参考資料

TEST DATA OF PCA600F-15

Regulated DC Power Supply
March 14, 2018

Approved by : Koji Todo
Koji Todo Design Manager

Prepared by : Masanobu Shima
Masanobu Shima Design Engineer

COSEL CO.,LTD.

COSEL

CONTENTS

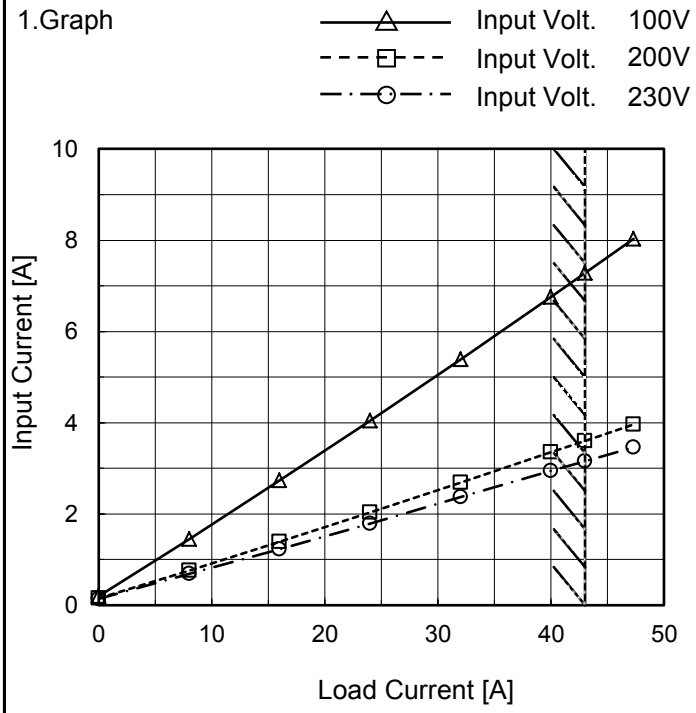
1.Input Current (by Load Current) ・・・・・・・・・・・・・・・・・・・・・・・・ 1
2.Input Power (by Load Current) ・・・・・・・・・・・・・・・・・・・・・・・・ 2
3.Efficiency (by Input Voltage) ・・・・・・・・・・・・・・・・・・・・・・・・ 3
4.Efficiency (by Load Current) ・・・・・・・・・・・・・・・・・・・・・・・・ 4
5.Power Factor (by Input Voltage) ・・・・・・・・・・・・・・・・・・・・・・・ 5
6.Power Factor (by Load Current) ・・・・・・・・・・・・・・・・・・・・・・・ 6
7.Inrush Current ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 7
8.Leakage Current ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 8
9.Line Regulation ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 9
10.Load Regulation ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 10
11.Dynamic Load Response ・・・・・・・・・・・・・・・・・・・・・・・・・・ 11
12.Ripple Voltage (by Load Current) ・・・・・・・・・・・・・・・・・・・・・・ 12
13.Ripple-Noise ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 13
14.Ripple Voltage (by Ambient Temperature) ・・・・・・・・・・・・・・・・・・ 14
15.Ambient Temperature Drift ・・・・・・・・・・・・・・・・・・・・・・・・・ 15
16.Output Voltage Accuracy ・・・・・・・・・・・・・・・・・・・・・・・・・・ 16
17.Time Lapse Drift ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 17
18.Rise and Fall Time ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 18
19.Hold-Up Time ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 19
20.Instantaneous Interruption Compensation ・・・・・・・・・・・・・・・・・・ 20
21.Minimum Input Voltage for Regulated Output Voltage ・・・・・・・・・・・・ 21
22.Overcurrent Protection ・・・・・・・・・・・・・・・・・・・・・・・・・・・ 22
23.Overvoltage Protection ・・・・・・・・・・・・・・・・・・・・・・・・・・・ 23
24.Figure of Testing Circuitry ・・・・・・・・・・・・・・・・・・・・・・・・・ 24
(Final Page 25)

COSEL

Model	PCA600F-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

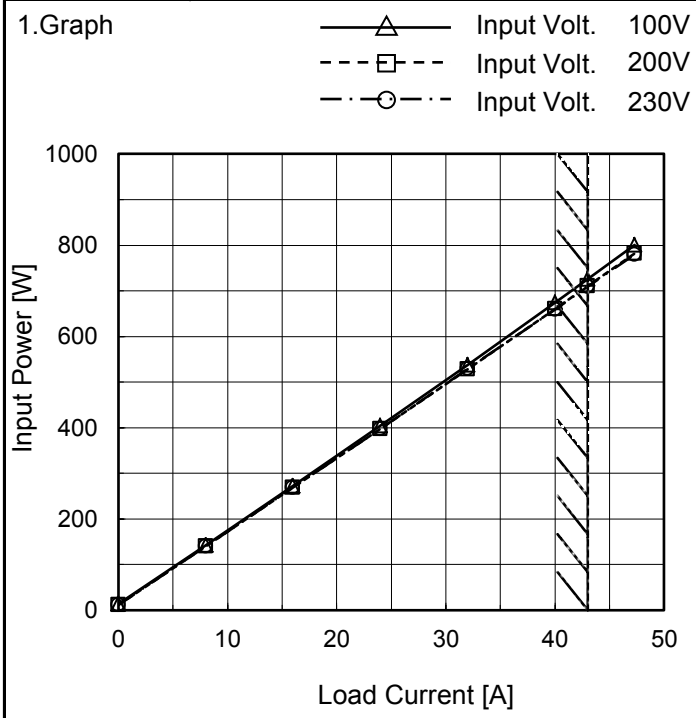
Load Current [A]	Input Current [A]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	0.195	0.146	0.143
8.0	1.445	0.760	0.681
16.0	2.729	1.391	1.227
24.0	4.047	2.034	1.785
32.0	5.389	2.681	2.373
40.0	6.757	3.357	2.941
43.0	7.277	3.603	3.157
47.3	8.030	3.964	3.463
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	PCA600F-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

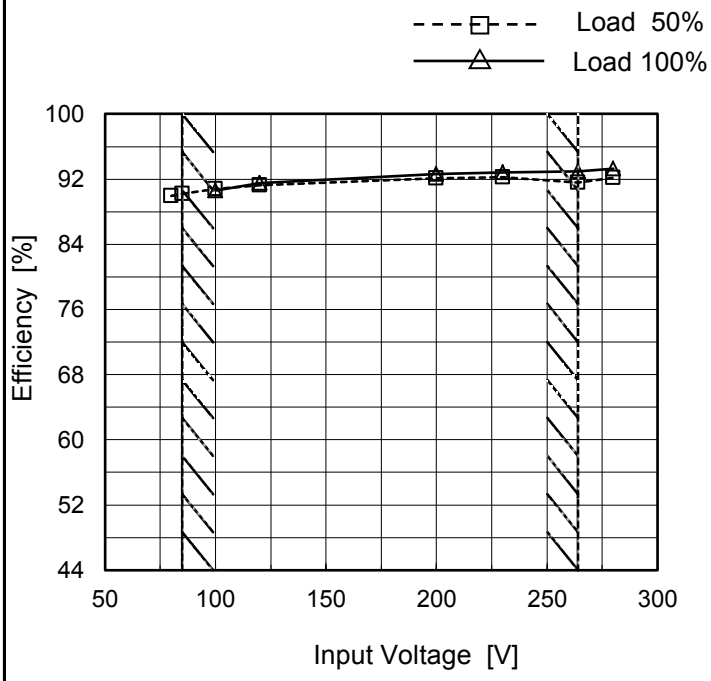
Load Current [A]	Input Power [W]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	14.1	11.2	10.8
8.0	142.6	140.3	140.5
16.0	271.8	268.4	268.1
24.0	404.0	397.7	396.9
32.0	537.8	527.9	529.1
40.0	673.9	660.7	659.7
43.0	725.5	710.3	709.1
47.3	800.2	781.7	780.1
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	PCA600F-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

