TEST DATA OF PCA600F-12

Regulated DC Power Supply
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COSEL CO.,LTD.

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Item	Input Current (by Load Current)
Object	

Temperature	25°C
Testing Circuitry	Figure A

1.Graph

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

Load Current [A]

Input Current [A]

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	0.226	0.138	0.150
8.0	1.174	0.634	0.573
16.0	2.190	1.121	0.994
24.0	3.229	1.635	1.440
32.0	4.280	2.147	1.884
40.0	5.347	2.687	2.360
48.0	6.436	3.206	2.812
53.0	7.122	3.534	3.095
58.3	7.858	3.885	3.399
--	-	-	-
--	-	-	-

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Model	PCA600F-12
Item	Input Power (by Load Current)
Object	

Temperature 25°C
Testing Circuitry Figure A

1.Graph

———△——— Input Volt. 100V
- - -⊟- - - Input Volt. 200V
—·—○—·— Input Volt. 230V

Load Current [A]

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	13.5	10.6	10.4
8.0	115.1	114.6	114.8
16.0	217.7	213.8	213.8
24.0	322.1	317.5	317.1
32.0	427.3	420.4	419.6
40.0	533.8	525.9	525.3
48.0	642.1	630.3	629.4
53.0	710.3	695.8	694.6
58.3	783.4	765.8	764.3
--	-	-	-
--	-	-	-

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Model	PCA600F-12
Item	Efficiency (by Input Voltage)
Object	
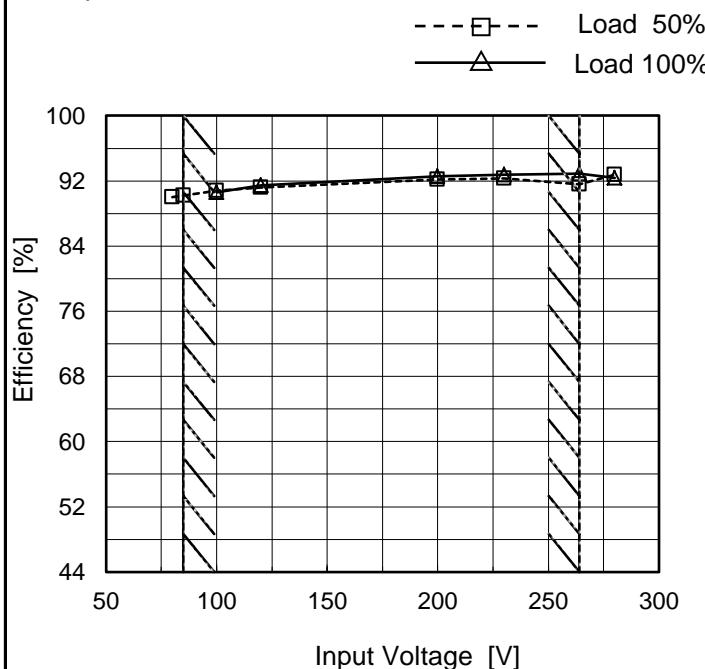
Temperature	25°C
Testing Circuitry	Figure A

1.Graph

--- ⊟ --- Load 50%
—— △ —— Load 100%

Efficiency [%] vs Input Voltage [V]

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

2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
80	90.0	-
85	90.2	-
100	90.8	90.6
120	91.2	91.5
200	92.2	92.6
230	92.3	92.7
264	91.6	92.9
280	92.7	92.4
--	-	-

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Model	PCA600F-12
Item	Efficiency (by Load Current)
Object	

Temperature	25°C
Testing Circuitry	Figure A

1.Graph

— △ — Input Volt. 100V
--- ⊟ --- Input Volt. 200V
—·— ⊖ —··— Input Volt. 230V

Load Current [A]

2.Values

Load Current [A]	Efficiency [%]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	-	-	-
8.0	84.5	84.9	84.7
16.0	89.3	90.9	90.9
24.0	90.6	91.9	92.0
32.0	91.0	92.5	92.7
40.0	91.1	92.4	92.6
48.0	90.9	92.6	92.7
53.0	90.7	92.6	92.7
58.3	90.4	92.5	92.7
--	-	-	-
--	-	-	-

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

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Model	PCA600F-12
Item	Power Factor (by Input Voltage)
Object	
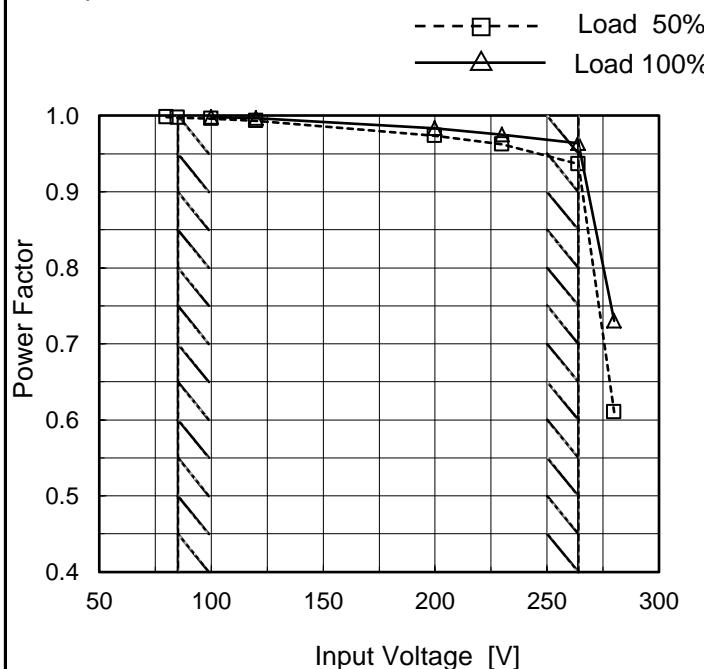
Temperature   25°C
Testing Circuitry   Figure A

1.Graph

- - - ☐ - - -   Load 50%
──── △ ────   Load 100%

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	0.974	0.984
230	0.962	0.975
264	0.936	0.964
280	0.610	0.730
--	-	-

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Model	PCA600F-12
Item	Power Factor (by Load Current)
Object	

