

TEST DATA OF PMA30F-24

Regulated DC Power Supply

June 4, 2010

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Katsumi Ishikawa Design Manager

Prepared by : Tsutomu Okano
Tsutomu Okano Design Engineer

COSEL CO.,LTD.

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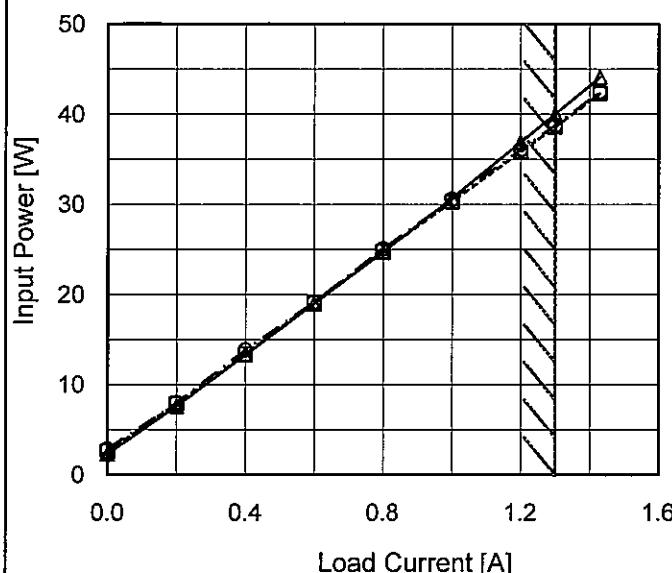
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Model	PMA30F-24	Temperature	25°C																																																				
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<p>The graph plots Efficiency [%] on the y-axis (30 to 86) against Input Voltage [V] on the x-axis (50 to 300). Two data series are shown: Load 50% (dashed line with square markers) and Load 100% (solid line with triangle markers). Both series show efficiency increasing with input voltage. A slanted line on the graph indicates the rated input voltage range.</p> <table border="1"> <thead> <tr> <th>Input Voltage [V]</th> <th>Efficiency Load 50% [%]</th> <th>Efficiency Load 100% [%]</th> </tr> </thead> <tbody> <tr><td>75</td><td>74.6</td><td>73.0</td></tr> <tr><td>85</td><td>75.7</td><td>75.6</td></tr> <tr><td>100</td><td>76.4</td><td>77.9</td></tr> <tr><td>120</td><td>76.8</td><td>79.5</td></tr> <tr><td>200</td><td>75.3</td><td>80.8</td></tr> <tr><td>230</td><td>74.9</td><td>80.3</td></tr> <tr><td>264</td><td>74.6</td><td>79.5</td></tr> <tr><td>280</td><td>73.9</td><td>78.9</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table>				Input Voltage [V]	Efficiency Load 50% [%]	Efficiency Load 100% [%]	75	74.6	73.0	85	75.7	75.6	100	76.4	77.9	120	76.8	79.5	200	75.3	80.8	230	74.9	80.3	264	74.6	79.5	280	73.9	78.9	--	-	-
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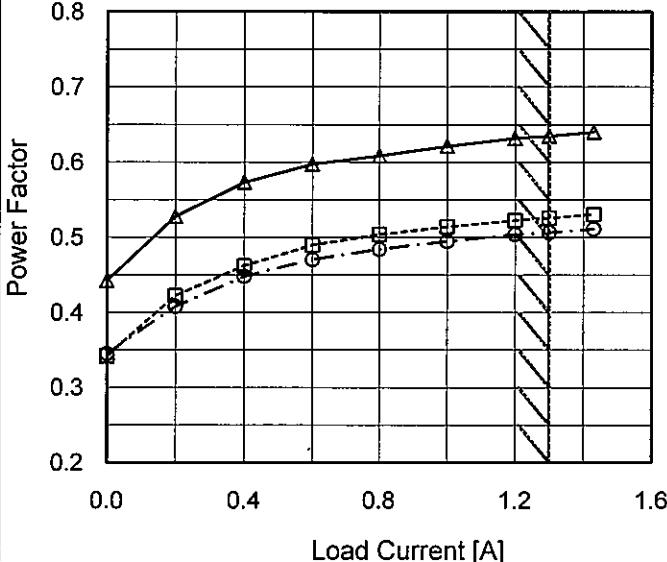
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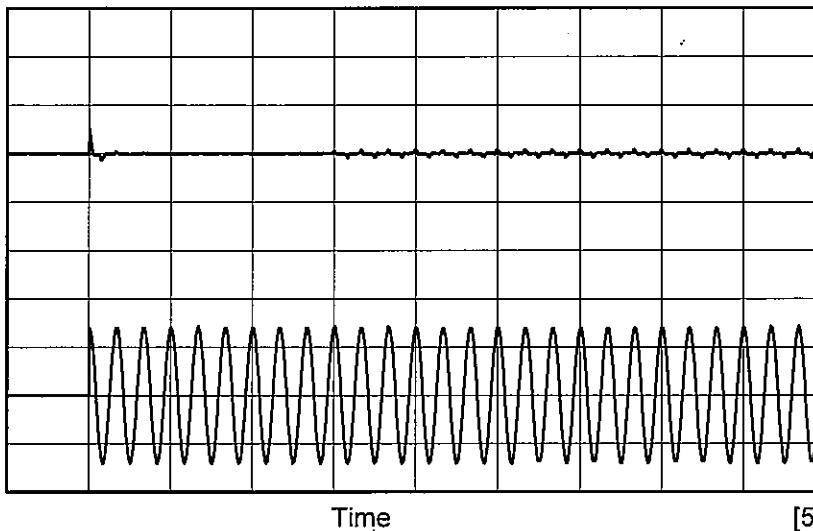
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1.43	0.640	0.531	0.511																																																		
--	-	-	-																																																		
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COSEL

