

TEST DATA OF PMA60F-5

Regulated DC Power Supply
June 4, 2010

Approved by : Katsumi Ishikawa
Katsumi Ishikawa Design Manager

Prepared by : Shintaro Oki
Shintaro Oki Design Engineer

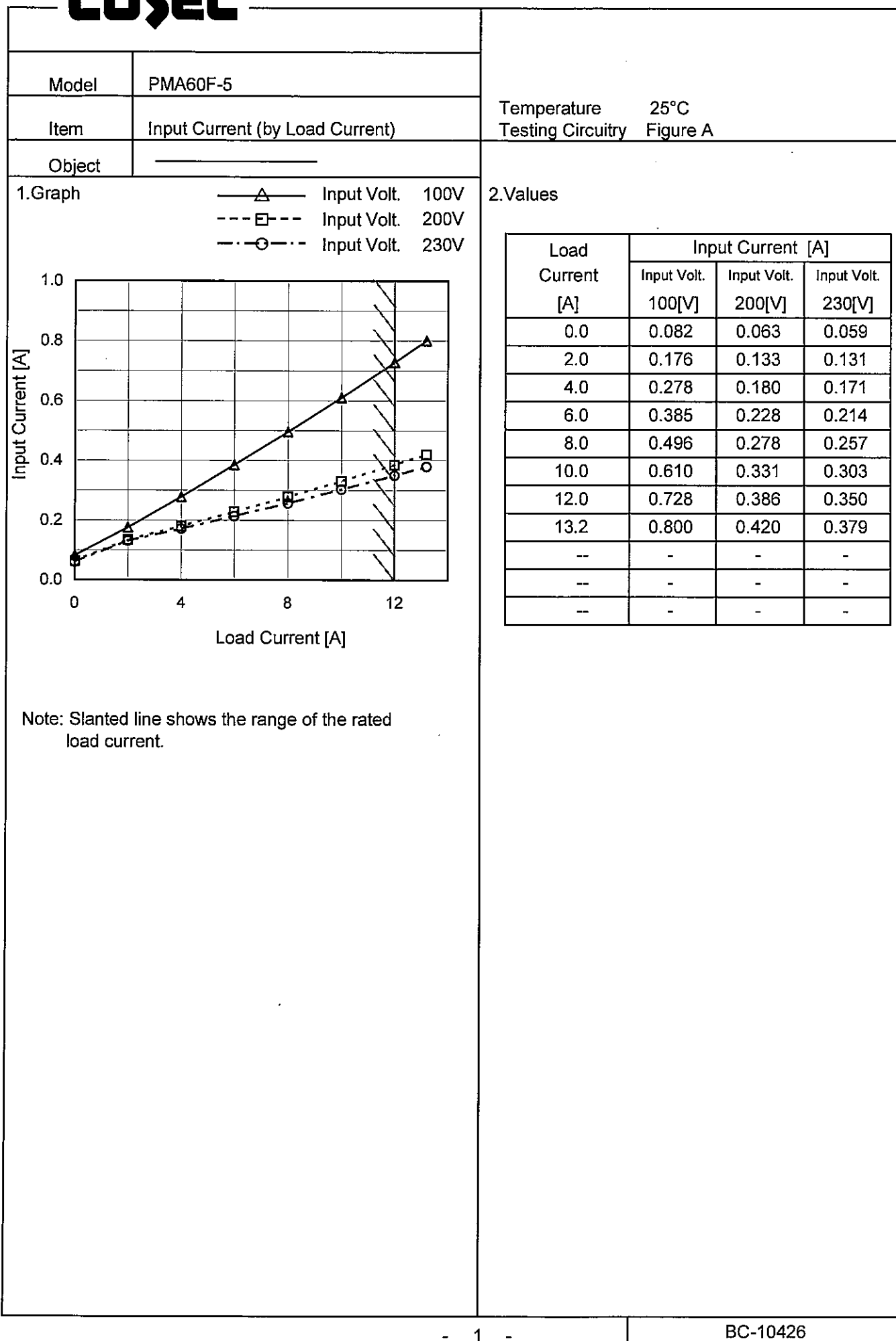
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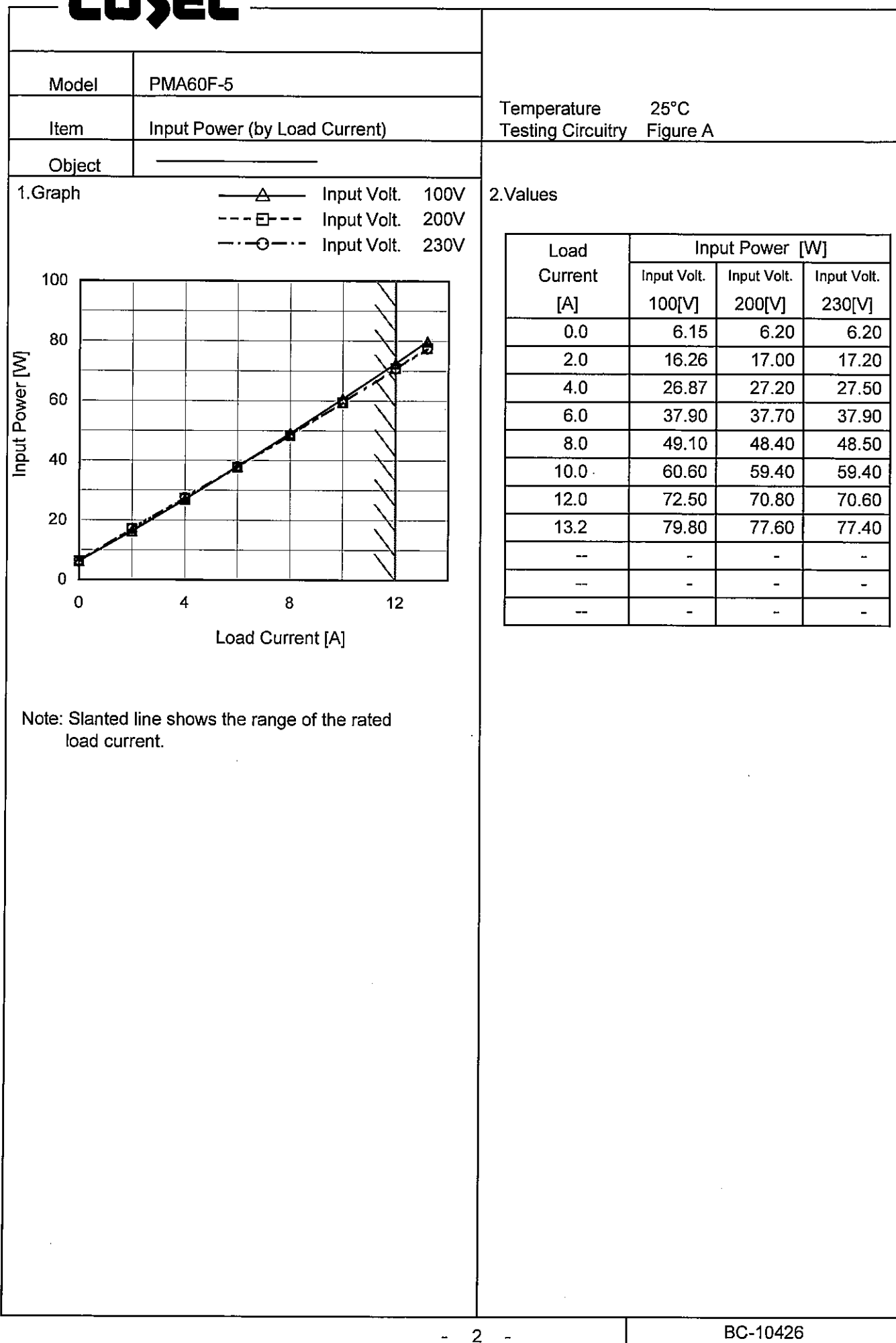
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Model	PMA60F-5
Item	Efficiency (by Input Voltage)
Object	

