COSEL

TEST DATA OF KHEA240F-24

Regulated DC Power Supply
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COSEL CO.,LTD.

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Model	KHEA240F-24
Item	Input Current (by Load Current)
Object	

Temperature　　　25°C
Testing Circuitry　Figure A

1.Graph

```
――――△―――― Input Volt.　100V
－－－日―－－ Input Volt.　115V
―・・―○―・・― Input Volt.　230V
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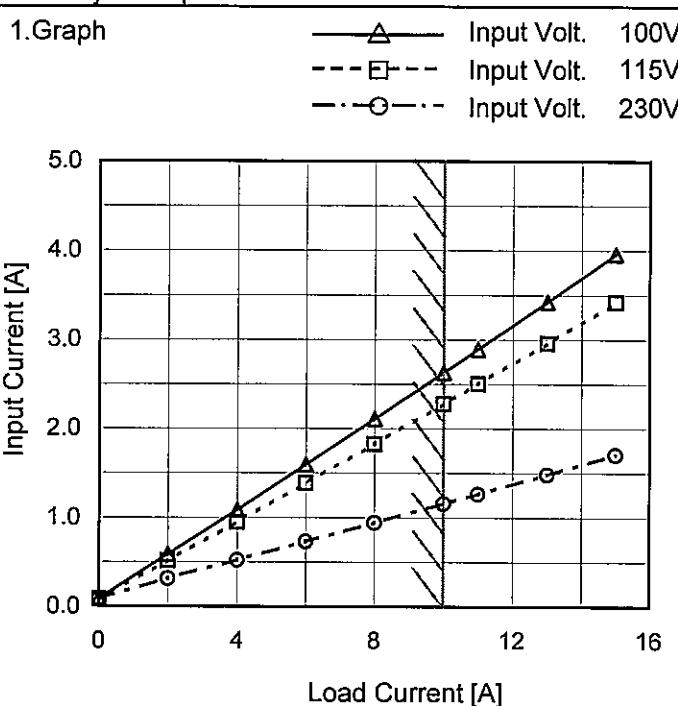

2.Values

Load Current [A]	Input Current [A]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	0.085	0.081	0.088
2.0	0.584	0.513	0.314
4.0	1.086	0.947	0.520
6.0	1.594	1.385	0.729
8.0	2.108	1.830	0.942
10.0	2.628	2.276	1.157
11.0	2.892	2.503	1.265
13.0	3.422	2.960	1.483
15.0	3.960	3.421	1.706
--	-	-	-
--	-	-	-

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

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Model	KHEA240F-24
Item	Input Power (by Load Current)
Object	————————

Temperature 25°C
Testing Circuitry Figure A

1.Graph

——△—— Input Volt. 100V
- - -☐- - - Input Volt. 115V
—·—○—·— Input Volt. 230V

Input Power [W] vs Load Current [A]

2.Values

Load Current [A]	Input Power [W]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	5.6	5.6	5.6
2.0	54.9	54.8	56.9
4.0	105.4	105.1	105.8