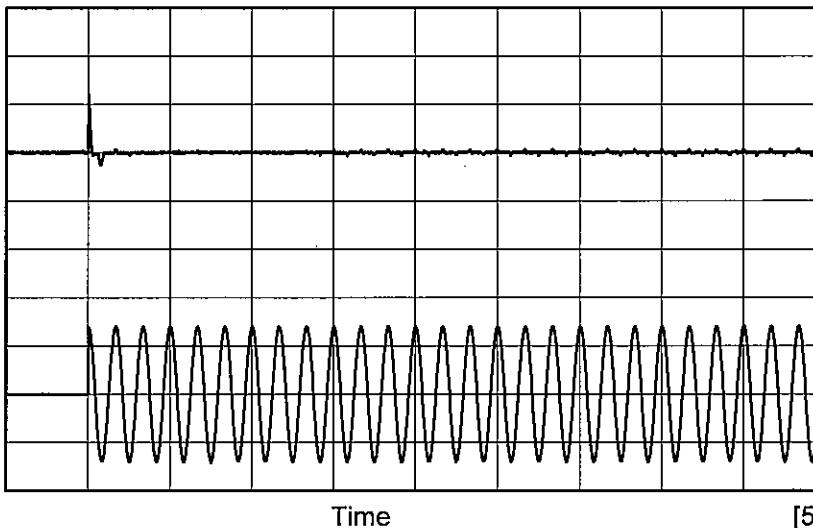
Model PMA30F-24

Item Inrush Current

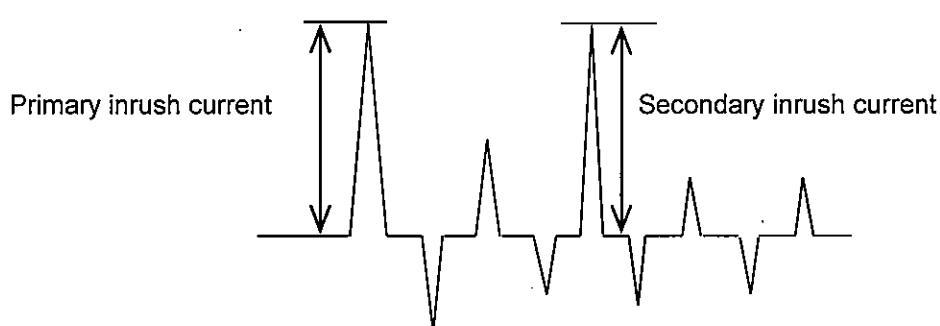
Object _____

Temperature 25°C
Testing Circuitry Figure AInput
Current
[20A/div]

Input Voltage 100 V
Frequency 60 Hz
Load 100 %
Primary inrush current : 10.3 A
Secondary inrush current : 1.8 A

Input
Current
[20A/div]

Input Voltage 230 V
Frequency 60 Hz
Load 100 %
Primary inrush current : 24.2 A
Secondary inrush current : 1.4 A





Model	PMA30F-24	Temperature	25°C
Item	Leakage Current	Testing Circuitry	Figure B
Object	<hr/>		

1. Results

Standards		Input Volt.			Note
		100 [V]	200 [V]	240 [V]	
IEC60601	Both phases	0.03	0.06	0.08	Operation
	One of phases	0.04	0.10	0.12	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.