Temperature 25°C
Testing Circuitry Figure A

1.Graph

---□--- Load 50%
—△— Load 100%

Input Voltage [V]	Load 50% Efficiency [%]	Load 100% Efficiency [%]
75	77.0	79.3
85	77.8	80.5
100	78.2	81.6
120	78.7	82.5
200	78.4	83.5
230	78.0	83.6
264	77.4	83.6
280	78.0	83.5

Efficiency [%]

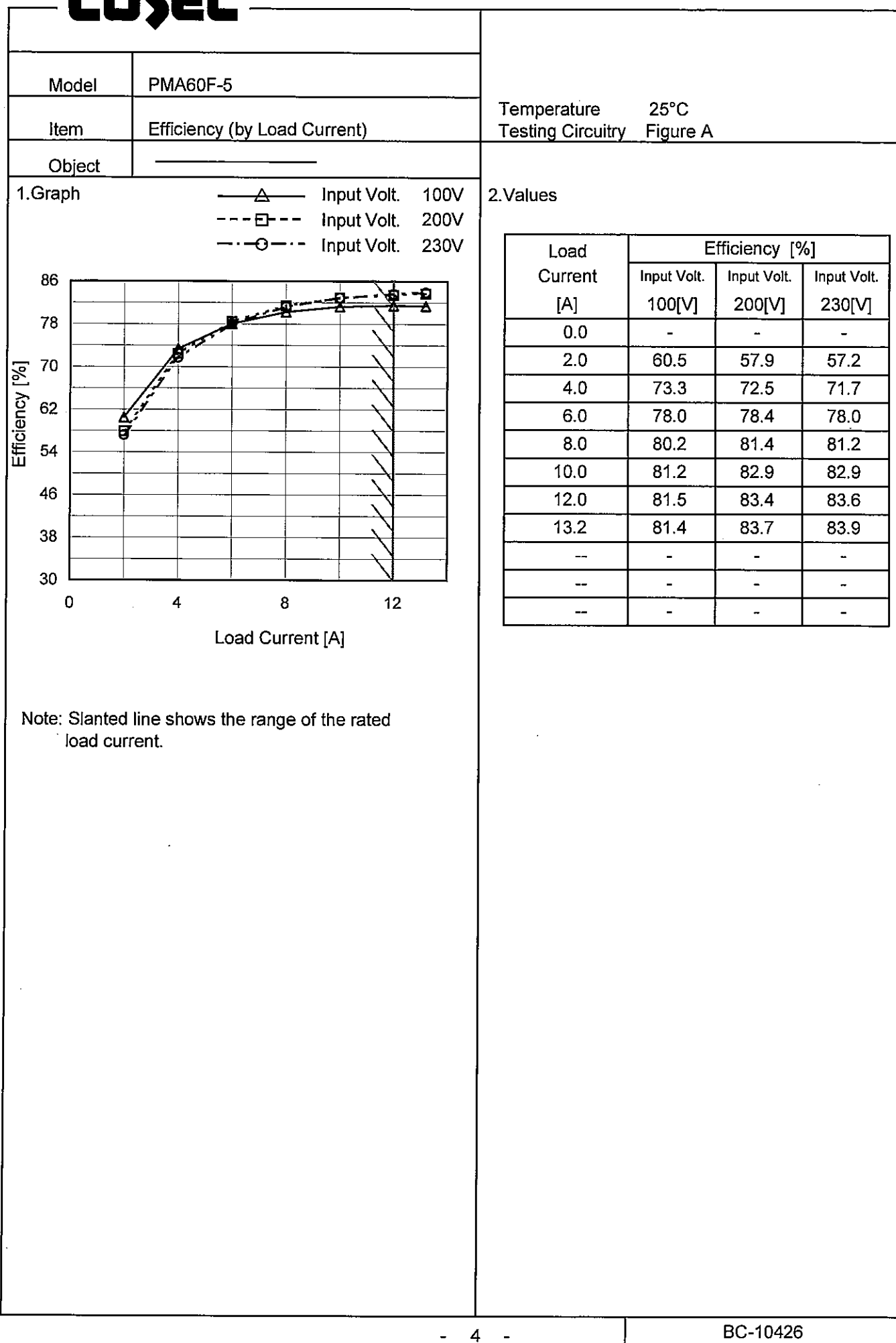
Input Voltage [V]

