参考資料

COSEL

TEST DATA OF PMA60F-15

Regulated DC Power Supply
June 4, 2010

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COSEL CO.,LTD.

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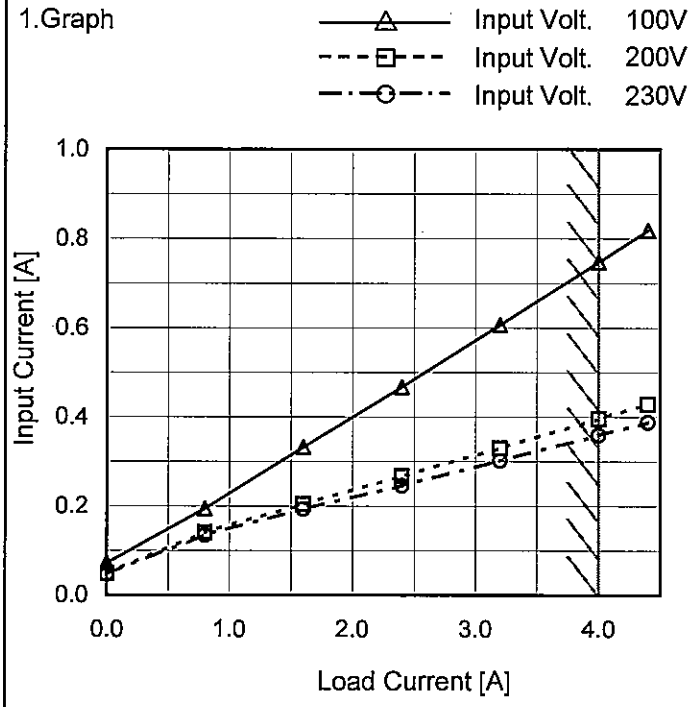
Model	PMA60F-15
Item	Input Current (by Load Current)
Object	———————

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

Load Current [A]	Input Current [A]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	0.072	0.048	0.047
0.8	0.194	0.141	0.134
1.6	0.332	0.204	0.193
2.4	0.467	0.267	0.246
3.2	0.606	0.330	0.302
4.0	0.747	0.396	0.359
4.4	0.818	0.429	0.388
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

BC-10428

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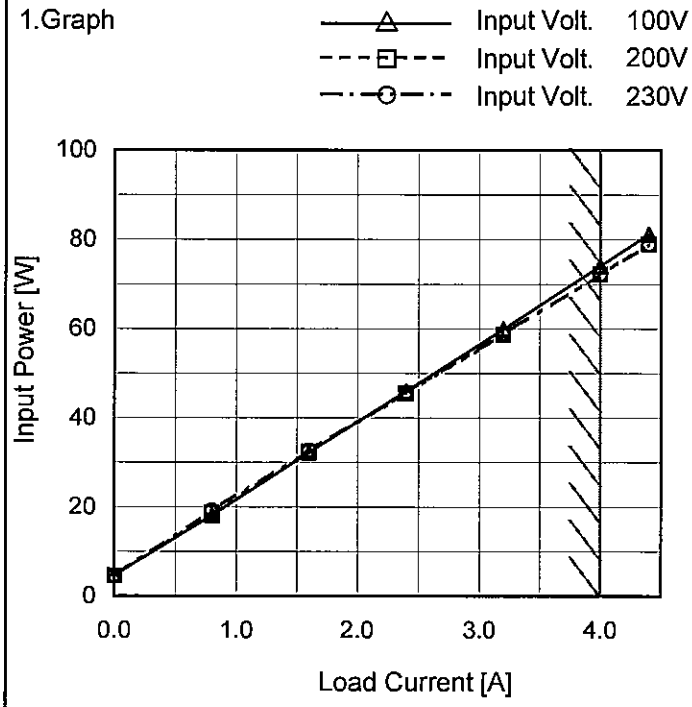
Model	PMA60F-15
Item	Input Power (by Load Current)
Object	———————

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

Load Current [A]	Input Power [W]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	4.60	4.50	4.50
0.8	18.10	18.70	19.20
1.6	32.20	32.40	32.60
2.4	46.00	45.50	45.70
3.2	59.90	58.80	58.90
4.0	74.10	72.20	72.20
4.4	81.20	79.00	78.90
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

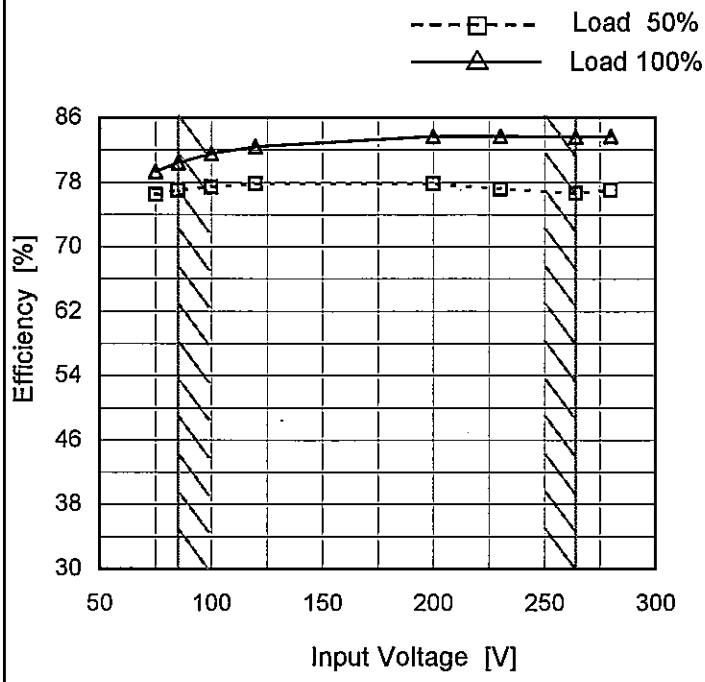
BC-10428

COSEL

Model	PMA60F-15
Item	Efficiency (by Input Voltage)
Object	———————

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
75	76.4	79.3
85	77.0	80.5
100	77.4	81.5
120	77.8	82.4
200	77.8	83.7
230	77.2	83.7
264	76.6	83.6
280	77.0	83.7
--	-	-