COSEL

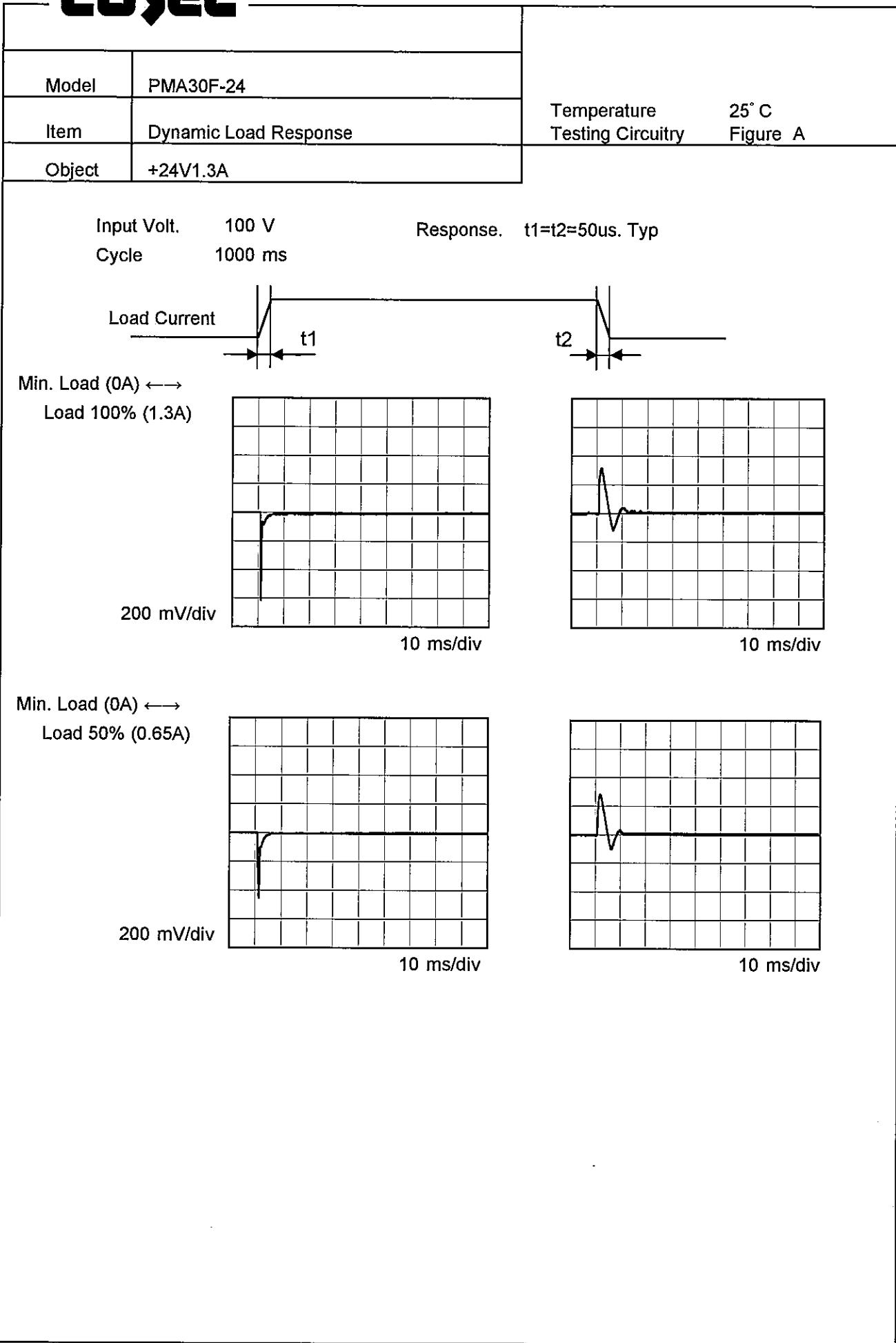
Model	PMA30F-24	Temperature	25°C																																
Item	Line Regulation	Testing Circuitry	Figure A																																
Object	+24V1.3A																																		
1.Graph			2.Values																																
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--	-	-																																	

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

COSEL

Model	PMA30F-24	Temperature	25°C
Item	Load Regulation	Testing Circuitry	Figure A
Object	+24V1.3A		
1.Graph	<p>—▲— Input Volt. 100V - - □ - - Input Volt. 200V - - ○ - - Input Volt. 230V</p> <p>Output Voltage [V]</p> <p>Load Current [A]</p>	2.Values	
Load Current [A]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	24.022	24.024	24.024
0.20	24.019	24.022	24.022
0.40	24.016	24.020	24.021
0.60	24.015	24.019	24.019
0.80	24.014	24.018	24.018
1.00	24.013	24.017	24.018
1.20	24.012	24.016	24.017
1.30	24.011	24.016	24.016
1.43	24.010	24.015	24.016
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--	-	-	-