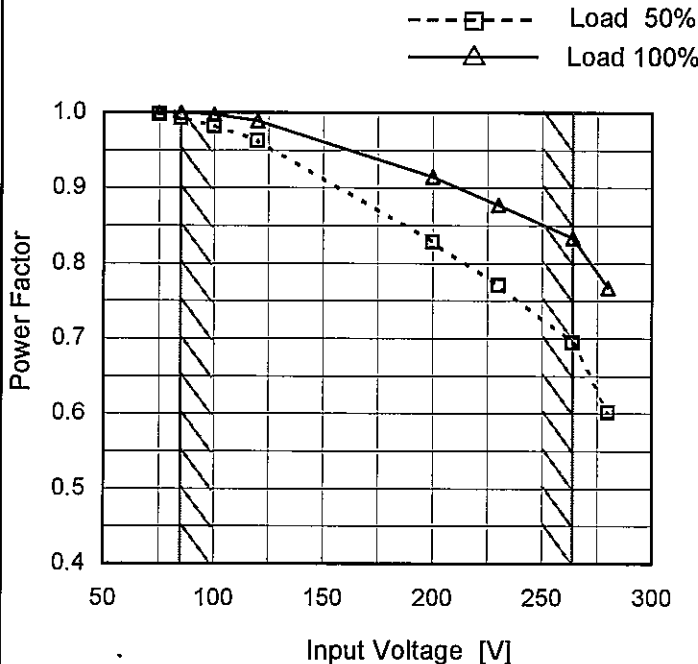
Note: Slanted line shows the range of the rated input voltage.

