

# TEST DATA OF PMA15F-12

Regulated DC Power Supply  
June 4, 2010

Approved by : Katsumi Ishikawa  
Katsumi Ishikawa Design Manager

Prepared by : Tsutomu Okano  
Tsutomu Okano Design Engineer

**COSEL CO.,LTD.**

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Model	PMA15F-12	Temperature	25°C																																																			
Item	Input Current (by Load Current)	Testing Circuitry	Figure A																																																			
Object	_____	_____																																																				
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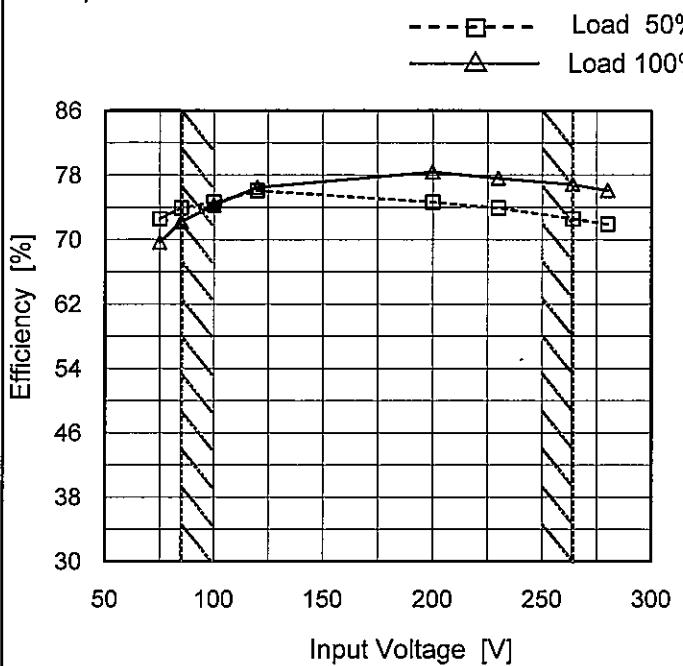
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1.Graph	<p>Graph showing Input Power [W] vs Load Current [A]. The Y-axis ranges from 0 to 50 W, and the X-axis ranges from 0.0 to 1.6 A. Three linear plots are shown for Input Voltages: 100V (solid line with triangles), 200V (dashed line with squares), and 230V (dash-dot line with circles). A vertical slanted line is drawn at a load current of approximately 1.35A.</p> <table border="1"> <thead> <tr> <th>Load Current [A]</th> <th>Input Power [W] (100V)</th> <th>Input Power [W] (200V)</th> <th>Input Power [W] (230V)</th> </tr> </thead> <tbody> <tr><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td></tr> <tr><td>0.20</td><td>3.70</td><td>7.40</td><td>9.20</td></tr> <tr><td>0.40</td><td>7.40</td><td>14.80</td><td>18.40</td></tr> <tr><td>0.60</td><td>11.10</td><td>21.20</td><td>25.20</td></tr> <tr><td>0.80</td><td>14.80</td><td>28.60</td><td>34.60</td></tr> <tr><td>1.00</td><td>18.50</td><td>36.00</td><td>42.00</td></tr> <tr><td>1.20</td><td>22.20</td><td>43.40</td><td>50.40</td></tr> <tr><td>1.35</td><td>24.75</td><td>48.75</td><td>56.25</td></tr> <tr><td>1.43</td><td>26.30</td><td>51.90</td><td>59.70</td></tr> </tbody> </table>	Load Current [A]	Input Power [W] (100V)	Input Power [W] (200V)	Input Power [W] (230V)	0.00	0.00	0.00	0.00	0.20	3.70	7.40	9.20	0.40	7.40	14.80	18.40	0.60	11.10	21.20	25.20	0.80	14.80	28.60	34.60	1.00	18.50	36.00	42.00	1.20	22.20	43.40	50.40	1.35	24.75	48.75	56.25	1.43	26.30	51.90	59.70
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Note: Slanted line shows the range of the rated load current.

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Model	PMA15F-12
Item	Efficiency (by Input Voltage)
Object	—