6.0	156.9	155.8	155.3
8.0	208.5	207.6	205.4
10.0	260.7	259.2	255.6
11.0	287.1	285.3	280.8
13.0	340.5	338.1	331.7
15.0	395.0	391.2	384.0
--	-	-	-
--	-	-	-

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

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Model	KHEA240F-24
Item	Efficiency (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]	Efficiency [%]	
	Load 50%	Load 100%
80	90.2	90.4
85	90.4	90.8
100	91.2	91.7
115	91.6	92.2
200	91.8	93.9
230	91.4	94.0
264	91.2	94.2
280	90.6	93.5
---	-	-

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Model	KHEA240F-24
Item	Efficiency (by Load Current)
Object	————————

Temperature   25°C
Testing Circuitry   Figure A

1.Graph
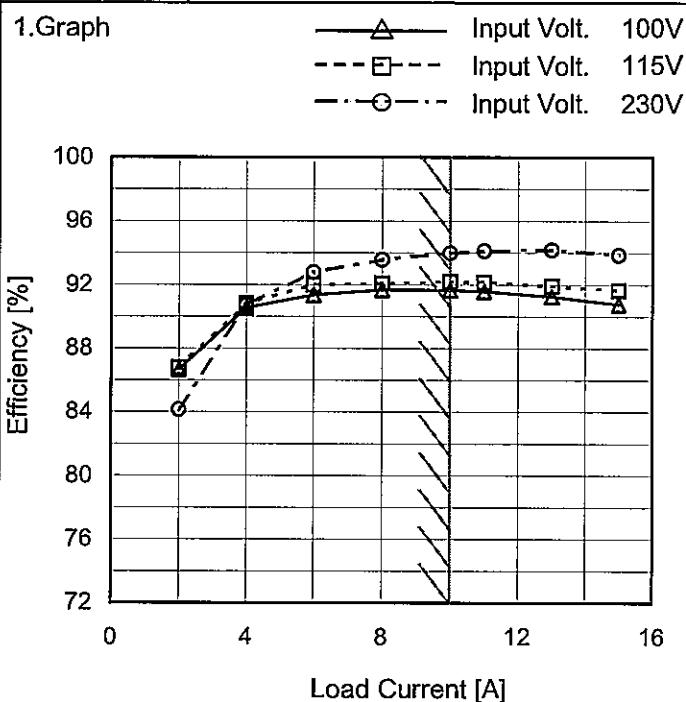
———△——— Input Volt.   100V
- - -⊟- - - Input Volt.   115V
—··—⊙—··— Input Volt.   230V

2.Values

Load Current [A]	Efficiency [%]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	-	-	-
2.0	86.7	86.8	84.1
4.0	90.5	90.8	90.7
6.0	91.3	92.0	92.8
8.0	91.7	92.1	93.6
10.0	91.7	92.2	94.0
11.0	91.6	92.2	94.1
13.0	91.3	91.9	94.2
15.0	90.8	91.7	93.9
--	-	-	-
--	-	-	-

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

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Model	KHEA240F-24
Item	Power Factor (by Input Voltage)
Object	
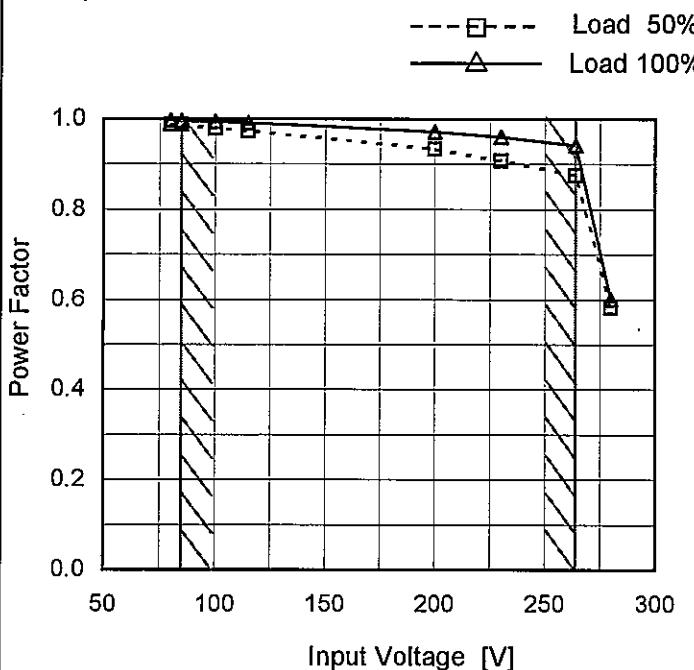