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

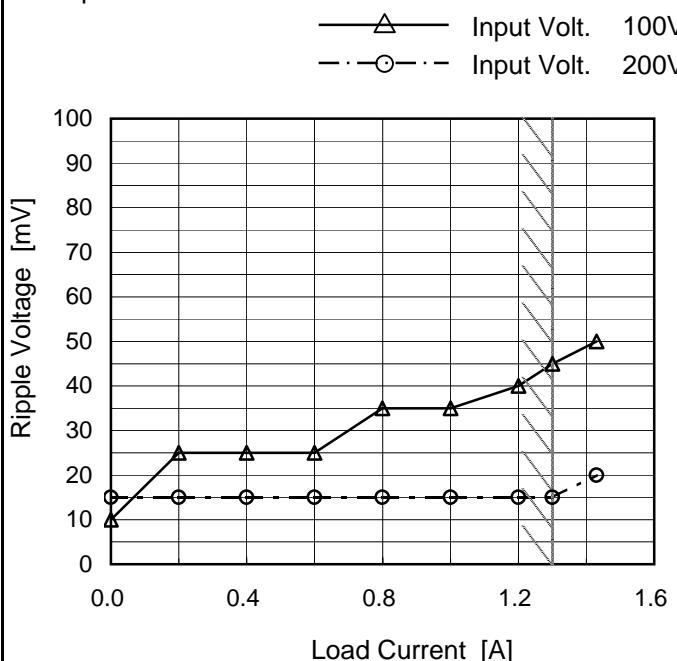
COSEL

COSEL

Model	PMA30F-24
Item	Ripple Voltage (by Load Current)
Object	+24V1.3A

 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	15
0.20	25	15
0.40	25	15
0.60	25	15
0.80	35	15
1.00	35	15
1.20	40	15
1.30	45	15
1.43	50	20
--	-	-
--	-	-

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.

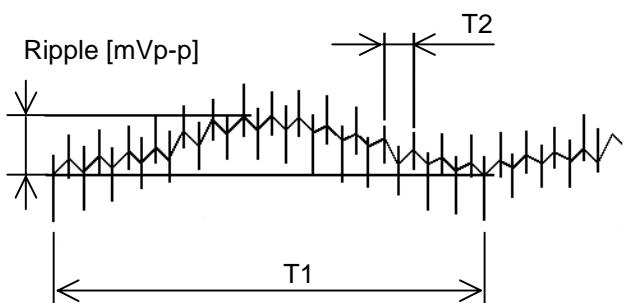
 T1: Due to AC Input Line
 T2: Due to Switching


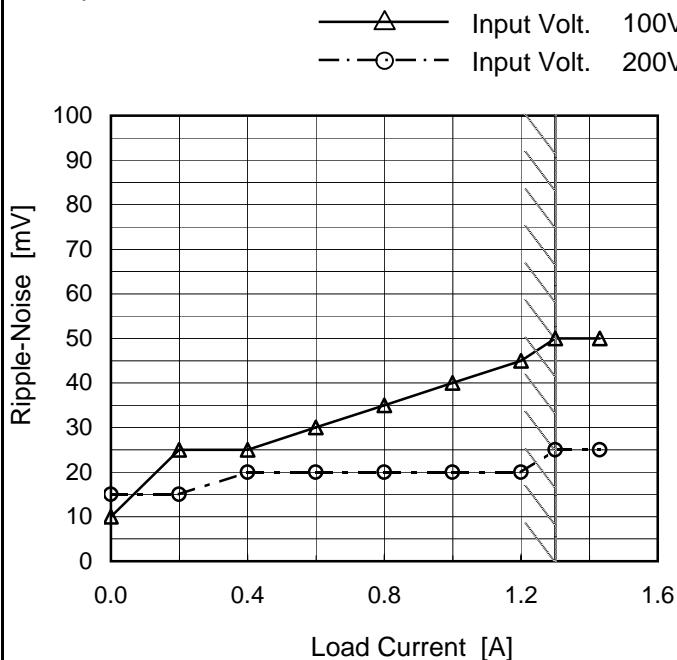
Fig. Complex Ripple Wave Form

COSEL

Model	PMA30F-24
Item	Ripple-Noise
Object	+24V1.3A

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	20
0.60	30	20
0.80	35	20
1.00	40	20
1.20	45	20
1.30	50	25
1.43	50	25
--	-	-
--	-	-