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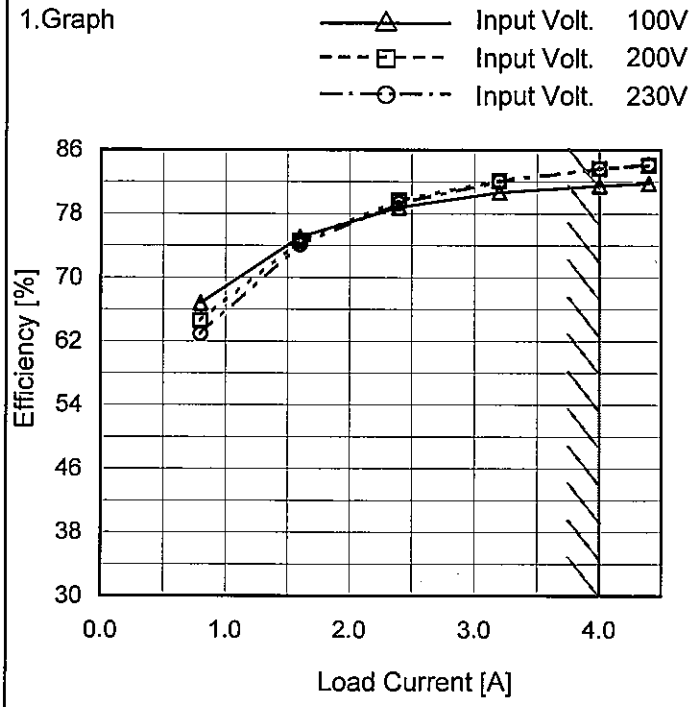
Model	PMA60F-15
Item	Efficiency (by Load Current)
Object	————————

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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	-	-	-
0.8	66.8	64.6	62.9
1.6	75.0	74.6	74.1
2.4	78.8	79.6	79.3
3.2	80.7	82.2	82.0
4.0	81.5	83.6	83.6
4.4	81.8	84.0	84.2
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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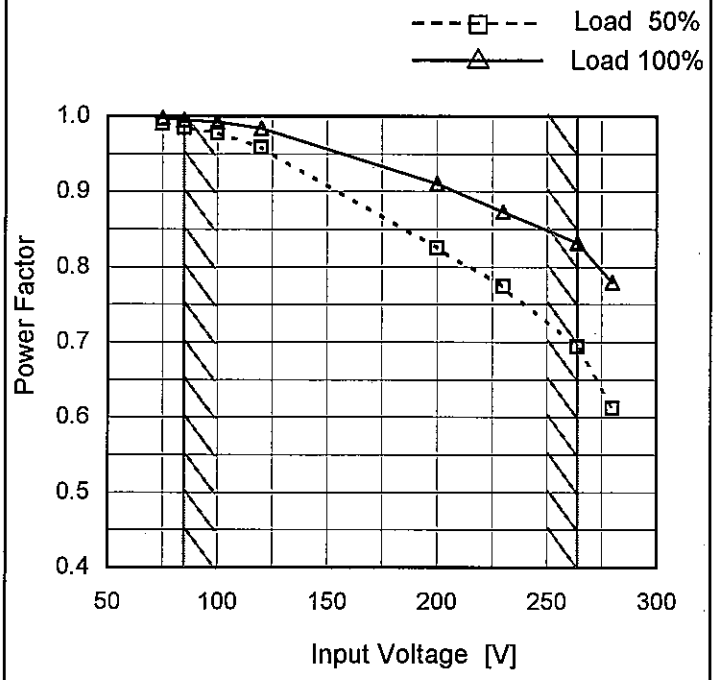
Model	PMA60F-15
Item	Power Factor (by Input Voltage)
Object	———————

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

Input Voltage [V]	Power Factor	
	Load 50%	Load 100%
75	0.990	0.997
85	0.985	0.995
100	0.977	0.992
120	0.958	0.984
200	0.826	0.910
230	0.774	0.873
264	0.694	0.832
280	0.613	0.779
--	-	-

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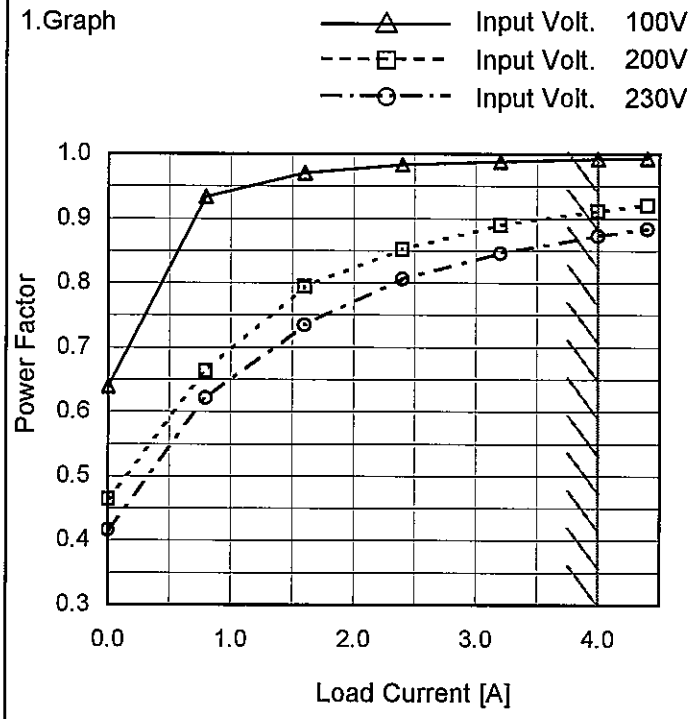
Model	PMA60F-15
Item	Power Factor (by Load Current)
Object	————————