2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
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85	77.8	80.5
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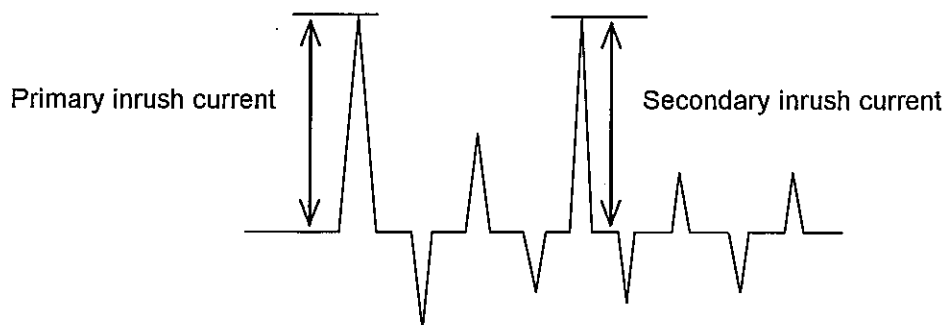
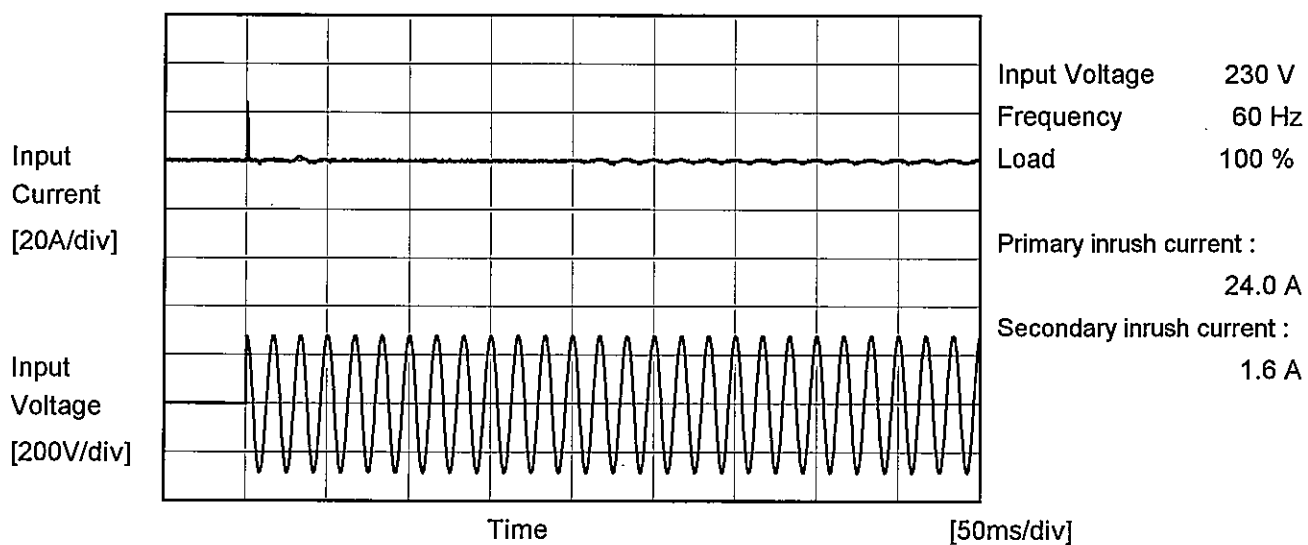
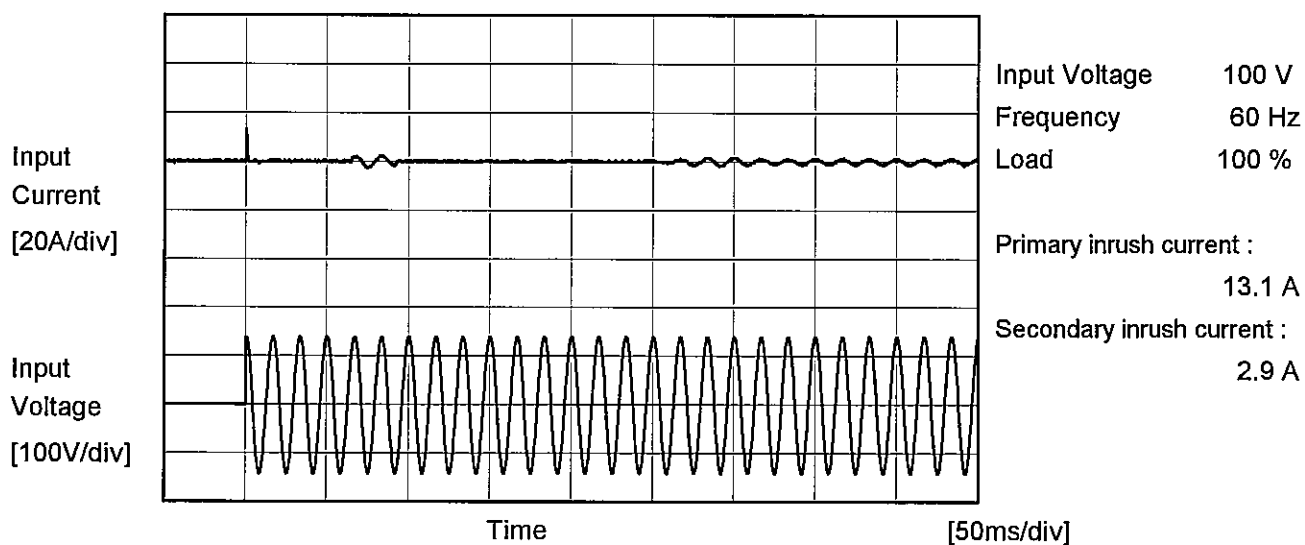
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Model	PMA60F-5																																		
Item	Power Factor (by Input Voltage)	Temperature	25°C																																
Object		Testing Circuitry	Figure A																																
1.Graph		2.Values																																	
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Model	PMA60F-5		
Item	Inrush Current	Temperature	25°C
Object		Testing Circuitry	Figure A



Model		PMA60F-5	Temperature 25°C Testing Circuitry Figure B
Item		Leakage Current	
Object		_____	

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	200 [V]	240 [V]	
IEC60601	Both phases	0.05	0.12	0.14	Operation
	One of phases	0.08	0.19	0.21	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	PMA60F-5																																
Item	Line Regulation	Temperature	25°C																														
Object	+5V12A	Testing Circuitry	Figure A																														
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Model PMA60F-5

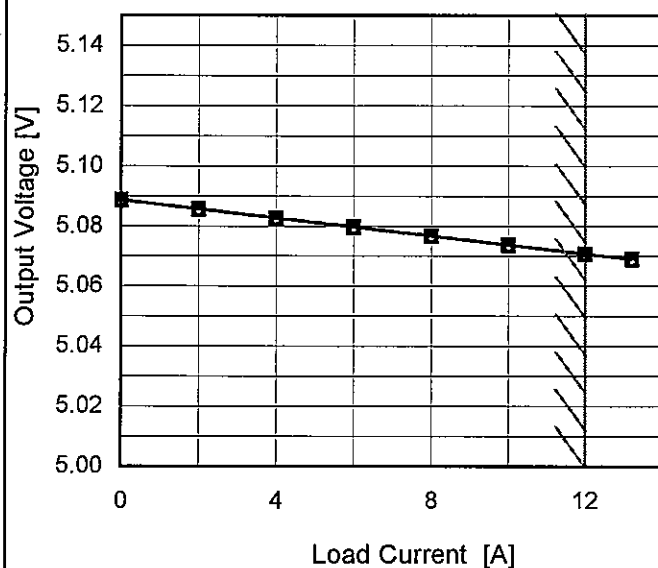
Item Load Regulation

Object +5V12A

Temperature 25°C
Testing Circuitry Figure A

1. Graph

—△— Input Volt. 100V
 ---□--- Input Volt. 200V
 ---○--- Input Volt. 230V



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

2. Values

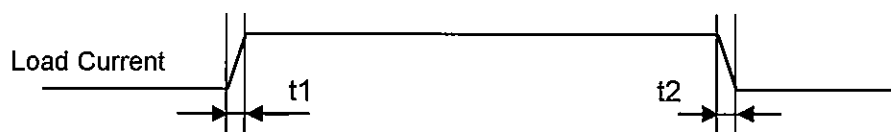
Load Current [A]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	5.089	5.089	5.089
2.0	5.086	5.086	5.086
4.0	5.083	5.083	5.083
6.0	5.080	5.080	5.080
8.0	5.077	5.077	5.077
10.0	5.074	5.074	5.074
12.0	5.071	5.071	5.071
13.2	5.069	5.069	5.069
--	-	-	-
--	-	-	-
--	-	-	-