Temperature 25°C
Testing Circuitry Figure A

1.Graph

— △ — Input Volt. 100V
--- ⊟ --- Input Volt. 200V
— · — ⊙ — · — Input Volt. 230V
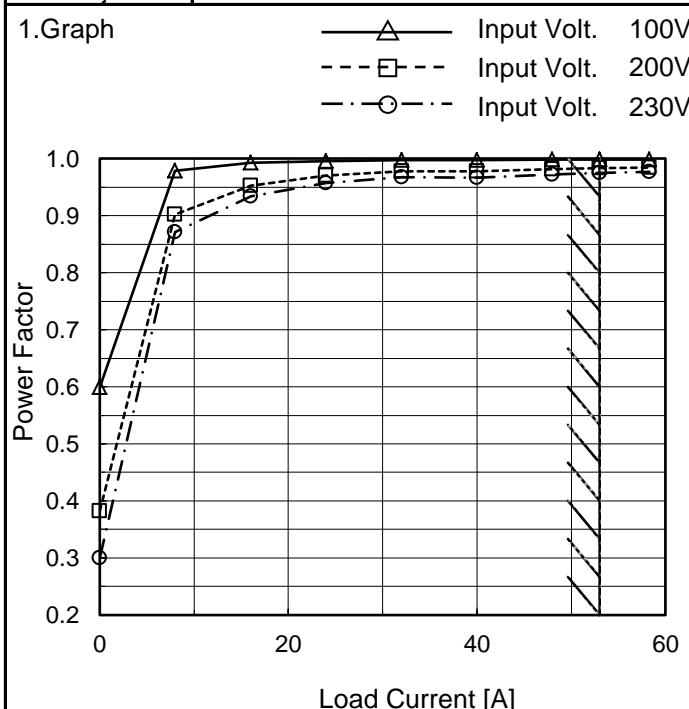
Power Factor

Load Current [A]

2.Values

Load Current [A]	Power Factor		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	0.599	0.382	0.300
8.0	0.979	0.902	0.872
16.0	0.993	0.953	0.934
24.0	0.996	0.970	0.957
32.0	0.997	0.978	0.968
40.0	0.998	0.978	0.967
48.0	0.998	0.982	0.973
53.0	0.998	0.984	0.975
58.3	0.999	0.985	0.977
--	-	-	-
--	-	-	-

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

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Model	PCA600F-12
Item	Inrush Current
Object	————————

Temperature 25℃
Testing Circuitry Figure A

Input
Current
[20A/div]

Input
Voltage
[100V/div]

Time   [200ms/div]

Input Voltage   100 V
Frequency   50 Hz
Load   100 %

Primary inrush current :
                     12.8 A
Secondary inrush current :
                     17.2 A

Input
Current
[20A/div]

Input
Voltage
[200V/div]

Time   [200ms/div]

Input Voltage   230 V
Frequency   50 Hz
Load   100 %

Primary inrush current :
                     29.2 A
Secondary inrush current :
                     13.6 A

Primary inrush current   Secondary inrush current

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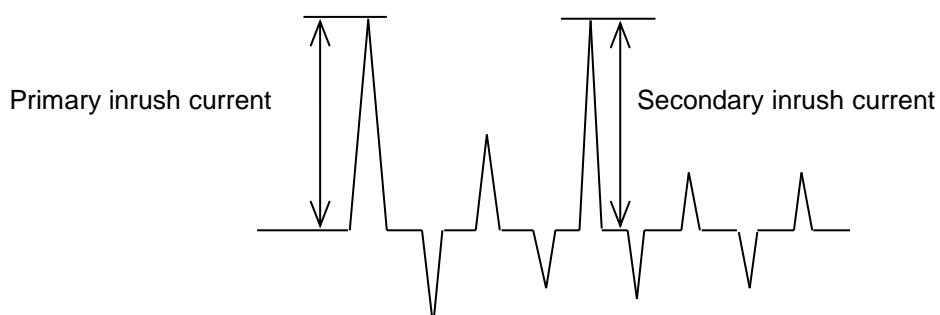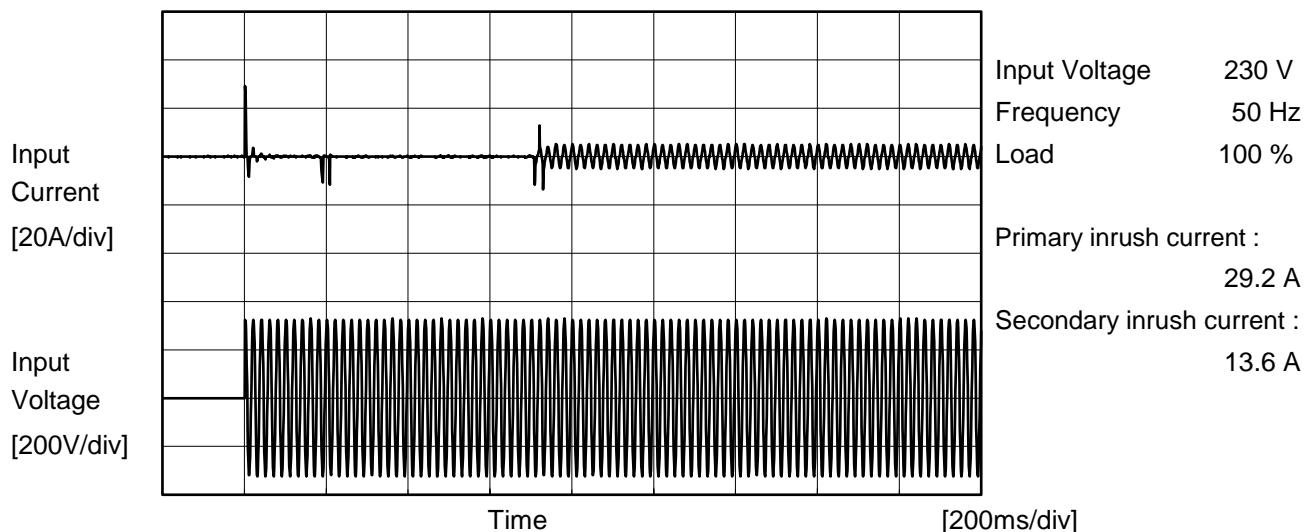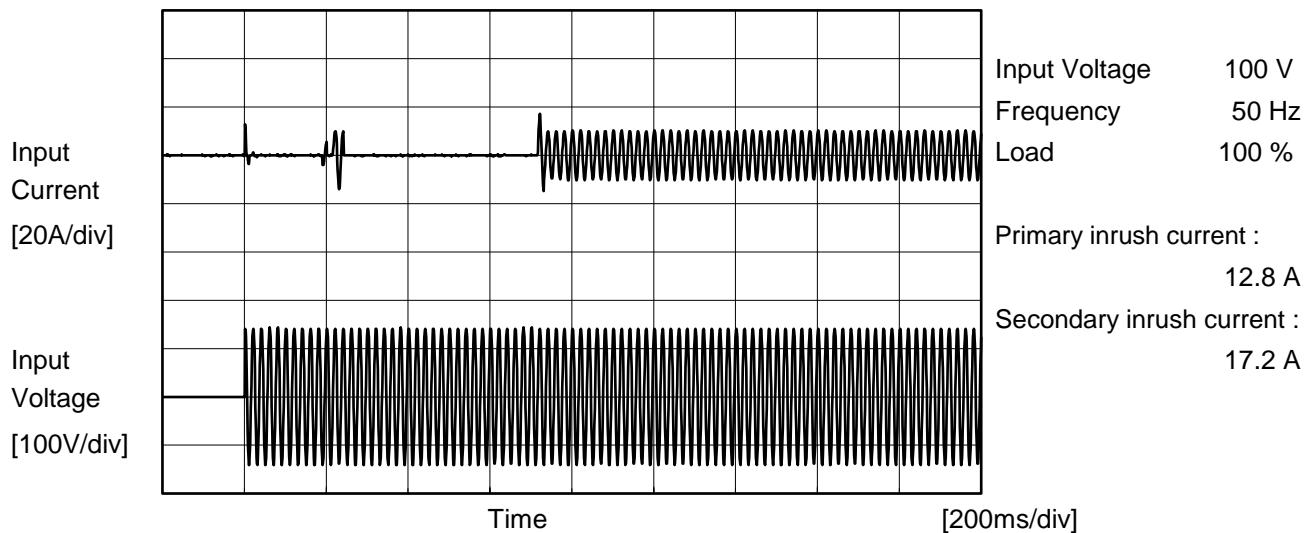
Model	PCA600F-12		
Item	Leakage Current	Temperature	25°C
Object		Testing Circuitry	Figure B

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.