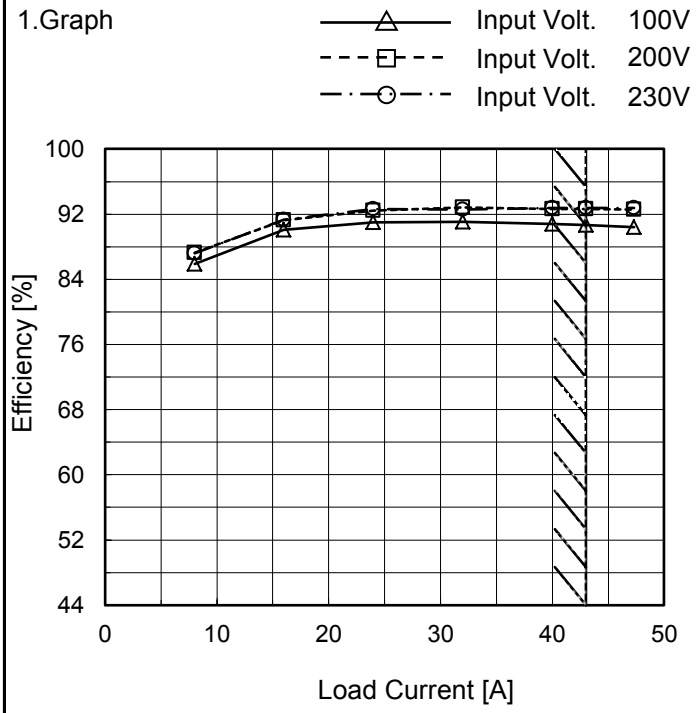
Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
80	89.9	-
85	90.2	-
100	90.8	90.6
120	91.2	91.5
200	92.1	92.6
230	92.2	92.8
264	91.6	93.0
280	92.2	93.3
--	-	-

COSEL

Model	PCA600F-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

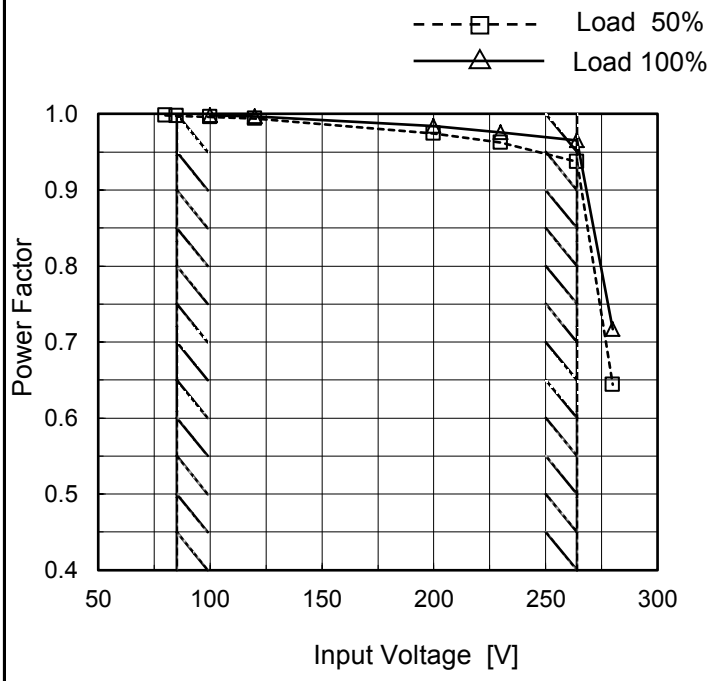
Load Current [A]	Efficiency [%]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	-	-	-
8.0	85.9	87.3	87.2
16.0	90.1	91.2	91.3
24.0	91.0	92.4	92.6
32.0	91.1	92.8	92.6
40.0	90.8	92.6	92.8
43.0	90.7	92.6	92.8
47.3	90.4	92.6	92.8
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	PCA600F-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

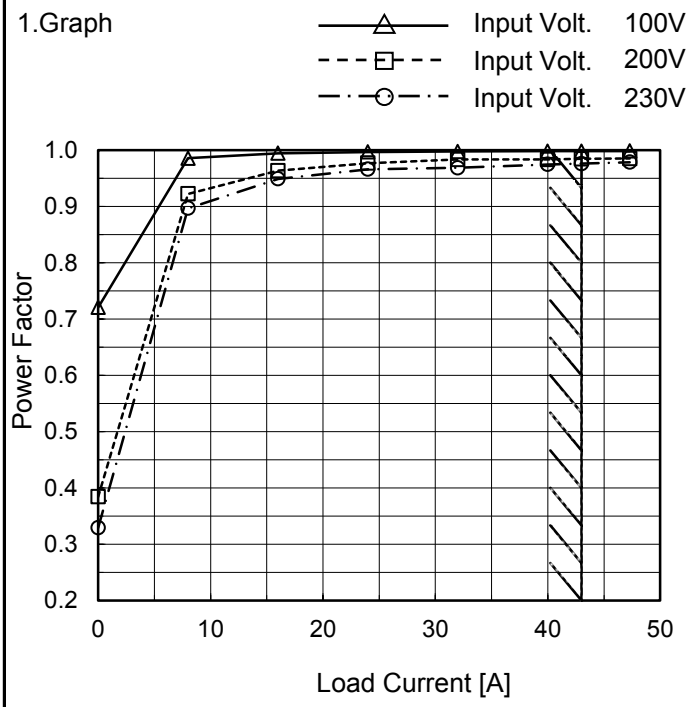
Input Voltage [V]	Power Factor	
	Load 50%	Load 100%
80	0.998	-
85	0.998	-
100	0.996	0.998
120	0.994	0.997
200	0.975	0.984
230	0.963	0.976
264	0.937	0.965
280	0.644	0.717
--	-	-

COSEL

Model	PCA600F-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.

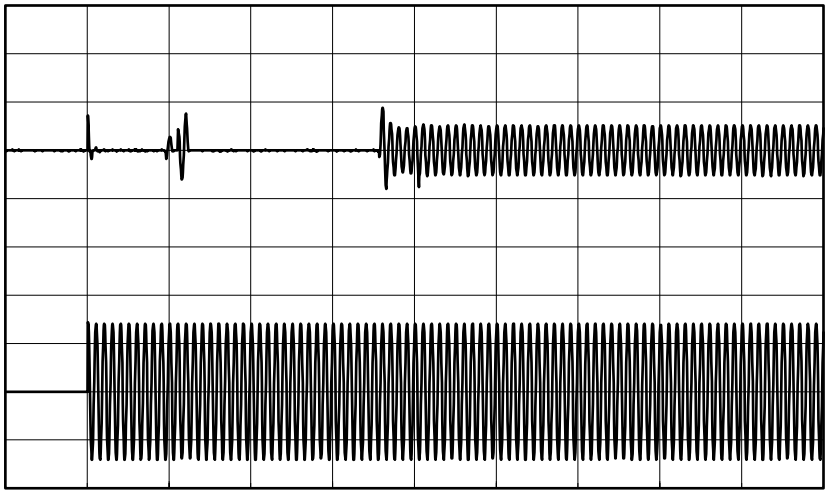
2.Values

Load Current [A]	Power Factor		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	0.721	0.384	0.329
8.0	0.986	0.922	0.897
16.0	0.995	0.964	0.949
24.0	0.997	0.977	0.966
32.0	0.998	0.984	0.969
40.0	0.998	0.984	0.975
43.0	0.998	0.985	0.976
47.3	0.999	0.985	0.979
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