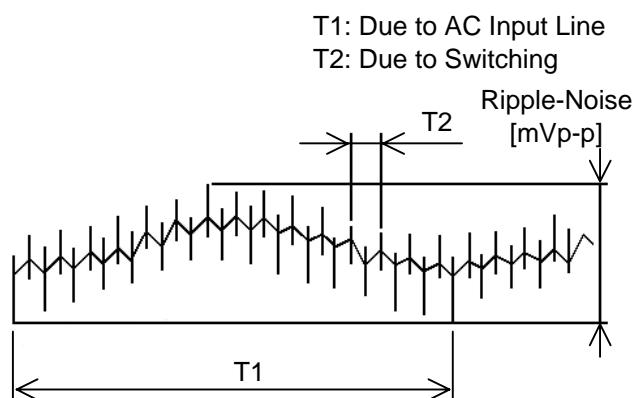
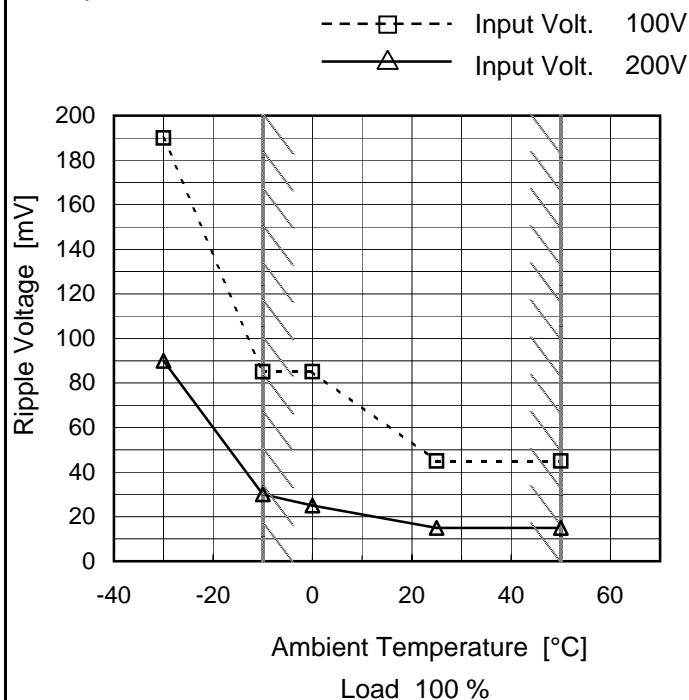


Fig. Complex Ripple Wave Form

COSEL

Model	PMA30F-24
Item	Ripple Voltage (by Ambient Temp.)
Object	+24V1.3A

1. Graph



Measured by 20 MHz Oscilloscope.

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

Testing Circuitry Figure A

2. Values

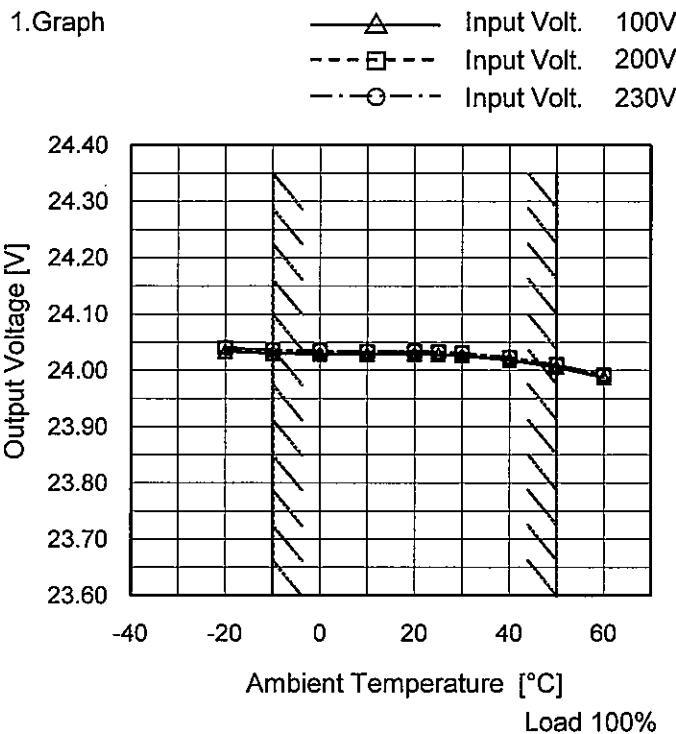
Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
-30	190	90
-10	85	30
0	85	25
25	45	15
50	45	15
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model PMA30F-24

