COSEL

TEST DATA OF LHA50F-48

Regulated DC Power Supply
September 13, 2019

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COSEL CO.,LTD.

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Model	LHA50F-48
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

Input Current [A] vs Load 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]
0.00	0.030	0.054	0.062
0.20	0.222	0.145	0.136
0.40	0.397	0.241	0.221
0.60	0.577	0.340	0.309
0.80	0.759	0.440	0.397
1.00	0.943	0.542	0.487
1.10	1.036	0.595	0.535
1.21	1.138	0.652	0.585
--	-	-	-
--	-	-	-
--	-	-	-

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Model	LHA50F-48
Item	Efficiency (by Load Current)
Object	

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

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

2.Values

Efficiency [%] vs Load Current [A]

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

Load Current [A]	Efficiency [%]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	-	-	-
0.20	83.3	82.1	81.6
0.40	85.8	86.8	86.4
0.60	86.5	88.2	88.0
0.80	86.8	89.1	89.0
1.00	86.7	89.5	89.7
1.10	86.6	89.7	89.9
1.21	86.4	89.7	90.0
--	-	-	-
--	-	-	-
--	-	-	-

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Model	LHA50F-48
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]

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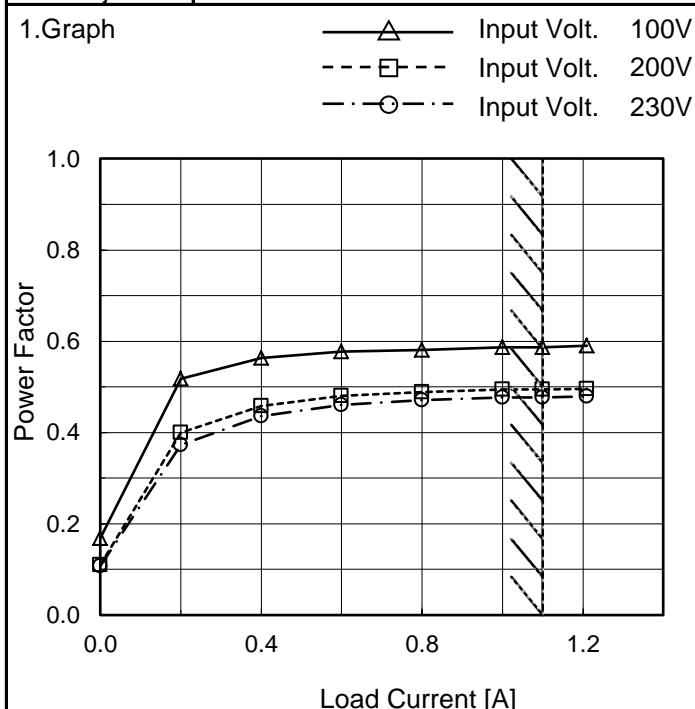
2.Values

Load Current	Power Factor		
	Input Volt.	Input Volt.	Input Volt.
[A]	100[V]	200[V]	230[V]
0.00	0.168	0.109	0.107
0.20	0.517	0.400	0.373
0.40	0.563	0.458	0.436
0.60	0.577	0.480	0.460
0.80	0.581	0.489	0.471
1.00	0.586	0.494	0.477
1.10	0.587	0.494	0.477
1.21	0.590	0.496	0.479
--	-	-	-
--	-	-	-
--	-	-	-

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Model	LHA50F-48
Item	Inrush Current
Object	———————

Temperature	25°C
Testing Circuitry	Figure A

Input Current [20A/div]

Input Voltage [100V/div]

Time [50ms/div]

Input Voltage	100 V
Frequency	60 Hz
Load	100 %

Primary inrush current :
13.1 A
Secondary inrush current :
2.4 A

Input Current [20A/div]

Input Voltage [200V/div]

Time [50ms/div]

Input Voltage	230 V
Frequency	60 Hz
Load	100 %

Primary inrush current :
35.2 A
Secondary inrush current :
2.0 A

Primary inrush current   Secondary inrush current

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Model	LHA50F-48

Item	Leakage Current

Object	

Temperature 25°C
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	0.08	0.21	0.22	Operation
		One of phases	0.16	0.42	0.45	Stand by
IEC62368-1	Figure B-2	Both phases	0.11	0.26	0.26	Operation
		One of phases	0.16	0.38	0.40	Stand by
	Figure B-3	Both phases	0.11	0.26	0.27	Operation
		One of phases	0.16	0.38	0.40	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	LHA50F-48
Item	Line Regulation
Object	+48V1.1A