Model	PMA60F-5	Temperature Testing Circuitry	25° C Figure A
Item	Dynamic Load Response		
Object	+5V12A		

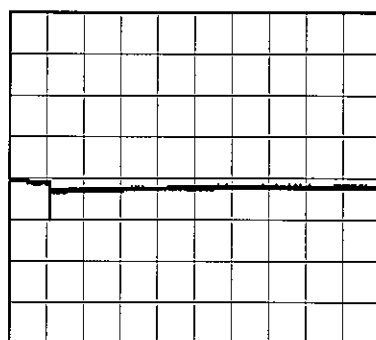
Input Volt. 100 V
Cycle 1000 ms

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

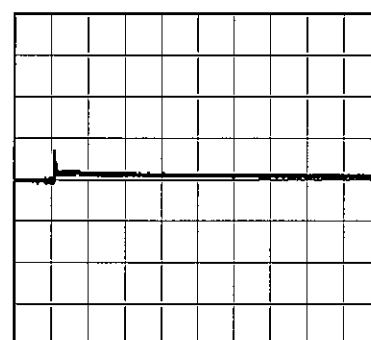


Min. Load (0A) \longleftrightarrow
Load 100% (12A)

100 mV/div



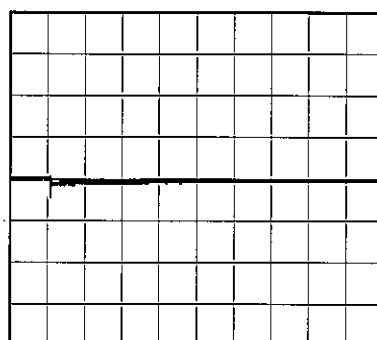
10 ms/div



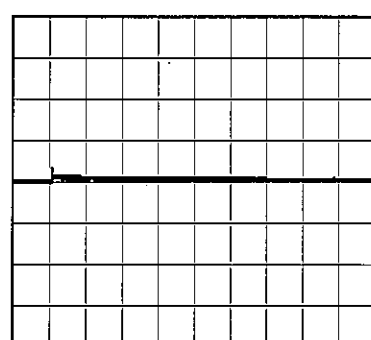
10 ms/div

Min. Load (0A) \longleftrightarrow
Load 50% (6A)

100 mV/div



10 ms/div



10 ms/div

Model	PMA60F-5	Temperature Testing Circuitry	25°C Figure A																																						
Item	Ripple Voltage (by Load Current)																																								
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		Testing Circuitry Figure A
Model	PMA60F-5	
Item	Output Voltage Accuracy	
Object	+5V12A	

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 - 12A

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

* 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	30	264	0	5.093	±11	±0.2
Minimum Voltage	50	264	12	5.071		

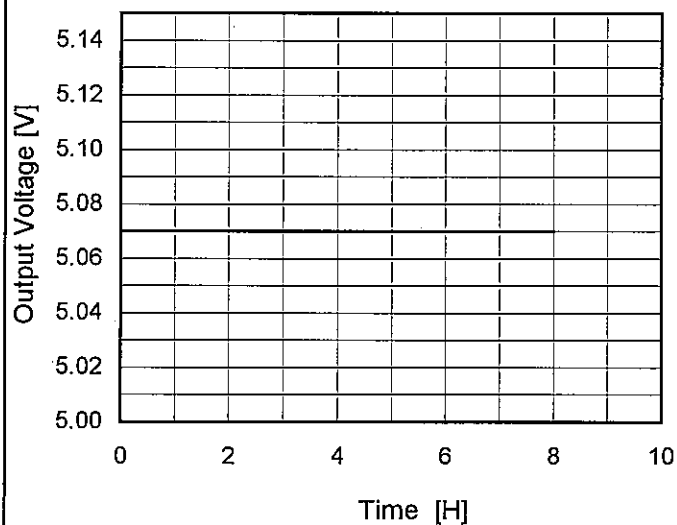
Model PMA60F-5

Item Time Lapse Drift

Object +5V12A

Temperature 25°C
Testing Circuitry Figure A

1. Graph



* The characteristic of AC200V is equal.