## 1.Graph



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

Temperature 25°C  
Testing Circuitry Figure A

## 2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
75	72.6	69.7
85	73.9	72.2
100	74.6	74.3
120	76.1	76.5
200	74.7	78.4
230	73.9	77.6
264	72.6	76.8
280	71.9	76.1
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1. Graph	<p>Graph showing Power Factor vs Input Voltage for PMA15F-12 at 25°C. The Y-axis is Power Factor (0.2 to 0.8) and the X-axis is Input Voltage [V] (50 to 300). Two curves are shown: Load 50% (dashed line with squares) and Load 100% (solid line with triangles). Both curves show a decreasing trend as input voltage increases. A vertical slanted line indicates the rated input voltage range.</p>																																	
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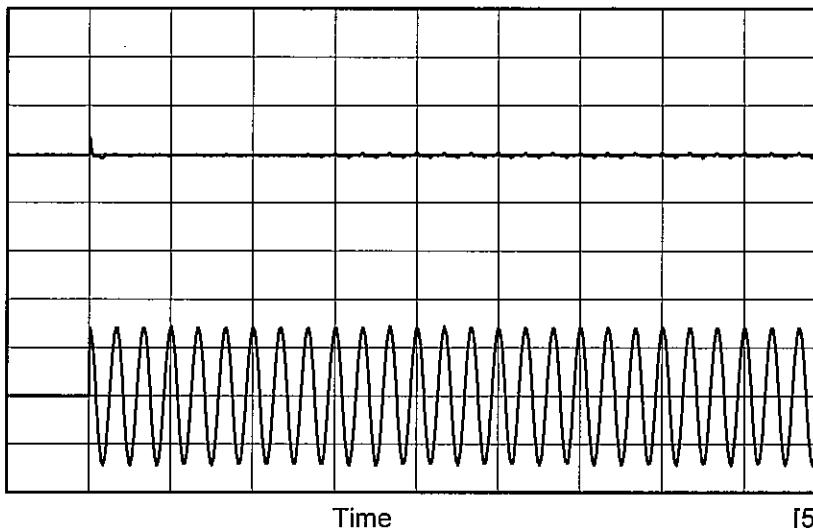
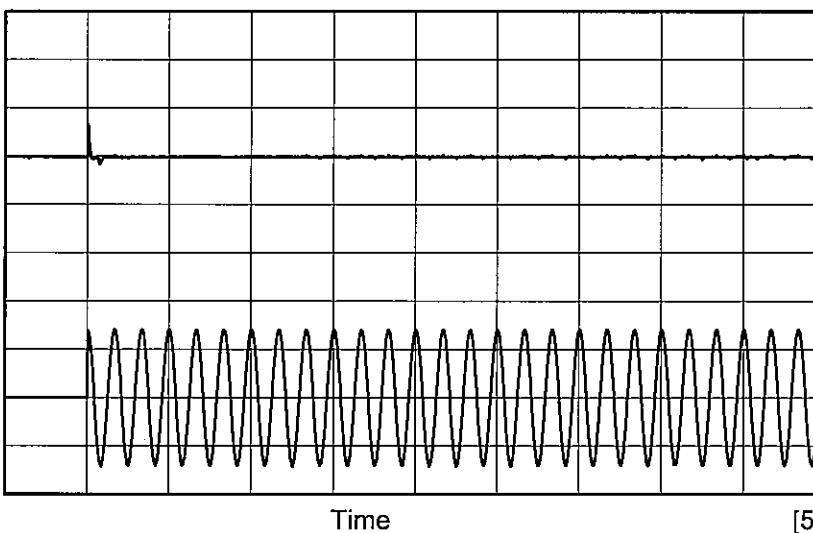
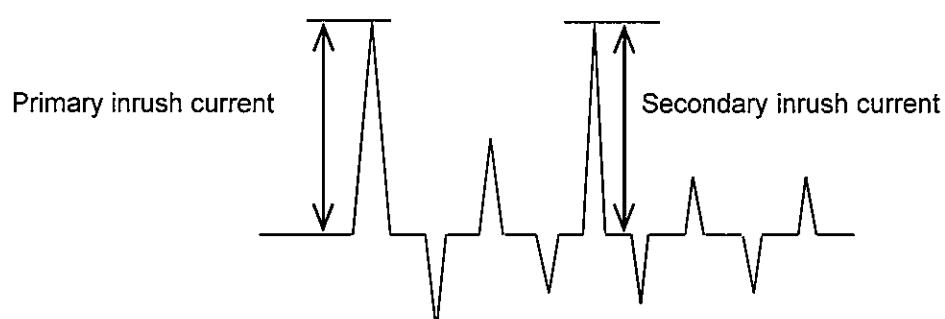
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Model PMA15F-12

Item Inrush Current

Object \_\_\_\_\_

Temperature 25°C  
Testing Circuitry Figure AInput  
Current  
[20A/div]Input Voltage 100 V  
Frequency 60 Hz  
Load 100 %Primary inrush current :  
7.1 A  
Secondary inrush current :  
1.2 AInput  
Voltage  
[100V/div]Input  
Current  
[20A/div]Input Voltage 230 V  
Frequency 60 Hz  
Load 100 %Primary inrush current :  
13.4 A  
Secondary inrush current :  
1.0 AInput  
Voltage  
[200V/div]



Model	PMA15F-12	Temperature	25°C
Item	Leakage Current	Testing Circuitry	Figure B
Object	<hr/>		

### 1. Results

Standards		Input Volt.			Note	[mA]
		100 [V]	200 [V]	240 [V]		
IEC60601	Both phases	0.02	0.04	0.05	Operation	
	One of phases	0.03	0.07	0.08	Stand by	