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Model	PCA600F-12
Item	Line Regulation
Object	+12V53A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

--- ⊟ --- Load 50%
——△—— Load 100%

Output Voltage [V] vs Input Voltage [V]
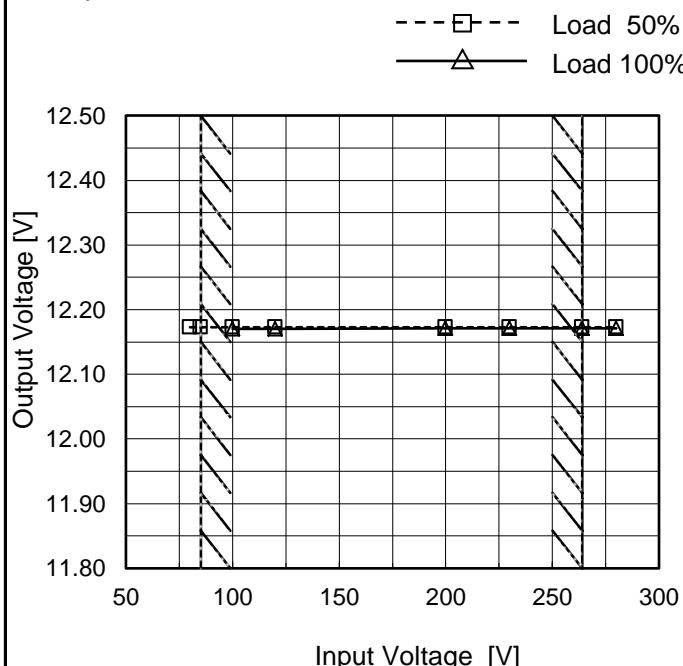
Note: Slanted line shows the range of the rated
input voltage.

2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
80	12.172	-
85	12.173	-
100	12.173	12.171
120	12.173	12.171
200	12.173	12.171
230	12.173	12.171
264	12.173	12.171
280	12.172	12.171
--	-	-

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Model	PCA600F-12
Item	Load Regulation
Object	+12V53A

Temperature　　25°C
Testing Circuitry　Figure A

1.Graph

—△— Input Volt. 100V
- - -⊟- - - Input Volt. 200V
—·—O—·— Input Volt. 230V

Load Current [A]

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	12.173	12.174	12.173
8.0	12.173	12.174	12.173
16.0	12.173	12.173	12.174
24.0	12.172	12.172	12.173
32.0	12.172	12.171	12.172
40.0	12.171	12.171	12.171
48.0	12.171	12.171	12.170
53.0	12.171	12.170	12.171
58.3	12.170	12.170	12.170
--	-	-	-
--	-	-	-

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Model	PCA600F-12
Item	Dynamic Load Response
Object	+12V53A

Temperature   25°C
Testing Circuitry   Figure A

Input Volt.   100 V
Cycle   1000 ms

t1,t2 = 50 μ s

Load Current

t1   t2

Min.Load (0A)←→
   Load 100% (53A)

1 V/div

2 ms/div   10 ms/div

Min.Load (0A)←→
   Load 50% (26.5A)

1 V/div

2 ms/div   10 ms/div

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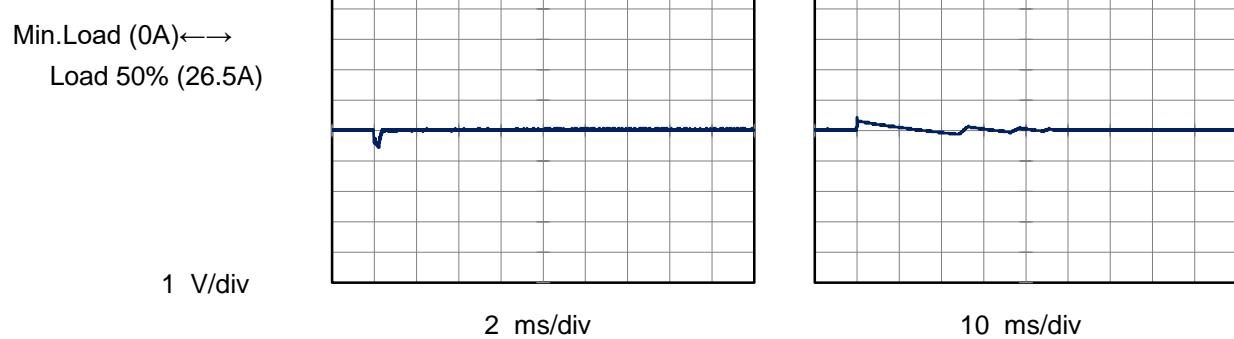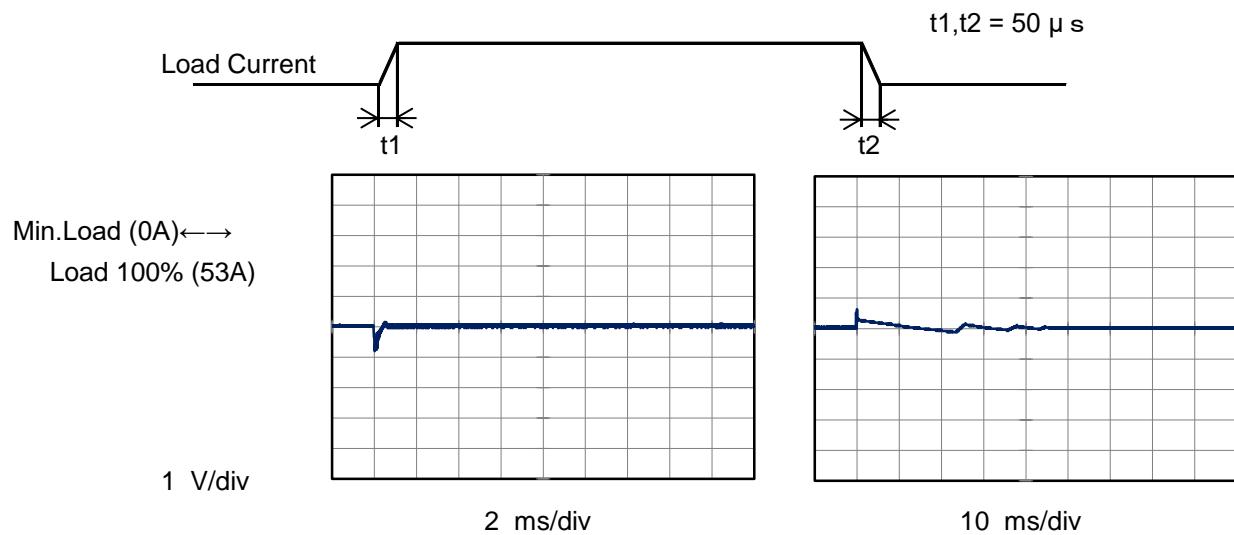
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Model	PCA600F-12
Item	Ripple Voltage (by Load Current)
Object	+12V53A