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

Load Current [A]	Power Factor		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	0.639	0.464	0.417
0.8	0.933	0.663	0.621
1.6	0.970	0.794	0.734
2.4	0.983	0.852	0.806
3.2	0.988	0.890	0.846
4.0	0.992	0.912	0.873
4.4	0.993	0.921	0.884
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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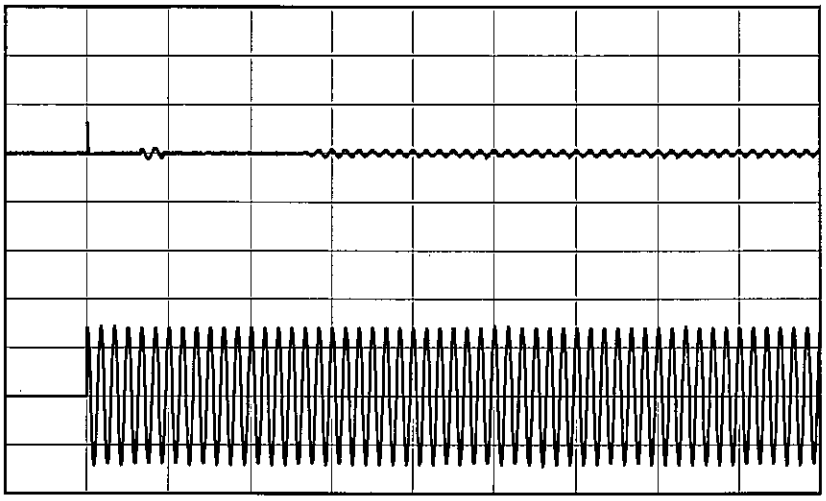
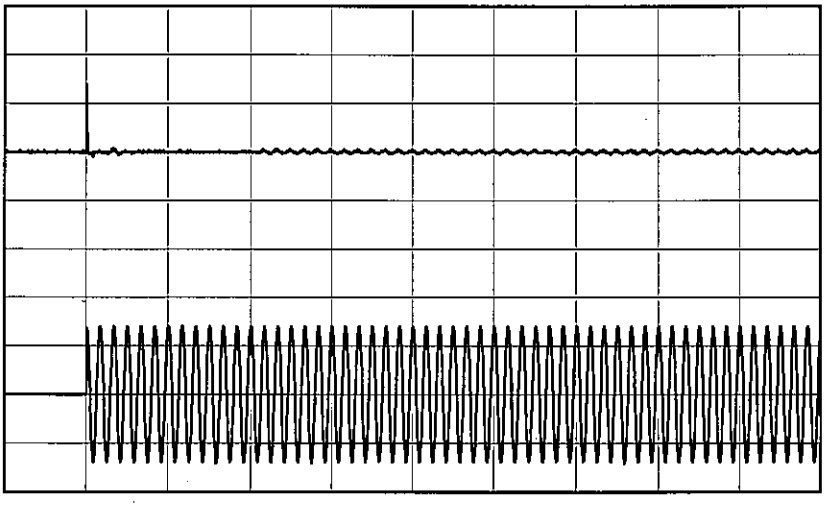
Model	PMA60F-15		
Item	Inrush Current	Temperature	25°C
Object	———————	Testing Circuitry	Figure A



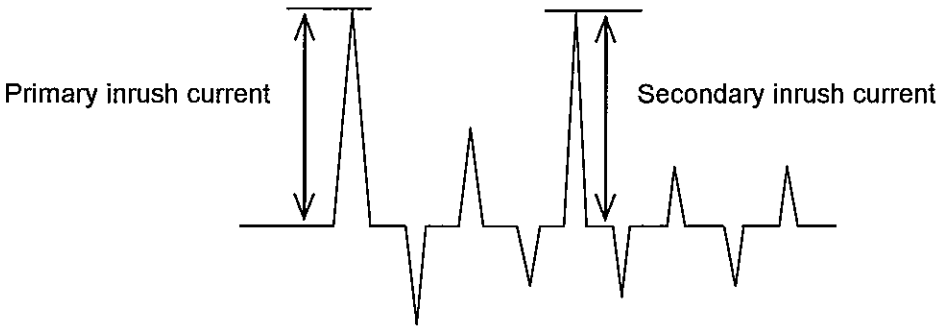
Input Voltage 100 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
12.6 A
Secondary inrush current :
2.4 A



Input Voltage 230 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
27.9 A
Secondary inrush current :
1.0 A



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Model	PMA60F-15		
Item	Leakage Current	Temperature 25°C Testing Circuitry Figure B	
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.

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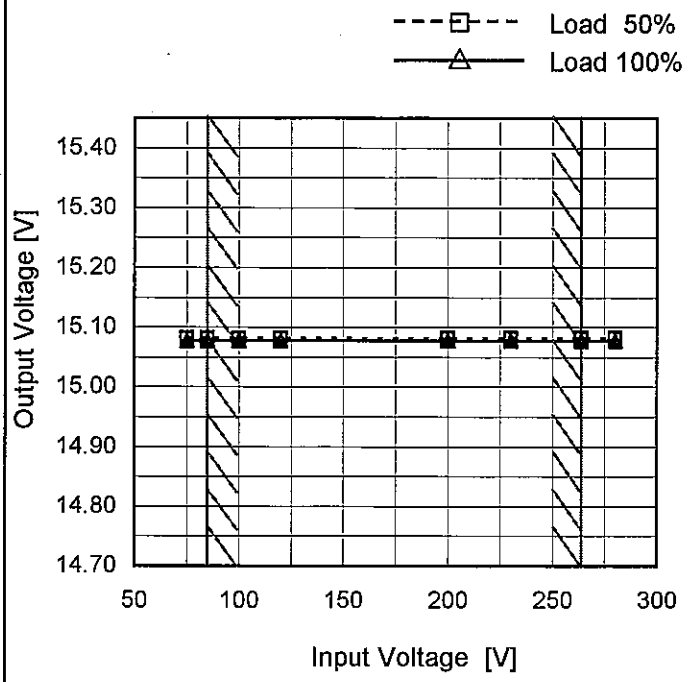
Model	PMA60F-15
Item	Line Regulation
Object	+15V4A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

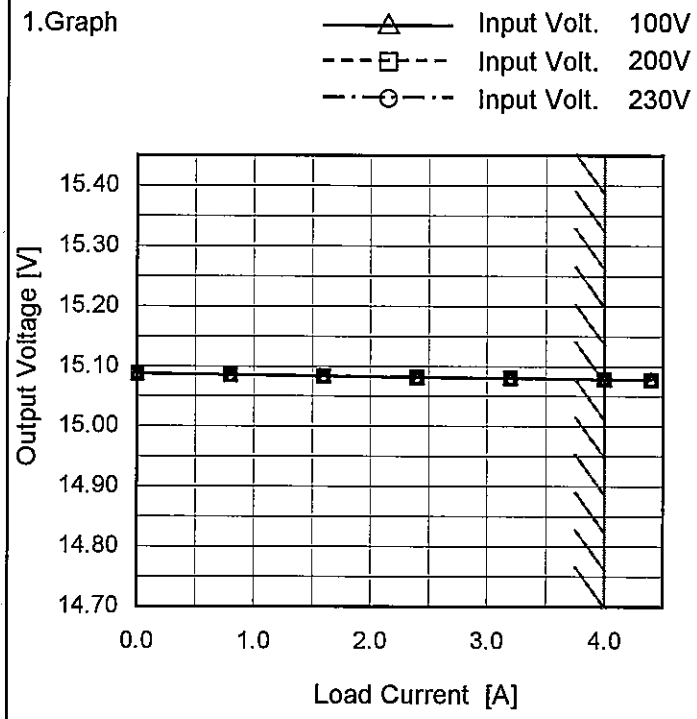
Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
75	15.082	15.078
85	15.082	15.078
100	15.082	15.078
120	15.082	15.078
200	15.082	15.077
230	15.082	15.077
264	15.082	15.077
280	15.082	15.077
--	-	-

