COSEL

TEST DATA OF GHA500F-56-SNF

Regulated DC Power Supply
December 8, 2015

Approved by : _Kenji Shiho_
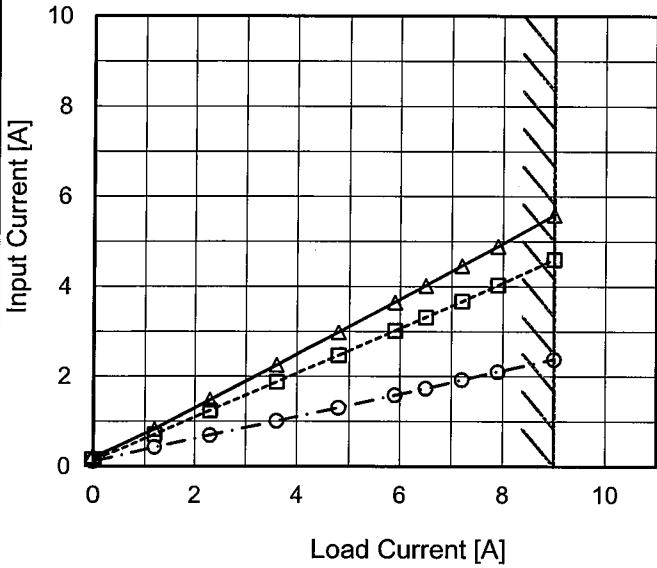Kenji Shiho   Design Manager

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COSEL CO.,LTD.

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Model	GHA500F-56-SNF
Item	Input Current (by Load Current)
Object	

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

————△———— Input Volt.   100V
- - -☐- - - Input Volt.   120V
—·—○—·— Input Volt.   230V

Load Current [A]

2.Values

Load Current [A]	Input Current [A]		
	Input Volt. 100[V]	Input Volt. 120[V]	Input Volt. 230[V]
0.0	0.213	0.149	0.118
1.2	0.829	0.707	0.427
2.3	1.478	1.239	0.694
3.6	2.254	1.876	1.010
4.8	2.980	2.468	1.306
5.9	3.648	3.016	1.584
6.5	4.020	3.316	1.734
7.2	4.460	3.668	1.926
7.9	4.890	4.030	2.106
9.0	5.590	4.600	2.386
--	-	-	-

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

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Model	GHA500F-56-SNF
Item	Input Power (by Load Current)
Object	

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

        ——△—— Input Volt.   100V
        - - -◻- - - Input Volt.   120V
        —·—○—·— Input Volt.   230V
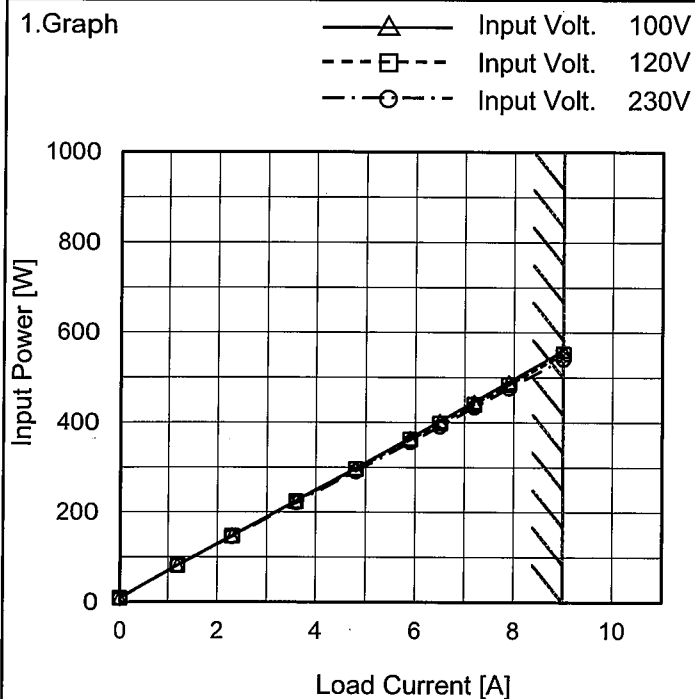
Note: Slanted line shows the range of the rated
       load current.

2.Values

Load Current [A]	Input Power [W]		
	Input Volt. 100[V]	Input Volt. 120[V]	Input Volt. 230[V]
0.0	9.2	8.9	8.4
1.2	81.7	82.1	81.9
2.3	147.2	147.1	145.6
3.6	225.3	224.4	221.0
4.8	297.9	295.8	290.9
5.9	364.8	361.7	356.0
6.5	403.0	397.8	391.0
7.2	446.0	440.4	434.0
7.9	490.0	484.0	476.0
9.0	560.0	552.0	541.0
--	-	-	-

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Model	GHA500F-56-SNF
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.
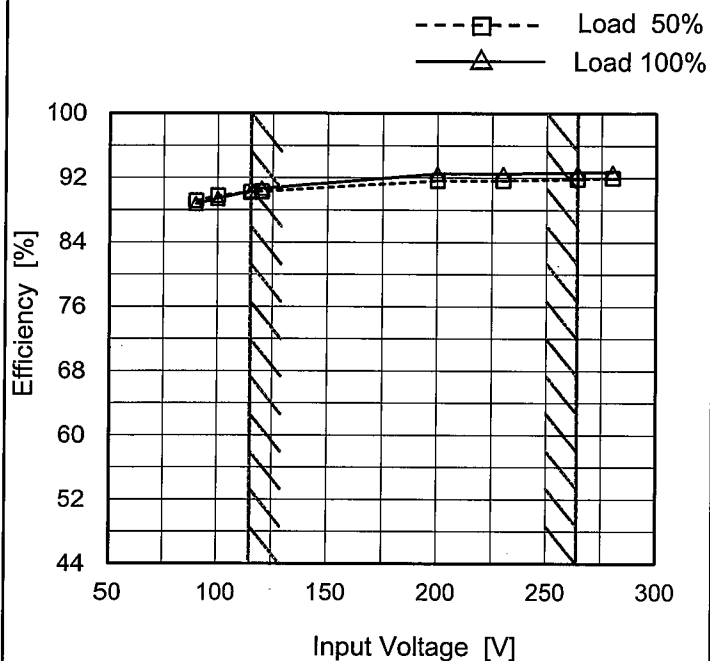
2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
90	89.1	88.8 ※1
100	89.8	89.4 ※2
115	90.2	90.3
120	90.3	90.7
200	91.7	92.5
230	91.7	92.5
264	91.8	92.7
280	92.0	92.7
--	-	-

