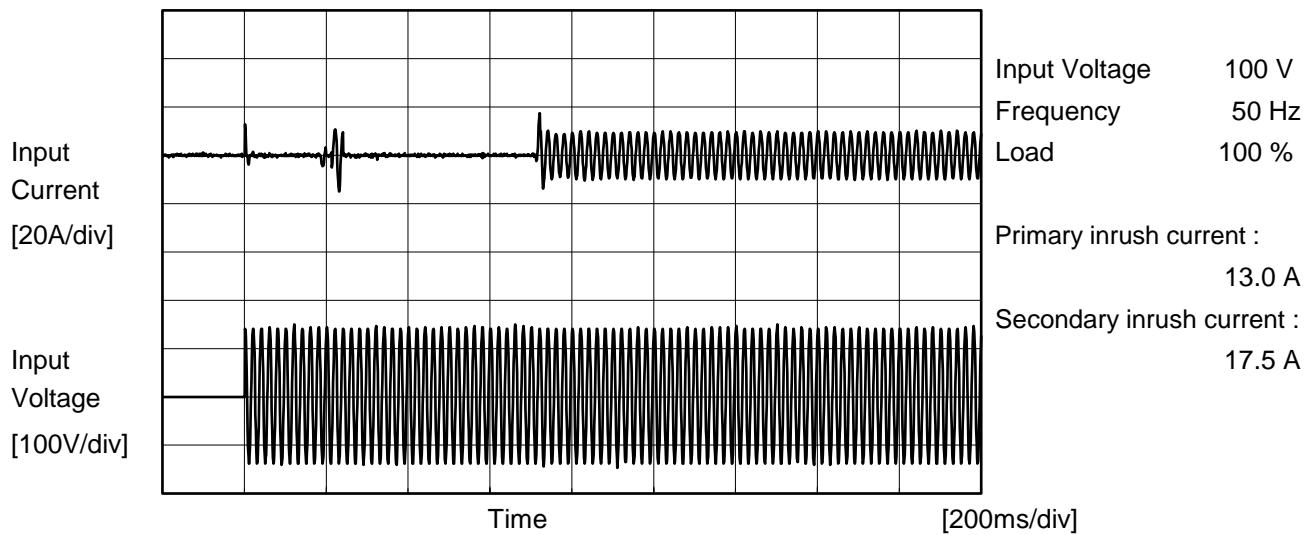
Note: Slanted line shows the range of the rated input voltage.

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Model	PCA600F-5	Temperature	25°C																																																			
Item	Power Factor (by Load Current)	Testing Circuitry	Figure A																																																			
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Note: Slanted line shows the range of the rated load current.																																																						

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Model	PCA600F-5	Temperature	25°C
Item	Inrush Current	Testing Circuitry	Figure A
Object	_____		





Model	PCA600F-5	Temperature Testing Circuitry	25°C Figure B	
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	0.13	0.30	0.31	Operation
		One of phases	0.25	0.56	0.58	Stand by
IEC62368-1	Figure B-2	Both phases	0.12	0.29	0.30	Operation
		One of phases	0.25	0.54	0.56	Stand by
	Figure B-3	Both phases	0.12	0.29	0.30	Operation
		One of phases	0.25	0.54	0.57	Stand by
IEC60601-1	Figure B-4	Both phases	0.12	0.29	0.30	Operation
		One of phases	0.24	0.53	0.55	Stand by

The value for "One of phases" is the reference value only.

2. Condition

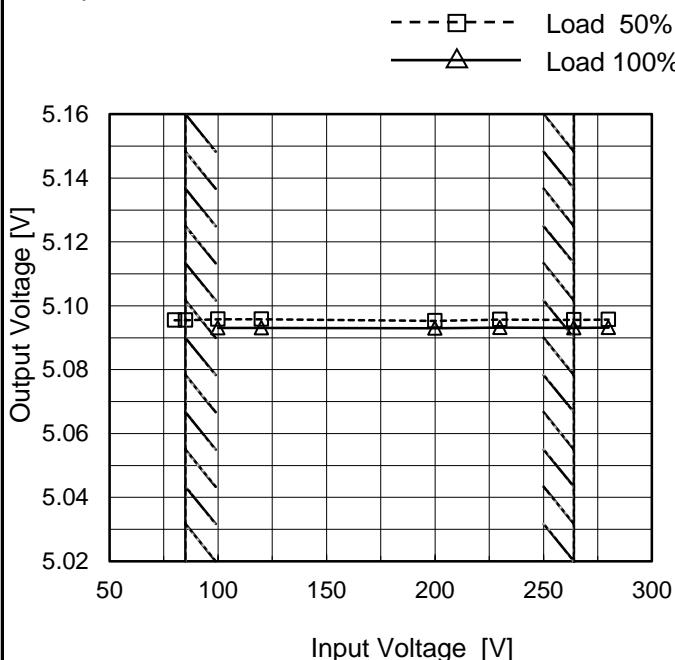
Leakage current value is concluded after measuring both phases of AC input and by choosing the larger one.