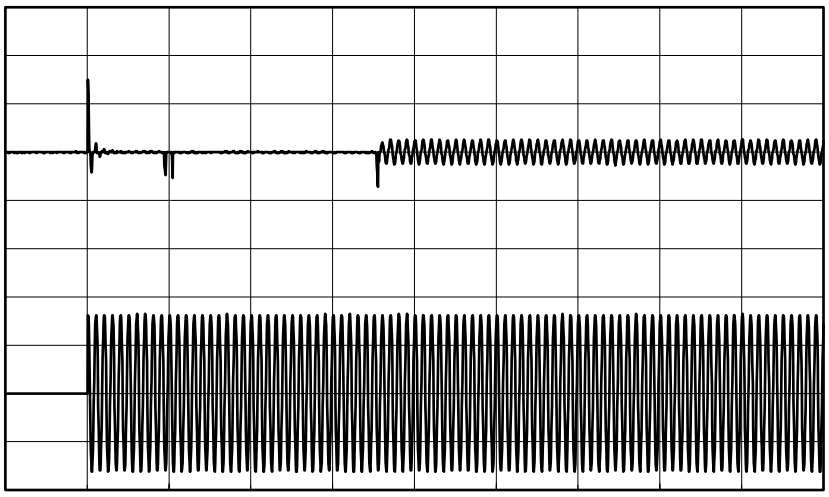
Model	PCA600F-15
Item	Inrush Current
Object	————————

Temperature 25°C
Testing Circuitry Figure A



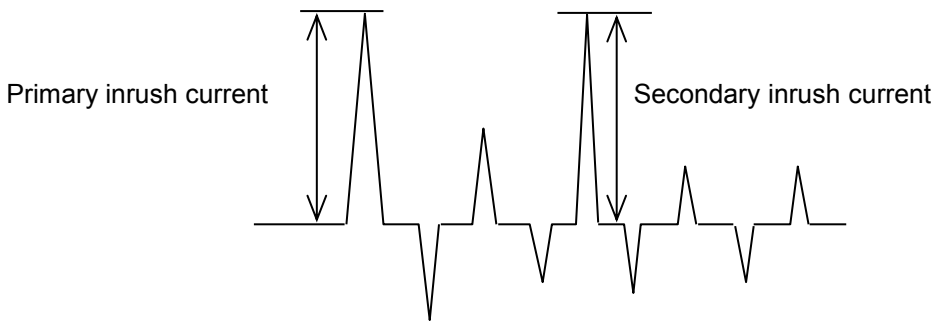
Input Voltage 100 V
Frequency 50 Hz
Load 100 %

Primary inrush current :
14.4 A
Secondary inrush current :
17.6 A



Input Voltage 230 V
Frequency 50 Hz
Load 100 %

Primary inrush current :
30.0 A
Secondary inrush current :
14.4 A



COSEL

Model	PCA600F-15	
Item	Leakage Current	Temperature 25°C Testing Circuitry Figure B
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

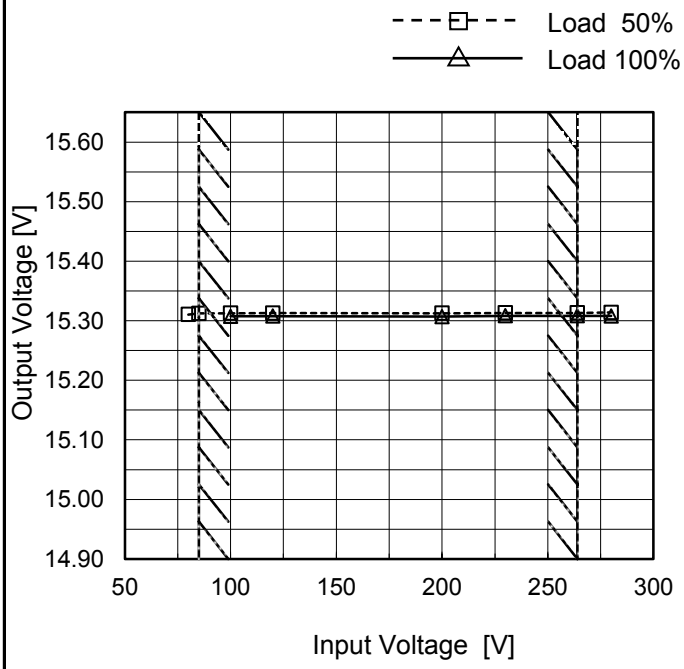
Leakage current value is concluded after measuring both phases of AC input and by choosing the larger one.

COSEL

Model	PCA600F-15
Item	Line Regulation
Object	+15V43A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

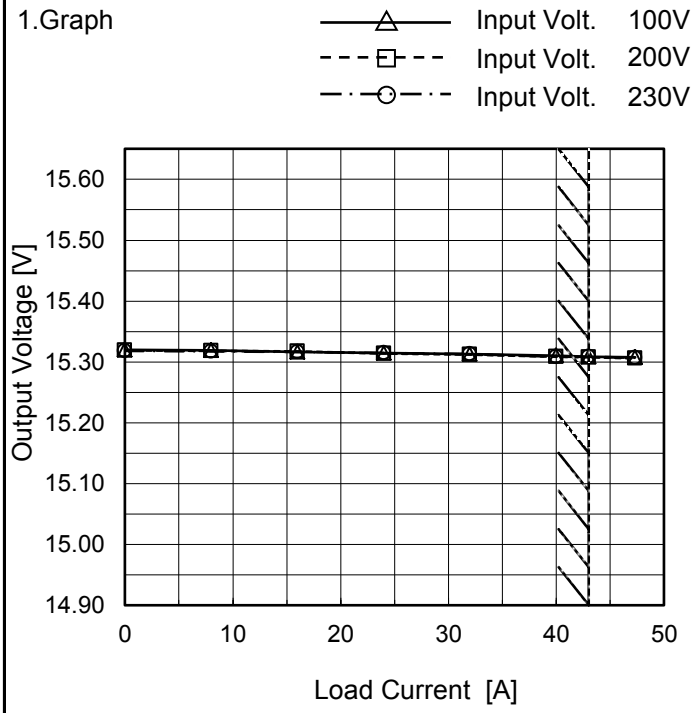
Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
80	15.310	-
85	15.312	-
100	15.312	15.307
120	15.313	15.308
200	15.312	15.307
230	15.313	15.308
264	15.313	15.308
280	15.314	15.308
--	-	-

COSEL

Model	PCA600F-15
Item	Load Regulation
Object	+15V43A

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	15.320	15.319	15.318
8.0	15.319	15.318	15.317
16.0	15.317	15.317	15.317
24.0	15.314	15.314	15.314
32.0	15.313	15.312	15.313
40.0	15.310	15.309	15.309
43.0	15.309	15.307	15.308
47.3	15.308	15.306	15.306
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	PCA600F-15
Item	Dynamic Load Response
Object	+15V43A