COSEL

Model	PMA60F-15
Item	Load Regulation
Object	+15V4A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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	15.088	15.088	15.088
0.8	15.086	15.086	15.086
1.6	15.084	15.084	15.083
2.4	15.082	15.082	15.081
3.2	15.080	15.080	15.080
4.0	15.079	15.078	15.078
4.4	15.078	15.077	15.077
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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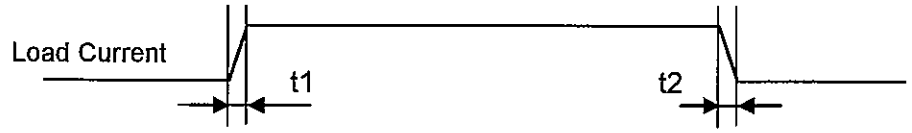
Model	PMA60F-15
Item	Dynamic Load Response
Object	+15V4A

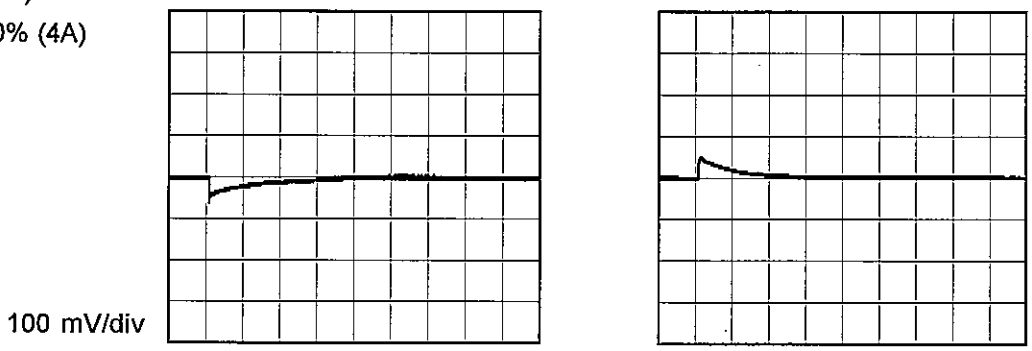
Temperature 25˚C
Testing Circuitry Figure A

Input Volt. 100 V
Cycle 1000 ms

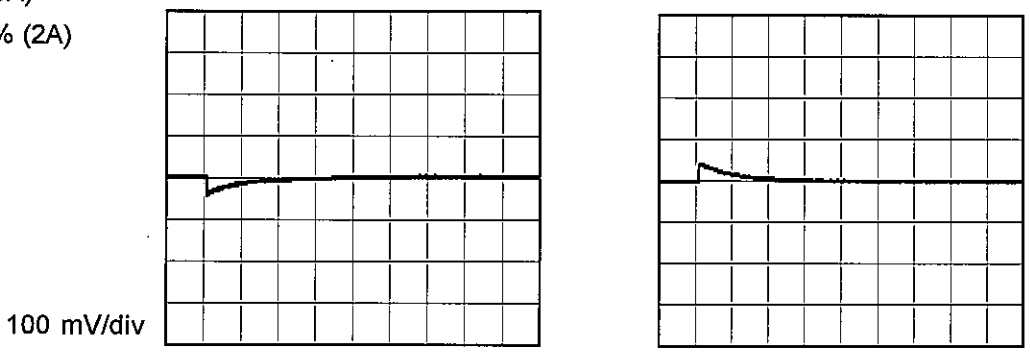
Response. t1=t2=50us. Typ



Min. Load (0A) ⟷
Load 100% (4A)



Min. Load (0A) ⟷
Load 50% (2A)



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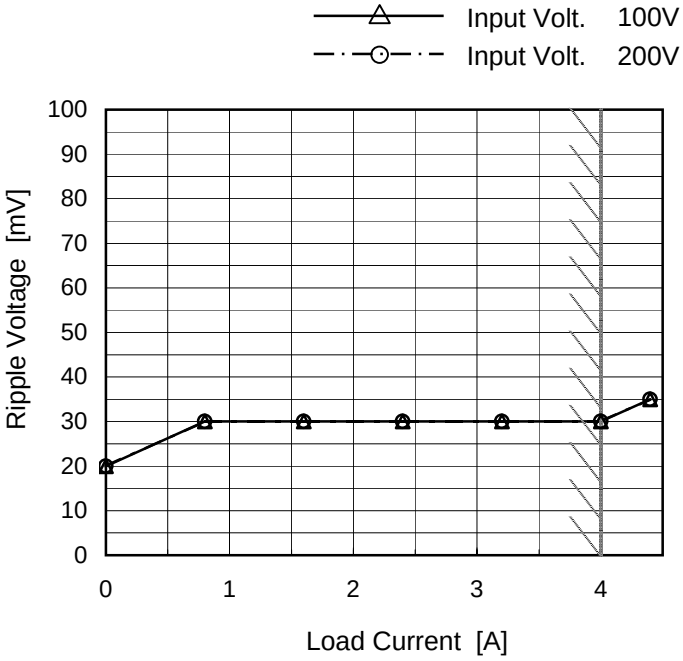
Model	PMA60F-15
Item	Ripple Voltage (by Load Current)
Object	+15V4A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

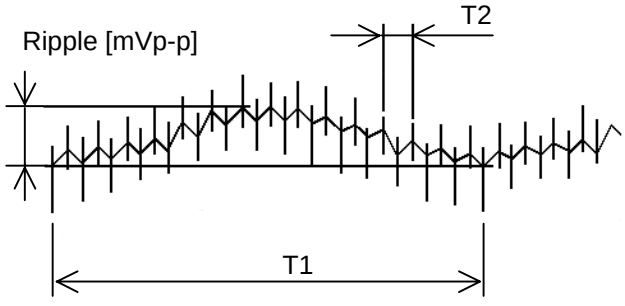


Fig. Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
0.0	20	20
0.8	30	30
1.6	30	30
2.4	30	30
3.2	30	30
4.0	30	30
4.4	35	35
--	-	-
--	-	-
--	-	-
--	-	-

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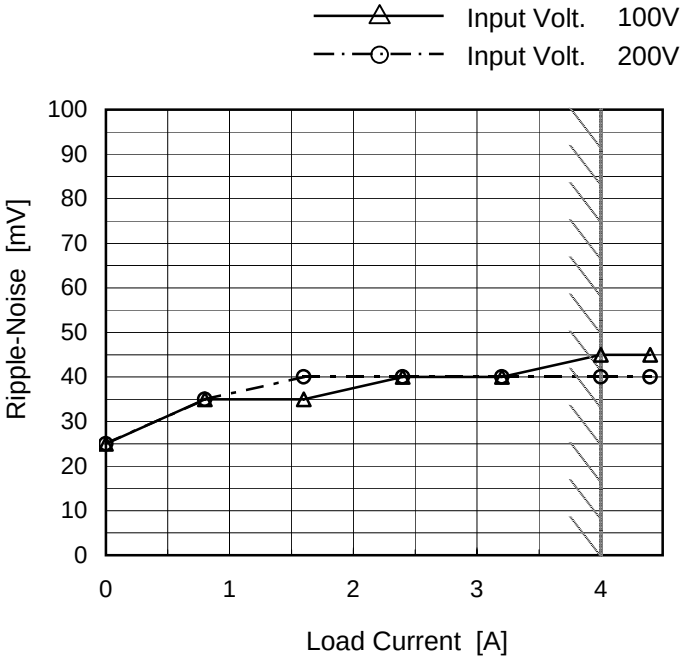
Model	PMA60F-15
Item	Ripple-Noise
Object	+15V4A

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.