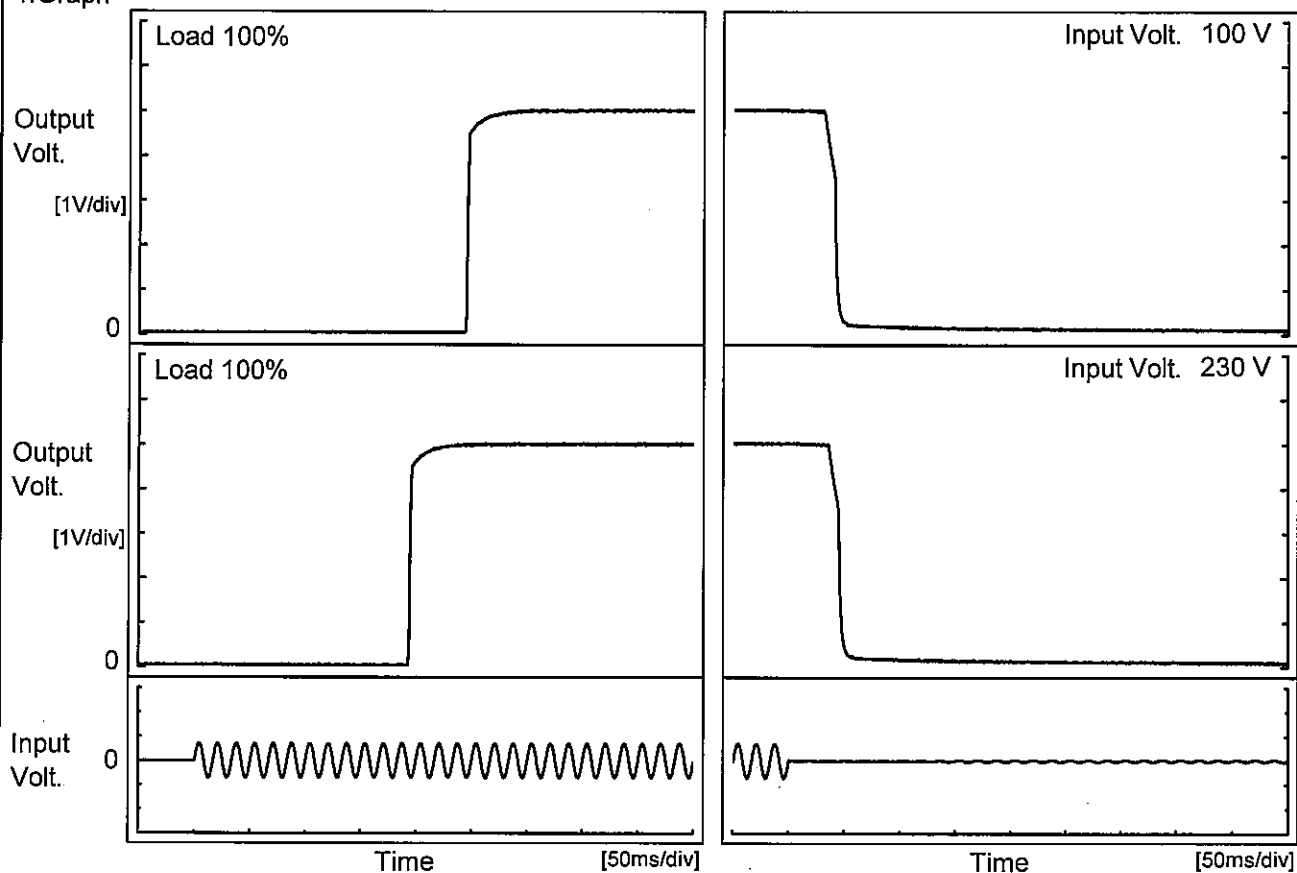
2. Values

Time since start [H]	Output Voltage [V]
0.0	5.071
0.5	5.070
1.0	5.070
2.0	5.070
3.0	5.070
4.0	5.070
5.0	5.070
6.0	5.070
7.0	5.070
8.0	5.070

COSEL

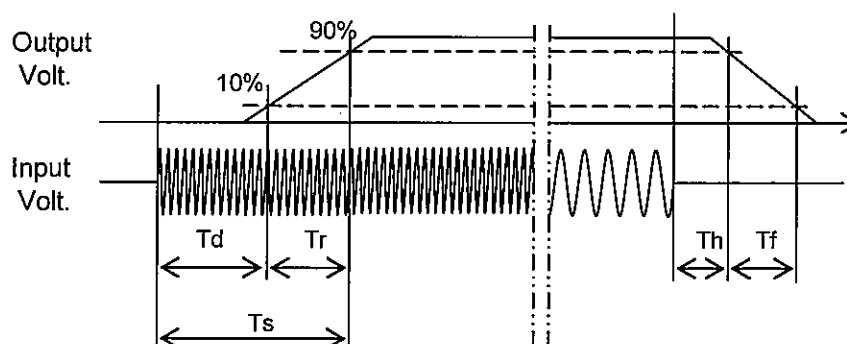
Model	PMA60F-5	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+5V12A		

1. Graph



2. Values

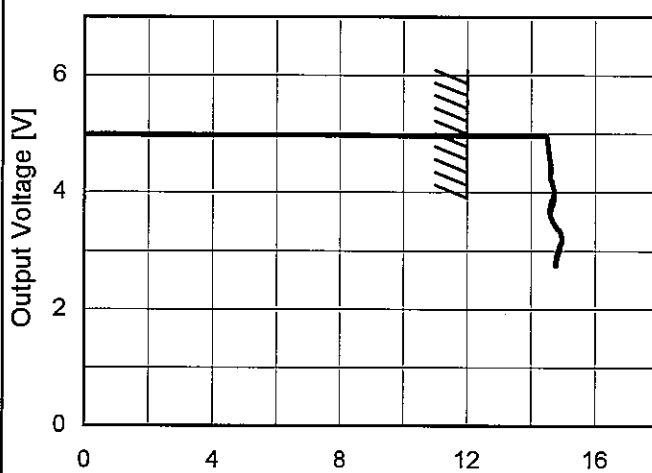
Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	245.0	4.0	249.0	34.3	11.0
230 V	194.0	3.8	197.8	38.5	11.3