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Model	PCA600F-5
Item	Line Regulation
Object	+5V120A

 Temperature 25°C
 Testing Circuitry Figure A

1.Graph



2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
80	5.096	-
85	5.096	-
100	5.096	5.093
120	5.096	5.093
200	5.095	5.093
230	5.096	5.093
264	5.096	5.093
280	5.096	5.093
--	-	-

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

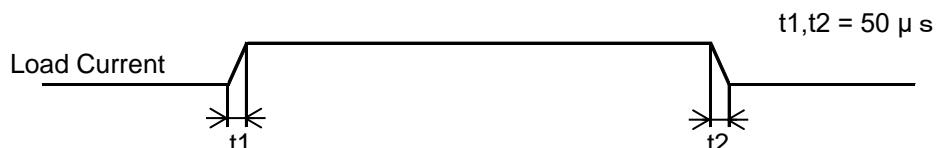
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Model	PCA600F-5	Temperature Testing Circuitry	25°C Figure A
Item	Dynamic Load Response		
Object	+5V120A		

Input Volt. 100 V
 Cycle 1000 ms

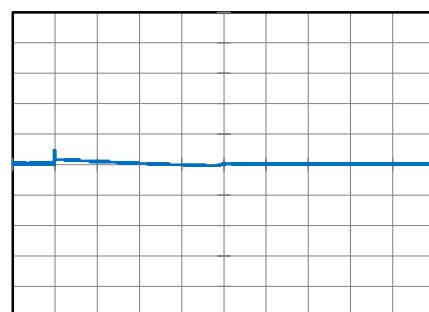
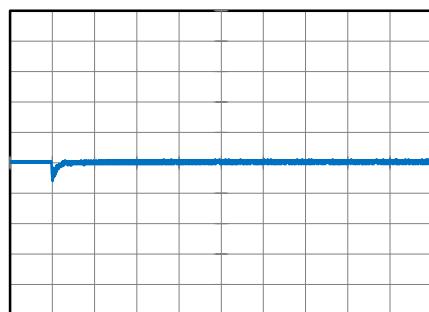


Min.Load (0A)↔
 Load 100% (120A)

1 V/div

2 ms/div

10 ms/div

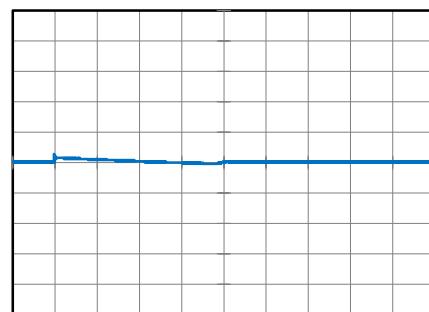
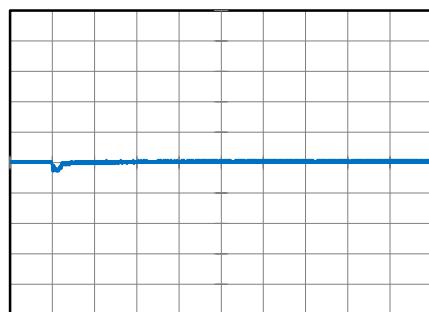


Min.Load (0A)↔
 Load 50% (60A)

1 V/div

2 ms/div

10 ms/div

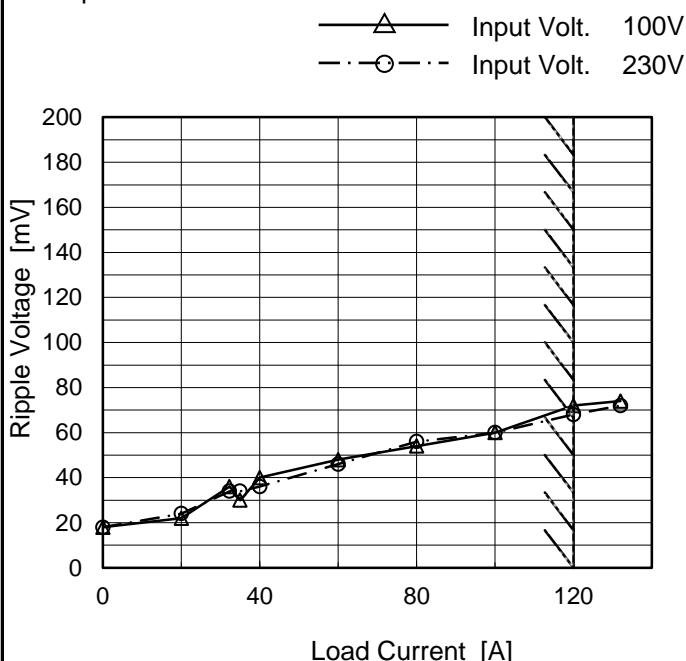


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Model	PCA600F-5
Item	Ripple Voltage (by Load Current)
Object	+5V120A

Temperature 25°C
Testing Circuitry Figure C

1. Graph



2. Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0.0	18	18
20.0	22	24
32.3	36	34
35.0	30	34
40.0	40	36
60.0	48	46
80.0	54	56
100.0	60	60
120.0	72	68
132.0	74	72
--	-	-

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.

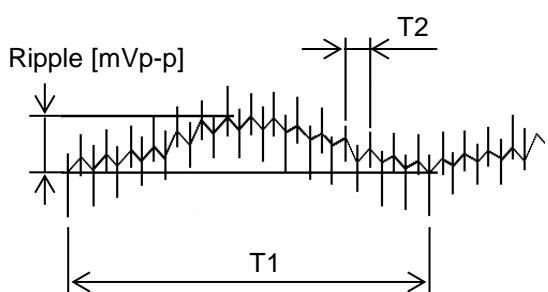
T1: Due to AC Input Line
T2: Due to Switching