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

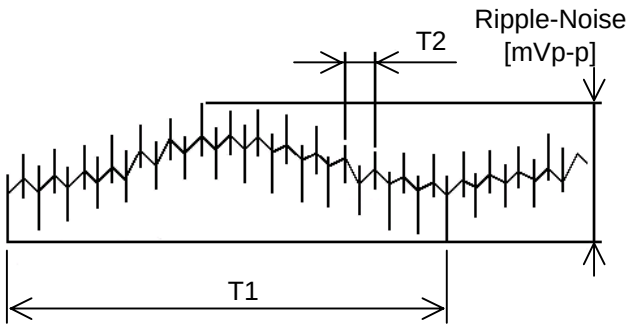


Fig. Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
0.0	25	25
0.8	35	35
1.6	35	40
2.4	40	40
3.2	40	40
4.0	45	40
4.4	45	40
--	-	-
--	-	-
--	-	-
--	-	-

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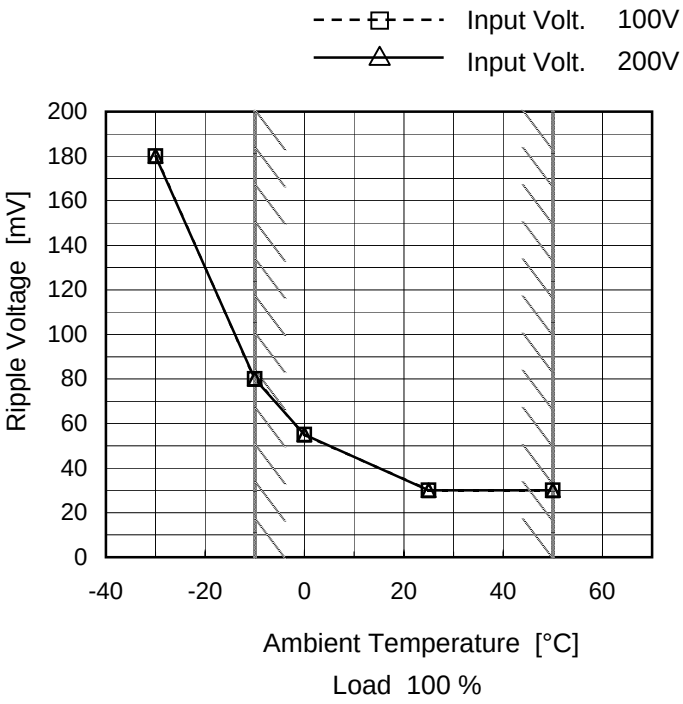
Model	PMA60F-15
Item	Ripple Voltage (by Ambient Temp.)
Object	+15V4A

Testing Circuitry Figure A

1.Graph



Measured by 20 MHz Oscilloscope.

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

2.Values

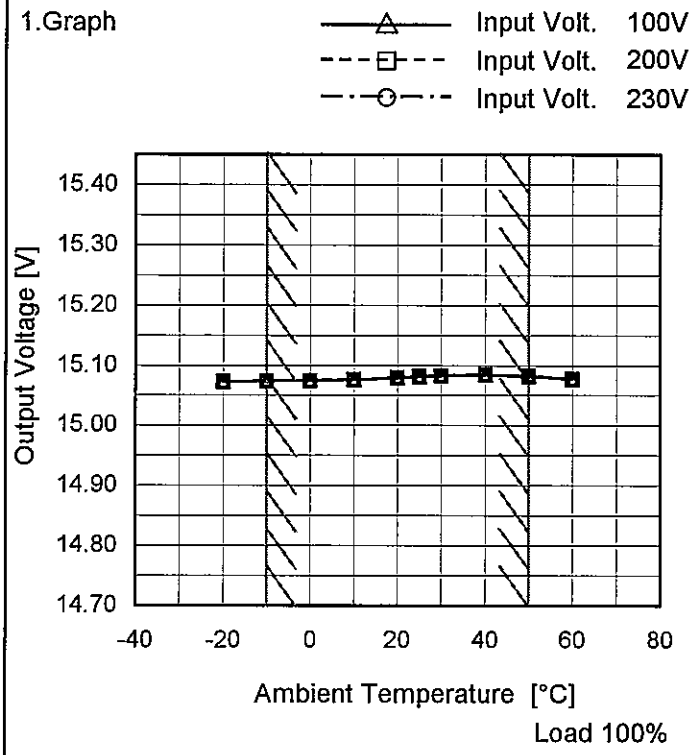
Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
-30	180	180
-10	80	80
0	55	55
25	30	30
50	30	30
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	PMA60F-15
Item	Ambient Temperature Drift
Object	+15V4A

Testing Circuitry Figure A

1.Graph



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

2.Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-20	15.073	15.072	15.072
-10	15.074	15.074	15.074
0	15.075	15.074	15.074
10	15.076	15.076	15.076
20	15.080	15.079	15.079
25	15.082	15.082	15.081
30	15.083	15.083	15.083
40	15.084	15.084	15.084
50	15.082	15.082	15.082
60	15.077	15.077	15.077
--	-	-	-

COSEL

Model	PMA60F-15	
Item	Output Voltage Accuracy	Testing Circuitry Figure A
Object	+15V4A	

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 - 4A

* Output Voltage Accuracy = ±(Maximum of Output Voltage - 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	40	264	0	15.094	±10	±0.1
Minimum Voltage	-10	264	4	15.074		