Temperature 25°C
Testing Circuitry Figure A

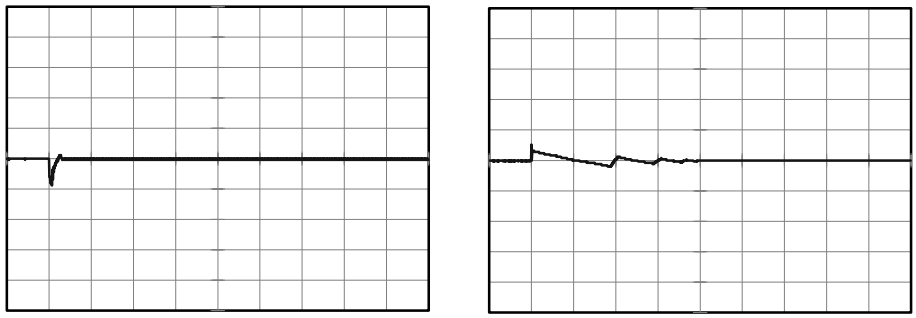
Input Volt. 100 V
Cycle 1000 ms

t1,t2 = 50 μs

Load Current

t1 t2

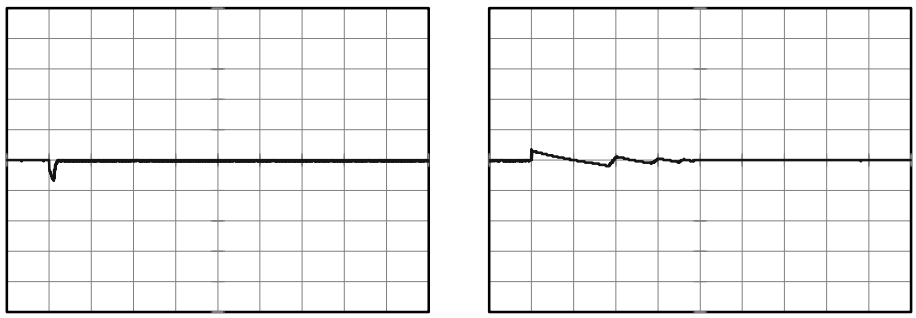
Min.Load (0A)←→
Load 100% (43A)



1 V/div

2 ms/div 10 ms/div

Min.Load (0A)←→
Load 50% (21.5A)



1 V/div

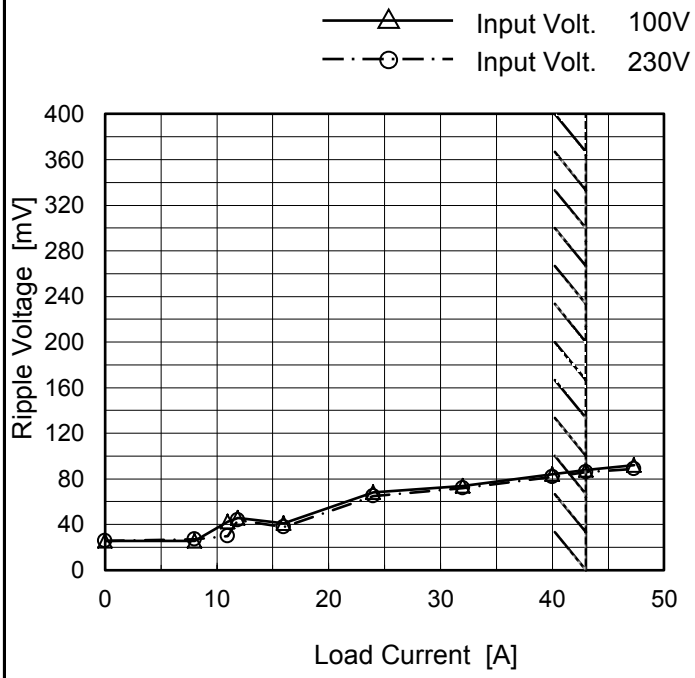
2 ms/div 10 ms/div

COSEL

Model	PCA600F-15
Item	Ripple Voltage (by Load Current)
Object	+15V43A

Temperature 25°C
Testing Circuitry Figure C

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

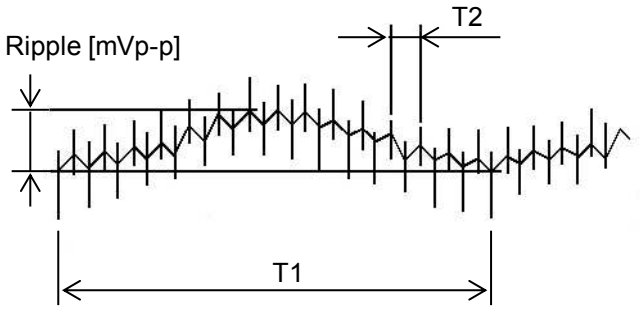


Fig. Complex Ripple Wave Form

2.Values

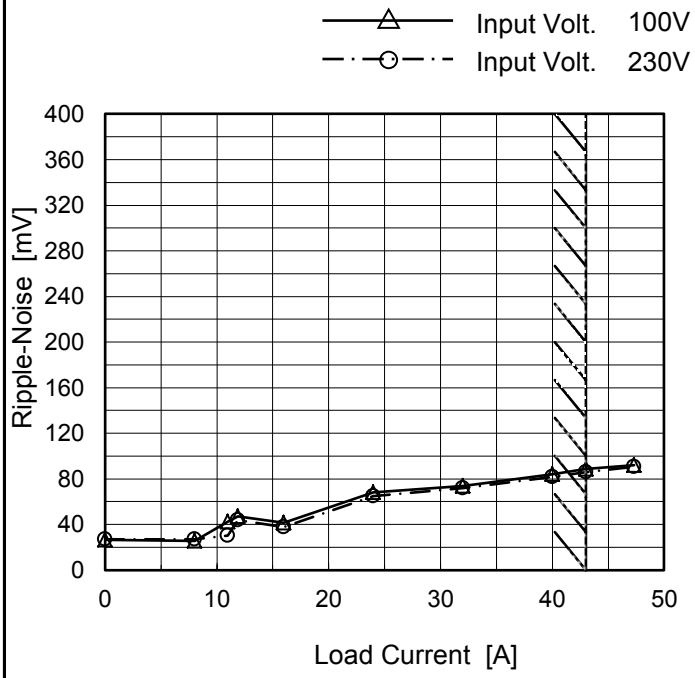
Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0.0	26	26
8.0	26	27
11.0	42	30
11.9	46	44
16.0	41	38
24.0	68	65
32.0	74	72
40.0	84	82
43.0	88	86
47.3	92	89
--	-	-

COSEL

Model	PCA600F-15
Item	Ripple-Noise
Object	+15V43A

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	26	27
8.0	26	27
11.0	42	30
11.9	47	44
16.0	42	38
24.0	68	65
32.0	74	72
40.0	84	82
43.0	89	86
47.3	92	90
--	-	-

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

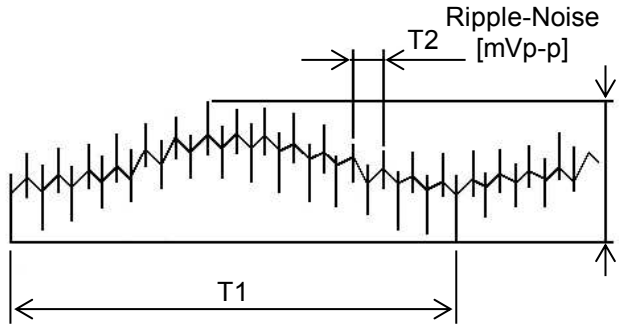


Fig. Complex Ripple Wave Form

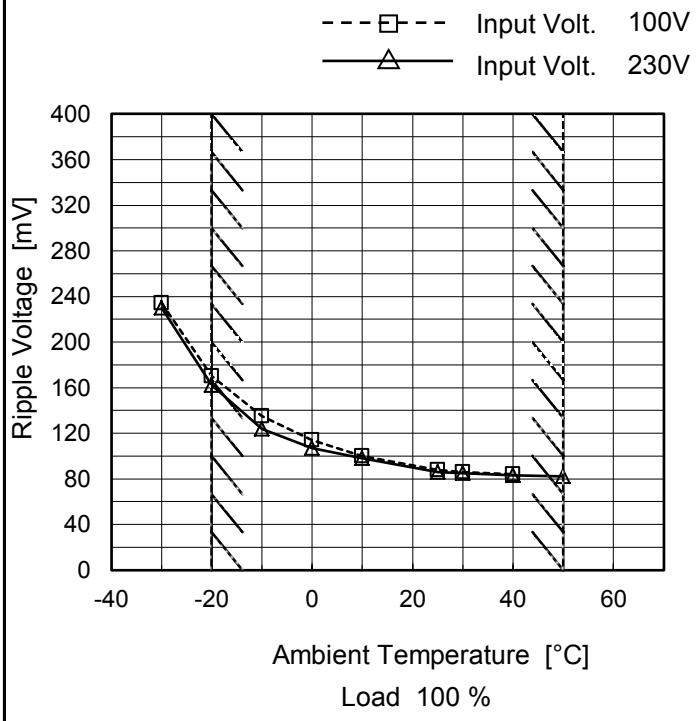
BC-11258

COSEL

Model	PCA600F-15
Item	Ripple Voltage (by Ambient Temp.)
Object	+15V43A

Testing Circuitry Figure C

1.Graph



Measured by 20 MHz Oscilloscope.