Temperature   25°C
Testing Circuitry   Figure A

1.Graph

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

Power Factor vs Input Voltage [V]

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

2.Values

Input Voltage	Power Factor	
[V]	Load 50%	Load 100%
80	0.987	0.997
85	0.987	0.996
100	0.978	0.994
115	0.972	0.992
200	0.933	0.972
230	0.908	0.961
264	0.875	0.941
280	0.582	0.600
--	-	-

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Model	KHEA240F-24
Item	Power Factor (by Load Current)
Object	————————

Temperature 25°C
Testing Circuitry Figure A

1.Graph

— △ — Input Volt. 100V
--- ⊟ --- Input Volt. 115V
—·— ⊖ —··— Input Volt. 230V

2.Values

Load Current [A]	Power Factor		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	0.657	0.599	0.277
2.0	0.940	0.929	0.788
4.0	0.971	0.964	0.885
6.0	0.985	0.979	0.926
8.0	0.990	0.988	0.948
10.0	0.994	0.992	0.961
11.0	0.995	0.993	0.965
13.0	0.997	0.995	0.972
15.0	0.997	0.996	0.980
--	-	-	-
--	-	-	-

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

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Model	KHEA240F-24		
Item	Inrush Current	Temperature	25°C
		Testing Circuitry	Figure A
Object			

Input
Current
[20A/div]

Input
Voltage
[100V/div]

Time   [50ms/div]

Input Voltage   115 V
Frequency   60 Hz
Load   100 %