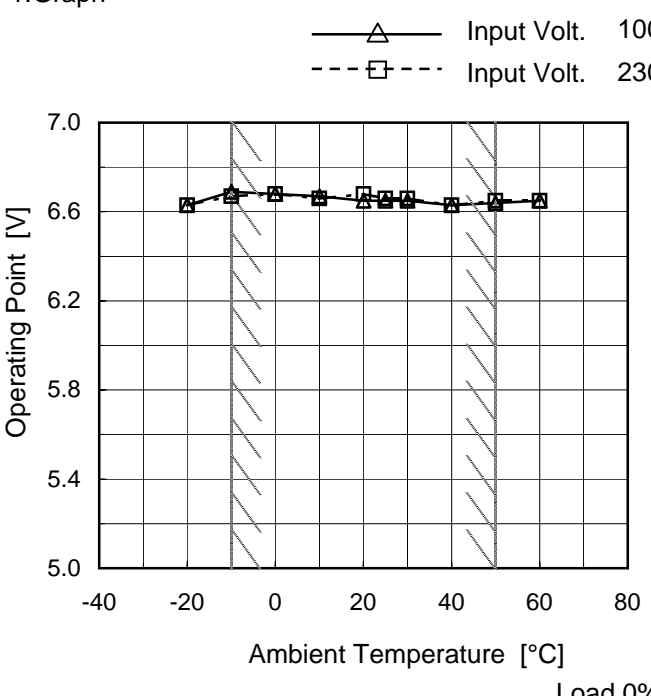


Model	PMA60F-5																																																																
Item	Hold-Up Time	Temperature	25°C																																																														
		Testing Circuitry	Figure A																																																														
Object	+5V12A																																																																
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<div><div>---□--- Load 50%</div><div>—△— Load 100%</div></div> <table border="1"><caption>Data for Graph: Hold-Up Time vs Input Voltage</caption><thead><tr><th>Input Voltage [V]</th><th>Load 50% [ms]</th><th>Load 100% [ms]</th></tr></thead><tbody><tr><td>75</td><td>65</td><td>29</td></tr><tr><td>85</td><td>68</td><td>31</td></tr><tr><td>100</td><td>70</td><td>33</td></tr><tr><td>120</td><td>72</td><td>34</td></tr><tr><td>200</td><td>76</td><td>37</td></tr><tr><td>230</td><td>77</td><td>38</td></tr><tr><td>264</td><td>78</td><td>38</td></tr><tr><td>280</td><td>77</td><td>38</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></tbody></table>		Input Voltage [V]	Load 50% [ms]	Load 100% [ms]	75	65	29	85	68	31	100	70	33	120	72	34	200	76	37	230	77	38	264	78	38	280	77	38	--	-	-	<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>75</td><td>65</td><td>29</td></tr><tr><td>85</td><td>68</td><td>31</td></tr><tr><td>100</td><td>70</td><td>33</td></tr><tr><td>120</td><td>72</td><td>34</td></tr><tr><td>200</td><td>76</td><td>37</td></tr><tr><td>230</td><td>77</td><td>38</td></tr><tr><td>264</td><td>78</td><td>38</td></tr><tr><td>280</td><td>77</td><td>38</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Input Voltage [V]	Hold-Up Time [ms]		Load 50%	Load 100%	75	65	29	85	68	31	100	70	33	120	72	34	200	76	37	230	77	38	264	78	38	280	77	38	--	-	-
Input Voltage [V]	Load 50% [ms]	Load 100% [ms]																																																															
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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	PMA60F-5																																																					
Item	Instantaneous Interruption Compensation	Temperature	25°C																																																			
Object	+5V12A	Testing Circuitry	Figure A																																																			
1.Graph		2.Values																																																				
<div><div>—△— Input Volt. 100V</div><div>---□--- Input Volt. 200V</div><div>-·-○-·- Input Volt. 230V</div></div> <p>Instantaneous Compensation Time [ms]</p> <p>Load Current [A]</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>2.0</td><td>147</td><td>204</td><td>221</td></tr><tr><td>4.0</td><td>106</td><td>112</td><td>115</td></tr><tr><td>6.0</td><td>72</td><td>79</td><td>80</td></tr><tr><td>8.0</td><td>52</td><td>60</td><td>60</td></tr><tr><td>10.0</td><td>42</td><td>47</td><td>46</td></tr><tr><td>12.0</td><td>35</td><td>36</td><td>40</td></tr><tr><td>13.2</td><td>28</td><td>35</td><td>35</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	-	-	-	2.0	147	204	221	4.0	106	112	115	6.0	72	79	80	8.0	52	60	60	10.0	42	47	46	12.0	35	36	40	13.2	28	35	35	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Time [ms]																																																					
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		Testing Circuitry Figure A																																						
Model	PMA60F-5																																							
Item	Minimum Input Voltage for Regulated Output Voltage																																							
Object	+5V12A																																							
1.Graph		2.Values																																						
<div><div><div>---□--- Load 50%</div><div>—△— Load 100%</div></div><div>Input Voltage [V]</div><div>Ambient Temperature [°C]</div></div>																																								
<p>Note: Slanted line shows the range of the rated ambient temperature.</p>																																								
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Ambient Temperature [°C]	Input Voltage [V]																																							
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Model	PMA60F-5																																														
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<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>5.00</td><td>13.02</td><td>13.03</td></tr><tr><td>4.75</td><td>14.58</td><td>14.55</td></tr><tr><td>4.50</td><td>14.62</td><td>14.60</td></tr><tr><td>4.00</td><td>14.72</td><td>14.71</td></tr><tr><td>3.50</td><td>14.65</td><td>14.65</td></tr><tr><td>3.00</td><td>14.95</td><td>14.89</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]	5.00	13.02	13.03	4.75	14.58	14.55	4.50	14.62	14.60	4.00	14.72	14.71	3.50	14.65	14.65	3.00	14.95	14.89	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-
Output Voltage [V]	Load Current [A]																																														
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1.Graph <div><div><div><div><div></div><div>—△—</div><div>Input Volt. 100V</div></div><div><div>---□---</div><div>Input Volt. 230V</div></div></div><div></div></div><p style="text-align: center;">Load 0%</p><p>Note: Slanted line shows the range of the rated ambient temperature.</p></div>		2.Values <table><tr><th rowspan="2">Ambient Temperature [°C]</th><th colspan="2">Operating Point [V]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>-20</td><td>6.63</td><td>6.63</td></tr><tr><td>-10</td><td>6.69</td><td>6.67</td></tr><tr><td>0</td><td>6.68</td><td>6.68</td></tr><tr><td>10</td><td>6.67</td><td>6.66</td></tr><tr><td>20</td><td>6.65</td><td>6.68</td></tr><tr><td>25</td><td>6.65</td><td>6.66</td></tr><tr><td>30</td><td>6.65</td><td>6.66</td></tr><tr><td>40</td><td>6.63</td><td>6.63</td></tr><tr><td>50</td><td>6.64</td><td>6.65</td></tr><tr><td>60</td><td>6.65</td><td>6.65</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Ambient Temperature [°C]	Operating Point [V]		Input Volt. 100[V]	Input Volt. 230[V]	-20	6.63	6.63	-10	6.69	6.67	0	6.68	6.68	10	6.67	6.66	20	6.65	6.68	25	6.65	6.66	30	6.65	6.66	40	6.63	6.63	50	6.64	6.65	60	6.65	6.65	--	-	-
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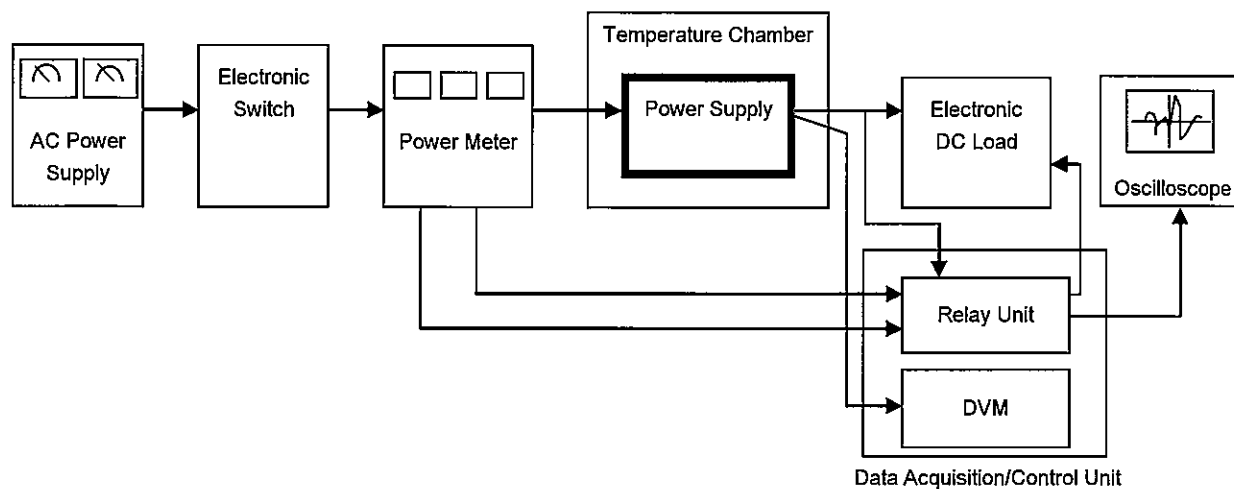