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

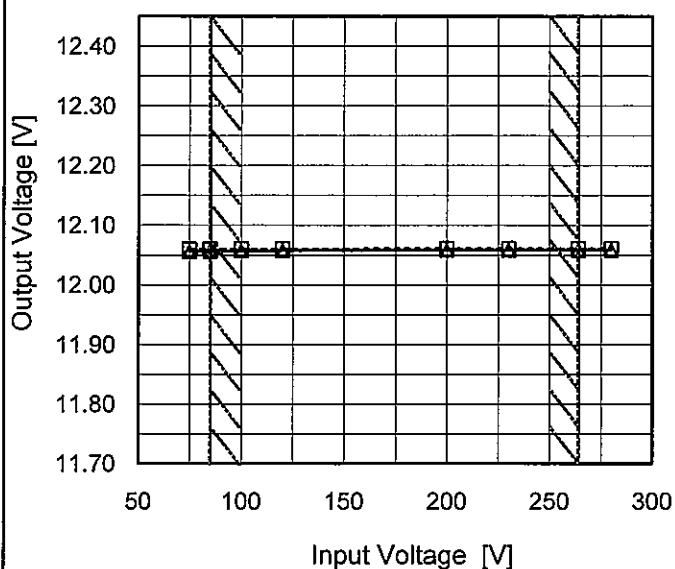
### 2. Condition

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

Model	PMA15F-12
Item	Line Regulation
Object	+12V1.3A

## 1. Graph

---□--- Load 50%  
—△— Load 100%



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

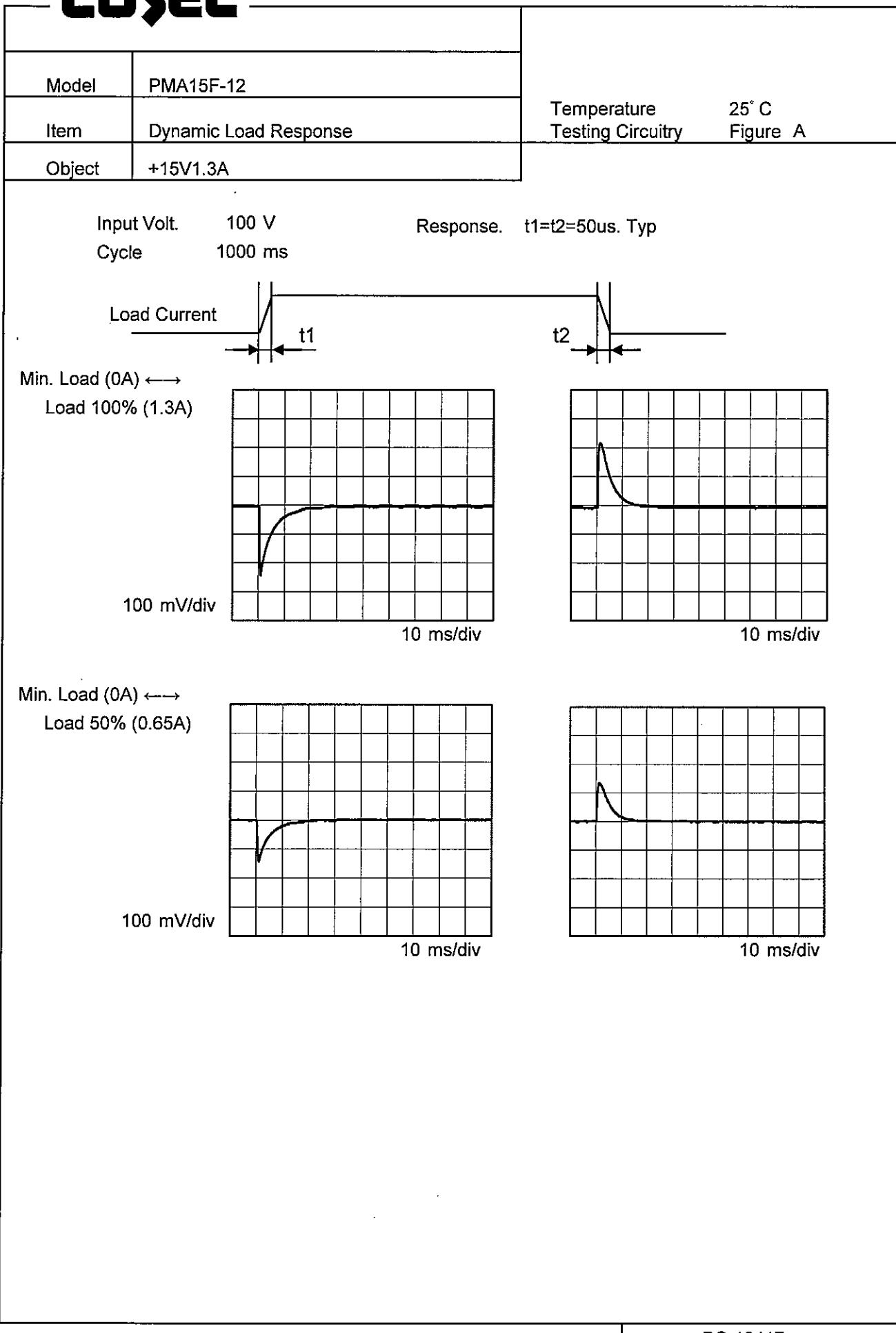
Temperature 25°C  
Testing Circuitry Figure A

## 2. Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
75	12.060	12.056
85	12.060	12.057
100	12.060	12.058
120	12.061	12.058
200	12.061	12.059
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1.20	12.058	12.059	12.059																																																				
1.30	12.057	12.059	12.059																																																				
1.43	12.056	12.058	12.058																																																				
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<p>Note: Slanted line shows the range of the rated load current.</p>																																																							