① 6.4 A
② 28.4 A
    (0.2msec or less) *1

Input
Current
[20A/div]

Input
Voltage
[200V/div]

Time   [50ms/div]

Input Voltage   230 V
Frequency   60 Hz
Load   100 %

① 12.8 A
② 36.0 A
    (0.2msec or less) *1
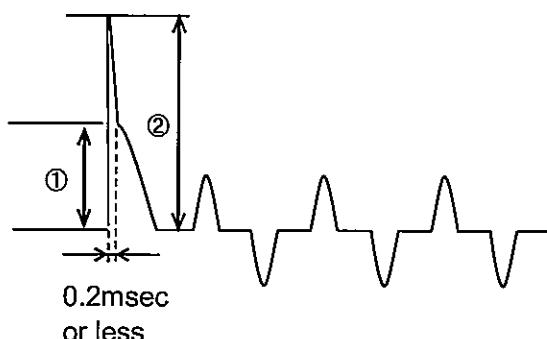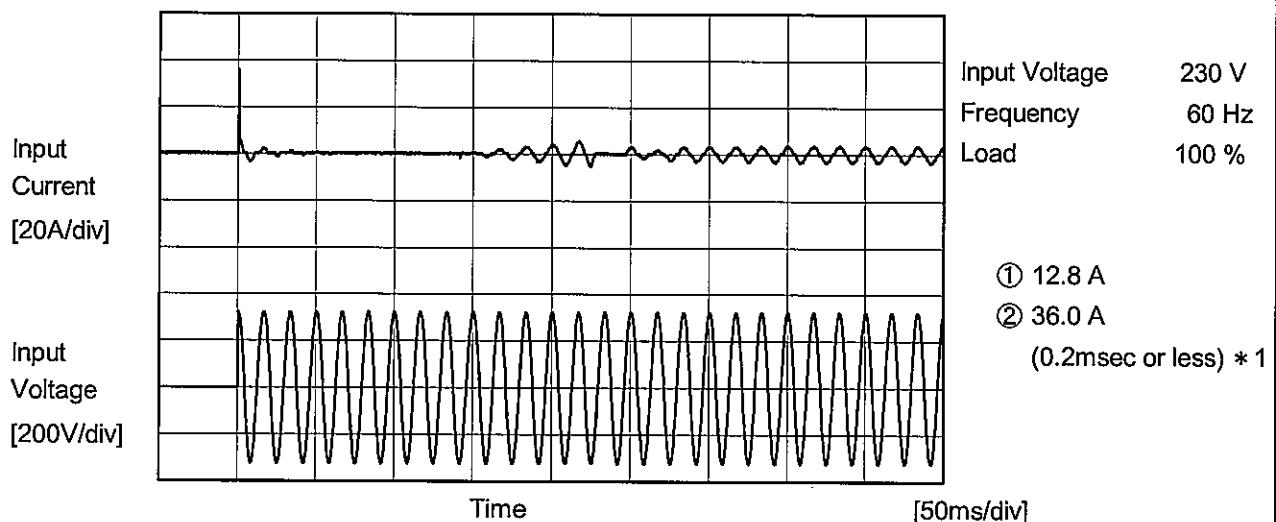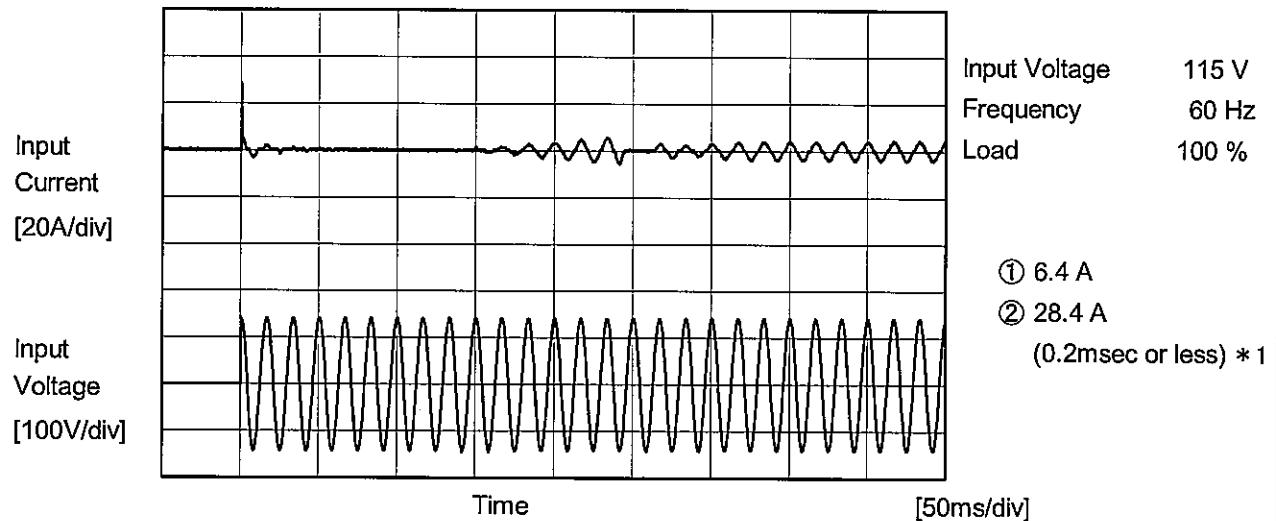
0.2msec
or less

*1 The specification of the inrush current (primary surge) means that the surge current
   to a built-in noise filter (0.2msec or less : waveform ②) is excluded.

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Model	KHEA240F-24
Item	Leakage Current
Object	————————

Temperature	25°C
Testing Circuitry	Figure B

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	115 [V]	240 [V]	
DEN-AN	Both phases	0.15	0.18	0.39	Operation
	One of phases	0.31	0.36	0.76	Stand by
IEC60950-1	Both phases	0.16	0.18	0.40	Operation
	One of phases	0.30	0.34	0.77	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	KHEA240F-24
Item	Line Regulation
Object	+24V10A

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	24.071	24.064
85	24.071	24.065
100	24.071	24.065
115	24.071	24.065
200	24.071	24.065
230	24.071	24.065
264	24.071	24.065
280	24.071	24.065
--	-	-

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Model	KHEA240F-24
Item	Load Regulation