Figure A

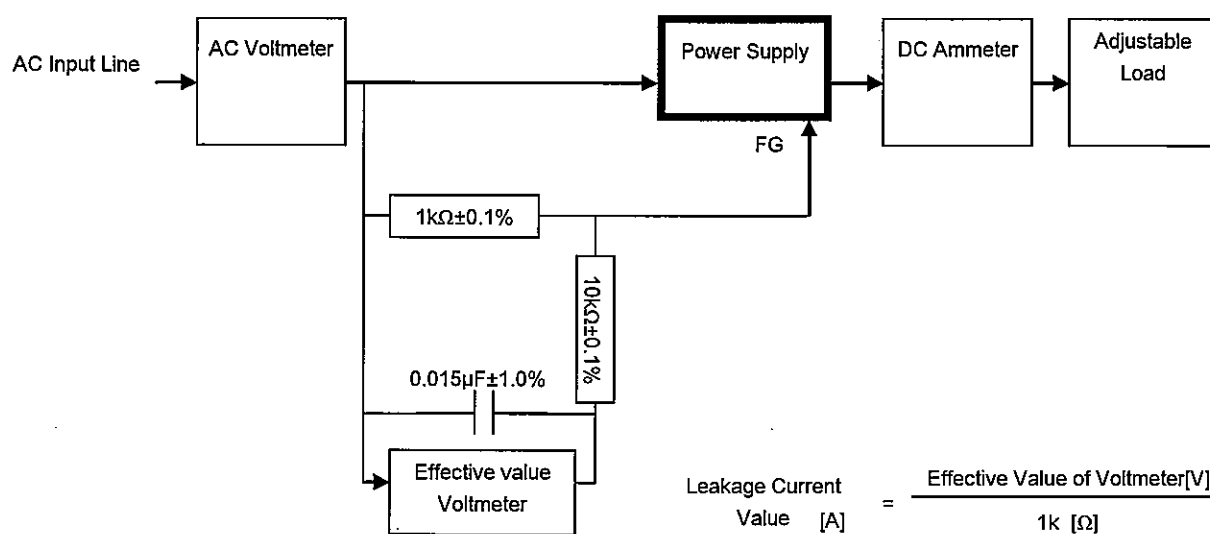


Figure B (IEC60601-1)