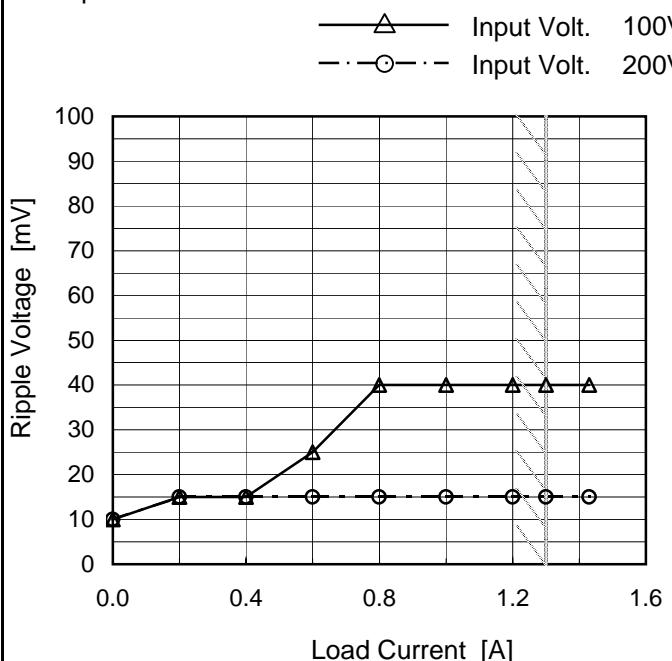
**COSEL**

**COSEL**

Model	PMA15F-12
Item	Ripple Voltage (by Load Current)
Object	+12V1.3A

 Temperature 25°C  
 Testing Circuitry Figure A

## 1. Graph



## 2. Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
0.00	10	10
0.20	15	15
0.40	15	15
0.60	25	15
0.80	40	15
1.00	40	15
1.20	40	15
1.30	40	15
1.43	40	15
--	-	-
--	-	-

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

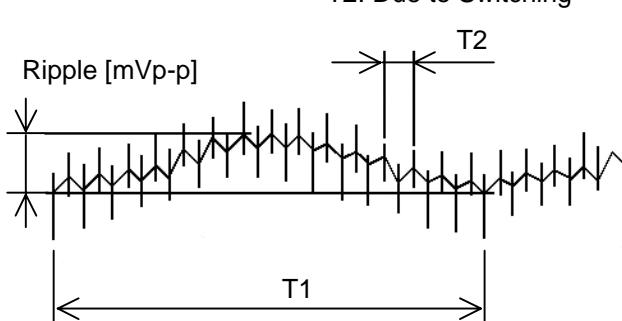


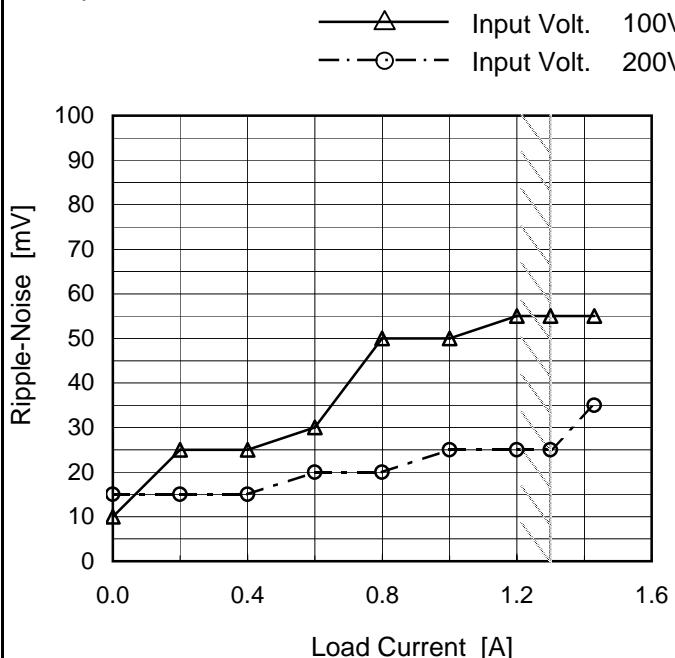
Fig. Complex Ripple Wave Form

**COSEL**

Model	PMA15F-12
Item	Ripple-Noise
Object	+12V1.3A

Temperature 25°C  
Testing Circuitry Figure A

## 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. 200 [V]
0.00	10	15
0.20	25	15
0.40	25	15
0.60	30	20
0.80	50	20
1.00	50	25
1.20	55	25
1.30	55	25
1.43	55	35
--	-	-
--	-	-

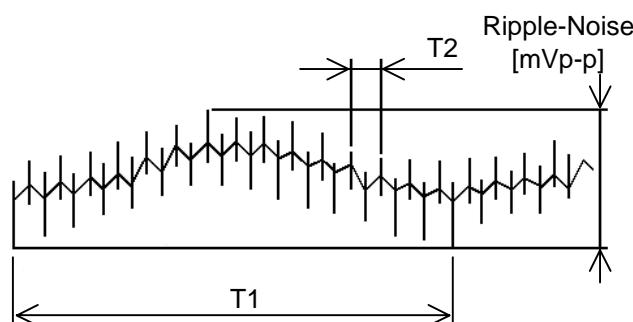
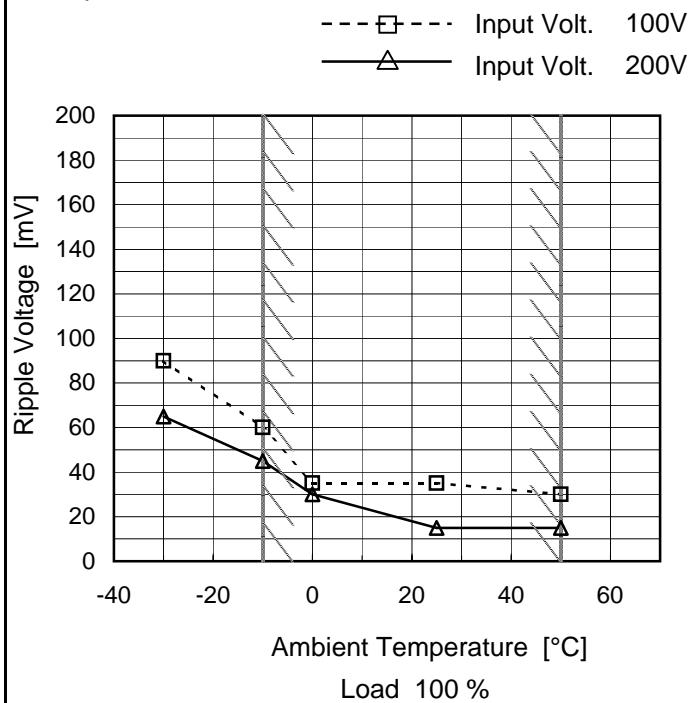
T1: Due to AC Input Line  
T2: Due to Switching