Object	+24V10A

Temperature　　25°C
Testing Circuitry　Figure A

1.Graph

——△—— Input Volt.　100V
---□--- Input Volt.　115V
—·—○—·— Input Volt.　230V

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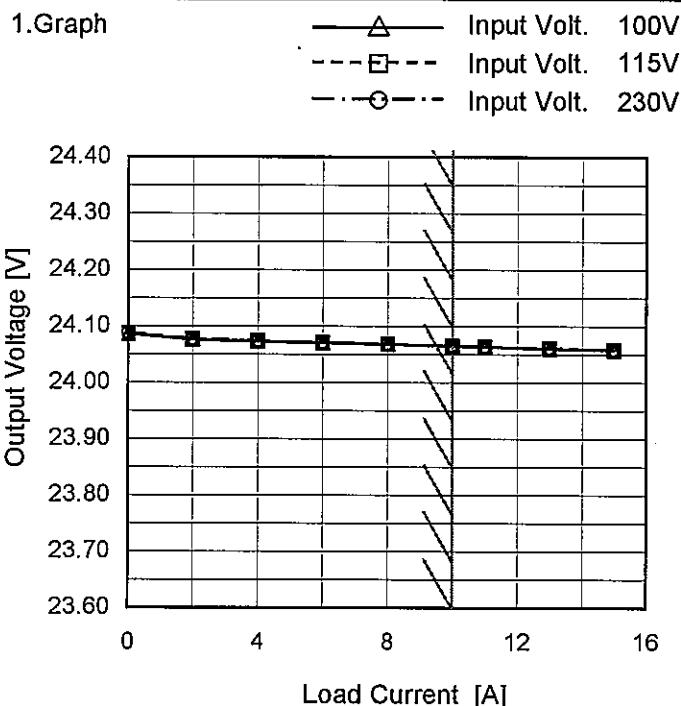
2.Values

Load Current [A]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	24.087	24.087	24.087
2.0	24.077	24.077	24.077
4.0	24.073	24.074	24.074
6.0	24.070	24.071	24.071
8.0	24.068	24.068	24.068
10.0	24.065	24.065	24.065
11.0	24.063	24.064	24.064
13.0	24.060	24.061	24.061
15.0	24.058	24.058	24.059
--	-	-	-
--	-	-	-

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Model	KHEA240F-24
Item	Dynamic Load Response
Object	+24V10A

Temperature   25°C
Testing Circuitry   Figure A

Input Volt.   230V   Response.   t1=t2=50us. Typ
Cycle   1000ms

Load Current   t1   t2

Min.Load (0A)←→
Load 100%(10.0A)

200 mV/div
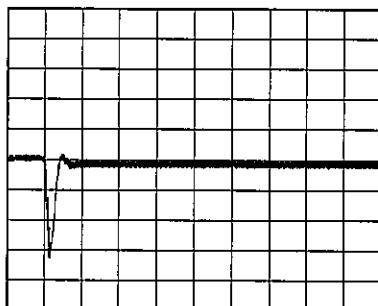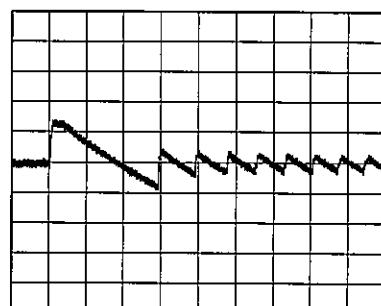
2 ms/div   20 ms/div

Load 20% (2.0A)←→
Load 100%(10.0A)

200 mV/div
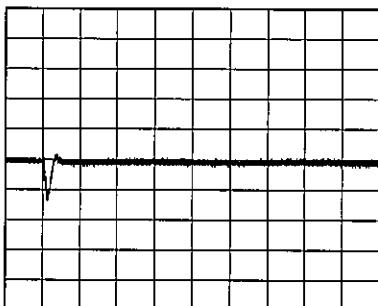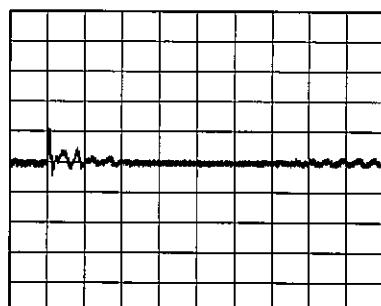
2 ms/div   20 ms/div

Load 20% (2.0A)←→
Load 150% (15.0A)

200 mV/div
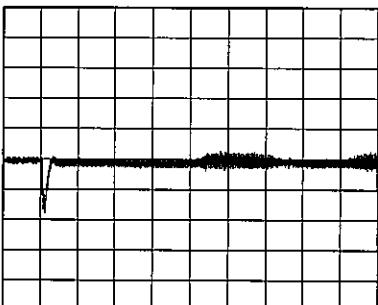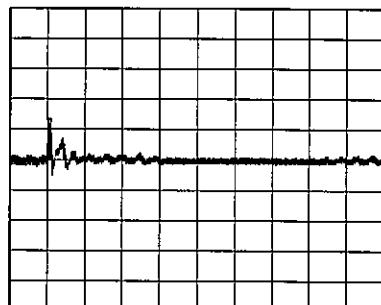
2 ms/div   20 ms/div

* The characteristic of AC115V is equal.