Temperature 25°C
Testing Circuitry Figure C

1.Graph

———△——— Input Volt. 100V
—·—○—·— Input Volt. 230V

Load Current [A]

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.
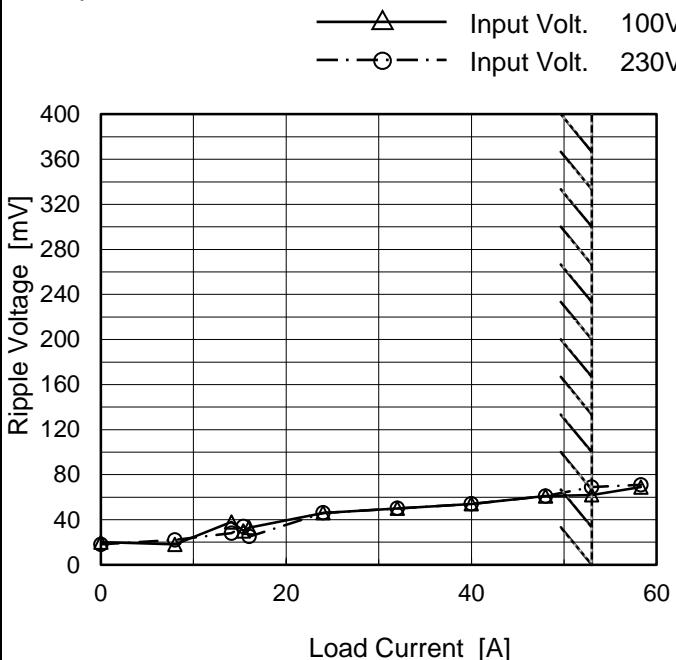
2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0.0	20	18
8.0	18	22
14.1	38	28
15.4	30	34
16.0	33	25
24.0	46	46
32.0	50	50
40.0	54	54
48.0	61	61
53.0	62	69
58.3	69	71

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

Ripple [mVp-p]

Fig. Complex Ripple Wave Form

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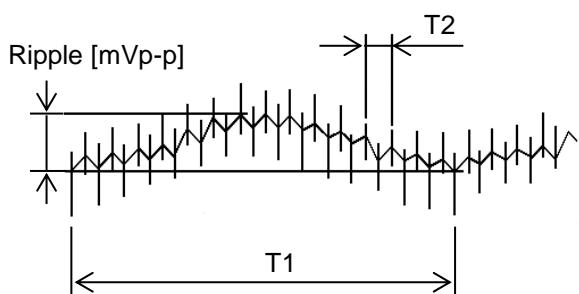
Model	PCA600F-12
Item	Ripple-Noise
Object	+12V53A

Temperature　　25°C
Testing Circuitry　Figure C

1.Graph

——△—— Input Volt.　100V
—·—○—·— Input Volt.　230V
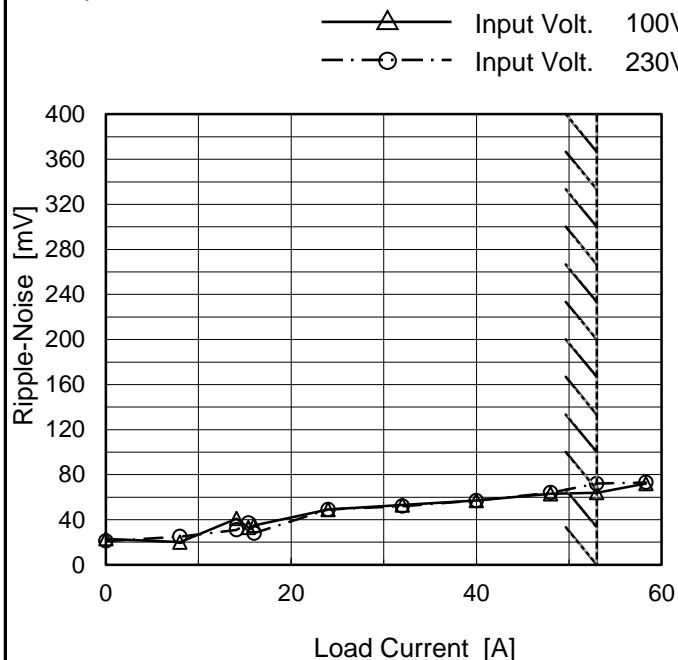
Load Current [A]

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	23	21
8.0	20	25
14.1	41	31
15.4	33	37
16.0	35	28
24.0	49	49
32.0	53	52
40.0	57	57
48.0	63	64
53.0	64	72
58.3	72	73

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

Fig. Complex Ripple Wave Form

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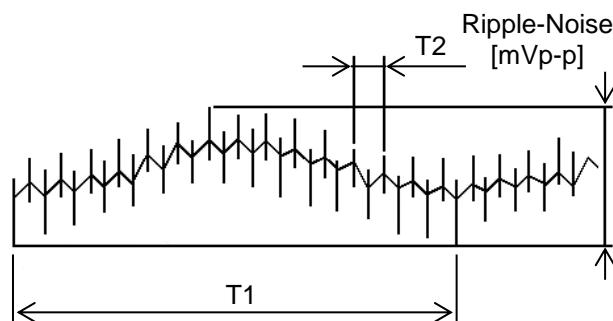
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Model	PCA600F-12
Item	Ripple Voltage (by Ambient Temp.)
Object	+12V53A

Testing Circuitry   Figure C

1.Graph

- - -⊟- - -   Input Volt.   100V
——△——   Input Volt.   230V

Ambient Temperature [°C]