Item Ambient Temperature Drift

Object +24V1.3A



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

Testing Circuitry Figure A

2. Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-20	24.034	24.040	24.041
-10	24.030	24.036	24.037
0	24.029	24.034	24.035
10	24.029	24.033	24.034
20	24.029	24.034	24.034
25	24.028	24.033	24.033
30	24.026	24.031	24.031
40	24.019	24.023	24.023
50	24.006	24.010	24.011
60	23.988	23.992	23.993
--	-	-	-



Model	PMA30F-24	
Item	Output Voltage Accuracy	Testing Circuitry Figure A
Object	+24V1.3A	

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

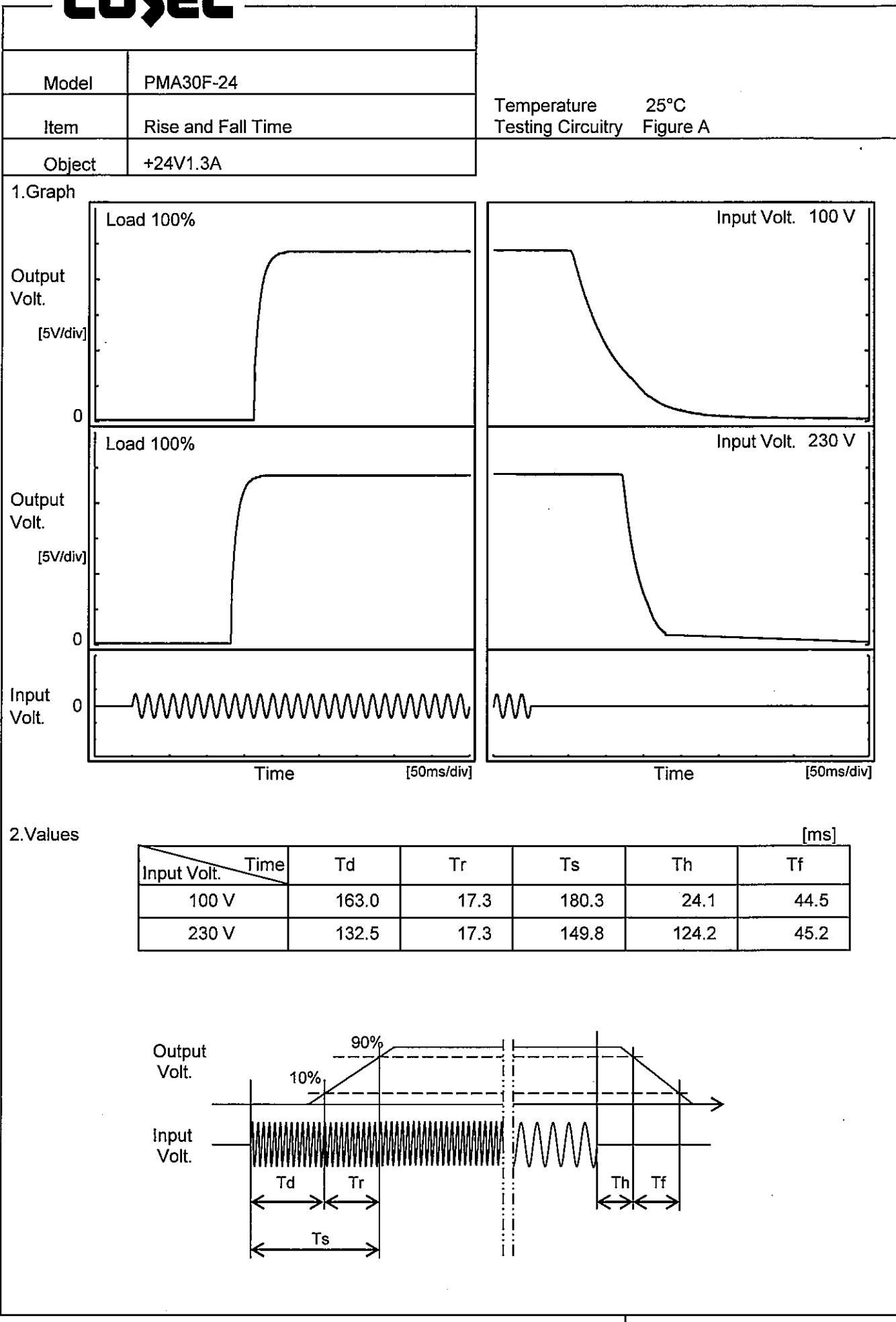
$$\text{* Output Voltage Accuracy (Ration)} = \frac{\text{Output Voltage Accuracy}}{\text{Rated Output Voltage}} \times 100$$