Fig. Complex Ripple Wave Form

**COSEL**

Model	PMA15F-12
Item	Ripple Voltage (by Ambient Temp.)
Object	+12V1.3A

## 1. Graph



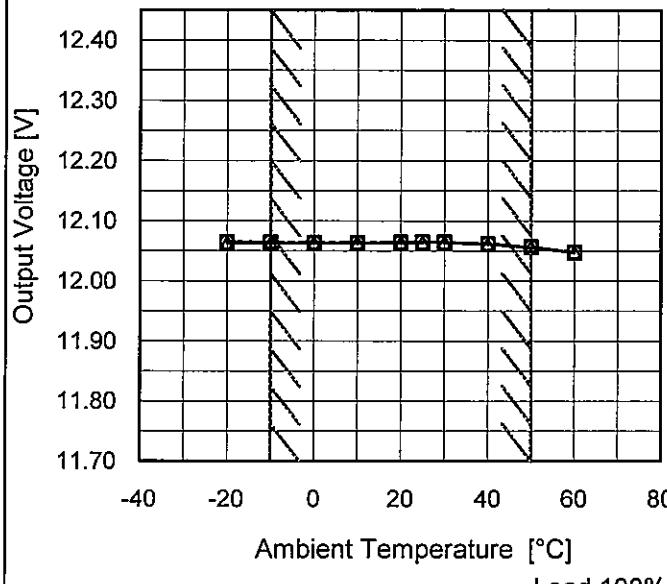
Measured by 20 MHz Oscilloscope.

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

## Testing Circuitry Figure A

## 2. Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
-30	90	65
-10	60	45
0	35	30
25	35	15
50	30	15
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

Model	PMA15F-12	Testing Circuitry Figure A		
Item	Ambient Temperature Drift			
Object	+12V1.3A			
1.Graph	<p>—△— Input Volt. 100V      - - -□- - Input Volt. 200V      - · -○- - Input Volt. 230V</p>  <p>Output Voltage [V]</p> <p>Ambient Temperature [°C]</p> <p>Load 100%</p>	2.Values		
2.Values				
Ambient Temperature [°C]	Output Voltage [V]			
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	
-20	12.063	12.065	12.065	
-10	12.063	12.065	12.065	
0	12.063	12.064	12.064	
10	12.063	12.064	12.064	
20	12.063	12.065	12.065	
25	12.064	12.065	12.065	
30	12.064	12.065	12.065	
40	12.061	12.063	12.063	
50	12.056	12.057	12.057	
60	12.048	12.049	12.049	
--	-	-	-	

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



Model	PMA15F-12	Testing Circuitry Figure A
Item	Output Voltage Accuracy	
Object	+12V1.3A	