※1 : Load 80%
※2 : Load 88%

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Model	GHA500F-56-SNF
Item	Efficiency (by Load Current)
Object	

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

———△——— Input Volt.   100V
--- ⊟ --- Input Volt.   120V
—·—○—·— Input Volt.   230V
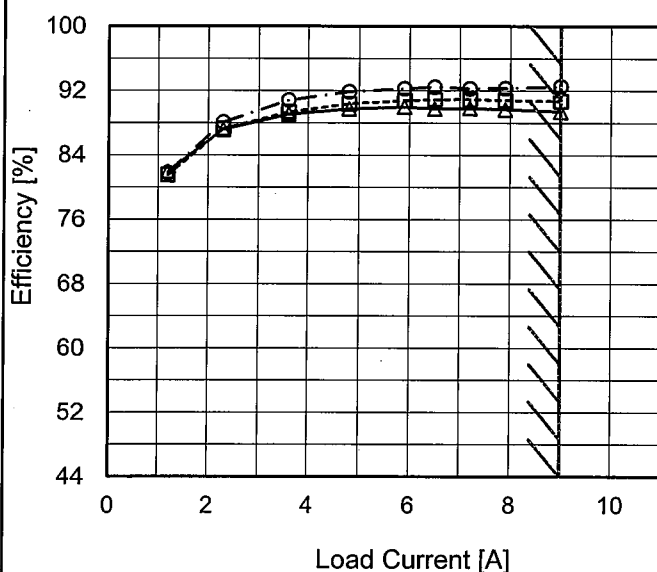
Load Current [A]

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

2.Values

Load Current [A]	Efficiency [%]		
	Input Volt. 100[V]	Input Volt. 120[V]	Input Volt. 230[V]
0.0	-	-	-
1.2	82.0	81.5	81.8
2.3	87.2	87.3	88.1
3.6	89.1	89.4	90.8
4.8	89.8	90.4	91.9
5.9	90.0	90.8	92.3
6.5	89.8	90.9	92.5
7.2	89.8	90.9	92.3
7.9	89.7	90.8	92.3
9.0	89.4	90.7	92.5
--	-	-	-

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Model	GHA500F-56-SNF
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.
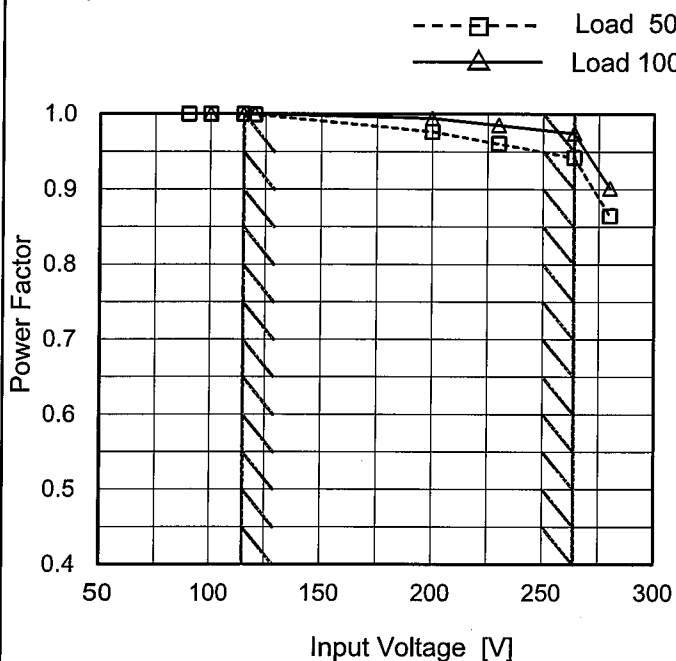
2.Values

Input Voltage [V]	Power Factor	
	Load 50%	Load 100%
90	0.999	0.999 ※1
100	0.999	0.999 ※2
115	0.999	0.999
120	0.999	0.999
200	0.977	0.994
230	0.961	0.985
264	0.942	0.975
280	0.865	0.902
--	-	-

※1 : Load 80%

※2 : Load 88%

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| Model	GHA500F-56-SNF
Item	Power Factor (by Load Current)
Object	