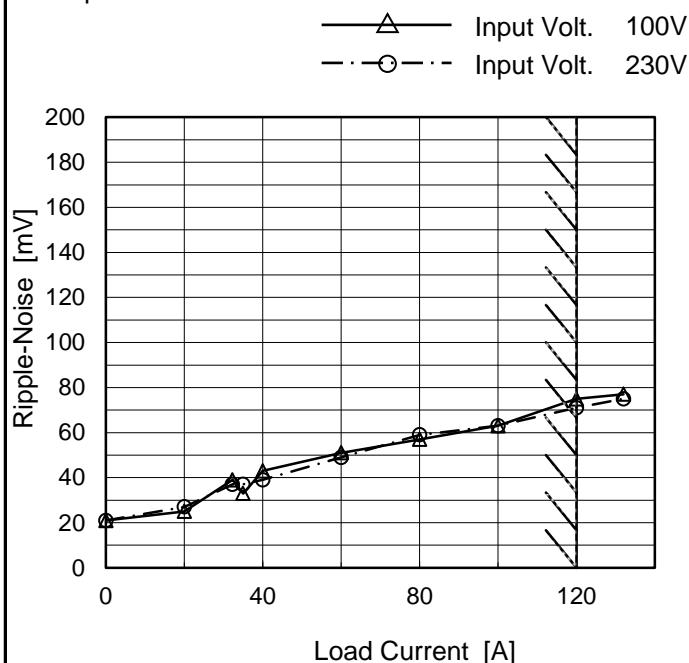
Fig. Complex Ripple Wave Form

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Model	PCA600F-5
Item	Ripple-Noise
Object	+5V120A

 Temperature 25°C
 Testing Circuitry Figure C

1.Graph



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.

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0.0	21	21
20.0	25	27
32.3	39	37
35.0	33	37
40.0	43	39
60.0	51	49
80.0	57	59
100.0	63	63
120.0	75	71
132.0	77	75
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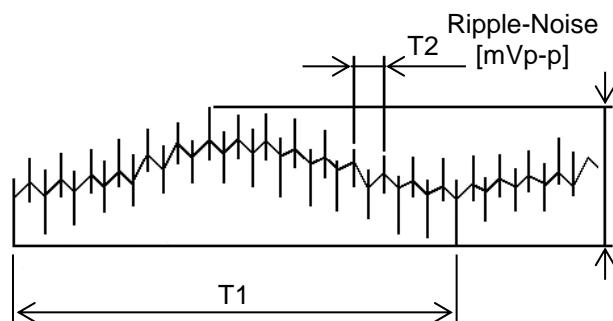
 T1: Due to AC Input Line
 T2: Due to Switching


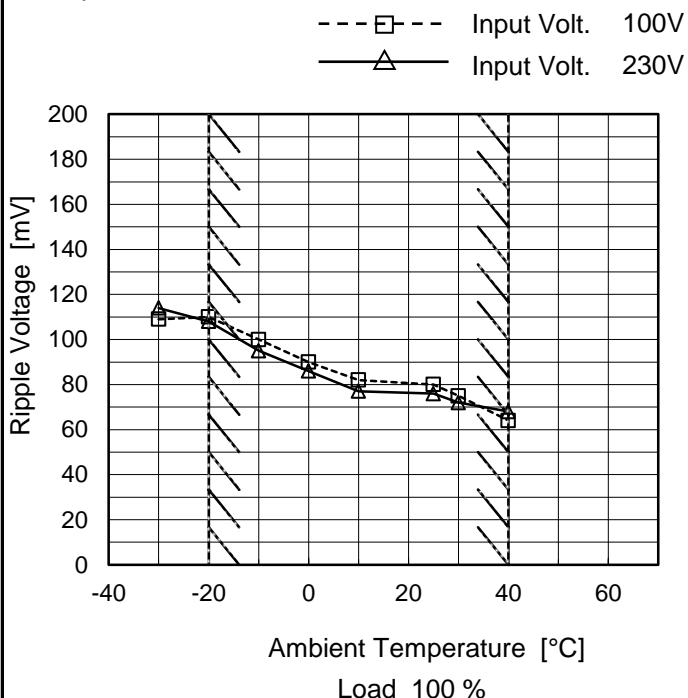
Fig. Complex Ripple Wave Form

COSEL

Model	PCA600F-5
Item	Ripple Voltage (by Ambient Temp.)
Object	+5V120A

Testing Circuitry Figure C

1.Graph



2.Values

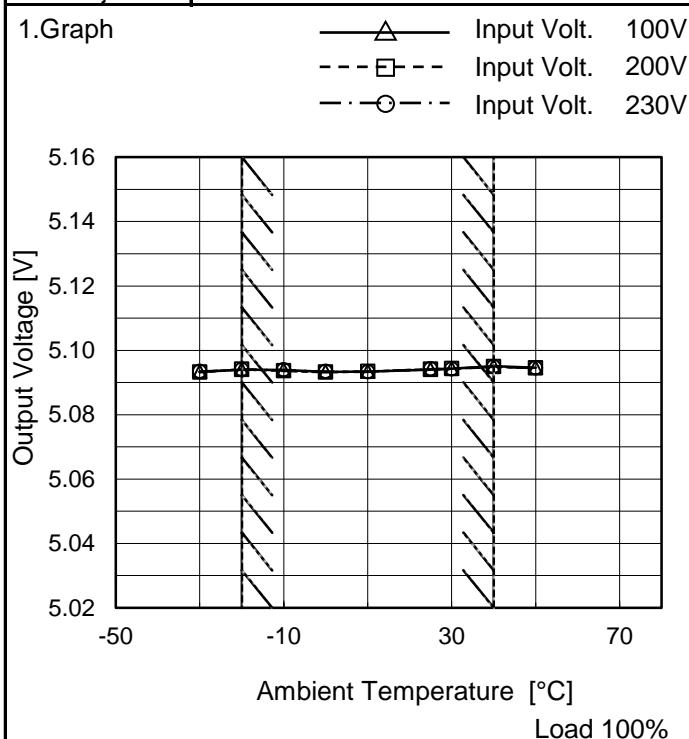
Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
-30	109	114
-20	110	108
-10	100	95
0	90	86
10	82	77
25	80	76
30	75	72
40	64	68
--	-	-
--	-	-
--	-	-

Measured by 20 MHz Oscilloscope.