### 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 - 50°C

Input Voltage : 85 - 264V

Load Current : 0 - 1.3A

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

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

### 2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	0	264	0	12.071	±8	±0.1
Minimum Voltage	50	85	1.3	12.055		

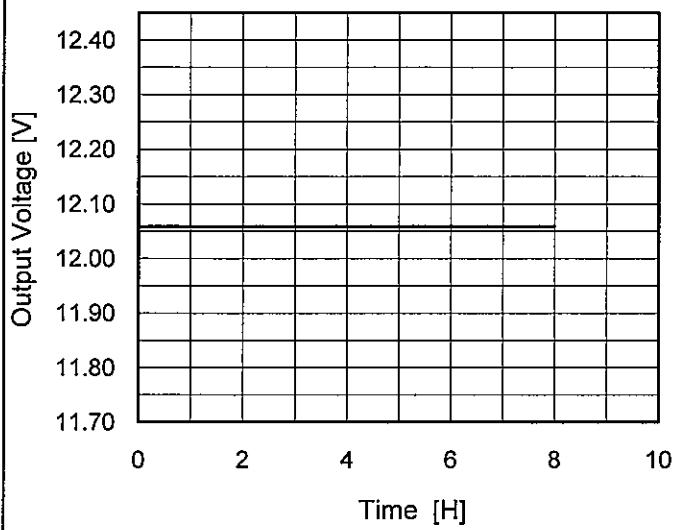
**COSEL**

Model PMA15F-12

Item Time Lapse Drift

Object +12V1.3A

## 1. Graph

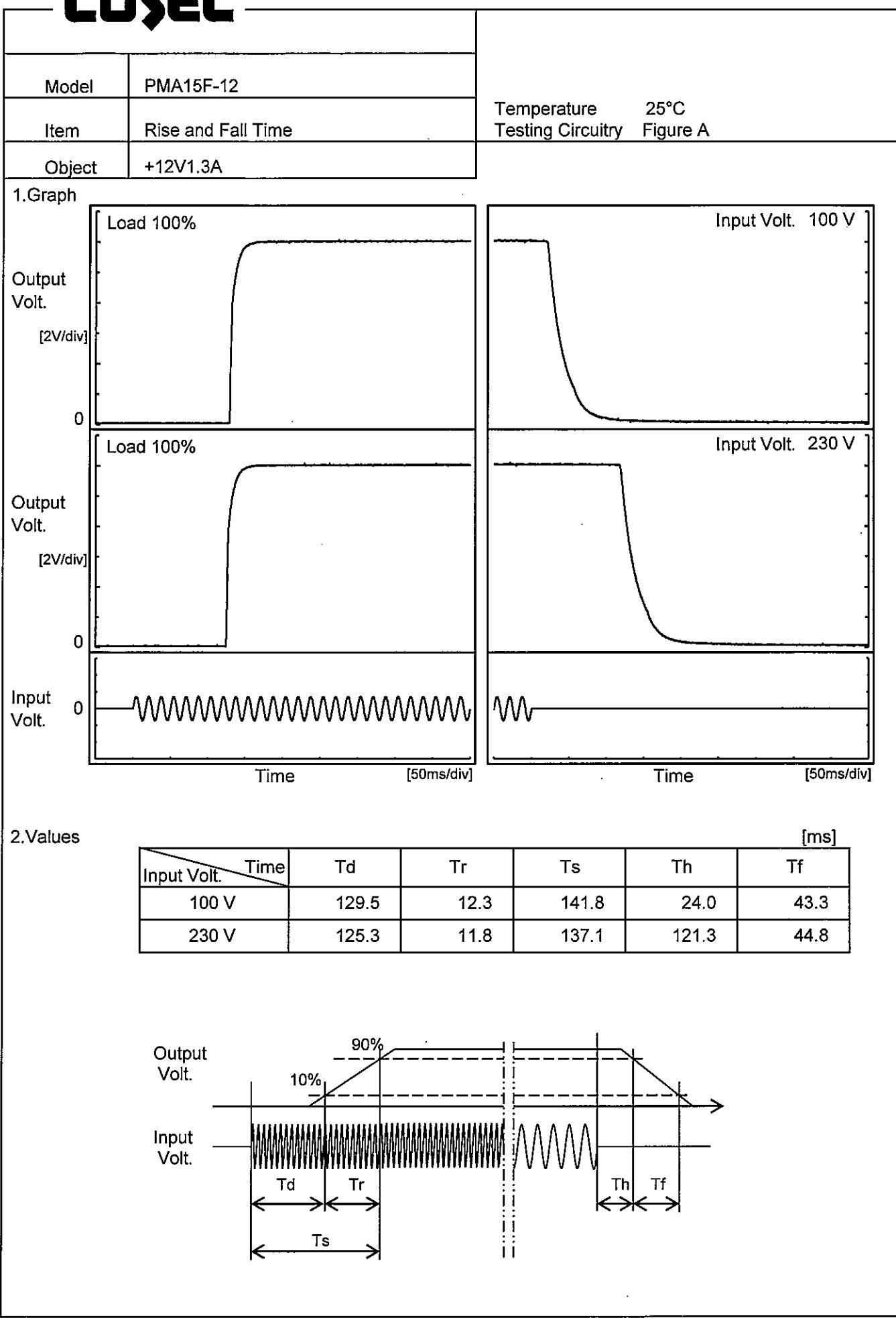


\* The characteristic of AC100V is equal.

Temperature 25°C  
Testing Circuitry Figure A

## 2. Values

Time since start [H]	Output Voltage [V]
0.0	12.059
0.5	12.059
1.0	12.059
2.0	12.059
3.0	12.059
4.0	12.059
5.0	12.059
6.0	12.059
7.0	12.059
8.0	12.059