Temperature 25°C
Testing Circuitry Figure A

1.Graph

———△——— Input Volt. 100V
- - -☐- - - Input Volt. 120V
—··—○—··— Input Volt. 230V
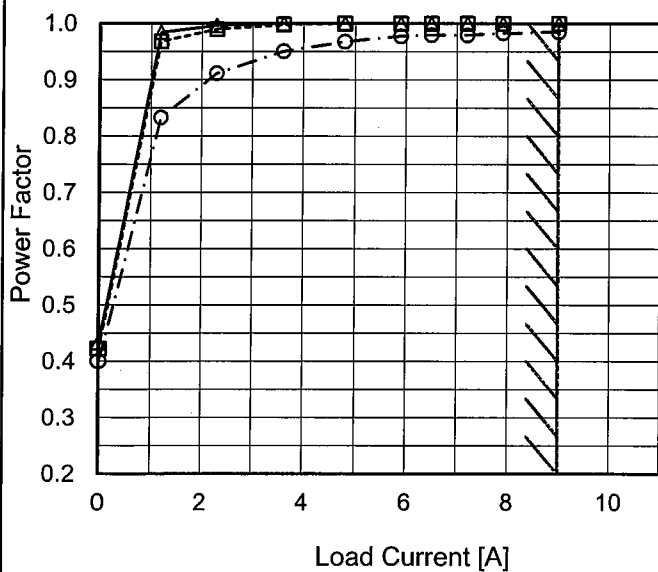
Load Current [A]

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

2.Values

Load Current	Power Factor		
	Input Volt.	Input Volt.	Input Volt.
[A]	100[V]	120[V]	230[V]
0.0	0.433	0.422	0.400
1.2	0.984	0.968	0.833
2.3	0.997	0.990	0.912
3.6	0.999	0.998	0.951
4.8	0.999	0.999	0.968
5.9	0.999	0.999	0.978
6.5	0.999	0.999	0.980
7.2	0.999	0.999	0.980
7.9	0.999	0.999	0.983
9.0	0.999	0.999	0.985
--	-	-	-

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Model	GHA500F-56-SNF
Item	Inrush Current
Object	————————

Temperature　　25°C
Testing Circuitry　Figure A

Input
Current
[50A/div]

Input
Voltage
[100V/div]

Time　　　　　　　　　[20ms/div]

Input Voltage	120 V
Frequency	60 Hz
Load	100 %

①Primary inrush current :
　　　　　　　　　20.4A
②Secondary inrush current :
　　　　　　　　　2.4A
③Surge current ※1:
　　　　　　　　　34.4A

Input
Current
[50A/div]

Input
Voltage
[200V/div]

Time　　　　　　　　　[20ms/div]

Input Voltage	230 V
Frequency	60 Hz
Load	100 %

①Primary inrush current :
　　　　　　　　　42A
②Secondary inrush current :
　　　　　　　　　4.8A
③Surge current ※1:
　　　　　　　　　64.8A

③　　①Primary inrush current

②Secondary inrush current

※1 The specification of the primary inrush current means that the surge current
　 to a built-in noise filter (0.4msec or less：waveform ③) is excluded.

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Model	GHA500F-56-SNF
Item	Leakage Current
Object	

Temperature 25°C
Testing Circuitry Figure B

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	120 [V]	240 [V]	
IEC60601	Both phases	0.07	0.09	0.17	Operation
	One of phases	0.13	0.15	0.32	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
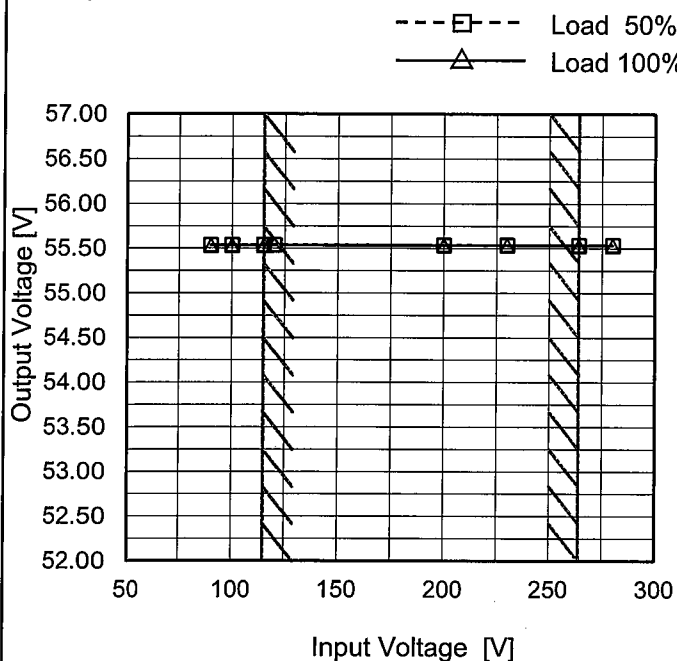AC input and by choosing the larger one.

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Model	GHA500F-56-SNF
Item	Line Regulation
Object	+56V9A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

- - -▢- - - Load 50%
———△——— Load 100%

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%
90	55.536	55.533 ※1
100	55.536	55.533 ※2
115	55.536	55.533
120	55.536	55.535
200	55.537	55.534
230	55.535	55.534
264	55.536	55.533
280	55.535	55.533
--	-	-

※1 : Load 80%
※2 : Load 88%

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COSEL

Model	GHA500F-56-SNF
Item	Load Regulation
Object	+56V9A

1.Graph

———△——— Input Volt.   100V
‐‐‐◻‐‐‐ Input Volt.   120V
—·—○—·— 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. 120[V]	Input Volt. 230[V]
0.0	55.534	55.535	55.535
1.2	55.535	55.535	55.535
2.3	55.534	55.536	55.536
3.6	55.535	55.535	55.536
4.8	55.535	55.536	55.535
5.9	55.535	55.536	55.535
6.5	55.535	55.535	55.535
7.2	55.534	55.535	55.534
7.9	55.534	55.535	55.534
9.0	55.533	55.535	55.534
--	-	-	-

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Model	GHA500F-56-SNF
Item	Dynamic Load Response
Object	+56V 9A