Temperature 25°C
Testing Circuitry Figure A

1.Graph


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

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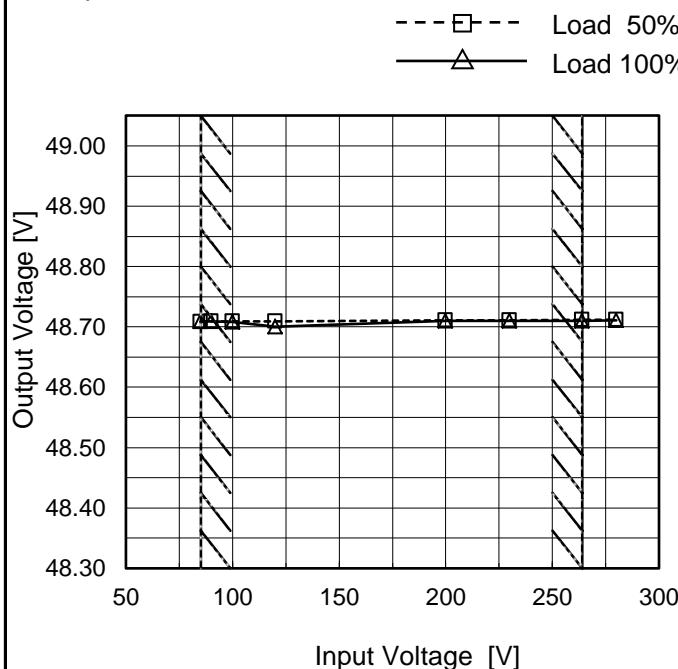
Note: Slanted line shows the range of the rated
input voltage.

2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
85	48.708	-
90	48.709	48.709
100	48.709	48.708
120	48.709	48.700
200	48.711	48.710
230	48.711	48.710
264	48.711	48.710
280	48.712	48.711
--	-	-

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Model	LHA50F-48
Item	Load Regulation
Object	+48V1.1A
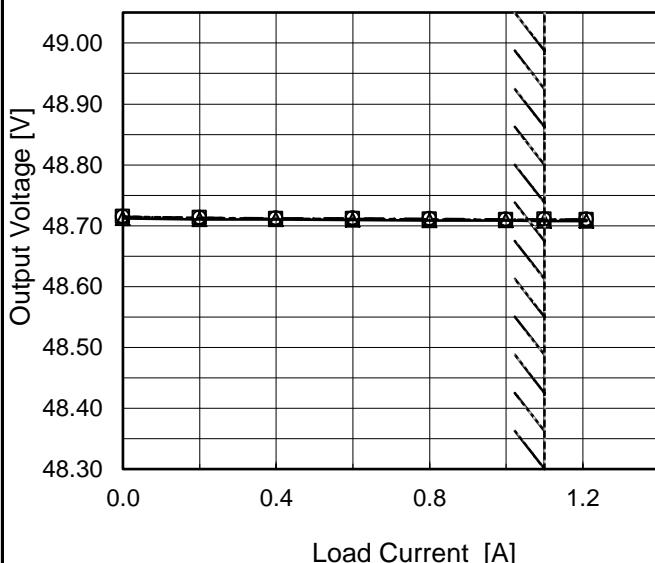
Temperature   25°C
Testing Circuitry   Figure A

1.Graph

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

2.Values

Output Voltage [V]

Load Current [A]

Load Current	Output Voltage [V]		
	Input Volt.	Input Volt.	Input Volt.
[A]	100[V]	200[V]	230[V]
0.00	48.712	48.715	48.715
0.20	48.710	48.713	48.713
0.40	48.710	48.711	48.712
0.60	48.709	48.711	48.712
0.80	48.709	48.710	48.711
1.00	48.708	48.710	48.710
1.10	48.708	48.710	48.710
1.21	48.707	48.710	48.710
--	-	-	-
--	-	-	-
--	-	-	-

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

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Model	LHA50F-48
Item	Dynamic Load Response
Object	+48V1.1A

Temperature   25°C
Testing Circuitry   Figure A

Input Volt.   230 V

Cycle   1000 ms

t1,t2 = 50 μ s

Load Current

t1   t2

Min.Load (0A)←→
   Load 100% (1.1A)

200 mV/div

800 µs/div   4 ms/div

Min.Load (0A)←→
   Load 50% (0.55A)

200 mV/div

800 µs/div   4 ms/div

Load 50% (0.55A)←→
   Load 100% (1.1A)

200 mV/div

800 µs/div   4 ms/div

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Model	LHA50F-48
Item	Ripple-Noise(by Load Current)
Object	+48V1.1A