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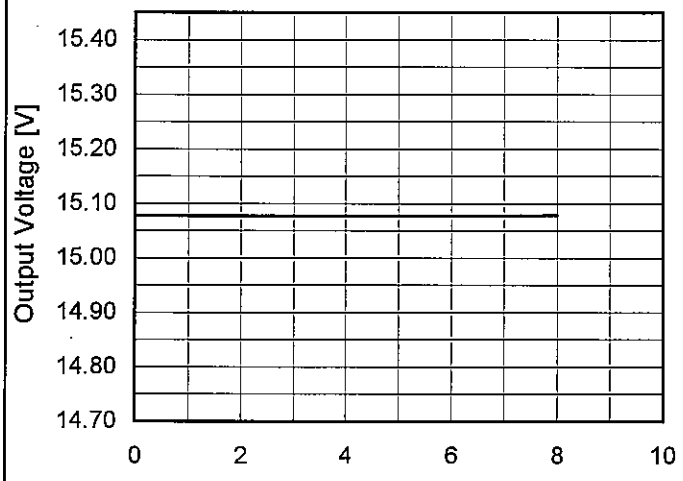
Model	PMA60F-15
Item	Time Lapse Drift
Object	+15V4A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



Input Volt. 100V
Load 100%

* The characteristic of AC200V is equal.

2.Values

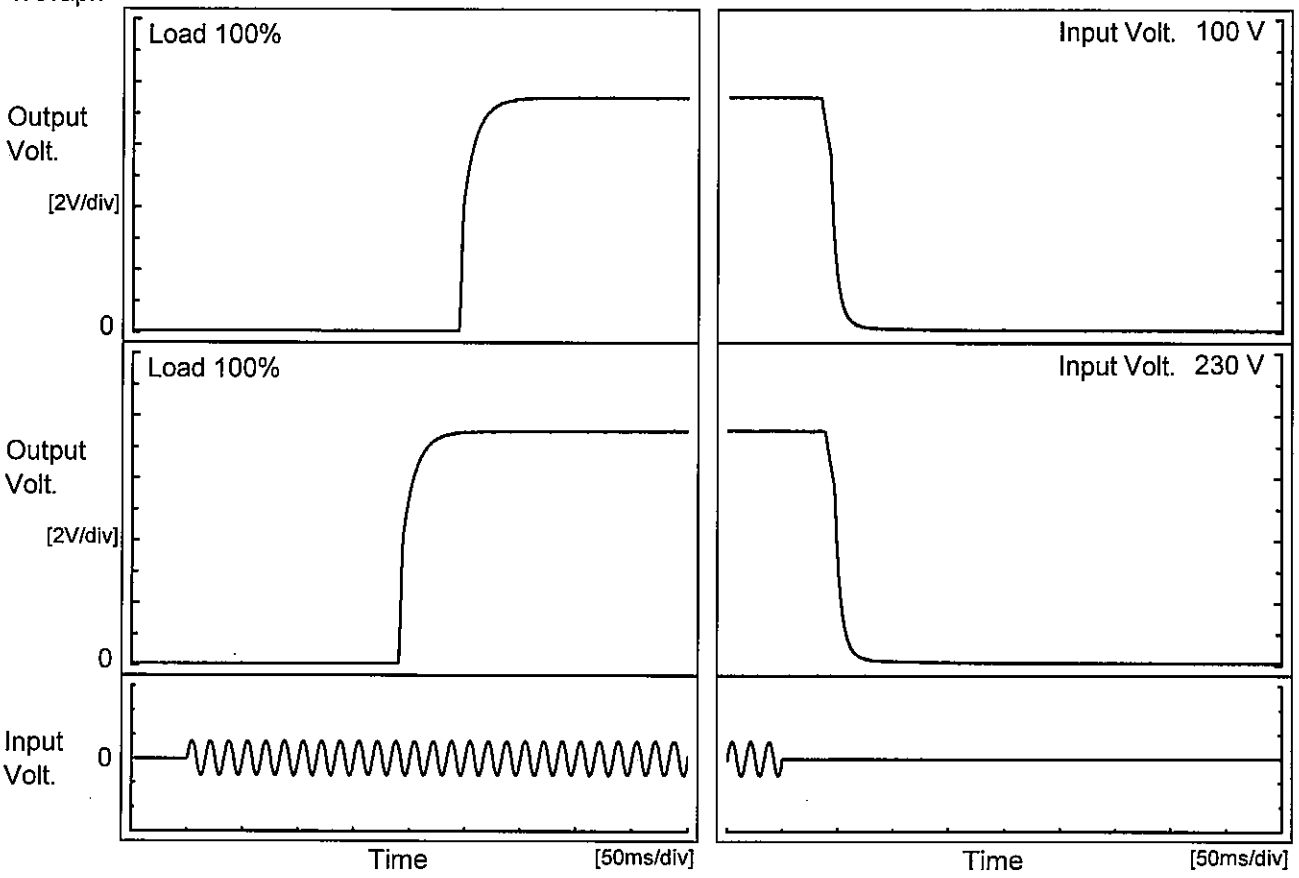
Time since start [H]	Output Voltage [V]
0.0	15.080
0.5	15.077
1.0	15.078
2.0	15.078
3.0	15.078
4.0	15.078
5.0	15.078
6.0	15.078
7.0	15.078
8.0	15.078

COSEL

Model	PMA60F-15
Item	Rise and Fall Time
Object	+15V4A

Temperature 25°C
Testing Circuitry Figure A

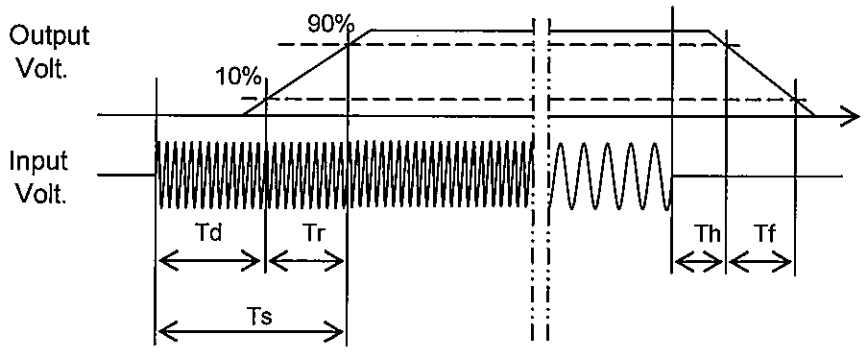
1.Graph



2.Values

[ms]

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	245.5	21.0	266.5	37.3	17.3
230 V	191.5	21.0	212.5	41.8	17.5