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

2.Values

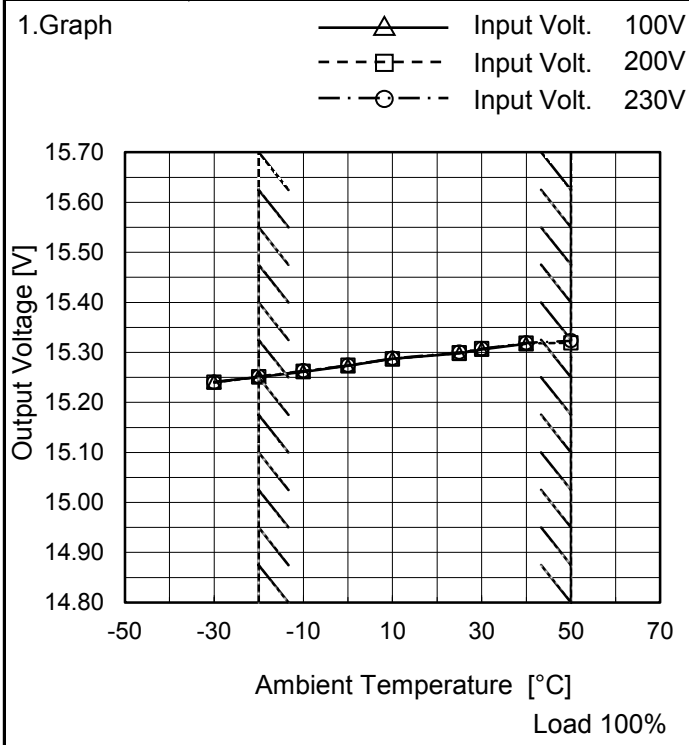
Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
-30	234	230
-20	170	162
-10	135	124
0	114	107
10	100	98
25	88	86
30	86	85
40	84	83
50	-	82
--	-	-
--	-	-

COSEL

Model	PCA600F-15
Item	Ambient Temperature Drift
Object	+15V43A

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]
-30	15.241	15.240	15.240
-20	15.251	15.251	15.252
-10	15.261	15.262	15.263
0	15.273	15.274	15.274
10	15.287	15.287	15.288
25	15.298	15.299	15.300
30	15.306	15.307	15.307
40	15.317	15.318	15.319
50	-	15.319	15.323
--	-	-	-
--	-	-	-

Model	PCA600F-15	
Item	Output Voltage Accuracy	Testing Circuitry Figure A
Object	+15V43A	

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 - 50°C
Input Voltage : 85 - 264V
Load Current : 0 - 43A

* Output Voltage Accuracy = ±(Maximum of Output Voltage - Minimum of Output Voltage) / 2

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

2.Values

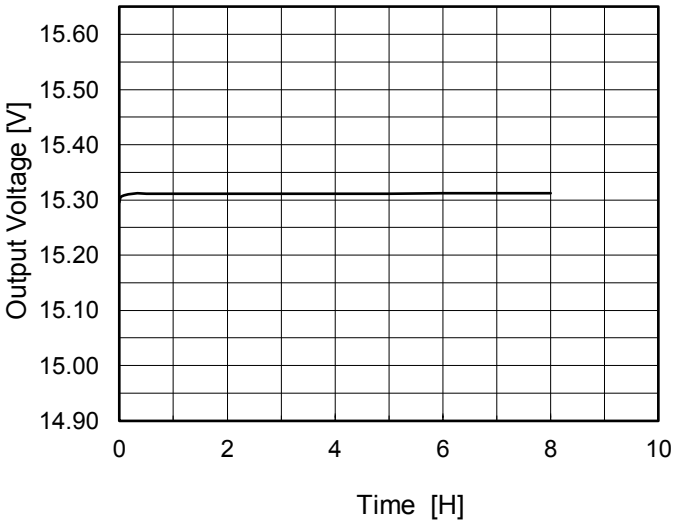
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	50	264	0	15.333	±43	±0.3
Minimum Voltage	-20	85	38.7	15.247		

COSEL

Model	PCA600F-15
Item	Time Lapse Drift
Object	+15V43A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



Input Volt. 230V
Load 100%

* The characteristic of AC100V is equal.