Temperature   25°C
Testing Circuitry   Figure C

1.Graph

Input Volt.   100V
Input Volt.   230V

Ripple-Noise [mV] vs Load Current [A]
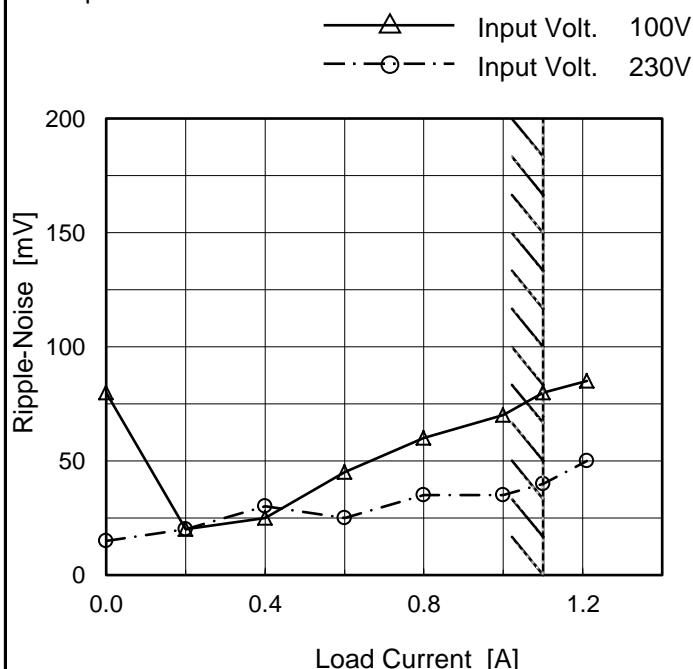
Load Current [A]

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]
0.00	80	15
0.20	20	20
0.40	25	30
0.60	45	25
0.80	60	35
1.00	70	35
1.10	80	40
1.21	85	50
--	-	-
--	-	-
--	-	-

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

Ripple-Noise
T2   [mVp-p]

T1
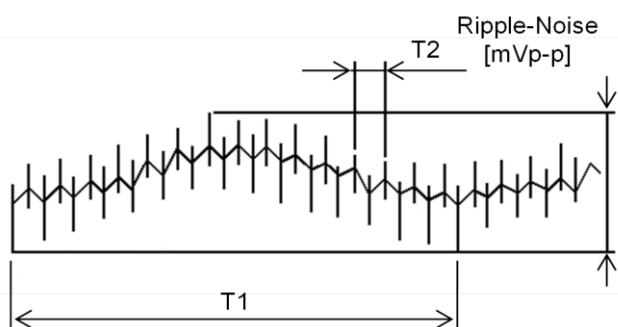
Fig. Complex Ripple Wave Form

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Model	LHA50F-48
Item	Ambient Temperature Drift
Object	+48V1.1A
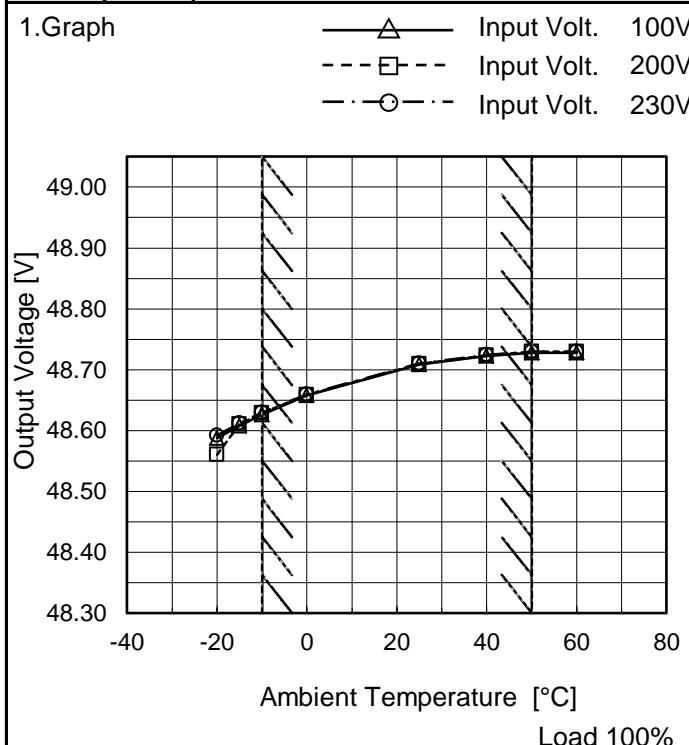
Testing Circuitry   Figure A

1.Graph

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

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

Load 100%

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	48.588	48.560	48.592
-15	48.607	48.610	48.612
-10	48.626	48.628	48.630
0	48.657	48.659	48.659
25	48.708	48.710	48.710
40	48.722	48.724	48.724
50	48.728	48.729	48.729
60	48.728	48.729	48.730
--	-	-	-
--	-	-	-
--	-	-	-

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Model	LHA50F-48		
Item	Rise and Fall Time	Temperature	25°C
		Testing Circuitry	Figure A
Object	+48V1.1A		

1.Graph

Load 100%

Input Volt.   100 V

Output Volt.