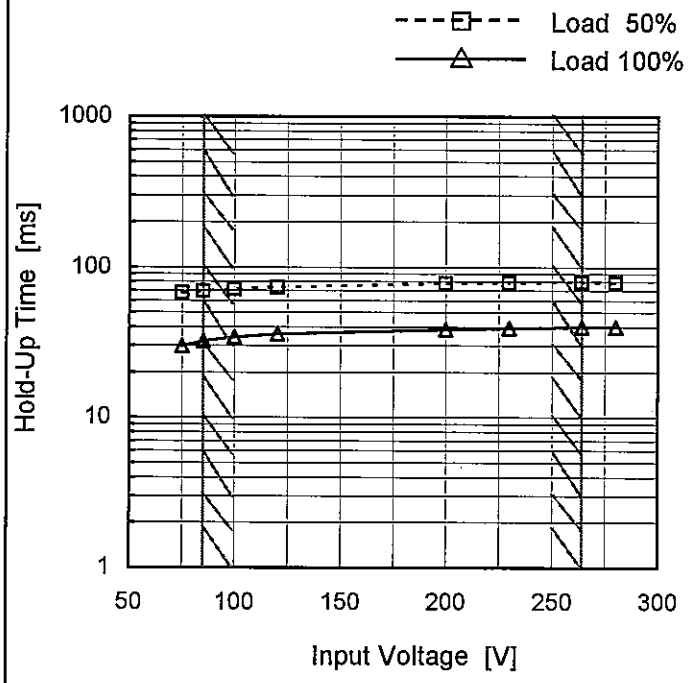


COSEL

Model	PMA60F-15
Item	Hold-Up Time
Object	+15V4A

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

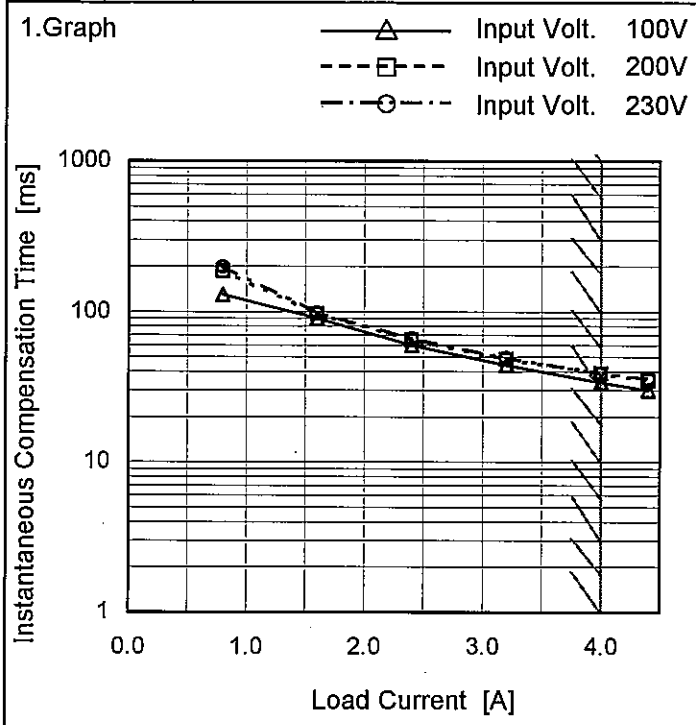
Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
75	67	30
85	69	32
100	72	34
120	74	36
200	78	39
230	79	39
264	80	40
280	79	40
--	-	-

COSEL

Model	PMA60F-15
Item	Instantaneous Interruption Compensation
Object	+15V4A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

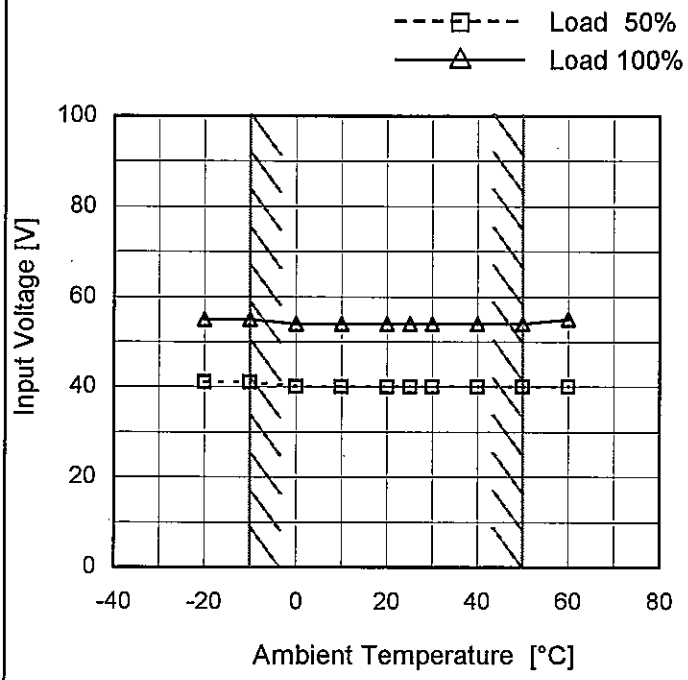
Load Current [A]	Time [ms] Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	-	-	-
0.8	130	187	198
1.6	90	97	98
2.4	60	65	66
3.2	44	48	49
4.0	34	39	39
4.4	30	35	36
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	PMA60F-15
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+15V4A

Testing Circuitry Figure A

1.Graph



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

2.Values

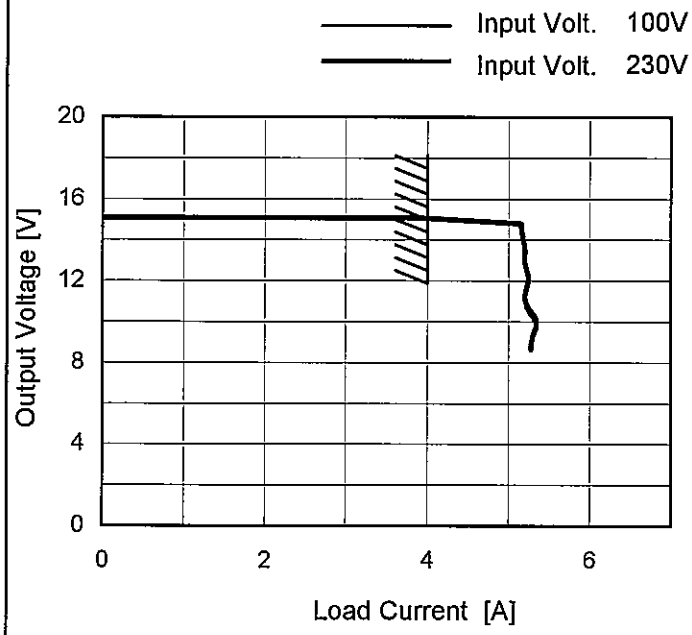
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-20	41	55
-10	41	55
0	40	54
10	40	54
20	40	54
25	40	54
30	40	54
40	40	54
50	40	54
60	40	55
--	-	-