Temperature   25℃
Testing Circuitry   Figure A

Input Volt.   120V
Cycle   1000ms

Load Current
9A / 50us

Min.Load (0A)←→
Load 100%(9A)

2 V/div
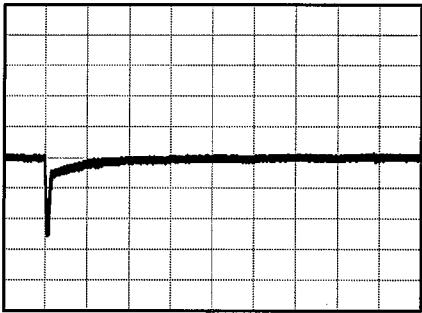
4 ms/div
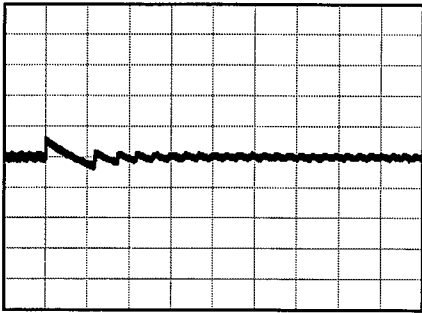
40 ms/div

Min.Load (0A)←→
Load 50%(4.5A)

2 V/div
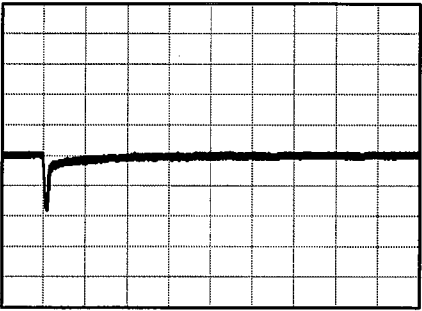
4 ms/div
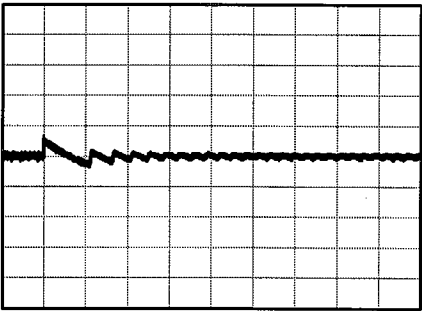
40 ms/div

Load 50% (4.5A)←→
Load 100% (9A)

1 V/div
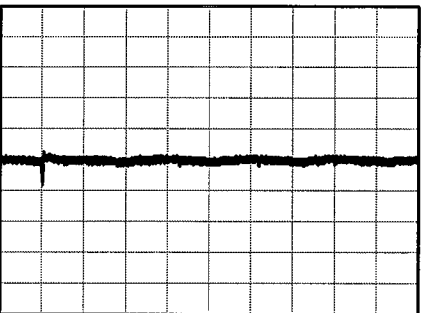
4 ms/div
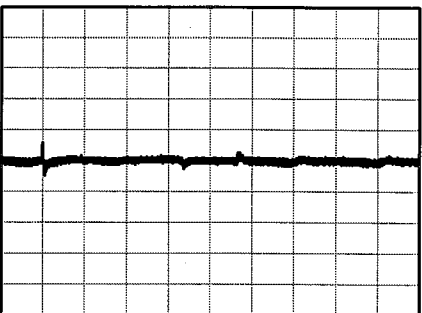
4 ms/div

Note : With recommended external capacitor 120μF

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Model	GHA500F-56-SNF
Item	Ripple Voltage (by Load Current)
Object	+56V9A

Temperature　　25°C
Testing Circuitry　Figure A

1.Graph

————△———— Input Volt.　120V
— · —○— · · — Input Volt.　230V

Load Current [A]
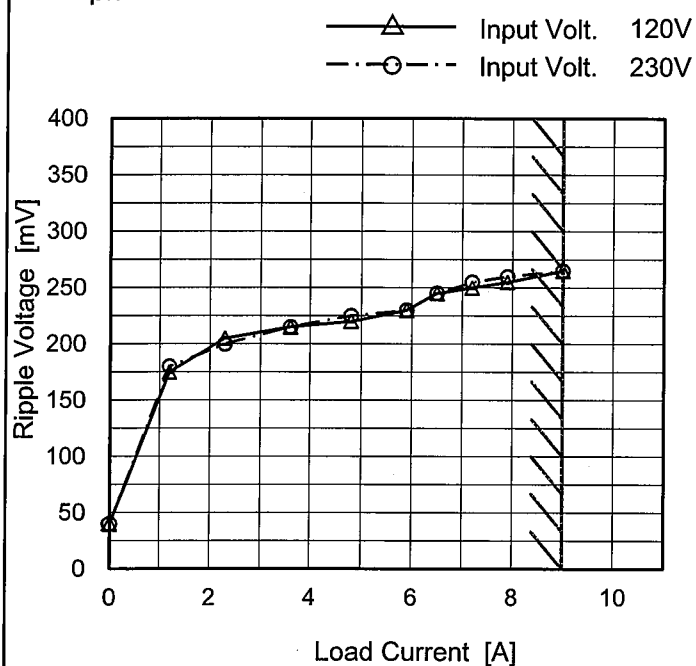
Ripple Voltage [mV]

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.