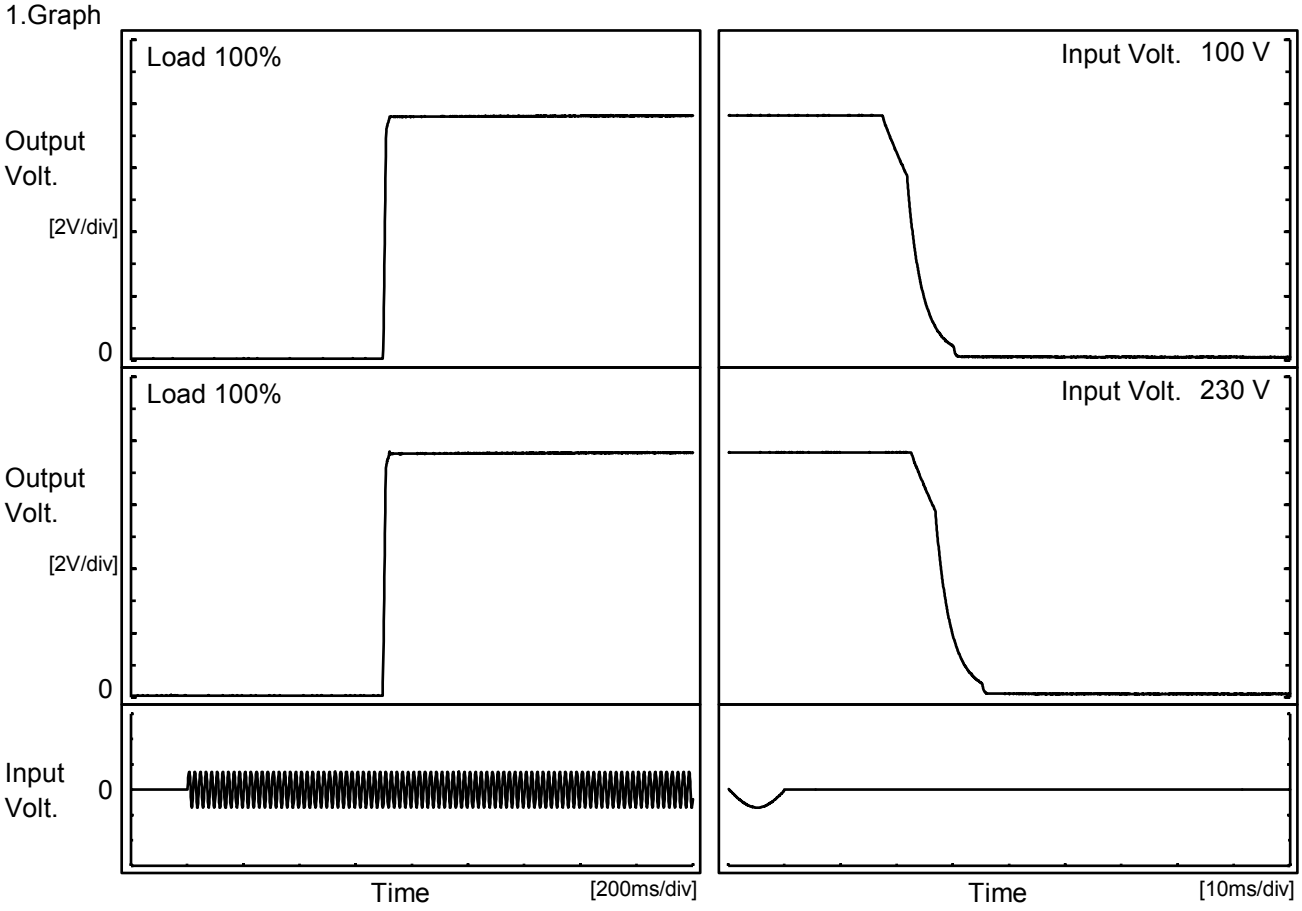
2.Values

Time since start [H]	Output Voltage [V]
0.0	15.296
0.5	15.312
1.0	15.311
2.0	15.312
3.0	15.312
4.0	15.311
5.0	15.312
6.0	15.312
7.0	15.312
8.0	15.312

COSEL

Model	PCA600F-15	
Item	Rise and Fall Time	Temperature 25°C Testing Circuitry Figure A
Object	+15V43A	

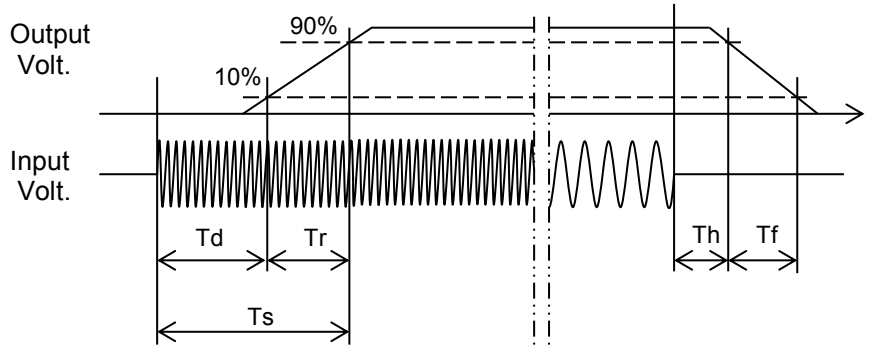
1.Graph



2.Values

[ms]

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	699.0	9.0	708.0	19.2	8.6
230 V	698.0	9.0	707.0	24.4	8.5

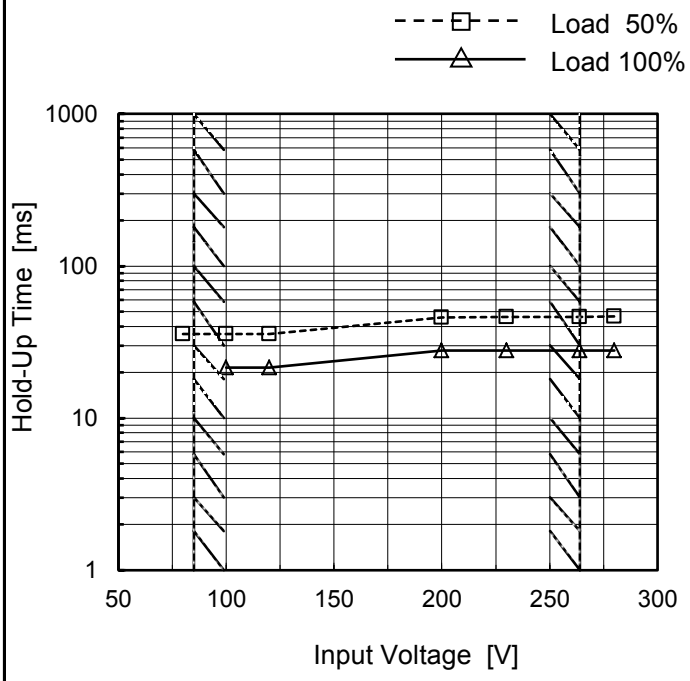


COSEL

Model	PCA600F-15
Item	Hold-Up Time
Object	+15V43A

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

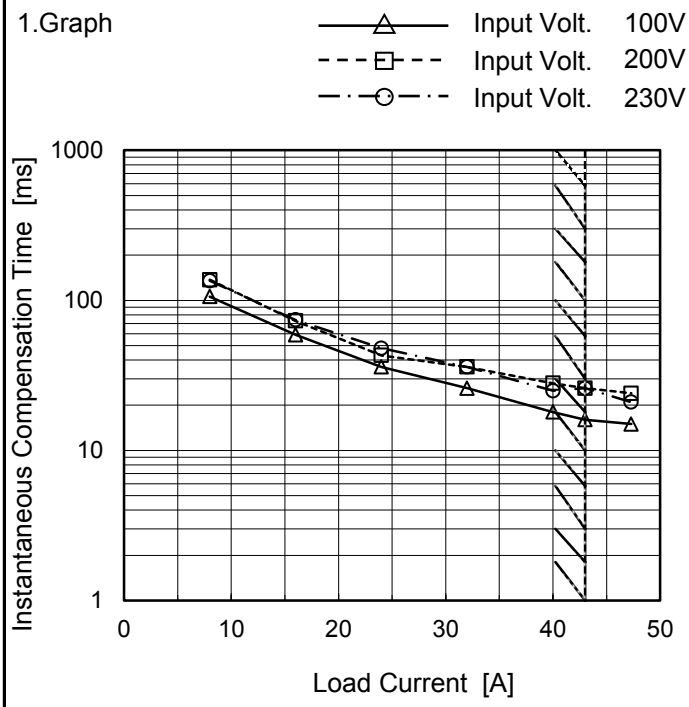
Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
80	36	-
85	36	-
100	36	22
120	36	22
200	46	28
230	46	28
264	46	28
280	47	28
--	-	-

COSEL

Model	PCA600F-15
Item	Instantaneous Interruption Compensation
Object	+15V43A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

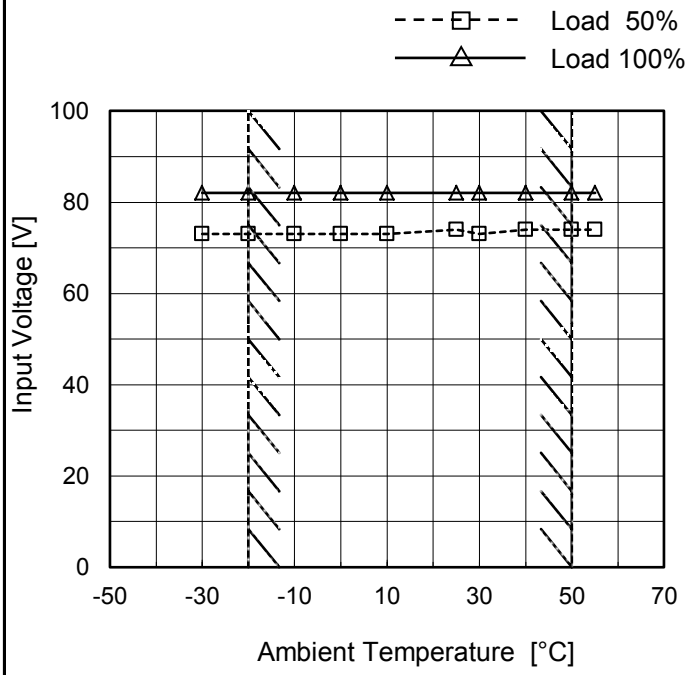
Load Current [A]	Time [ms] Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	-	-	-
8.0	106	137	135
16.0	59	73	74
24.0	36	43	48
32.0	26	36	36
40.0	18	28	25
43.0	16	26	26
47.3	15	24	21
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	PCA600F-15
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+15V43A