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Model	KHEA240F-24
Item	Ripple Voltage (by Load Current)
Object	+24V10A

Temperature   25°C
Testing Circuitry   Figure C

1.Graph

——△—— Input Volt.   115V
—·—○—·— 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.
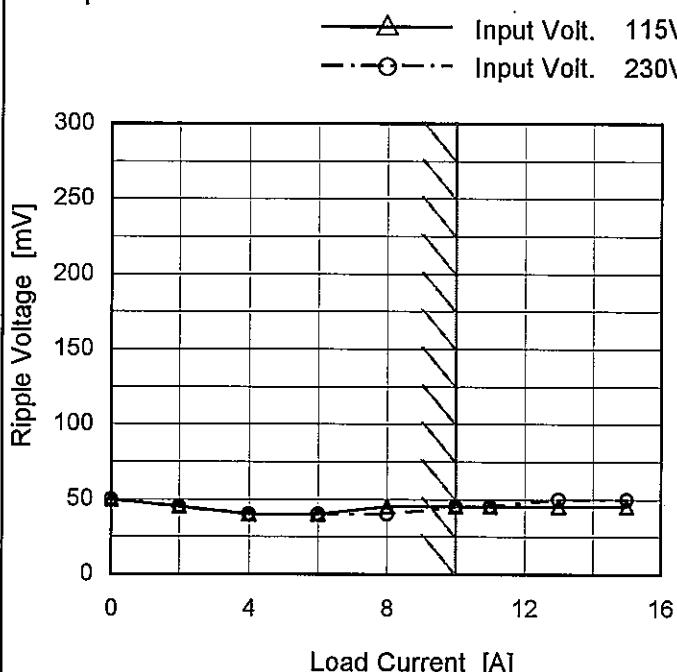
2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 115 [V]	Input Volt. 230 [V]
0.0	50	50
2.0	45	45
4.0	40	40
6.0	40	40
8.0	45	40
10.0	45	45
11.0	45	45
13.0	45	50
15.0	45	50
--	-	-
--	-	-

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

Fig. Complex Ripple Wave Form

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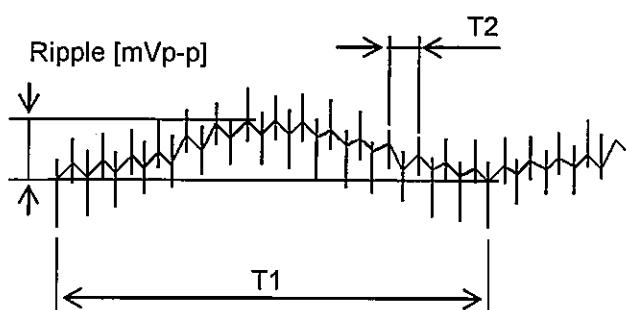
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Model	KHEA240F-24
Item	Ripple-Noise
Object	+24V10A

Temperature	25°C
Testing Circuitry	Figure C

1.Graph

————△———— Input Volt. 115V