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

COSEL

Model	PCA600F-5
Item	Ambient Temperature Drift
Object	+5V120A



Testing Circuitry Figure A

2.Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-30	5.093	5.093	5.093
-20	5.094	5.094	5.094
-10	5.094	5.094	5.094
0	5.093	5.093	5.093
10	5.093	5.093	5.093
25	5.094	5.094	5.094
30	5.094	5.094	5.094
40	5.095	5.095	5.095
50	5.095	5.095	5.095
--	-	-	-
--	-	-	-

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



Model	PCA600F-5	Testing Circuitry Figure A
Item	Output Voltage Accuracy	
Object	+5V120A	

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 - 40°C

Input Voltage : 85 - 264V

Load Current : 0 - 120A

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

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

2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	40	100	0	5.100	± 3	± 0.1
Minimum Voltage	-20	85	108	5.094		

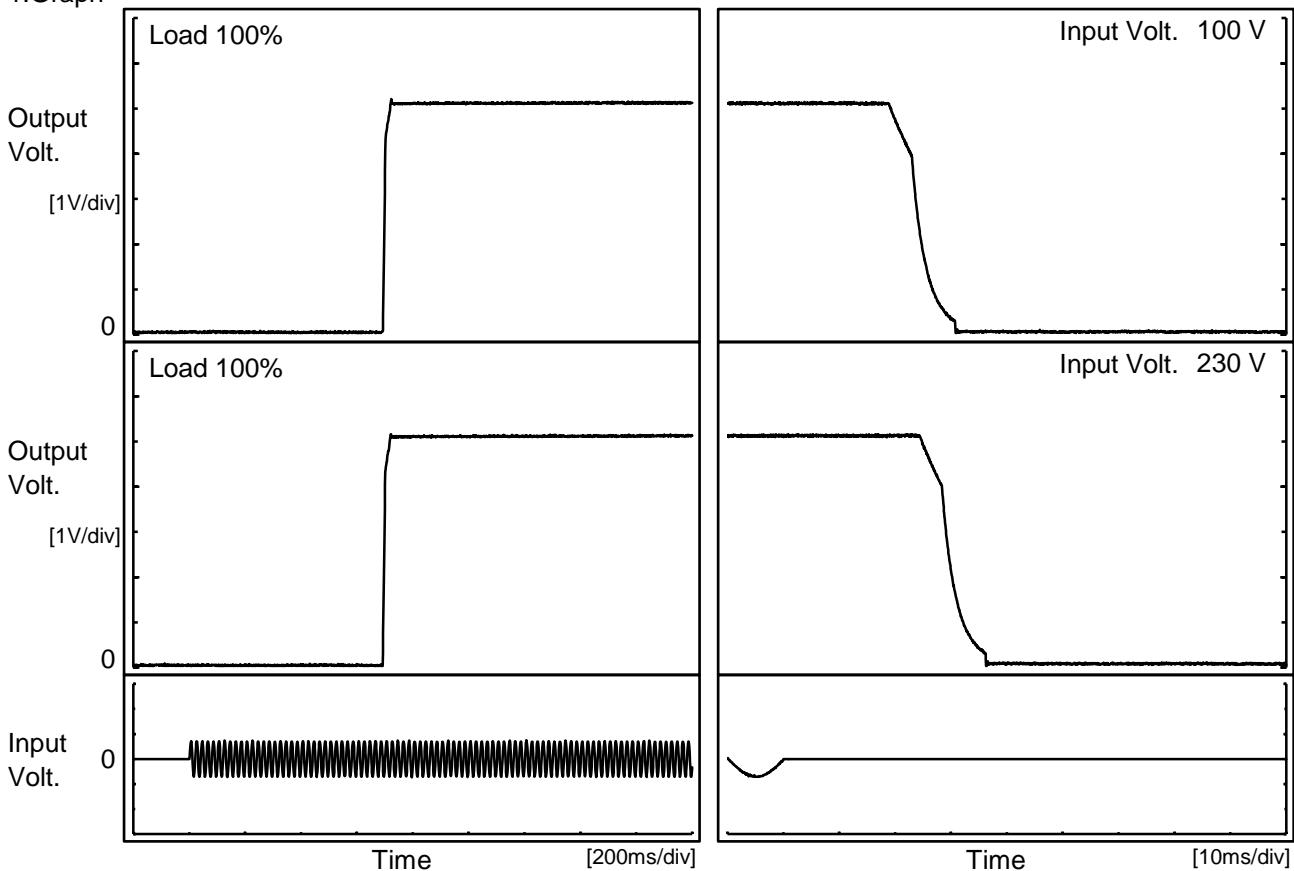
COSEL

Model	PCA600F-5	Temperature	25°C																						
Item	Time Lapse Drift	Testing Circuitry	Figure A																						
Object	+5V120A																								
1.Graph																									
<p>Output Voltage [V]</p> <p>Time [H]</p> <p>Input Volt. 230V</p> <p>Load 100%</p>			2.Values																						
			<table border="1"> <thead> <tr> <th>Time since start [H]</th> <th>Output Voltage [V]</th> </tr> </thead> <tbody> <tr><td>0.0</td><td>5.093</td></tr> <tr><td>0.5</td><td>5.092</td></tr> <tr><td>1.0</td><td>5.093</td></tr> <tr><td>2.0</td><td>5.093</td></tr> <tr><td>3.0</td><td>5.093</td></tr> <tr><td>4.0</td><td>5.093</td></tr> <tr><td>5.0</td><td>5.093</td></tr> <tr><td>6.0</td><td>5.093</td></tr> <tr><td>7.0</td><td>5.093</td></tr> <tr><td>8.0</td><td>5.093</td></tr> </tbody> </table>	Time since start [H]	Output Voltage [V]	0.0	5.093	0.5	5.092	1.0	5.093	2.0	5.093	3.0	5.093	4.0	5.093	5.0	5.093	6.0	5.093	7.0	5.093	8.0	5.093
Time since start [H]	Output Voltage [V]																								
0.0	5.093																								
0.5	5.092																								
1.0	5.093																								
2.0	5.093																								
3.0	5.093																								
4.0	5.093																								
5.0	5.093																								
6.0	5.093																								
7.0	5.093																								
8.0	5.093																								
* The characteristic of AC100V is equal.																									

COSEL

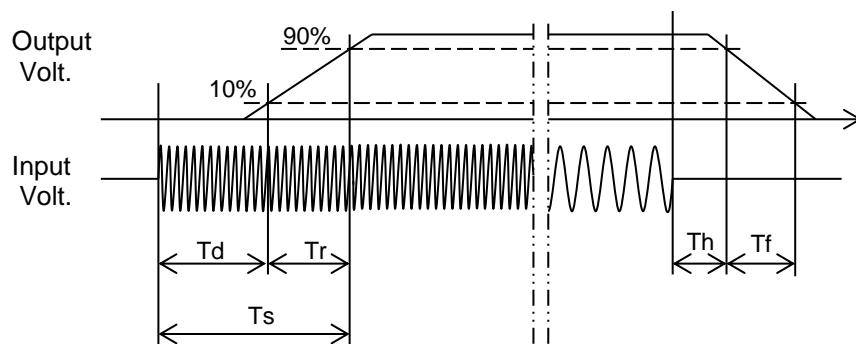
Model	PCA600F-5	Temperature Testing Circuitry Figure A
Item	Rise and Fall Time	
Object	+5V120A	

1. Graph



2. Values

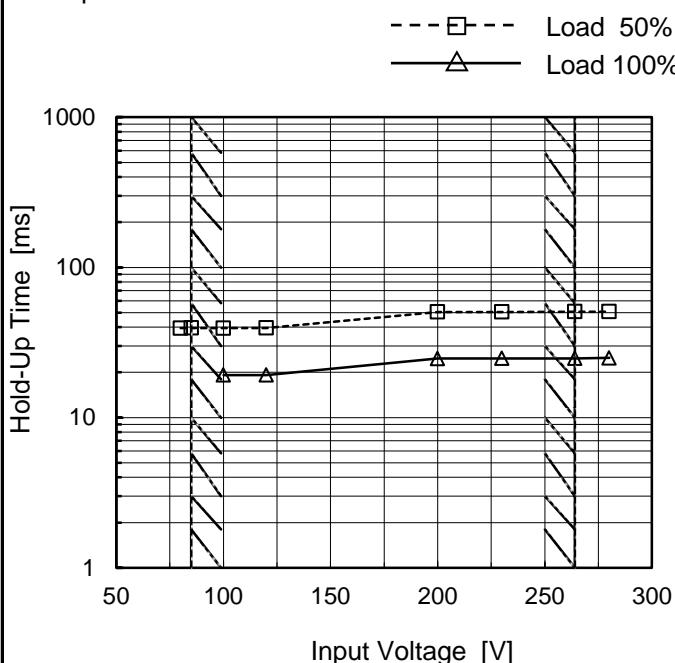
Input Volt.	Time	Td	Tr	Ts	Th	Tf	[ms]
100 V		695.0	13.0	708.0	20.7	8.0	
230 V		694.0	13.0	707.0	26.4	7.9	



COSEL

Model	PCA600F-5	Temperature	25°C
Item	Hold-Up Time	Testing Circuitry	Figure A
Object	+5V120A		

1. Graph



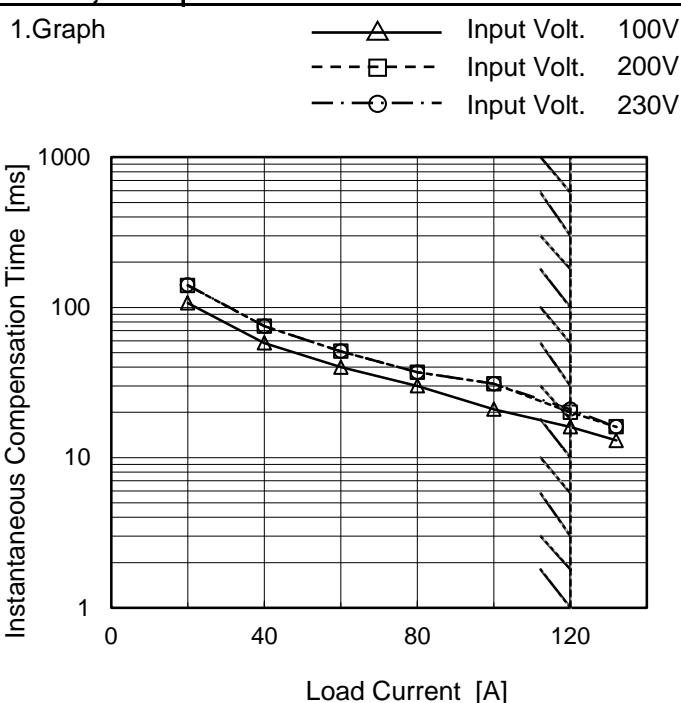
2. Values

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
80	39	-
85	40	-
100	39	19
120	40	19
200	51	25
230	51	25
264	51	25
280	51	25
--	-	-

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.