COSEL

Model	PMA60F-15
Item	Overcurrent Protection
Object	+15V4A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

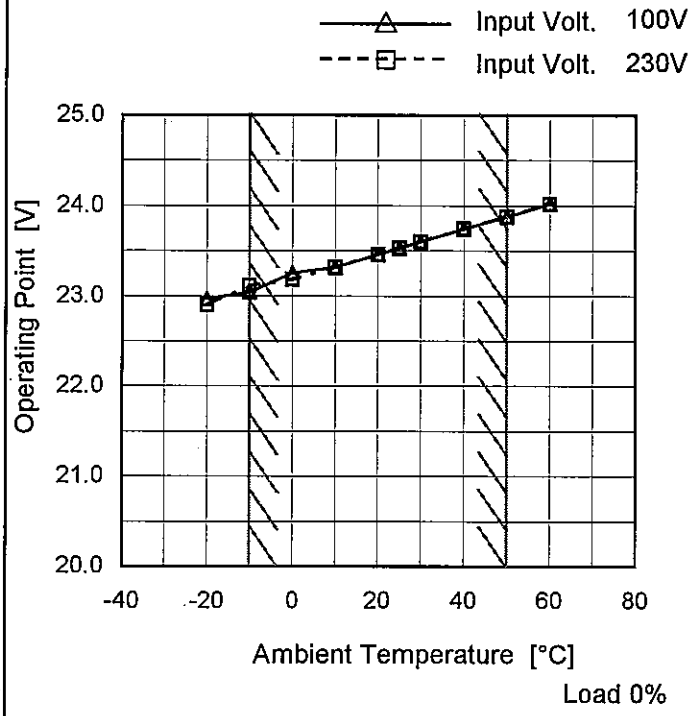
Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 230[V]
15.00	5.14	5.15
14.25	5.16	5.17
13.50	5.19	5.20
12.00	5.24	5.24
10.50	5.24	5.27
9.00	5.29	5.28
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	PMA60F-15
Item	Overvoltage Protection
Object	+15V4A

Testing Circuitry Figure A

1.Graph



Load 0%

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	22.97	22.90
-10	23.04	23.11
0	23.25	23.18
10	23.32	23.32
20	23.46	23.46
25	23.53	23.53
30	23.60	23.60
40	23.74	23.74
50	23.88	23.88
60	24.02	24.02
--	-	-

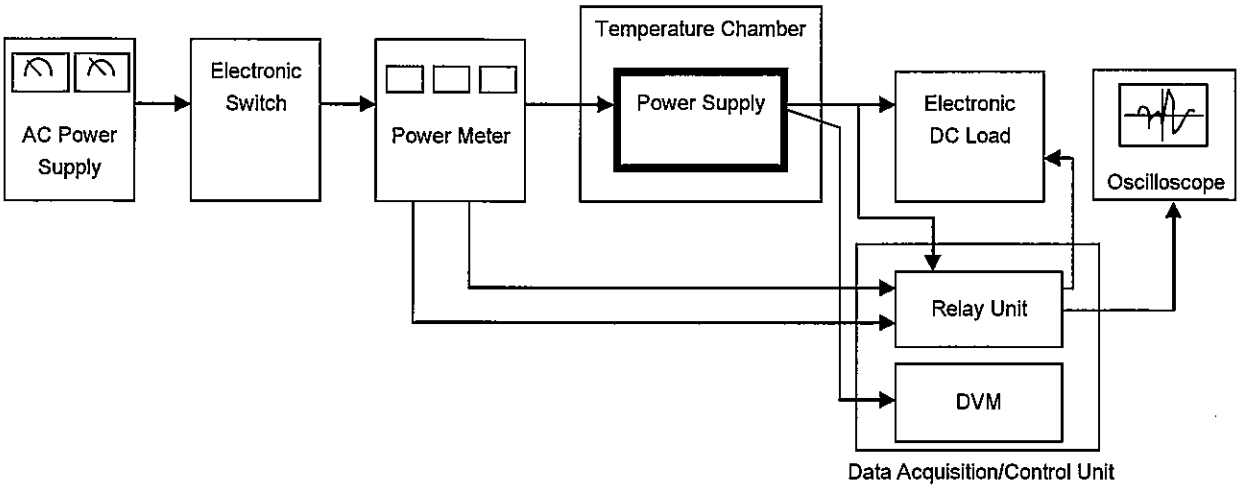


Figure A

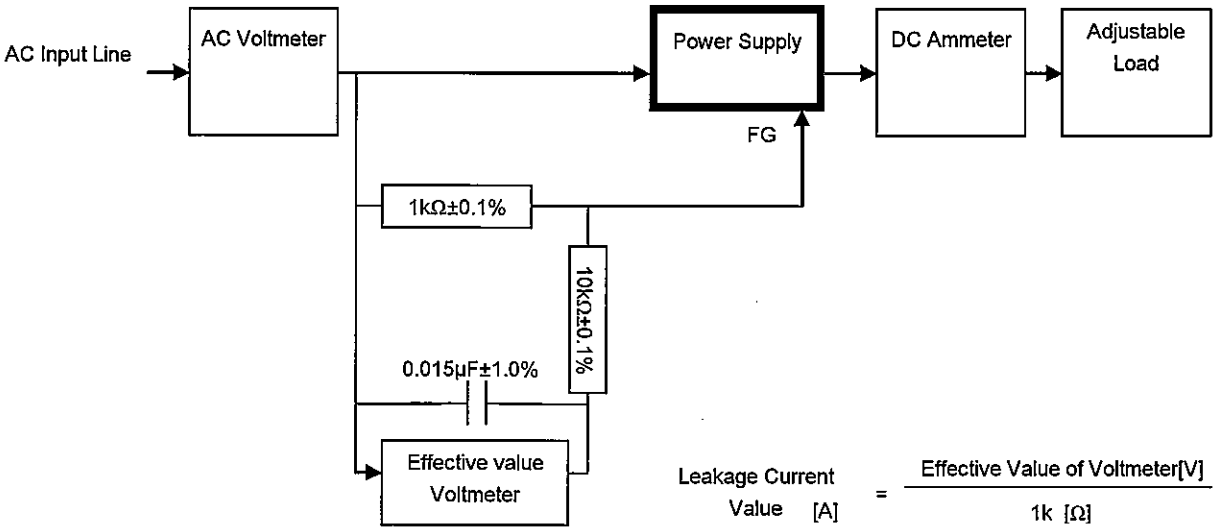


Figure B (IEC60601-1)