Ripple [mVp-p]
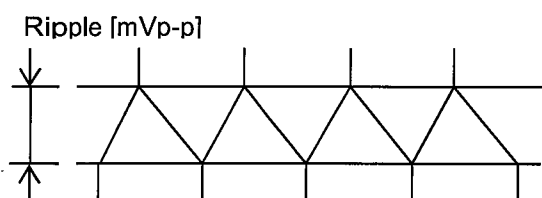
Fig.Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 120 [V]	Input Volt. 230 [V]
0.0	40	40
1.2	175	180
2.3	205	200
3.6	215	215
4.8	220	225
5.9	230	230
6.5	245	245
7.2	250	255
7.9	255	260
9.0	265	265
--	-	-

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Model	GHA500F-56-SNF
Item	Ripple-Noise
Object	+56V9A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

———△——— Input Volt. 120V
—·—○—·— Input Volt. 230V
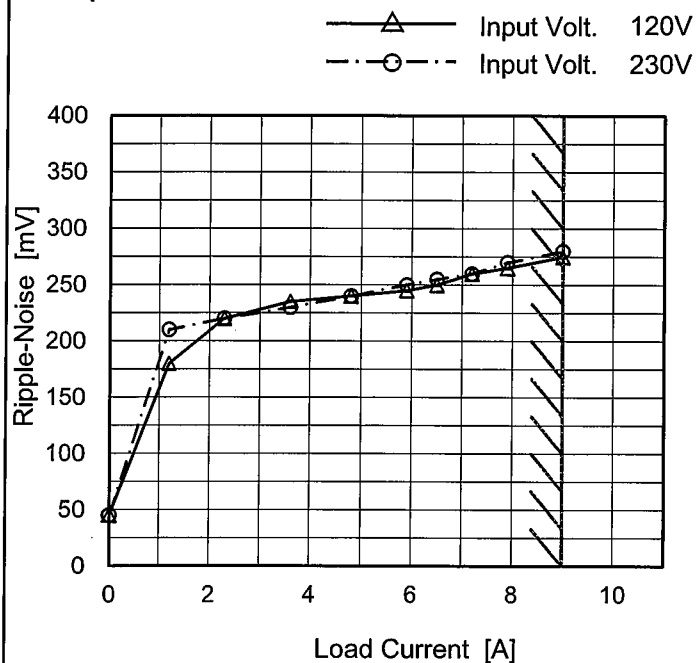
Load Current [A]

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.
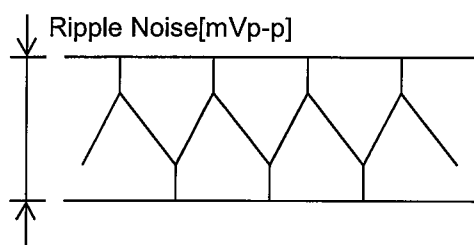
Ripple Noise[mVp-p]

Fig.Complex Ripple Noise Wave Form

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 120 [V]	Input Volt. 230 [V]
0.0	45	45
1.2	180	210
2.3	220	220
3.6	235	230
4.8	240	240
5.9	245	250
6.5	250	255
7.2	260	260
7.9	265	270
9.0	275	280
--	-	-

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CO$EL

Model	GHA500F-56-SNF
Item	Ripple Voltage (by Ambient Temp.)
Object	+56V9A

Testing Circuitry   Figure A

1.Graph

- - - ⊡ - - - Input Volt.   120V
——— △ ——— Input Volt.   230V

Ambient Temperature [°C]
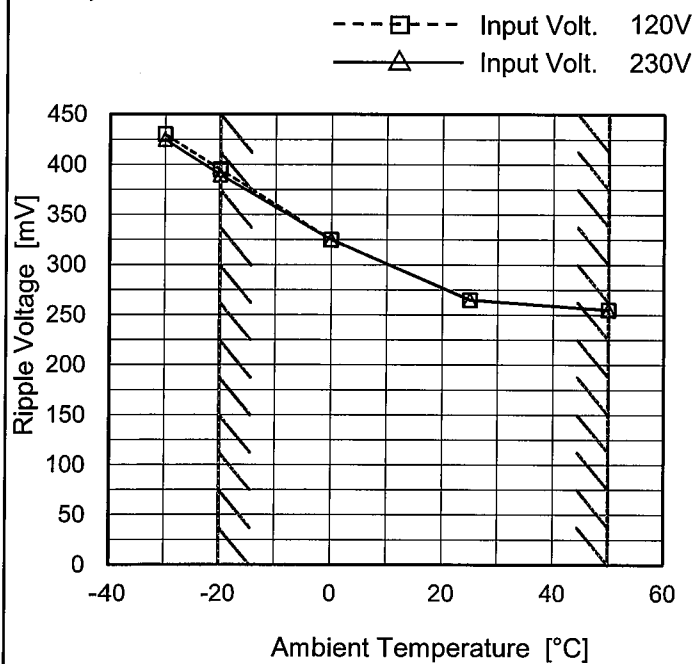
Measured by 20 MHz Oscilloscope.
Note: Slanted line shows the range of the rated
     ambient temperature.

2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 120 [V]	Input Volt. 230 [V]
-30	430	425
-20	395	390
0	325	325
25	265	265
50	255	255
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

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CO$EL

Model	GHA500F-56-SNF
Item	Ambient Temperature Drift
Object	+56V9A

Testing Circuitry   Figure A

1.Graph

— △ — Input Volt. 100V
--- ☐ --- Input Volt. 120V
—·—○—·— Input Volt. 230V

Ambient Temperature [°C]

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. 120[V]	Input Volt. 230[V]
-20	55.355	55.369	55.371
-10	55.393	55.400	55.401
0	55.437	55.447	55.450
10	55.480	55.489	55.491
20	55.517	55.513	55.513
25	55.549	55.535	55.534
30	55.582	55.544	55.547
40	55.613	55.573	55.577
50	55.634	55.605	55.608
60	55.664	55.654	55.656
--	-	-	-

Note: In case of Input Volt. 100V, Load 88%.
Other case Load 100%.