[10V/div]

0

Load 100%

Input Volt.   230 V

Output Volt.

[10V/div]

0

Input Volt.

0

Time   [20ms/div]

Time   [50ms/div]
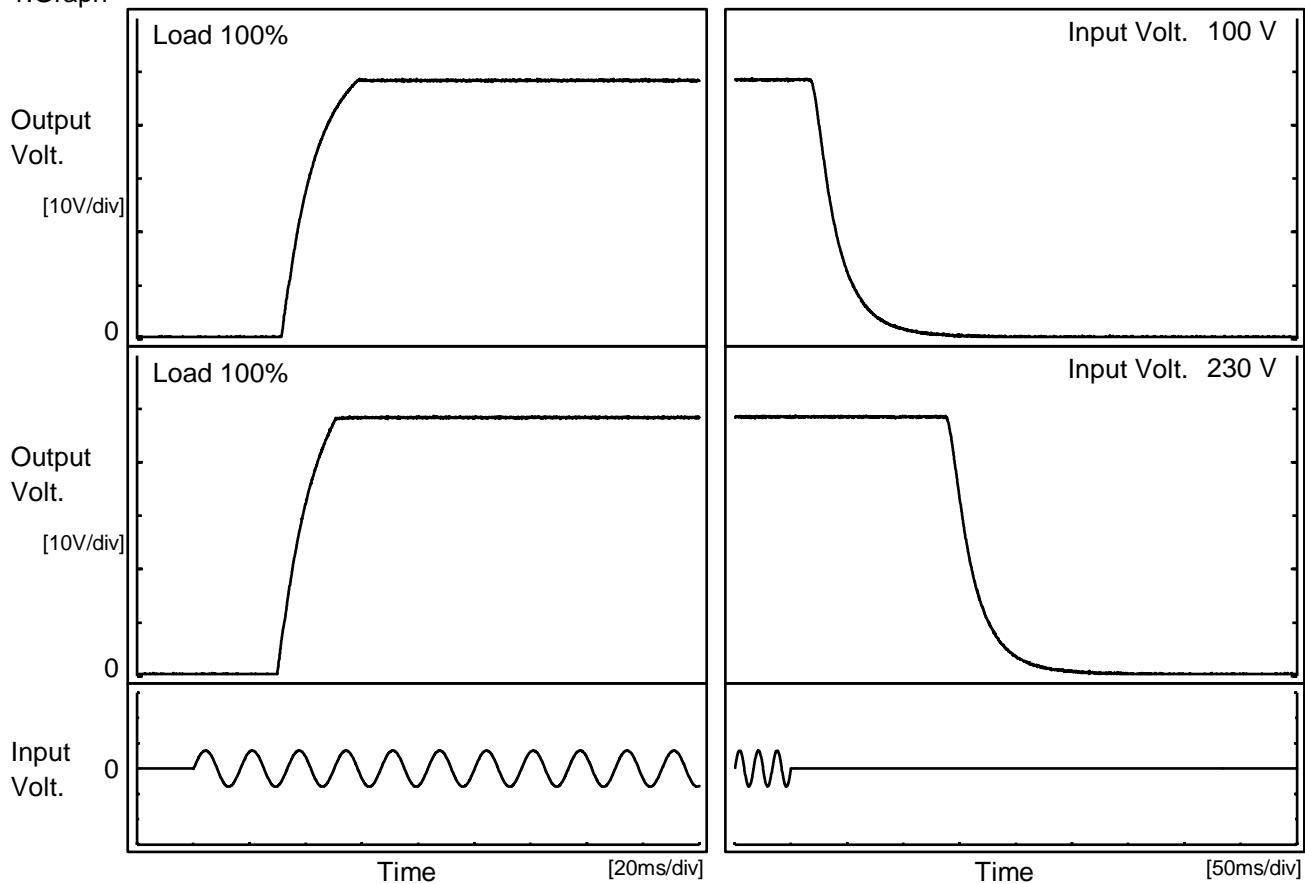
2.Values

[ms]

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	32.6	18.9	51.5	22.5	48.0
230 V	31.1	15.8	46.9	143.3	47.8

Output Volt.

90%

10%

Input Volt.