**coSEL**

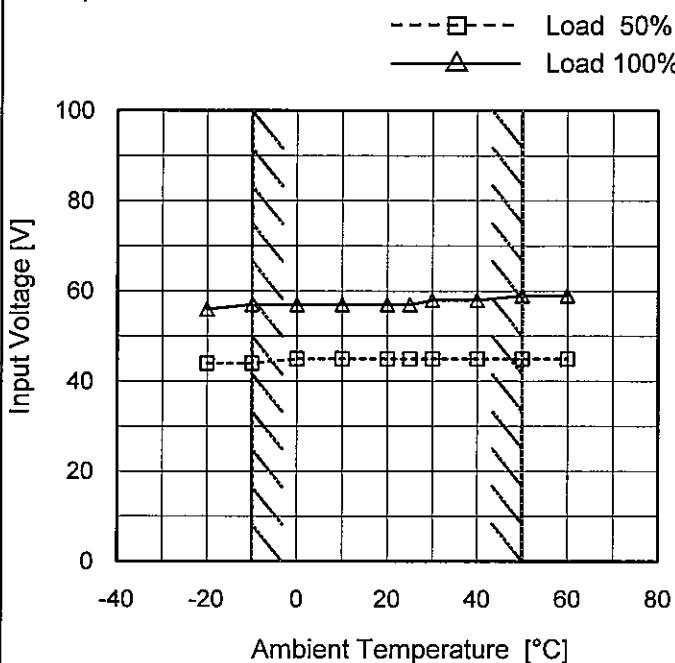
Model	PMA15F-12	Temperature	25°C																																
Item	Hold-Up Time	Testing Circuitry	Figure A																																
Object	+12V1.3A																																		
1. Graph																																			
2. Values																																			
<table border="1"> <thead> <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> </thead> <tbody> <tr> <td>75</td><td>23</td><td>9</td></tr> <tr> <td>85</td><td>33</td><td>14</td></tr> <tr> <td>100</td><td>50</td><td>22</td></tr> <tr> <td>120</td><td>77</td><td>36</td></tr> <tr> <td>200</td><td>242</td><td>120</td></tr> <tr> <td>230</td><td>326</td><td>163</td></tr> <tr> <td>264</td><td>438</td><td>220</td></tr> <tr> <td>280</td><td>496</td><td>250</td></tr> <tr> <td>--</td><td>-</td><td>-</td></tr> </tbody> </table>				Input Voltage [V]	Hold-Up Time [ms]		Load 50%	Load 100%	75	23	9	85	33	14	100	50	22	120	77	36	200	242	120	230	326	163	264	438	220	280	496	250	--	-	-
Input Voltage [V]	Hold-Up Time [ms]																																		
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230	326	163																																	
264	438	220																																	
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<p>This duration covers from Shut-off of input voltage to the moment when output voltage descends to the rated range of voltage accuracy.</p> <p>Note: Slanted line shows the range of the rated input voltage.</p>																																			

Model	PMA15F-12	Temperature	25°C																																																			
Item	Instantaneous Interruption Compensation	Testing Circuitry	Figure A																																																			
Object	+12V1.3A																																																					
1.Graph	<p>—△— Input Volt. 100V        - - -□--- Input Volt. 200V        - - -○--- Input Volt. 230V</p> <table border="1"> <caption>Data points estimated from Graph 1</caption> <thead> <tr> <th>Load Current [A]</th> <th>100V [ms]</th> <th>200V [ms]</th> <th>230V [ms]</th> </tr> </thead> <tbody> <tr><td>0.3</td><td>180</td><td>800</td><td>950</td></tr> <tr><td>0.4</td><td>80</td><td>450</td><td>650</td></tr> <tr><td>0.6</td><td>40</td><td>250</td><td>350</td></tr> <tr><td>0.8</td><td>30</td><td>200</td><td>300</td></tr> <tr><td>1.0</td><td>25</td><td>150</td><td>250</td></tr> <tr><td>1.2</td><td>20</td><td>120</td><td>200</td></tr> <tr><td>1.4</td><td>18</td><td>100</td><td>180</td></tr> </tbody> </table>			Load Current [A]	100V [ms]	200V [ms]	230V [ms]	0.3	180	800	950	0.4	80	450	650	0.6	40	250	350	0.8	30	200	300	1.0	25	150	250	1.2	20	120	200	1.4	18	100	180																			
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Note:	Slanted line shows the range of the rated load current.																																																					



Model	PMA15F-12
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+12V1.3A

## 1. Graph



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

Testing Circuitry Figure A

## 2. Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-20	44	56
-10	44	57
0	45	57
10	45	57
20	45	57
25	45	57
30	45	58
40	45	58
50	45	59
60	45	59
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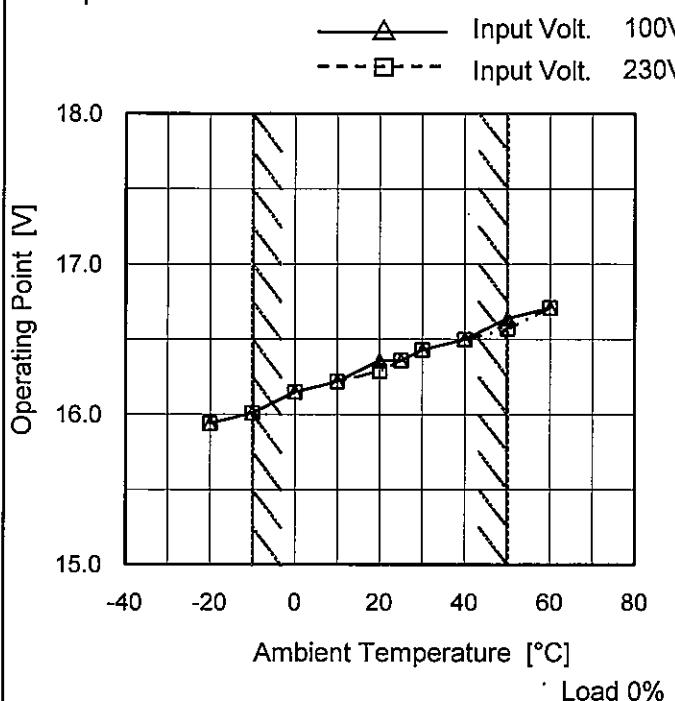
**COSEL**