Testing Circuitry Figure A

1.Graph



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

2.Values

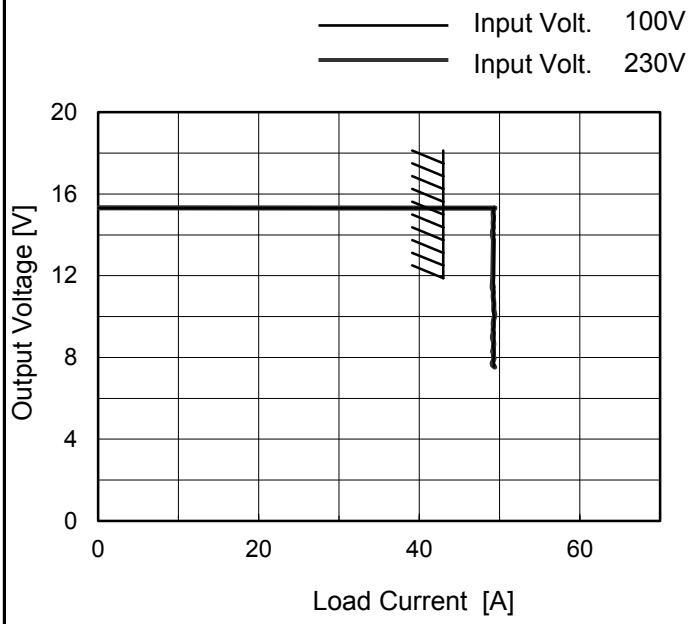
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-30	73	82
-20	73	82
-10	73	82
0	73	82
10	73	82
25	74	82
30	73	82
40	74	82
50	74	82
55	74	82
--	-	-

COSEL

Model	PCA600F-15
Item	Overcurrent Protection
Object	+15V43A

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 7.5V to 0V.

2.Values

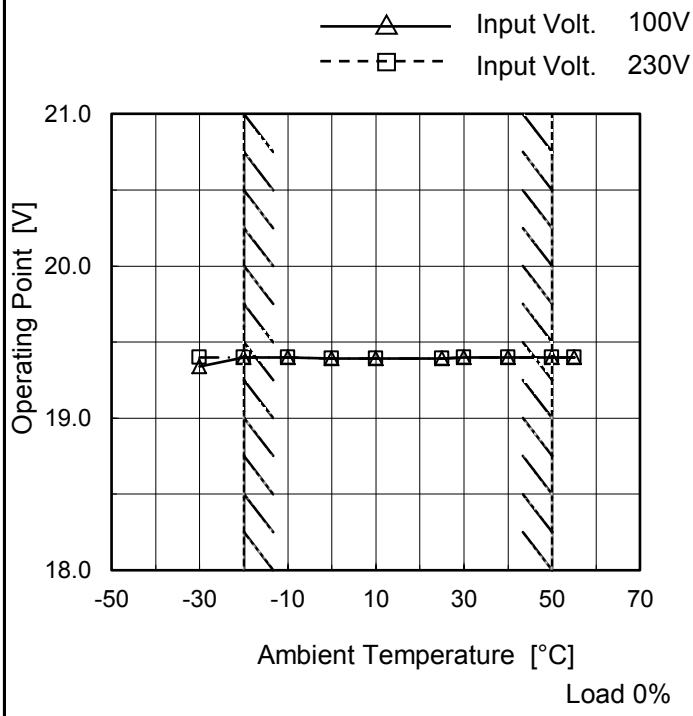
Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 230[V]
14.3	49.23	49.22
13.5	49.27	49.23
12.0	49.27	49.16
10.5	49.23	49.29
9.0	49.34	49.10
7.6	49.28	49.39
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	PCA600F-15
Item	Overvoltage Protection
Object	+15V43A

Testing Circuitry Figure A

1.Graph



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]
-30	19.34	19.40
-20	19.40	19.40
-10	19.40	19.40
0	19.39	19.39
10	19.39	19.39
25	19.39	19.39
30	19.40	19.40
40	19.40	19.40
50	19.40	19.40
55	19.40	19.40
--	-	-

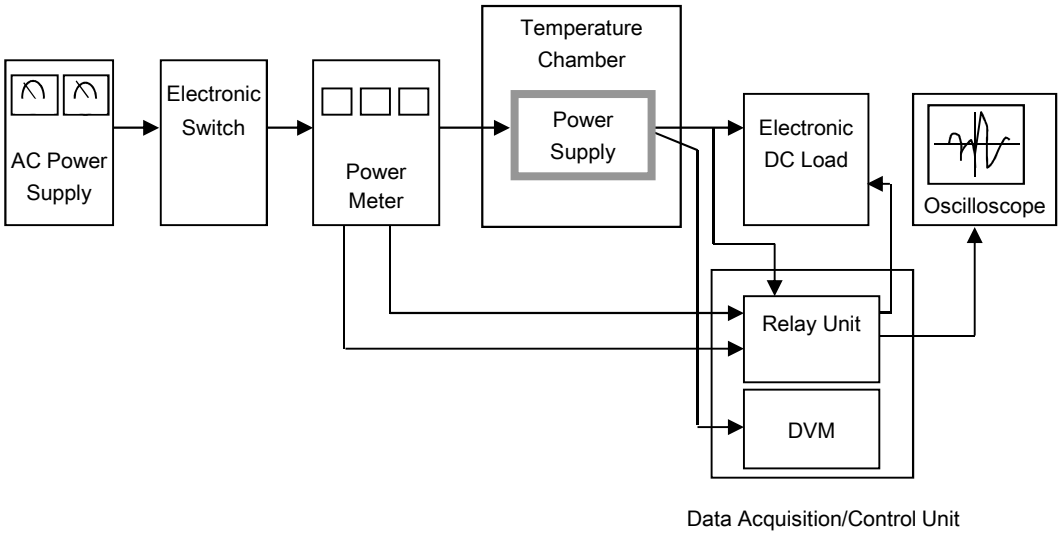


Figure A

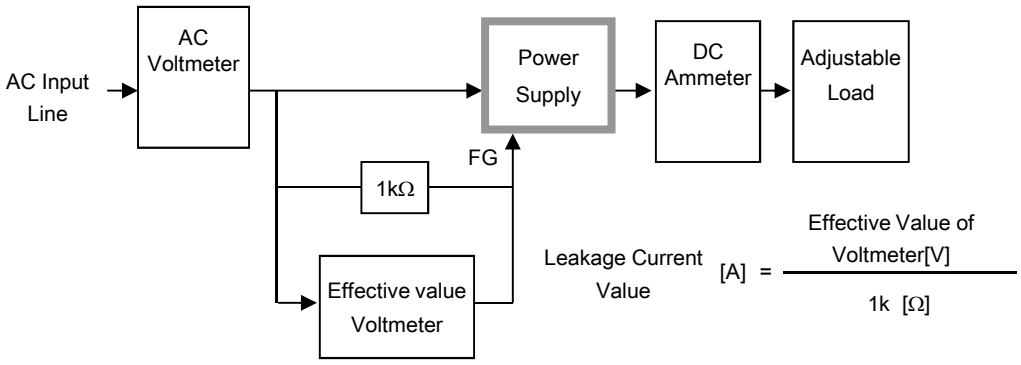


Figure B-1 (DEN-AN)