2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	-10	200	0	24.045	±20	±0.1
Minimum Voltage	50	85	1.3	24.005		

COSSEL

Model	PMA30F-24	Temperature	25°C																						
Item	Time Lapse Drift	Testing Circuitry	Figure A																						
Object	+24V1.3A																								
1.Graph			2.Values																						
<p>Output Voltage [V]</p> <p>Time [H]</p> <p>Input Volt. 230V Load 100%</p>			<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>24.021</td></tr> <tr><td>0.5</td><td>24.017</td></tr> <tr><td>1.0</td><td>24.017</td></tr> <tr><td>2.0</td><td>24.017</td></tr> <tr><td>3.0</td><td>24.017</td></tr> <tr><td>4.0</td><td>24.017</td></tr> <tr><td>5.0</td><td>24.017</td></tr> <tr><td>6.0</td><td>24.017</td></tr> <tr><td>7.0</td><td>24.017</td></tr> <tr><td>8.0</td><td>24.017</td></tr> </tbody> </table>	Time since start [H]	Output Voltage [V]	0.0	24.021	0.5	24.017	1.0	24.017	2.0	24.017	3.0	24.017	4.0	24.017	5.0	24.017	6.0	24.017	7.0	24.017	8.0	24.017
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<p>* The characteristic of AC100V is equal.</p>																									

COSEL

COSEL

Model	PMA30F-24	Temperature	25°C																															
Item	Hold-Up Time	Testing Circuitry	Figure A																															
Object	+24V1.3A																																	
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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. Note: Slanted line shows the range of the rated input voltage.</p>																																		

COSEL

Model	PMA30F-24	Temperature	25°C																																																			
Item	Instantaneous Interruption Compensation	Testing Circuitry	Figure A																																																			
Object	+24V1.3A																																																					
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>250</td><td>350</td></tr> <tr><td>0.4</td><td>120</td><td>180</td><td>250</td></tr> <tr><td>0.6</td><td>60</td><td>100</td><td>150</td></tr> <tr><td>0.8</td><td>40</td><td>70</td><td>100</td></tr> <tr><td>1.0</td><td>30</td><td>50</td><td>70</td></tr> <tr><td>1.2</td><td>25</td><td>40</td><td>60</td></tr> <tr><td>1.4</td><td>20</td><td>30</td><td>45</td></tr> <tr><td>1.6</td><td>25</td><td>-</td><td>-</td></tr> </tbody> </table>			Load Current [A]	100V [ms]	200V [ms]	230V [ms]	0.3	180	250	350	0.4	120	180	250	0.6	60	100	150	0.8	40	70	100	1.0	30	50	70	1.2	25	40	60	1.4	20	30	45	1.6	25	-	-															
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COSEL

Model	PMA30F-24																																											
Item	Overcurrent Protection	Temperature 25°C Testing Circuitry Figure A																																										
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16.8	-	-																																										
14.4	-	-																																										
12.0	-	-																																										
9.6	-	-																																										
7.2	-	-																																										
4.8	-	-																																										
2.4	-	-																																										
0.0	-	-																																										

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Model PMA30F-24 Item Overvoltage Protection Object +24V1.3A	Testing Circuitry Figure A																																						
	2.Values																																						
	<table border="1"> <thead> <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> </thead> <tbody> <tr> <td>-20</td><td>33.23</td><td>33.16</td></tr> <tr> <td>-10</td><td>33.44</td><td>33.44</td></tr> <tr> <td>0</td><td>33.66</td><td>33.66</td></tr> <tr> <td>10</td><td>33.94</td><td>33.94</td></tr> <tr> <td>20</td><td>34.15</td><td>34.15</td></tr> <tr> <td>25</td><td>34.29</td><td>34.29</td></tr> <tr> <td>30</td><td>34.36</td><td>34.36</td></tr> <tr> <td>40</td><td>34.64</td><td>34.64</td></tr> <tr> <td>50</td><td>34.92</td><td>34.85</td></tr> <tr> <td>60</td><td>35.13</td><td>35.13</td></tr> <tr> <td>--</td><td>-</td><td>-</td></tr> </tbody> </table>		Ambient Temperature [°C]	Operating Point [V]		Input Volt. 100[V]	Input Volt. 230[V]	-20	33.23	33.16	-10	33.44	33.44	0	33.66	33.66	10	33.94	33.94	20	34.15	34.15	25	34.29	34.29	30	34.36	34.36	40	34.64	34.64	50	34.92	34.85	60	35.13	35.13	--	-
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1.Graph <p>Operating Point [V]</p> <p>Ambient Temperature [°C]</p> <p>Load 0%</p> <p>Legend:</p> <ul style="list-style-type: none"> — □ — Input Volt. 100V - - □ - - Input Volt. 230V 																																							
<p>Note: Slanted line shows the range of the rated ambient temperature.</p>																																							