—··—○—·· Input Volt. 230V
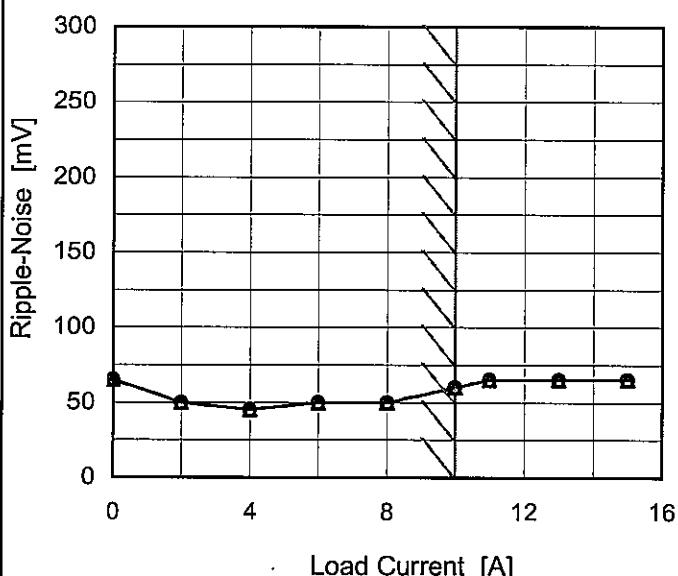
Load Current [A]

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. 115 [V]	Input Volt. 230 [V]
0.0	65	65
2.0	50	50
4.0	45	45
6.0	50	50
8.0	50	50
10.0	60	60
11.0	65	65
13.0	65	65
15.0	65	65
--	-	-
--	-	-

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

Ripple-Noise [mVp-p]

T2

T1

Fig. Complex Ripple Wave Form

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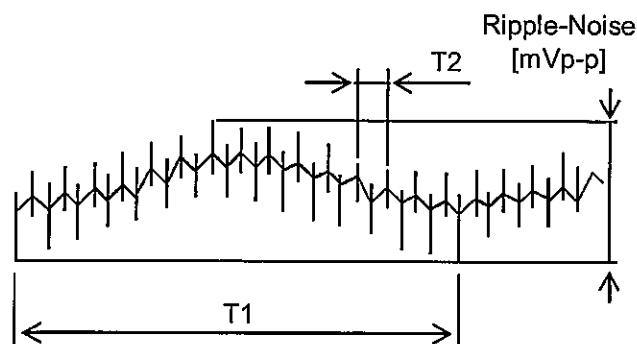
Model	KHEA240F-24
Item	Ripple Voltage (by Ambient Temp.)
Object	+24V10A

Testing Circuitry   Figure C

1.Graph

- - -□- - - 115V
———△——— 230V

Ambient Temperature [°C]

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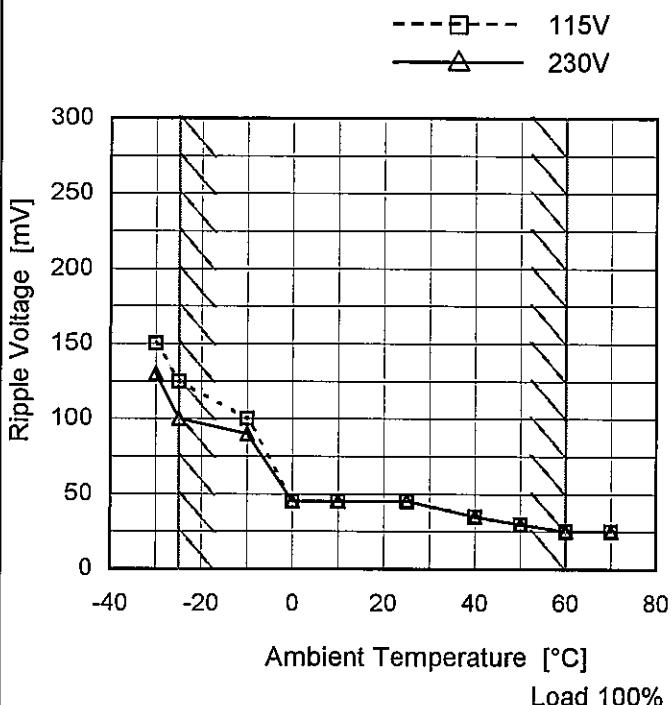
Measured by 20 MHz Oscilloscope.
Note: Slanted line shows the range of the rated
       ambient temperature.