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Model	GHA500F-56-SNF
Item	Output Voltage Accuracy
Object	+56V9A

Testing Circuitry   Figure A

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 : 115 - 264V

Load Current   : 0 - 9A

* 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	50	264	0	55.581	±113	±0.2
Minimum Voltage	-20	115	9	55.355		

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Model	GHA500F-56-SNF
Item	Time Lapse Drift
Object	+56V9A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

Time [H]

Input Volt. 230V
Load 100%

2.Values

Time since start [H]	Output Voltage [V]
0.0	55.524
0.5	55.534
1.0	55.534
2.0	55.533
3.0	55.533
4.0	55.534
5.0	55.534
6.0	55.534
7.0	55.534
8.0	55.534

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COSEL

Model	GHA500F-56-SNF
Item	Rise and Fall Time
Object	+56V9A

Temperature	25°C
Testing Circuitry	Figure A
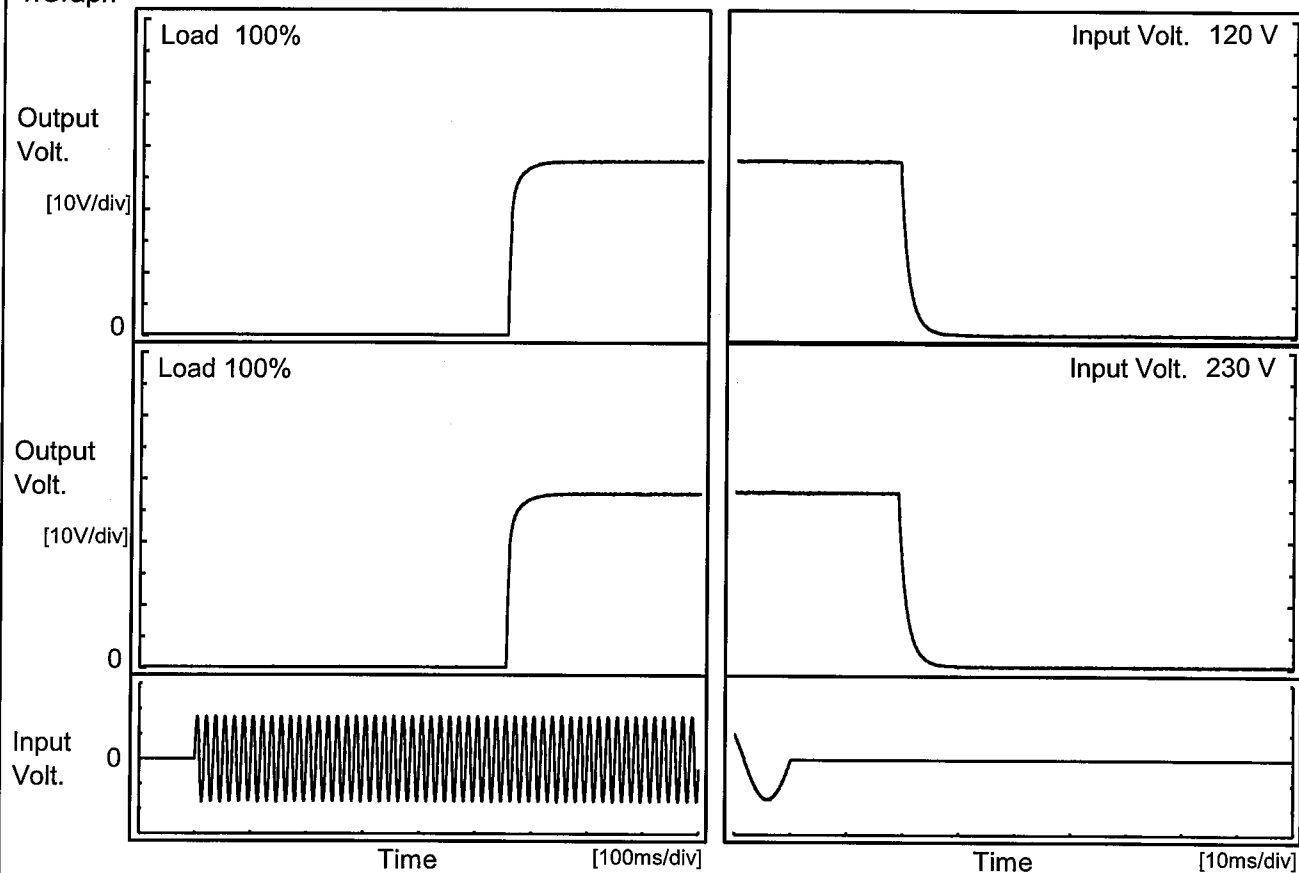
1.Graph

2.Values

[ms]

Input Volt. Time	Td	Tr	Ts	Th	Tf
120V	554.5	22.5	577.0	19.3	3.5
230V	554.5	22.0	576.5	19.3	3.4

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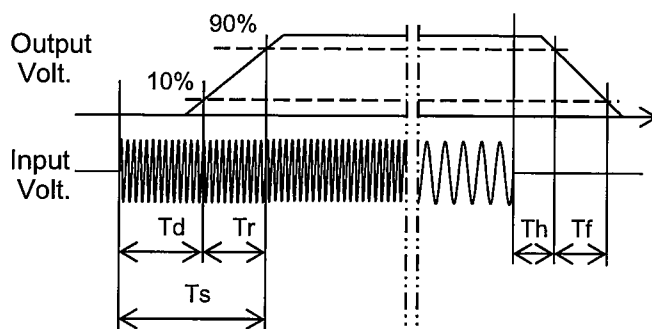
Model	GHA500F-56-SNF
Item	Hold-Up Time
Object	+56V9A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