Load   100 %
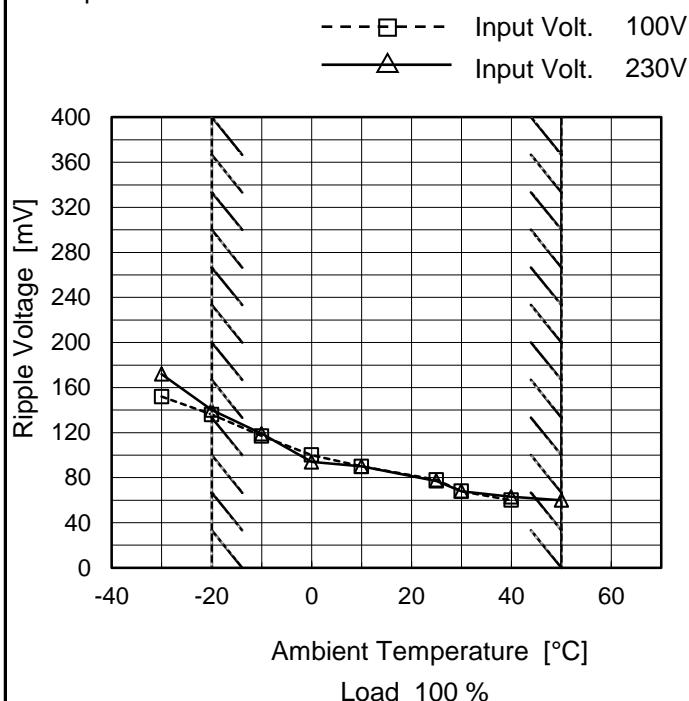
Measured by 20 MHz Oscilloscope.
Note: Slanted line shows the range of the rated
ambient temperature.

2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
-30	152	172
-20	136	140
-10	117	119
0	100	94
10	90	90
25	78	77
30	68	68
40	60	63
50	-	60
--	-	-
--	-	-

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Model	PCA600F-12
Item	Ambient Temperature Drift
Object	+12V53A
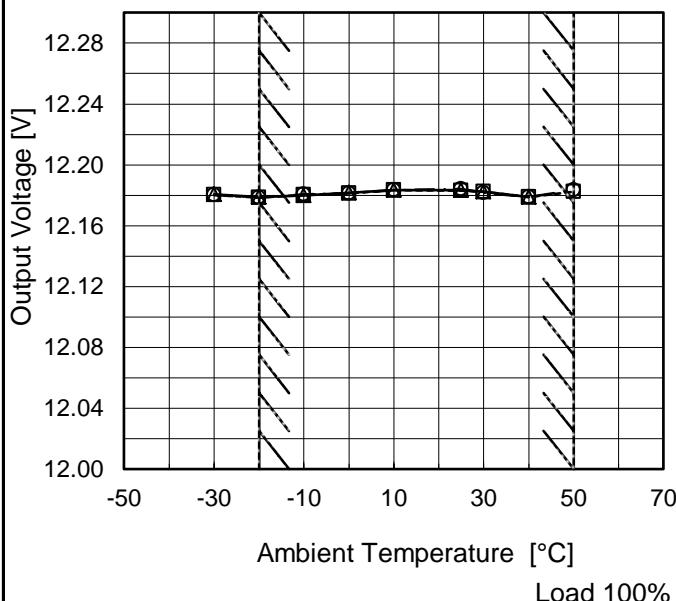
Testing Circuitry   Figure A

1.Graph

——△—— Input Volt.   100V
- - -⊟- - - Input Volt.   200V
—·—⊖—·— Input Volt.   230V

2.Values

Ambient Temperature [°C]

Load 100%

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

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-30	12.181	12.180	12.180
-20	12.179	12.178	12.179
-10	12.180	12.180	12.181
0	12.182	12.181	12.181
10	12.183	12.183	12.183
25	12.183	12.183	12.184
30	12.182	12.182	12.182
40	12.179	12.179	12.179
50	-	12.182	12.183
--	-	-	-
--	-	-	-

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Model	PCA600F-12	
Item	Output Voltage Accuracy	Testing Circuitry Figure A
Object	+12V53A	

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 - 53A

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

  * Output Voltage Accuracy (Ratio) = $\dfrac{\text{Output Voltage Accuracy}}{\text{Rated Output Voltage}}$ × 100

2.Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	30	200	0	12.192	±8	±0.1
Minimum Voltage	-20	85	0	12.176		

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Model	PCA600F-12
Item	Time Lapse Drift
Object	+12V53A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

Output Voltage [V] vs Time [H]

Input Volt. 230V
Load 100%

* The characteristic of AC100V is equal.

2.Values

Time since start [H]	Output Voltage [V]
0.0	12.180
0.5	12.174
1.0	12.175
2.0	12.174
3.0	12.177
4.0	12.172
5.0	12.175
6.0	12.177
7.0	12.177
8.0	12.176

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Model	PCA600F-12
Item	Rise and Fall Time
Object	+12V53A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

Load 100%

Output Volt.

[2V/div]

0

Load 100%

Output Volt.

[2V/div]

0

Input Volt.

0

Time   [200ms/div]

Input Volt.   100 V

Input Volt.   230 V

Time   [10ms/div]
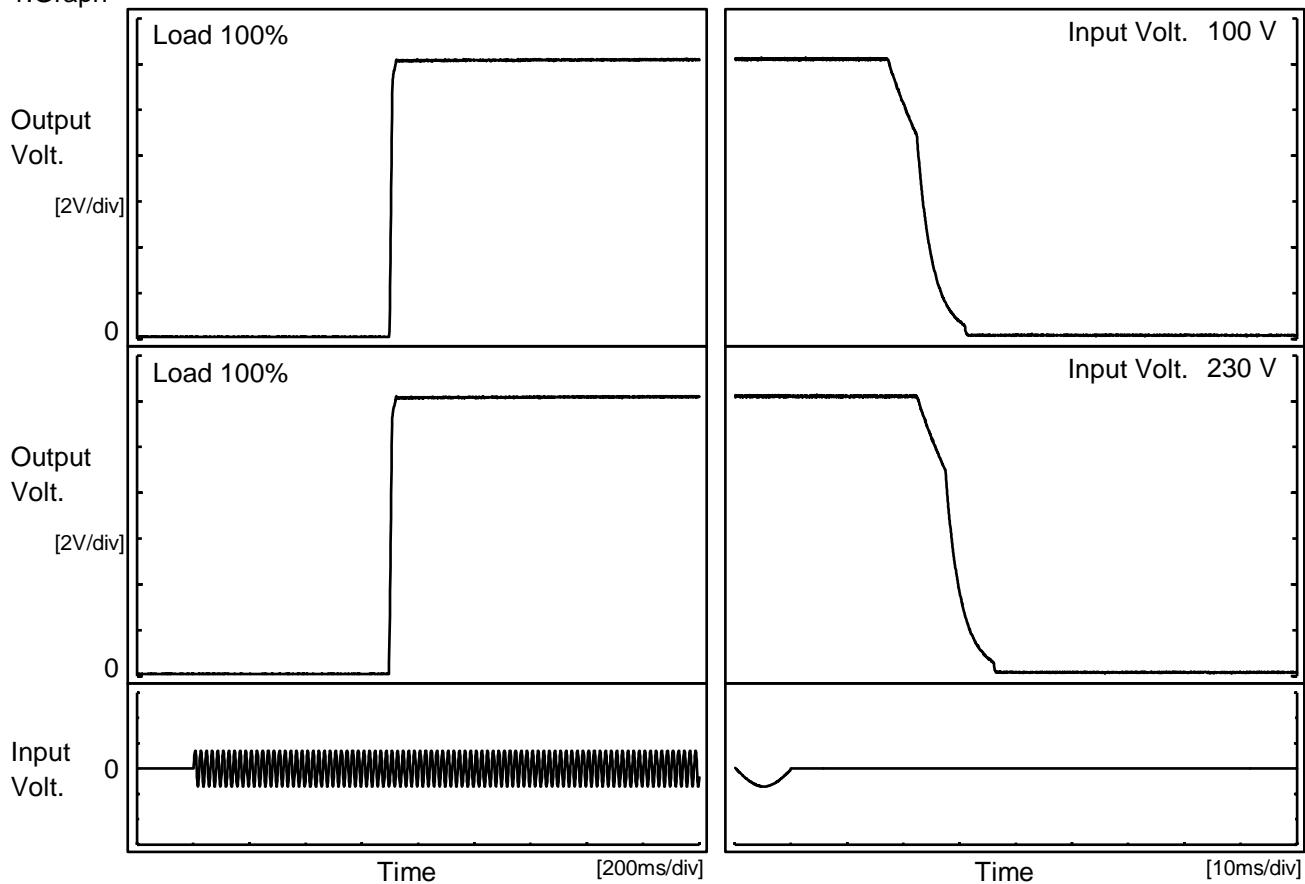
2.Values   [ms]