COSEL

Model	PCA600F-5
Item	Instantaneous Interruption Compensation
Object	+5V120A

 Temperature 25°C
 Testing Circuitry Figure A


2.Values

Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0	-	-	-
20	107	140	141
40	58	75	75
60	40	51	51
80	30	37	37
100	21	31	31
120	16	20	21
132	13	16	16
--	-	-	-
--	-	-	-
--	-	-	-

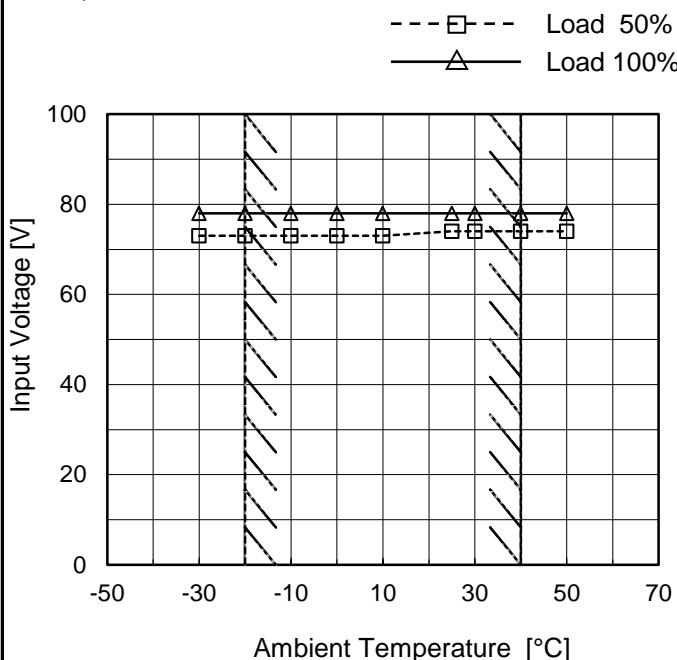
Note: Slanted line shows the range of the rated load current.

COSEL

Model	PCA600F-5
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+5V120A

Testing Circuitry Figure A

1. Graph



2. Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-30	73	78
-20	73	78
-10	73	78
0	73	78
10	73	78
25	74	78
30	74	78
40	74	78
50	74	78
--	-	-
--	-	-

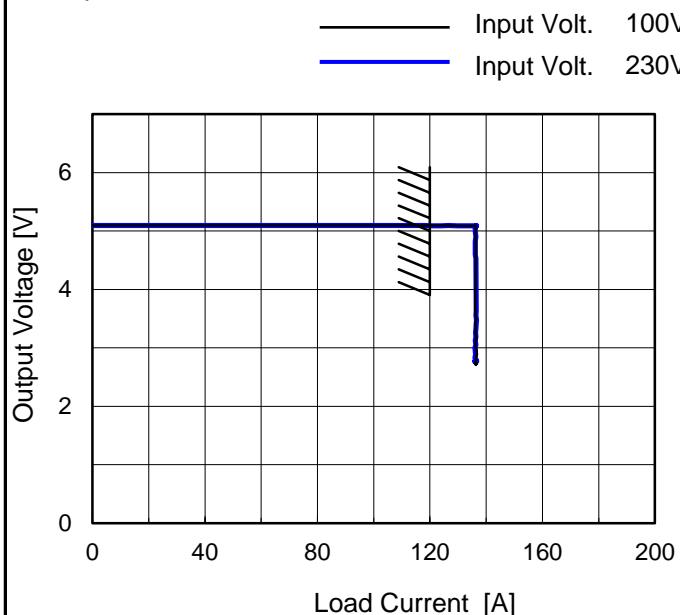
Note: Slanted line shows the range of the rated ambient temperature.

COSEL

Model	PCA600F-5
Item	Overcurrent Protection
Object	+5V120A

 Temperature 25°C
 Testing Circuitry Figure A

1. Graph



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

Intermittent operation occurs when the output voltage is from 2.5V to 0V.

2. Values

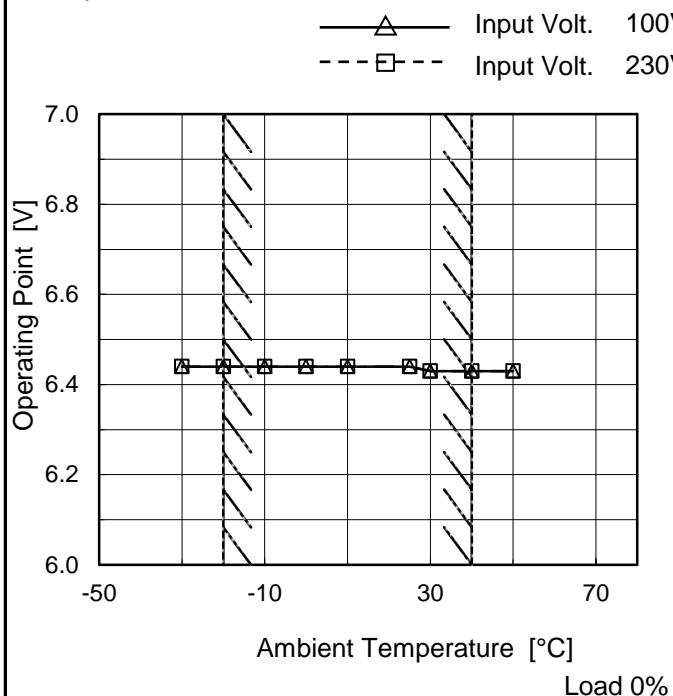
Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 230[V]
4.75	136.31	136.14
4.50	136.29	136.34
4.00	136.13	136.41
3.50	136.45	136.38
3.00	136.21	136.05
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	PCA600F-5
Item	Overvoltage Protection
Object	+5V120A