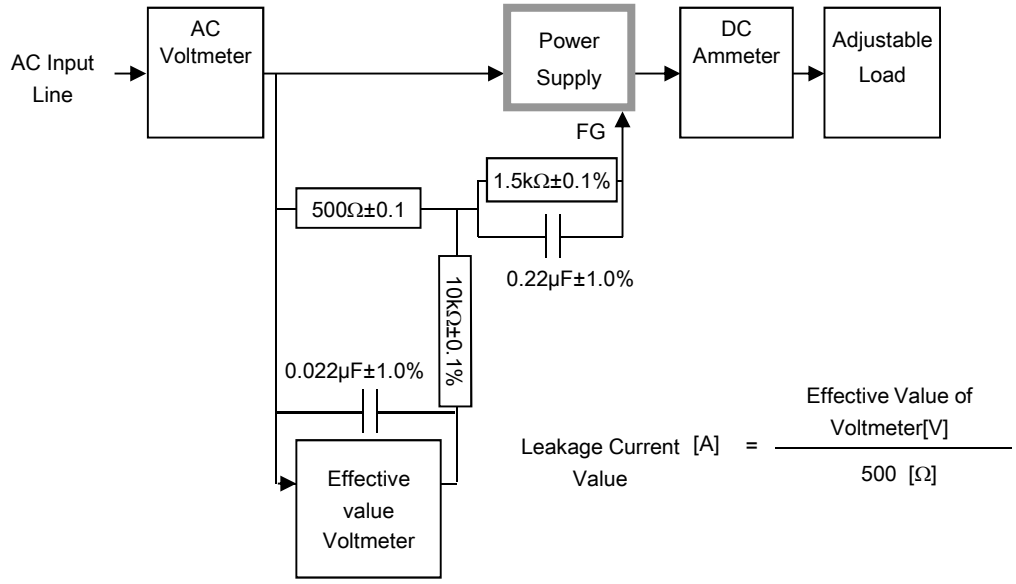


Figure B-2 (IEC62368-1 refer to IEC60990 Fig.4)

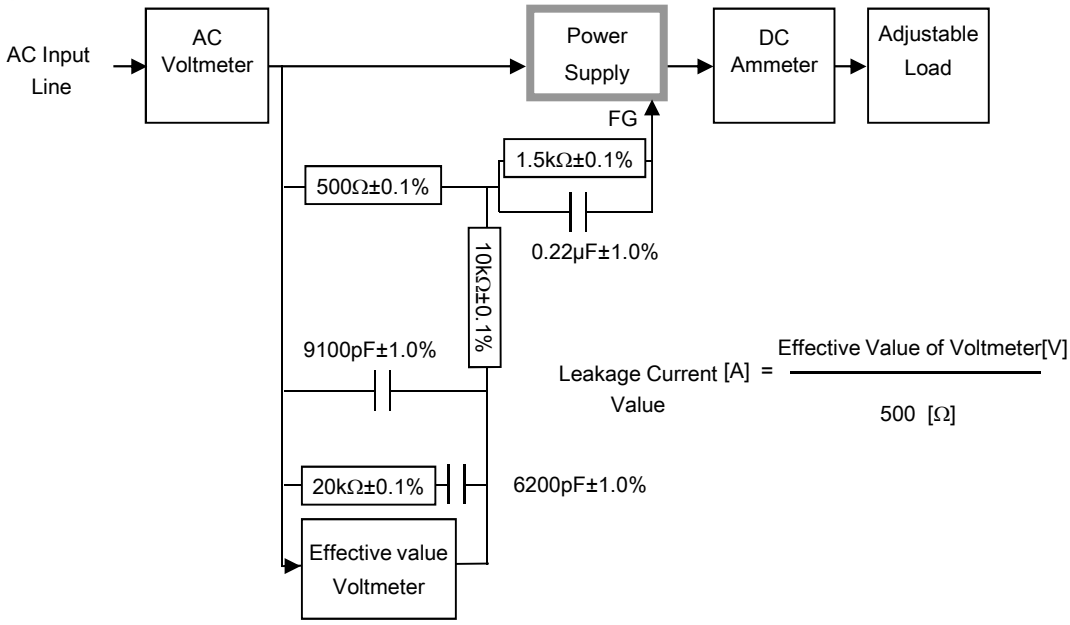


Figure B-3 (IEC62368-1 refer to IEC60990 Fig.5)

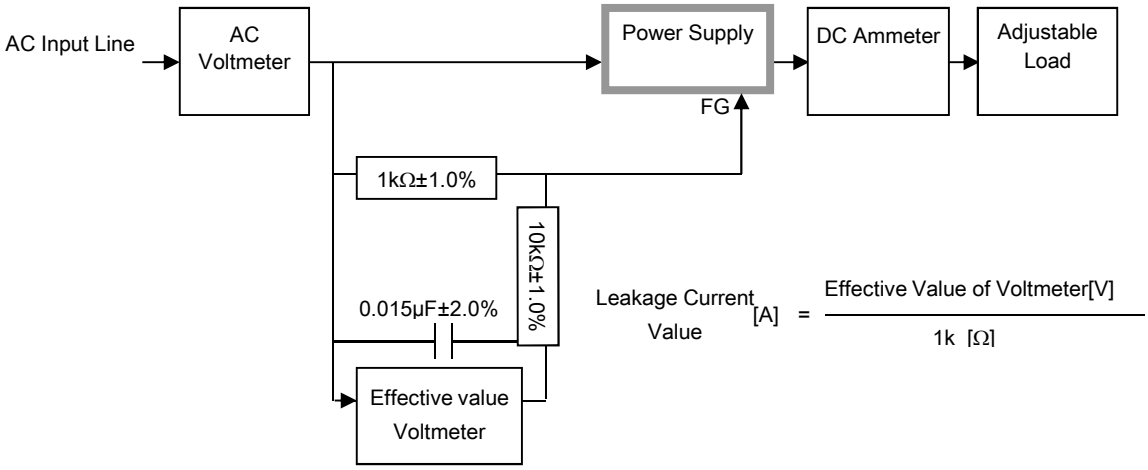


Figure B-4 (IEC60601-1)

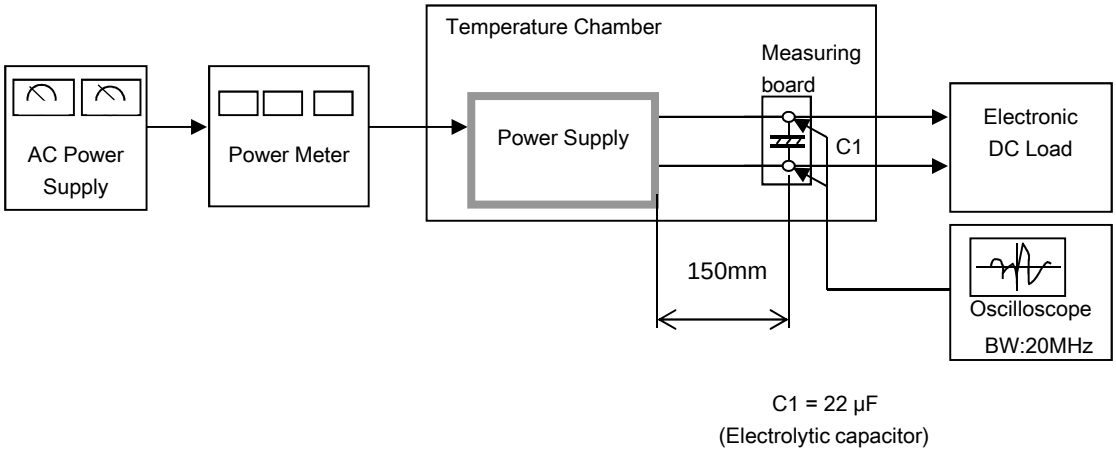


Figure C