Model	PMA15F-12	
Item	Overcurrent Protection	Temperature      25°C Testing Circuitry      Figure A
Object	+12V1.3A	
1. Graph		
<p>Output Voltage [V]</p> <p>Load Current [A]</p> <p>Input Volt. 100V</p> <p>Input Volt. 230V</p>		
<p>Note: Slanted line shows the range of the rated load current.</p>		
2. Values		
Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 230[V]
12.0	2.24	2.74
11.4	-	-
10.8	-	-
9.6	-	-
8.4	-	-
7.2	-	-
6.0	-	-
4.8	-	-
3.6	-	-
2.4	-	-
1.2	-	-
0.0	-	-

**COSEL**

Model	PMA15F-12
Item	Oversupply Protection
Object	+12V1.3A

## 1. Graph



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

## Testing Circuitry Figure A

## 2. Values

Ambient Temperature [°C]	Operating Point [V]	
	Input Volt. 100[V]	Input Volt. 230[V]
-20	15.94	15.94
-10	16.01	16.01
0	16.15	16.15
10	16.22	16.22
20	16.36	16.29
25	16.36	16.36
30	16.43	16.43
40	16.50	16.50
50	16.64	16.57
60	16.71	16.71
--	-	-

COSEL

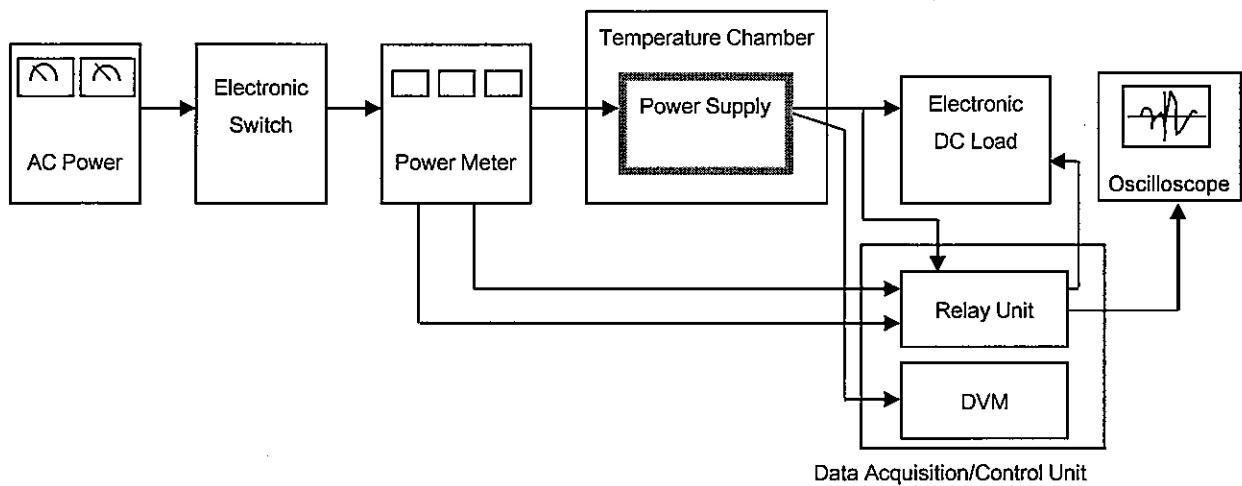


Figure A

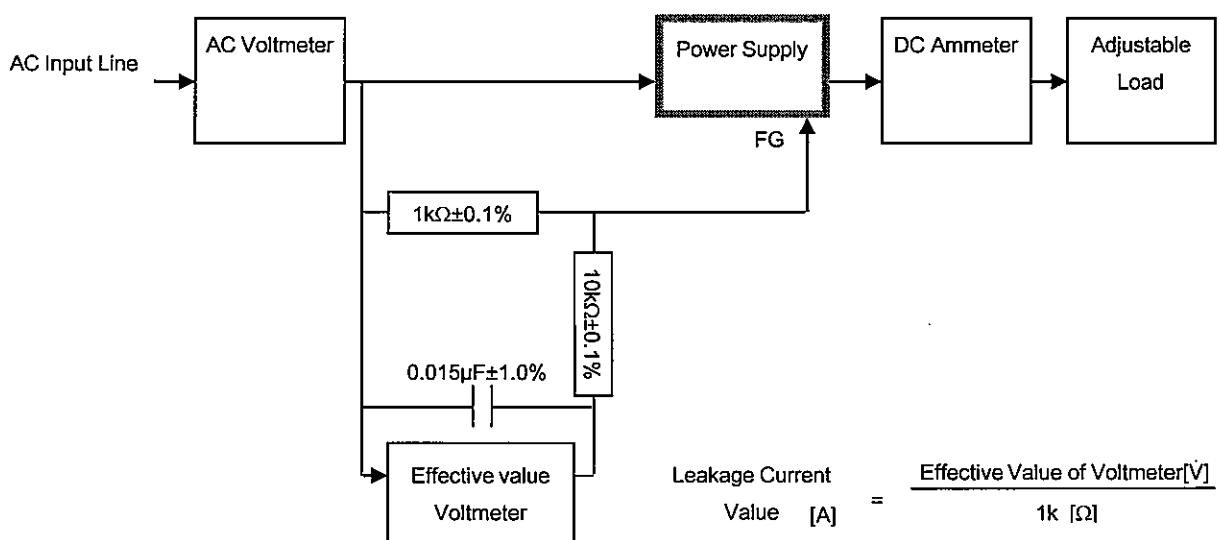


Figure B ( IEC60601-1 )