Testing Circuitry Figure A

1. Graph



2. Values

Ambient Temperature [°C]	Operating Point [V]	
	Input Volt. 100[V]	Input Volt. 230[V]
-30	6.44	6.44
-20	6.44	6.44
-10	6.44	6.44
0	6.44	6.44
10	6.44	6.44
25	6.44	6.44
30	6.43	6.43
40	6.43	6.43
50	6.43	6.43
--	-	-
--	-	-

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

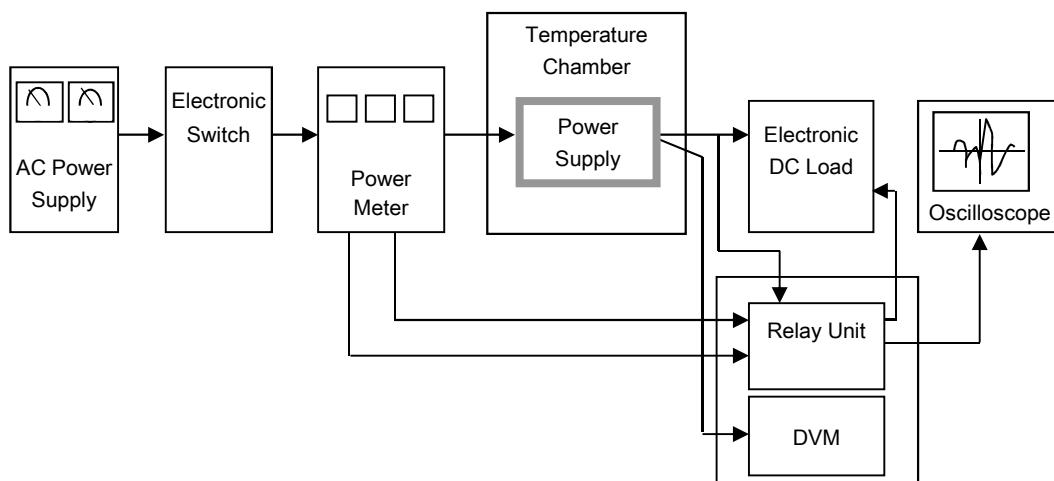


Figure A

Data Acquisition/Control Unit

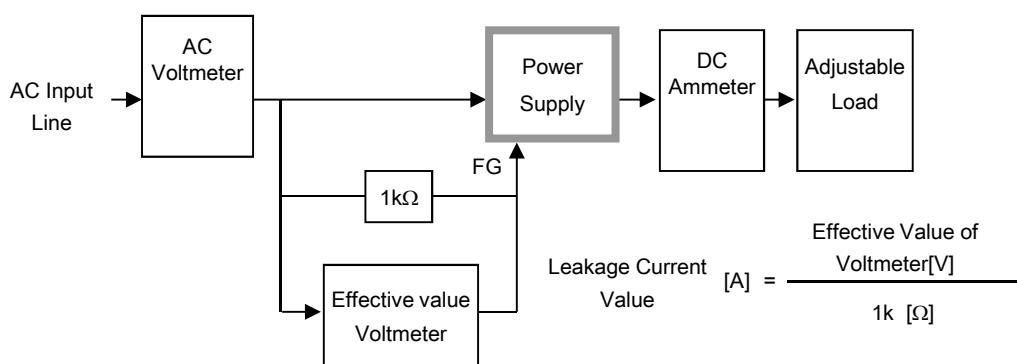


Figure B-1 (DEN-AN)

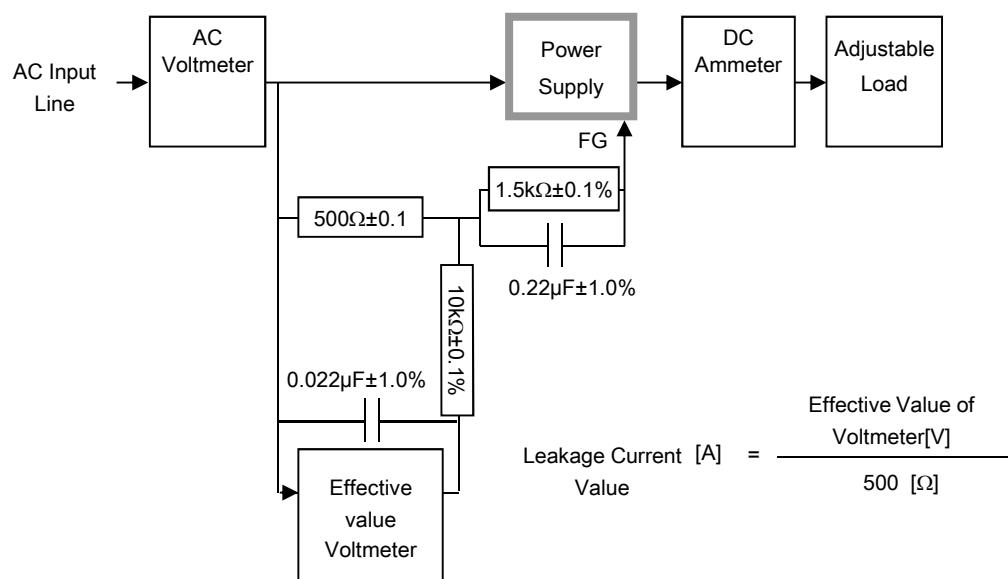


Figure B-2 (IEC62368-1 refer to IEC60990 Fig.4)