Input Volt.　　Time	Td	Tr	Ts	Th	Tf
100 V	699.0	10.0	709.0	19.1	9.0
230 V	698.0	9.0	707.0	24.2	9.1

Output Volt.

90%

10%

Input Volt.

Td   Tr

Th   Tf

Ts

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Model	PCA600F-12
Item	Hold-Up Time
Object	+12V53A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

--- ⊟ --- Load 50%
——— △ ——— Load 100%

Hold-Up Time [ms] vs Input Voltage [V]

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	23
120	36	23
200	46	30
230	46	30
264	47	30
280	47	30
--	-	-

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Model	PCA600F-12
Item	Instantaneous Interruption Compensation
Object	+12V53A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

⎯△⎯ Input Volt. 100V
---⊟--- Input Volt. 200V
—·—○—·— Input Volt. 230V

Instantaneous Compensation Time [ms] vs Load Current [A]

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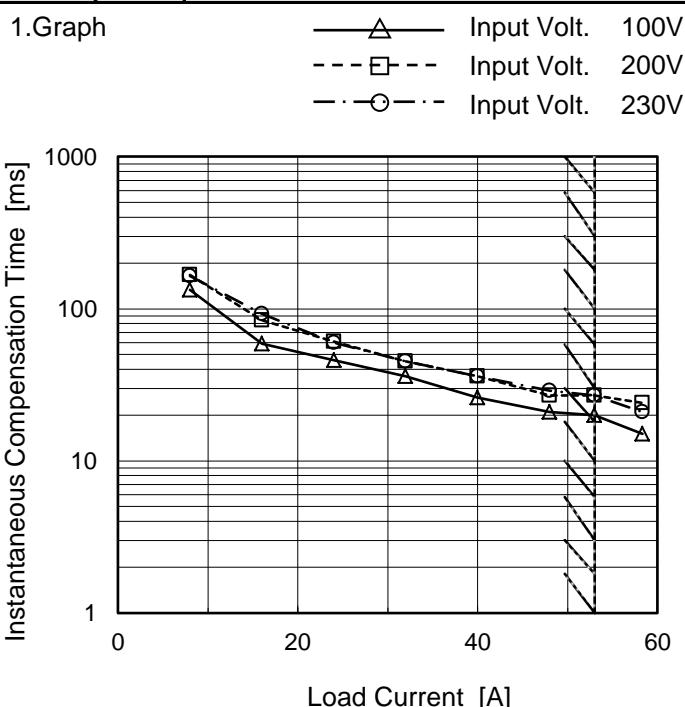
2.Values

Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	-	-	-
8.0	133	167	165
16.0	59	84	93
24.0	46	61	60
32.0	36	45	45
40.0	26	36	36
48.0	21	27	29
53.0	20	27	27
58.3	15	24	21
--	-	-	-
--	-	-	-

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Model	PCA600F-12
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+12V53A
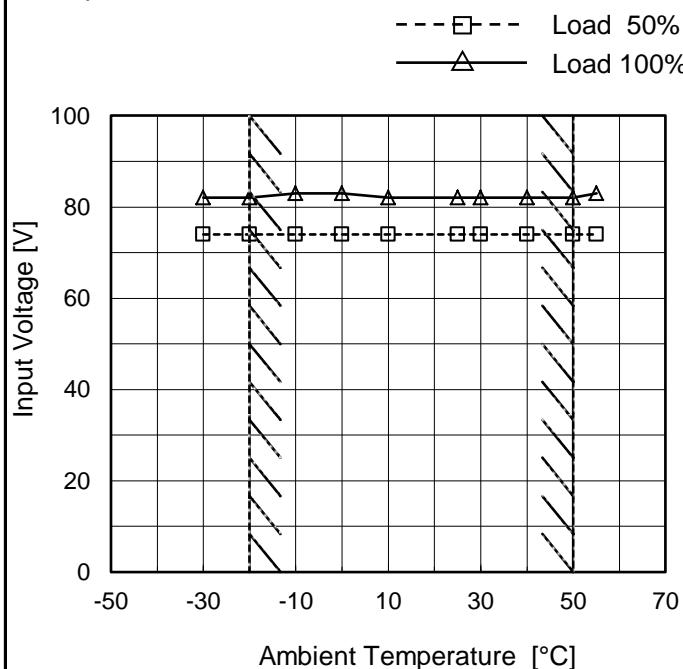
Testing Circuitry   Figure A

1.Graph

- - -⊟- - - Load 50%
———△——— Load 100%

Input Voltage [V] vs Ambient Temperature [°C]

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

2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-30	74	82
-20	74	82
-10	74	83
0	74	83
10	74	82
25	74	82
30	74	82
40	74	82
50	74	82
55	74	83
--	-	-

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Model	PCA600F-12
Item	Overcurrent Protection
Object	+12V53A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

—————— Input Volt.   100V

—————— Input Volt.   230V

Output Voltage [V]
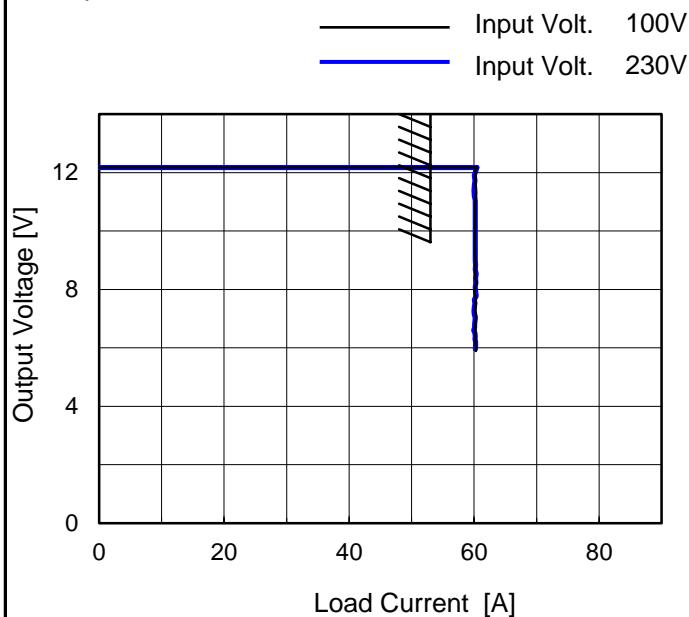
Load Current [A]

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

Intermittent operation occurs when the output
voltage is from 6V to 0V.