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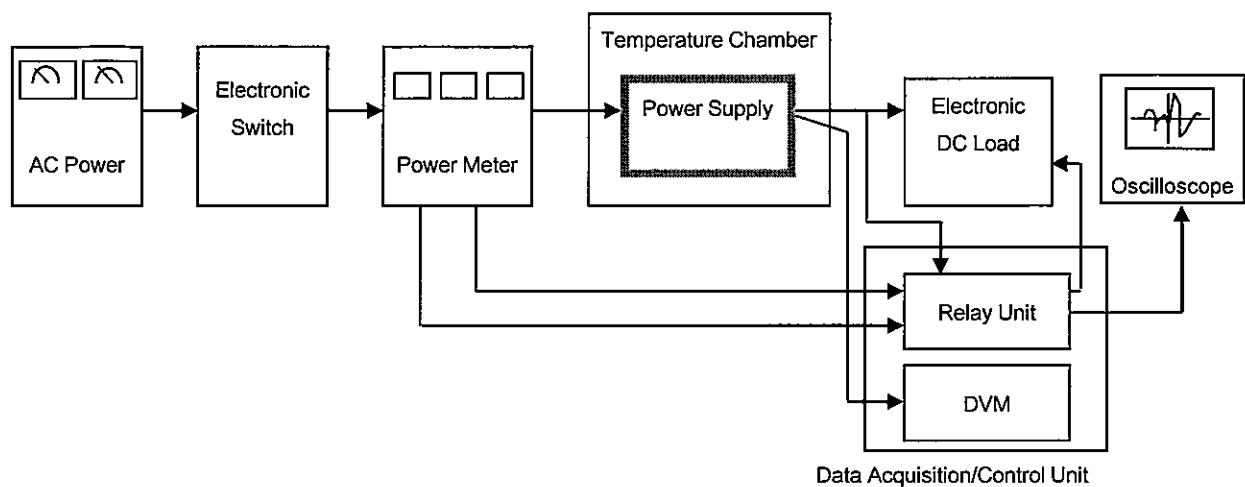


Figure A

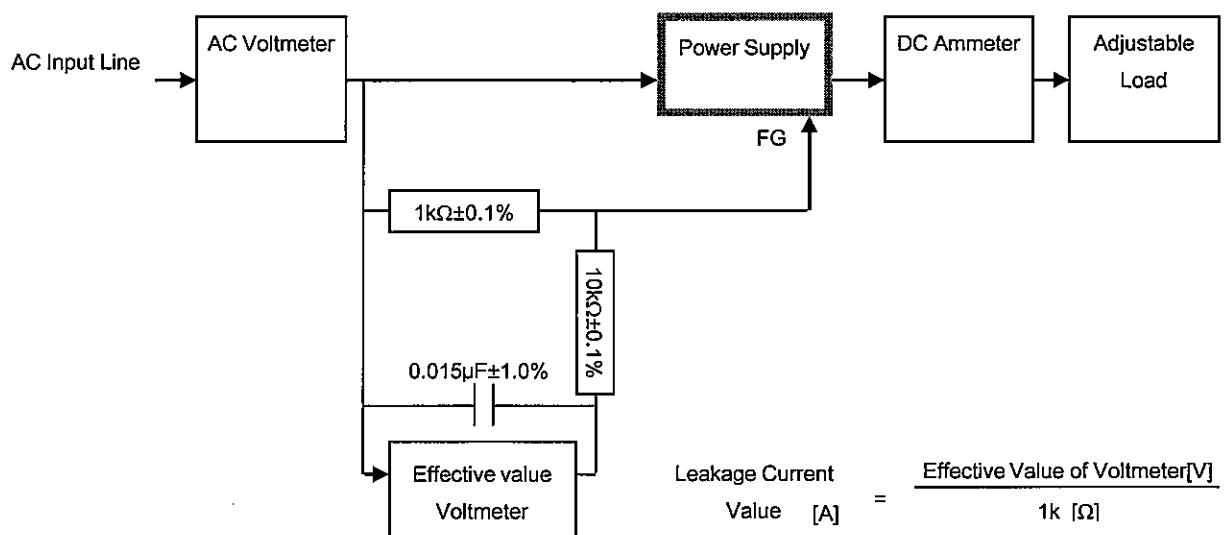


Figure B (IEC60601-1)