Td   Tr

Th   Tf

Ts
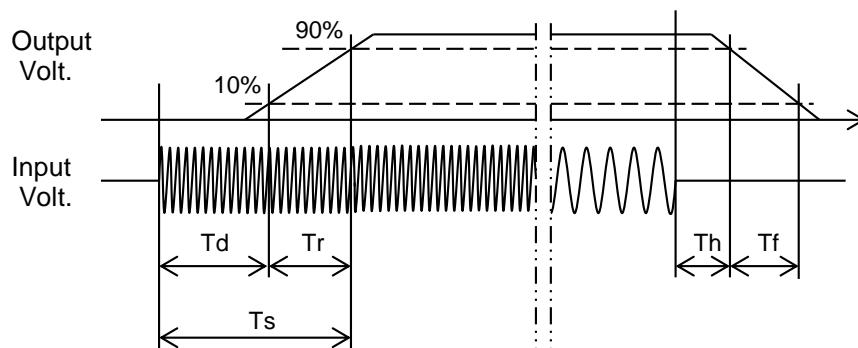
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Model	LHA50F-48
Item	Hold-Up Time
Object	+48V1.1A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

Load 50%
Load 100%

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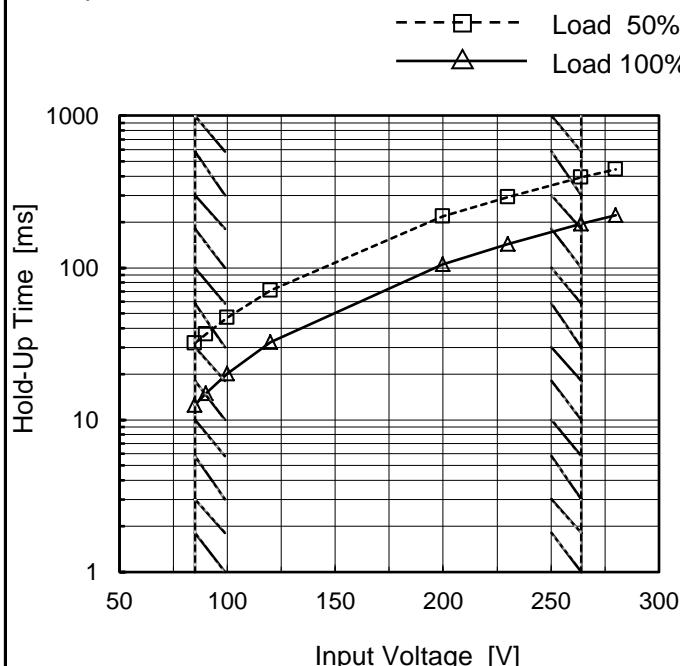
Input Voltage [V]

2.Values

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
85	32	13
90	37	15
100	47	20
120	71	32
200	217	106
230	292	144
264	392	195
280	445	222
--	-	-

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.

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Model	LHA50F-48
Item	Instantaneous Interruption Compensation
Object	+48V1.1A

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.
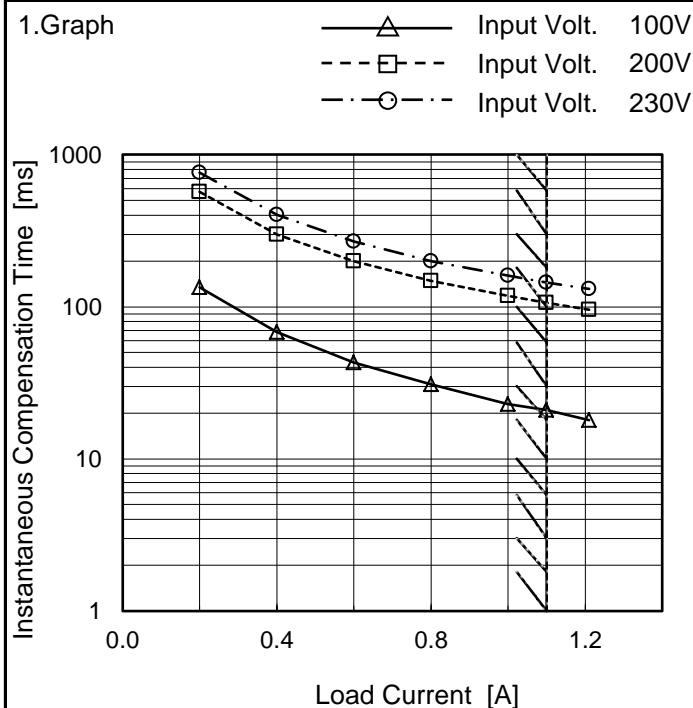
2.Values

Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	-	-	-
0.20	134	572	765
0.40	68	300	403
0.60	43	199	269
0.80	31	148	200
1.00	23	118	160
1.10	21	106	145
1.21	18	96	131
--	-	-	-
--	-	-	-
--	-	-	-

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Model	LHA50F-48
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+48V1.1A
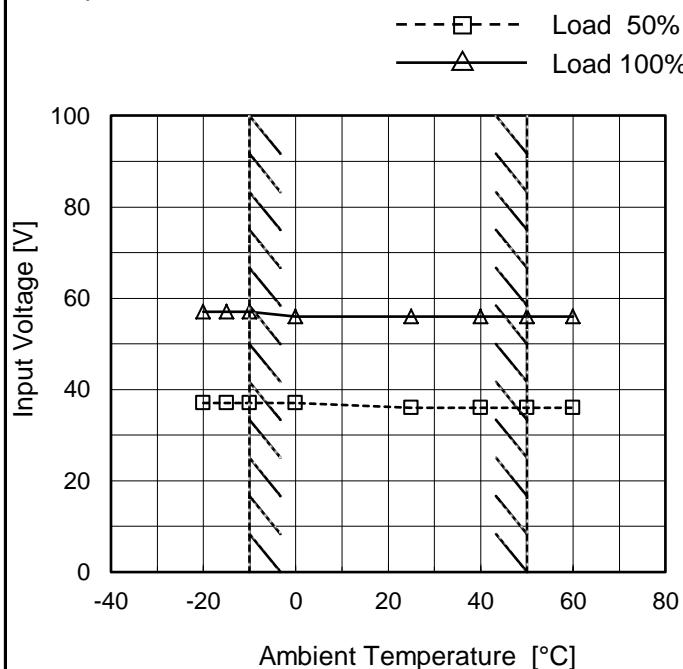
Testing Circuitry　Figure A

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	37	57
-15	37	57
-10	37	57
0	37	56
25	36	56
40	36	56
50	36	56
60	36	56
--	-	-
--	-	-
--	-	-

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Model	LHA50F-48
Item	Overcurrent Protection
Object	+48V1.1A
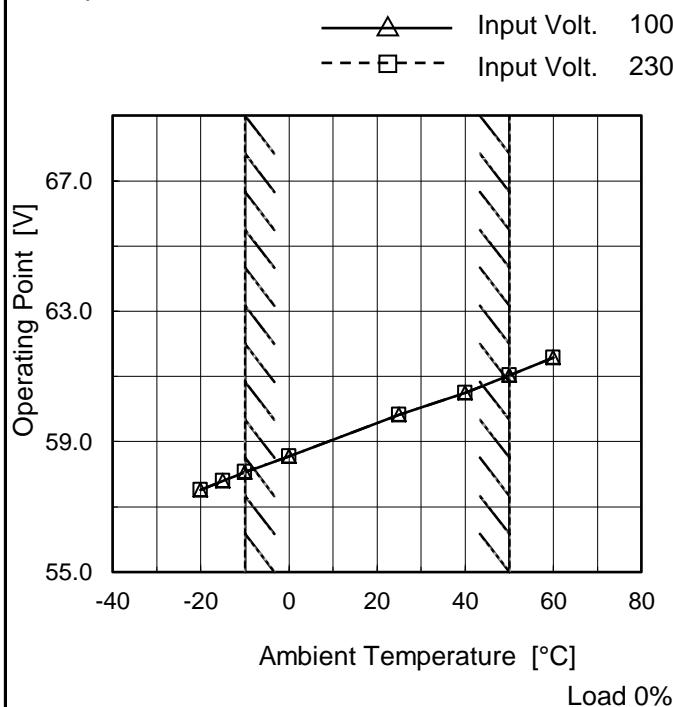
Temperature 25°C
Testing Circuitry Figure A

1.Graph

—————— Input Volt. 100V

—————— Input Volt. 230V

Load Current [A]

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

Overcurrent protection is Hiccup mode.

2.Values

Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 230[V]
48.0	1.36	1.37
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

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Model	LHA50F-48

Item	Overvoltage Protection	Testing Circuitry	Figure A

Object	+48V1.1A

1.Graph

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

Operating Point [V]

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]
-20	57.52	57.52
-15	57.79	57.79
-10	58.06	58.07
0	58.54	58.54
25	59.82	59.82
40	60.49	60.49
50	61.03	61.04
60	61.58	61.58
--	-	-
--	-	-
--	-	-

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Figure A

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

Figure B-1 (DEN-AN)