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

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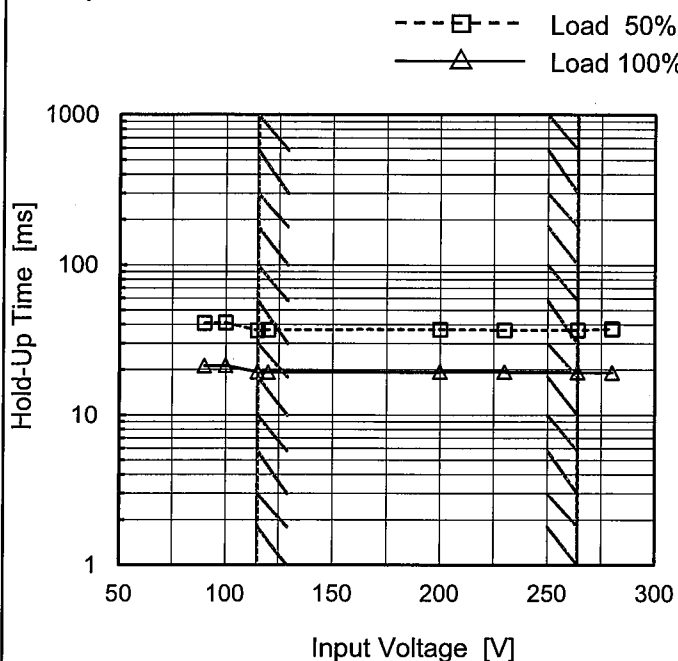
Input Voltage [V]

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%
90	41	21 ※1
100	41	21 ※2
115	37	19
120	37	19
200	37	19
230	37	19
264	37	19
280	38	19
--	-	-

※1 : Load 80%

※2 : Load 88%

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Model	GHA500F-56-SNF
Item	Instantaneous Interruption Compensation
Object	+56V9A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

——△—— Input Volt. 100V
- - -⊟- - - Input Volt. 120V
—·-○-·- Input Volt. 230V
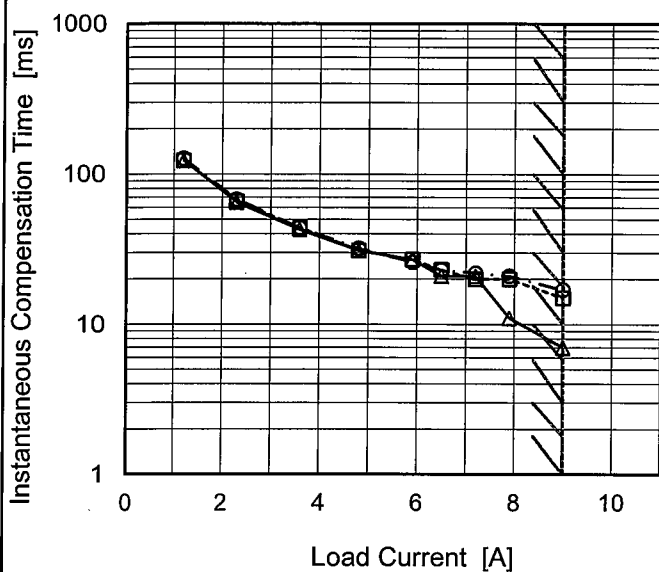
Load Current [A]

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

2.Values

Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 120[V]	Input Volt. 230[V]
0.0	-	-	-
1.2	123	123	127
2.3	65	66	68
3.6	43	44	44
4.8	31	31	32
5.9	27	27	26
6.5	21	23	23
7.2	21	20	22
7.9	11	20	21
9.0	7	15	17
--	-	-	-

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Model	GHA500F-56-SNF
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+56V9A

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.
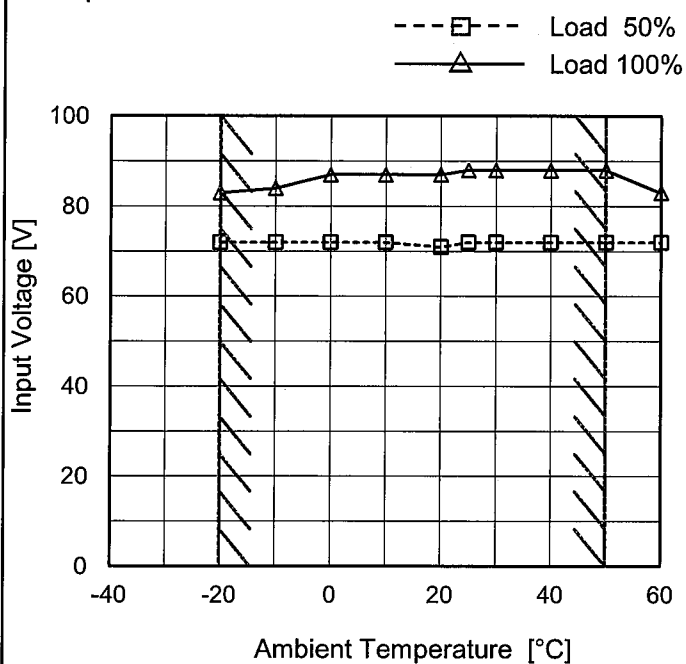
2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-20	72	83
-10	72	84
0	72	87
10	72	87
20	71	87
25	72	88
30	72	88
40	72	88
50	72	88
60	72	83
--	-	-

COSEL

Model	GHA500F-56-SNF
Item	Overcurrent Protection
Object	+56V9A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