2.Values

Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 230[V]
11.4	60.30	59.98
10.8	60.20	60.18
9.6	60.20	60.18
8.4	60.23	60.21
7.2	60.15	59.98
5.9	60.28	60.19
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

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COSEL

Model	PCA600F-12
Item	Overvoltage Protection
Object	+12V53A

Testing Circuitry   Figure A

1.Graph

——△—— Input Volt.   100V
- - -☐- - - Input Volt.   230V

Operating Point [V] vs Ambient Temperature [°C]

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]
-30	15.42	15.42
-20	15.42	15.42
-10	15.42	15.42
0	15.41	15.41
10	15.42	15.42
25	15.44	15.44
30	15.45	15.45
40	15.48	15.48
50	15.48	15.48
55	15.48	15.48
--	-	-

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COSEL

AC Power Supply → Electronic Switch → Power Meter → Temperature Chamber [Power Supply] → Electronic DC Load → Oscilloscope

Relay Unit

DVM
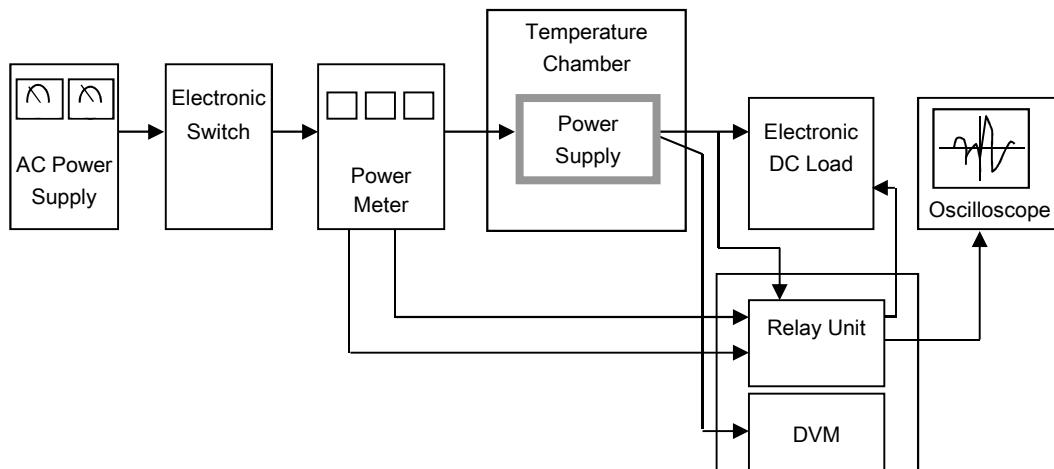
Data Acquisition/Control Unit

Figure A

AC Input Line → AC Voltmeter → Power Supply → DC Ammeter → Adjustable Load

FG

1kΩ

Effective value Voltmeter

Leakage Current Value [A] = $\dfrac{\text{Effective Value of Voltmeter[V]}}{1k\ [\Omega]}$

Figure B-1 (DEN-AN)

AC Input Line → AC Voltmeter → Power Supply → DC Ammeter → Adjustable Load

FG

500Ω±0.1

1.5kΩ±0.1%

0.22μF±1.0%

10kΩ±0.1%

0.022μF±1.0%

Effective value Voltmeter

Leakage Current Value [A] = $\dfrac{\text{Effective Value of Voltmeter[V]}}{500\ [\Omega]}$
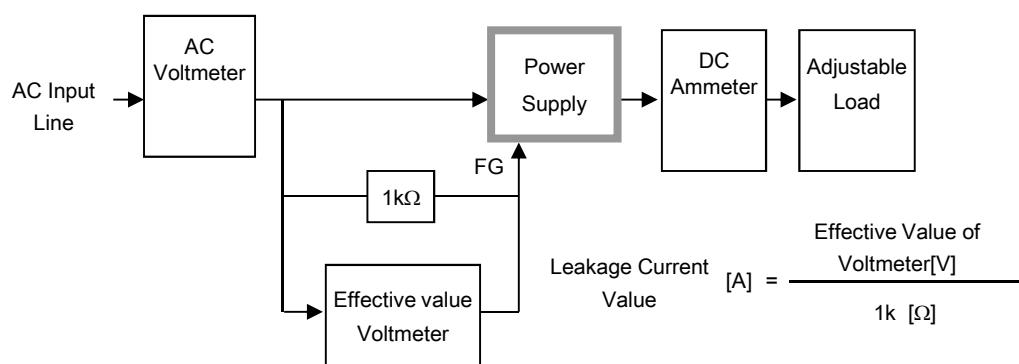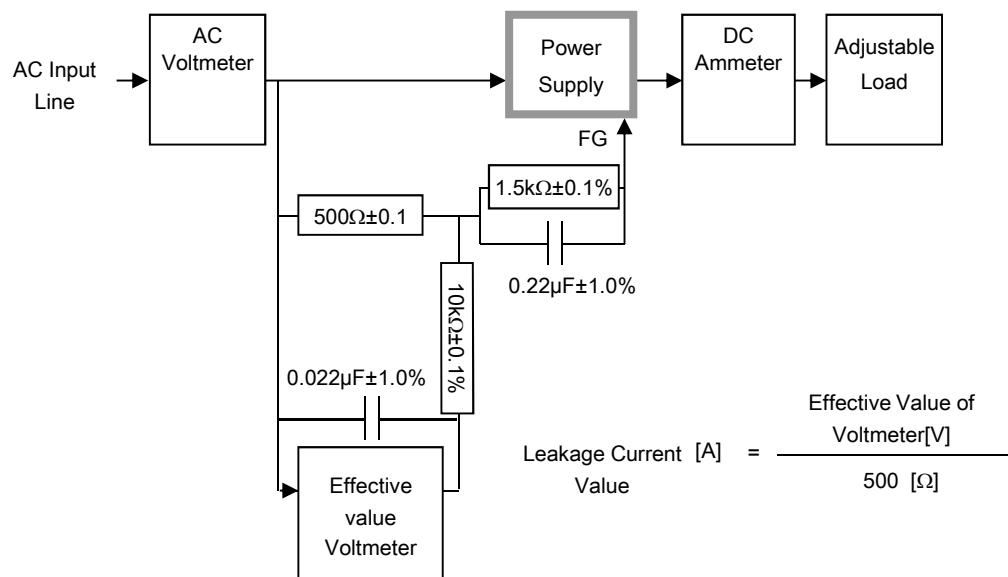
Figure B-2 (IEC62368-1 refer to IEC60990 Fig.4)