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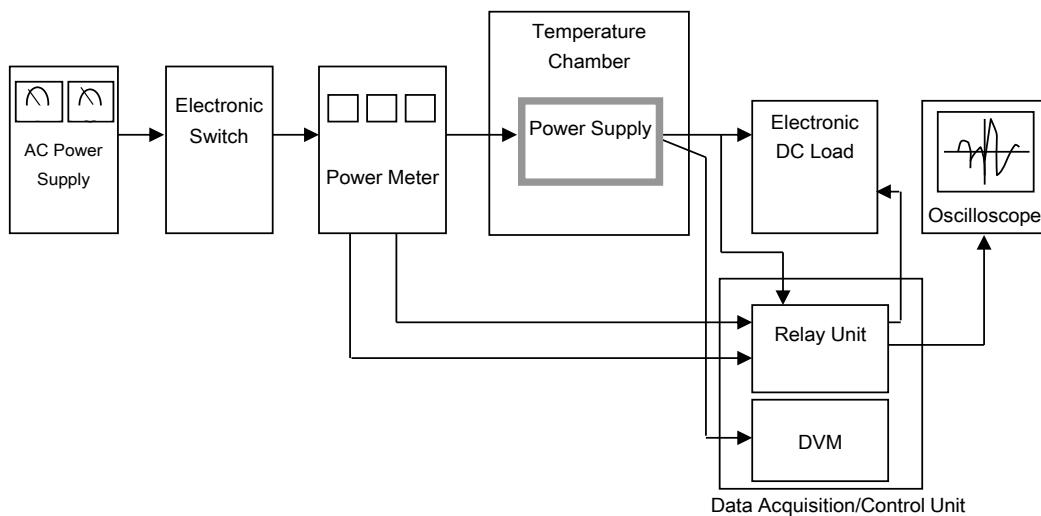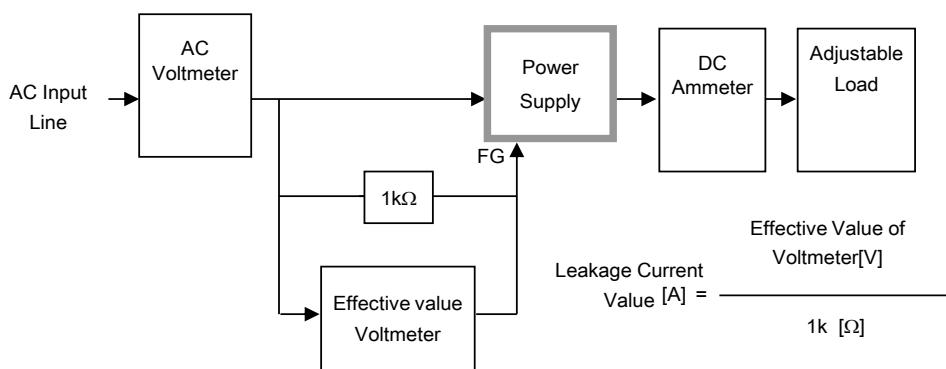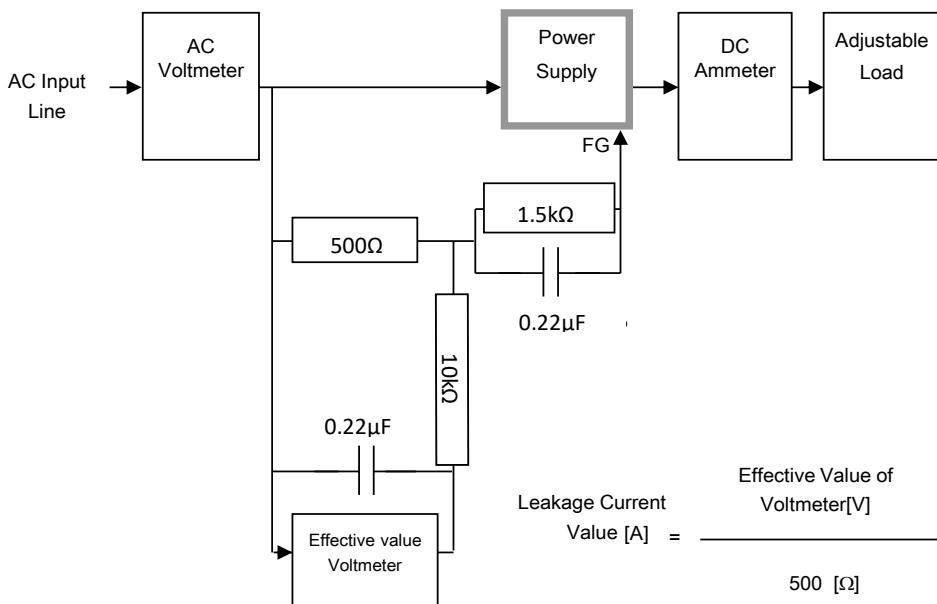
Figure B-2 (IEC62368-1 refer to IEC60990 Fig.4)