━━━━━O Input Volt.   120V
━━━━━□ Input Volt.   230V

Output Voltage [V]
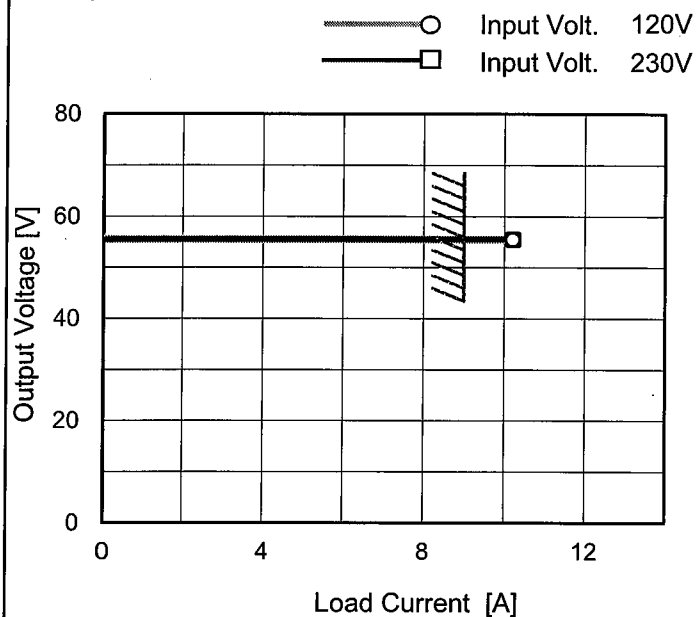
Load Current [A]

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

Intermittent operation occurs when overcurrent protection is activated.

2.Values

Output Voltage [V]	Load Current [A]	
	Input Volt. 120[V]	Input Volt. 230[V]
56.0	10.22	10.21
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

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CO$EL

Model	GHA500F-56-SNF
Item	Overvoltage Protection
Object	+56V9A
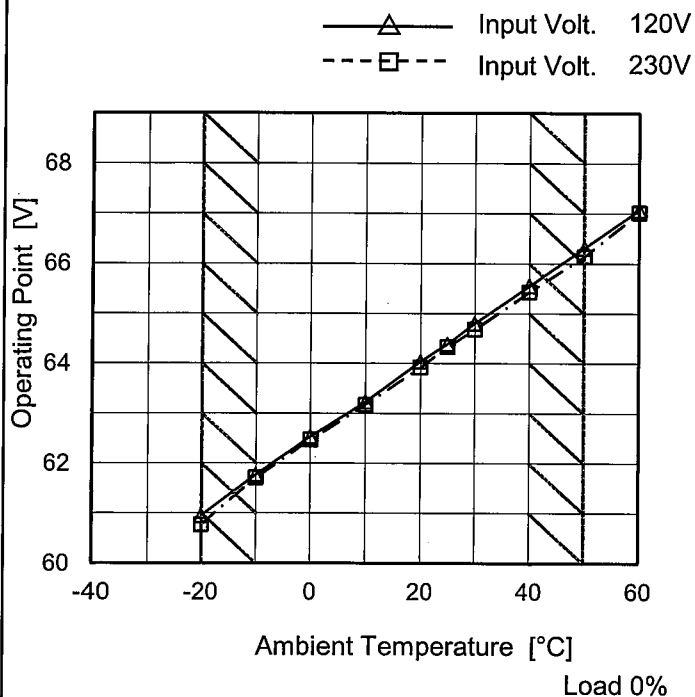
1.Graph

——△—— Input Volt.   120V
– – –◻– – – Input Volt.   230V

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. 120[V]	Input Volt. 230[V]
-20	60.95	60.77
-10	61.77	61.71
0	62.53	62.47
10	63.23	63.17
20	64.04	63.92
25	64.39	64.33
30	64.80	64.68
40	65.55	65.43
50	66.31	66.14
60	67.07	67.02
--	-	-

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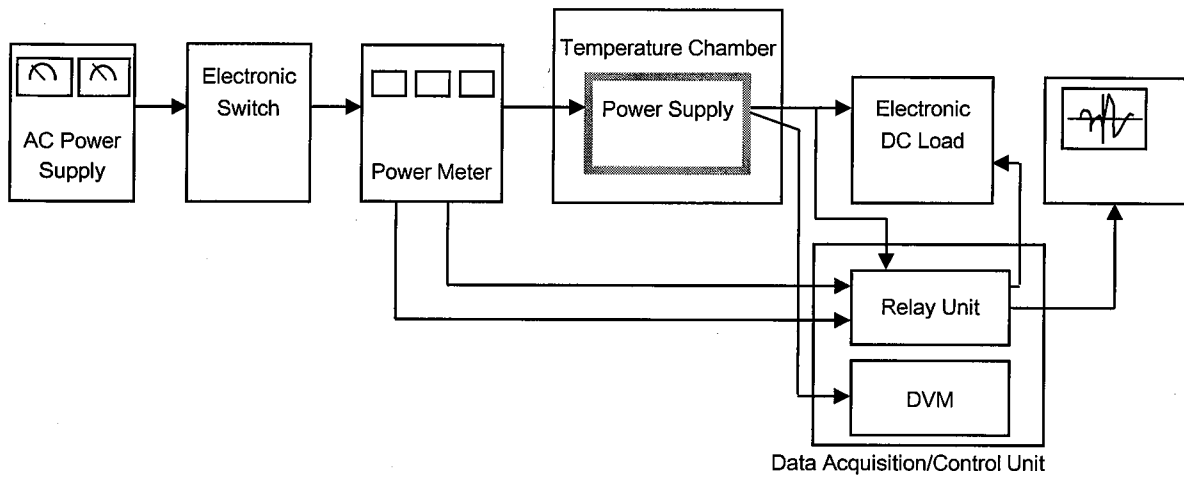
Figure A

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

Figure B (IEC60601-1)

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