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AC Input Line

AC Voltmeter

Power Supply

DC Ammeter

Adjustable Load

FG

500Ω±0.1%

1.5kΩ±0.1%

0.22μF±1.0%

10kΩ±0.1%

9100pF±1.0%

$$\text{Leakage Current [A] Value} = \frac{\text{Effective Value of Voltmeter[V]}}{500\ [\Omega]}$$

20kΩ±0.1%

6200pF±1.0%

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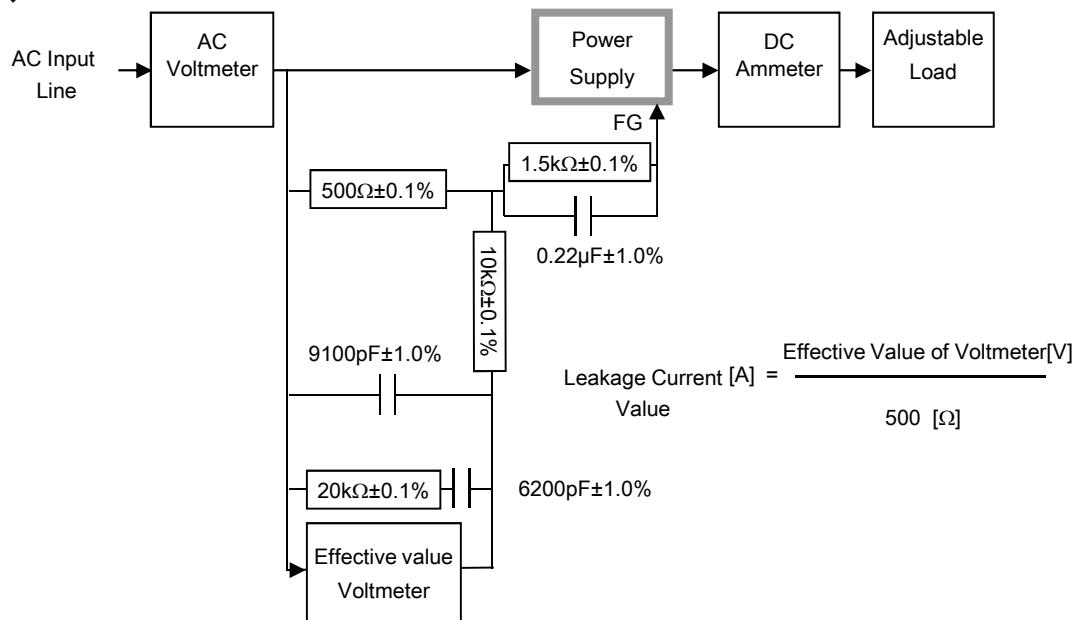
Figure B-3 (IEC62368-1 refer to IEC60990 Fig.5)

AC Input Line

AC Voltmeter

Power Supply

DC Ammeter

Adjustable Load

FG

1kΩ±1.0%

10kΩ±1.0%

0.015μF±2.0%

$$\text{Leakage Current Value [A]} = \frac{\text{Effective Value of Voltmeter[V]}}{1k\ [\Omega]}$$

Effective value Voltmeter

Figure B-4 (IEC60601-1)

Temperature Chamber

Measuring board

AC Power Supply

Power Meter

Power Supply

C1

Electronic DC Load

150mm

Oscilloscope

BW:20MHz
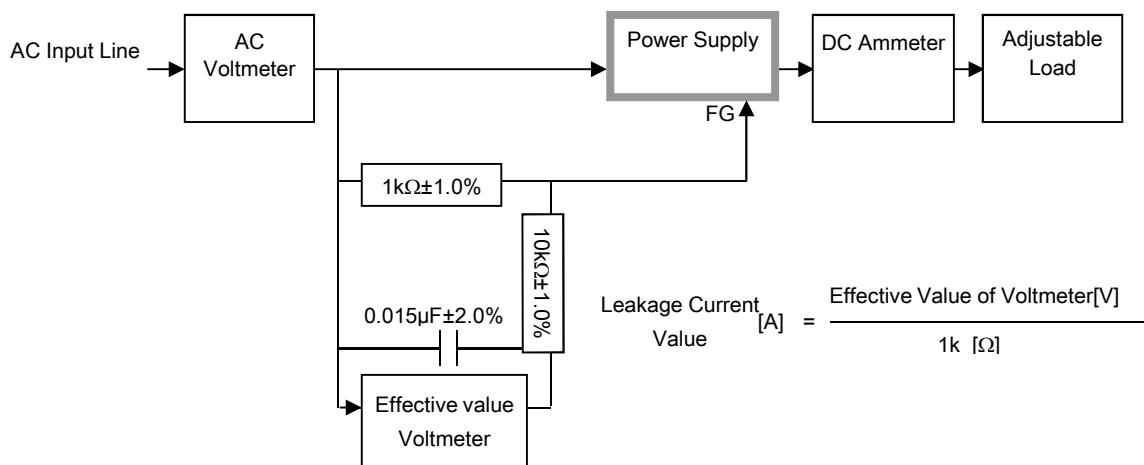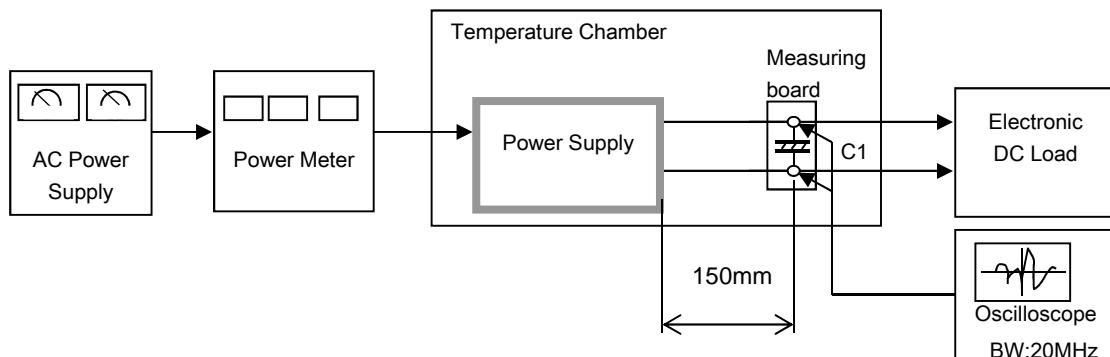
C1 = 22 μF

(Electrolytic capacitor)

Figure C

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