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AC Input Line → AC Voltmeter → Power Supply (FG) → DC Ammeter → Adjustable Load

500Ω

1.5kΩ

0.22µF

10kΩ

9100pF

20kΩ   6200pF

Effective value Voltmeter

$$\text{Leakage Current Value [A]} = \frac{\text{Effective Value of Voltmeter[V]}}{500\ [\Omega]}$$
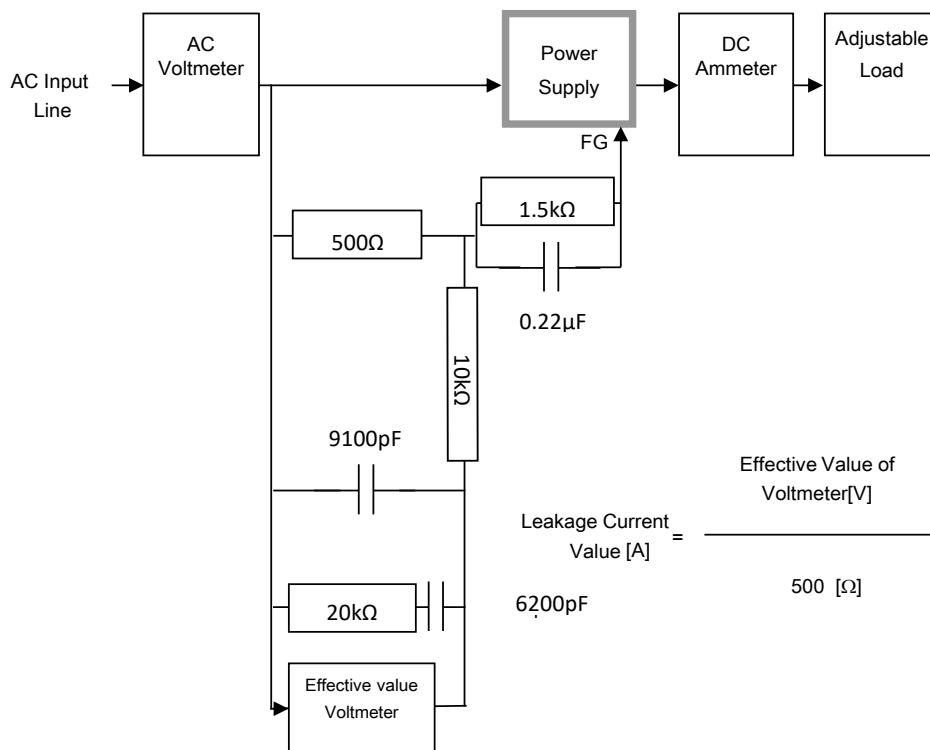
Figure B-3（IEC62368-1 refer to IEC60990 Fig.5）

AC Power Supply → Power Meter → Temperature Chamber [Power Supply] → C1 — Measuring board — C2 → Electronic DC Load

Oscilloscope BW:20MHz

150mm
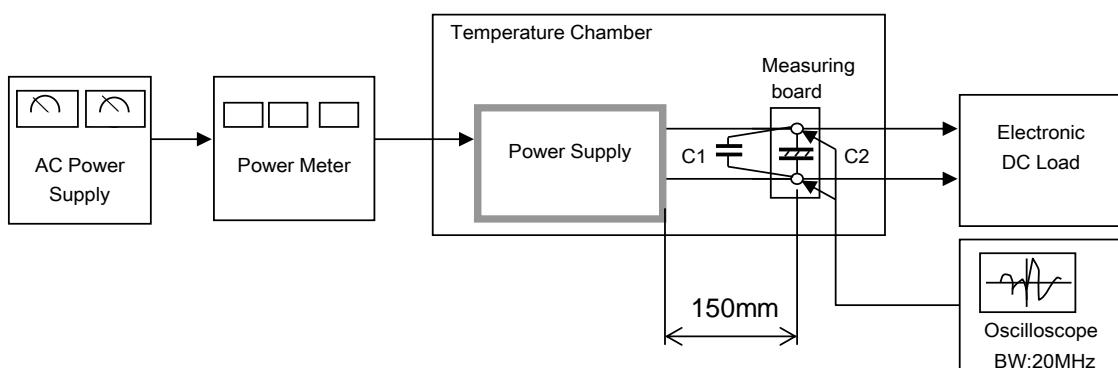
C1= 0.1 µF
（ Film capacitor)

C2= 22 µF
(Electrolytic capacitor)

Figure C

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