COSEL

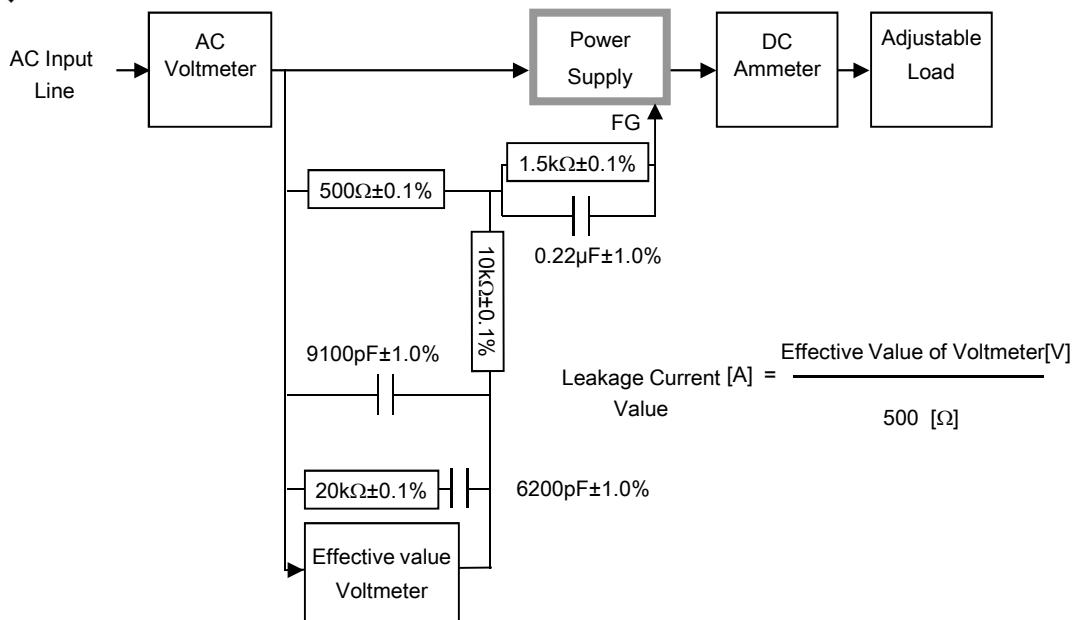


Figure B-3 (IEC62368-1 refer to IEC60990 Fig.5)

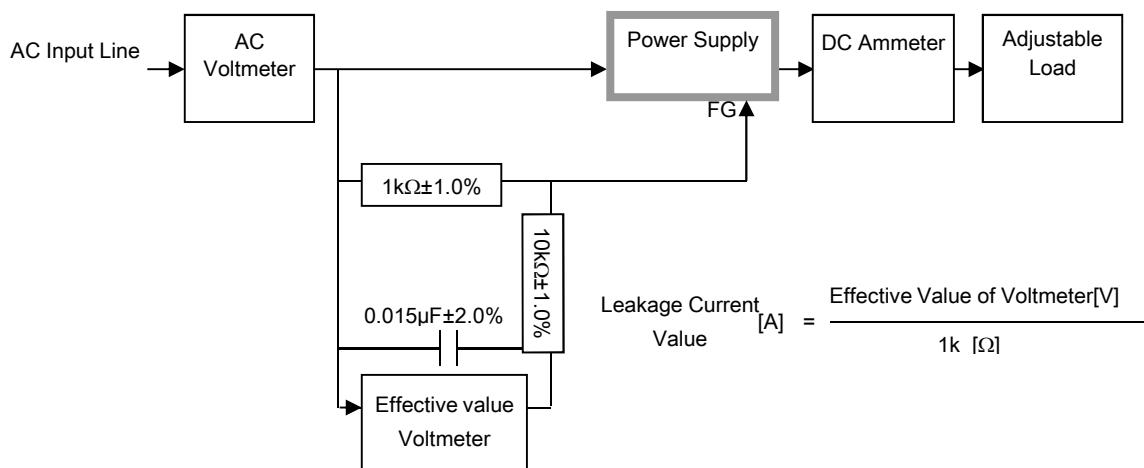
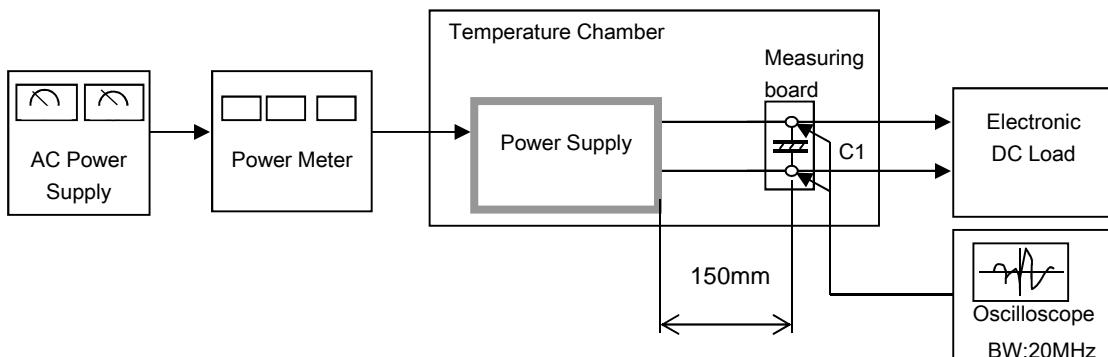


Figure B-4 (IEC60601-1)



$$C1 = 22 \mu F
(\text{Electrolytic capacitor})$$

Figure C