2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	115V	230V
-30	150	130
-25	125	100
-10	100	90
0	45	45
10	45	45
25	45	45
40	35	35
50	30	30
60	25	25
70	25	25
--	-	-

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Model	KHEA240F-24
Item	Ambient Temperature Drift
Object	+24V10A
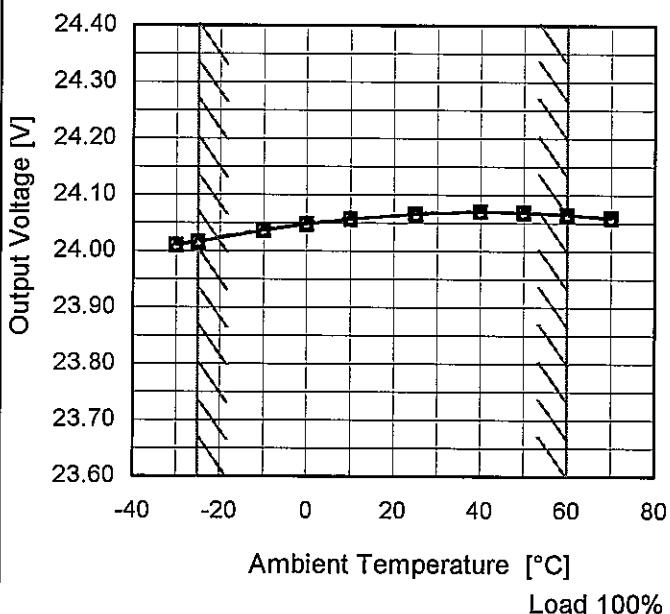
Testing Circuitry   Figure A

1.Graph

———△——— Input Volt.   100V
— — -⊟- — — Input Volt.   115V
— ·· -⊖- ·· — Input Volt.   230V

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. 115[V]	Input Volt. 230[V]
-30	24.010	24.010	24.011
-25	24.016	24.016	24.017
-10	24.037	24.037	24.038
0	24.048	24.048	24.049
10	24.057	24.057	24.058
25	24.065	24.065	24.065
40	24.070	24.070	24.071
50	24.069	24.069	24.069
60	24.065	24.065	24.065
70	24.060	24.059	24.060
--	-	-	-

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Model	KHEA240F-24
Item	Output Voltage Accuracy
Object	+24V10A

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   : -25 - 60°C

Input Voltage : 85 - 264V

Load Current   : 0 - 10A

* 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	50	264	0	24.097	±41	±0.2
Minimum Voltage	-25	85	10	24.016		

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Model	KHEA240F-24
Item	Time Lapse Drift
Object	+24V10A

Temperature	25°C
Testing Circuitry	Figure A

1.Graph

Input Volt.　230V
Load　　　　100%

* The characteristic of AC115V is equal.
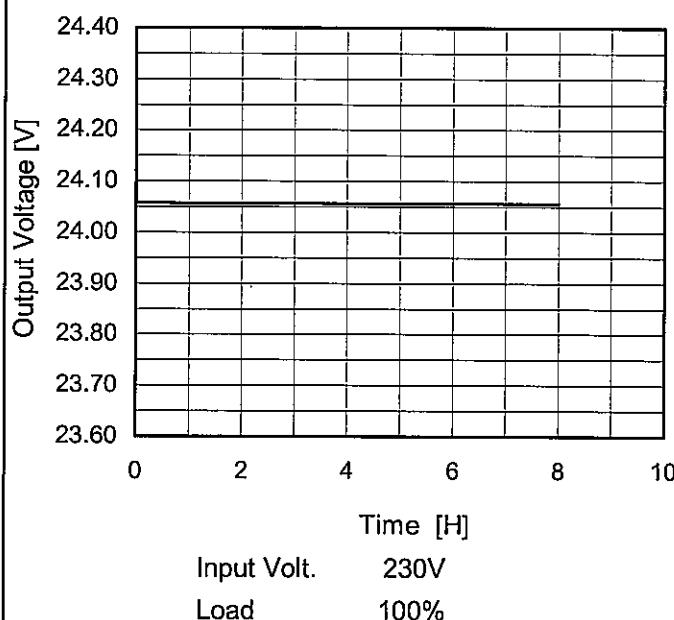
2.Values

Time since start [H]	Output Voltage [V]
0.0	24.065
0.5	24.058
1.0	24.056
2.0	24.056
3.0	24.056
4.0	24.056
5.0	24.056
6.0	24.056
7.0	24.056
8.0	24.056

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Model	KHEA240F-24
Item	Rise and Fall Time
Object	+24V10A

Temperature	25°C
Testing Circuitry	Figure A

1.Graph

Load 100% — Output Volt. [5V/div]

Input Volt. 115 V

Load 100% — Output Volt. [5V/div]

Input Volt. 230 V

Input Volt.

Time [100ms/div]

Time [20ms/div]
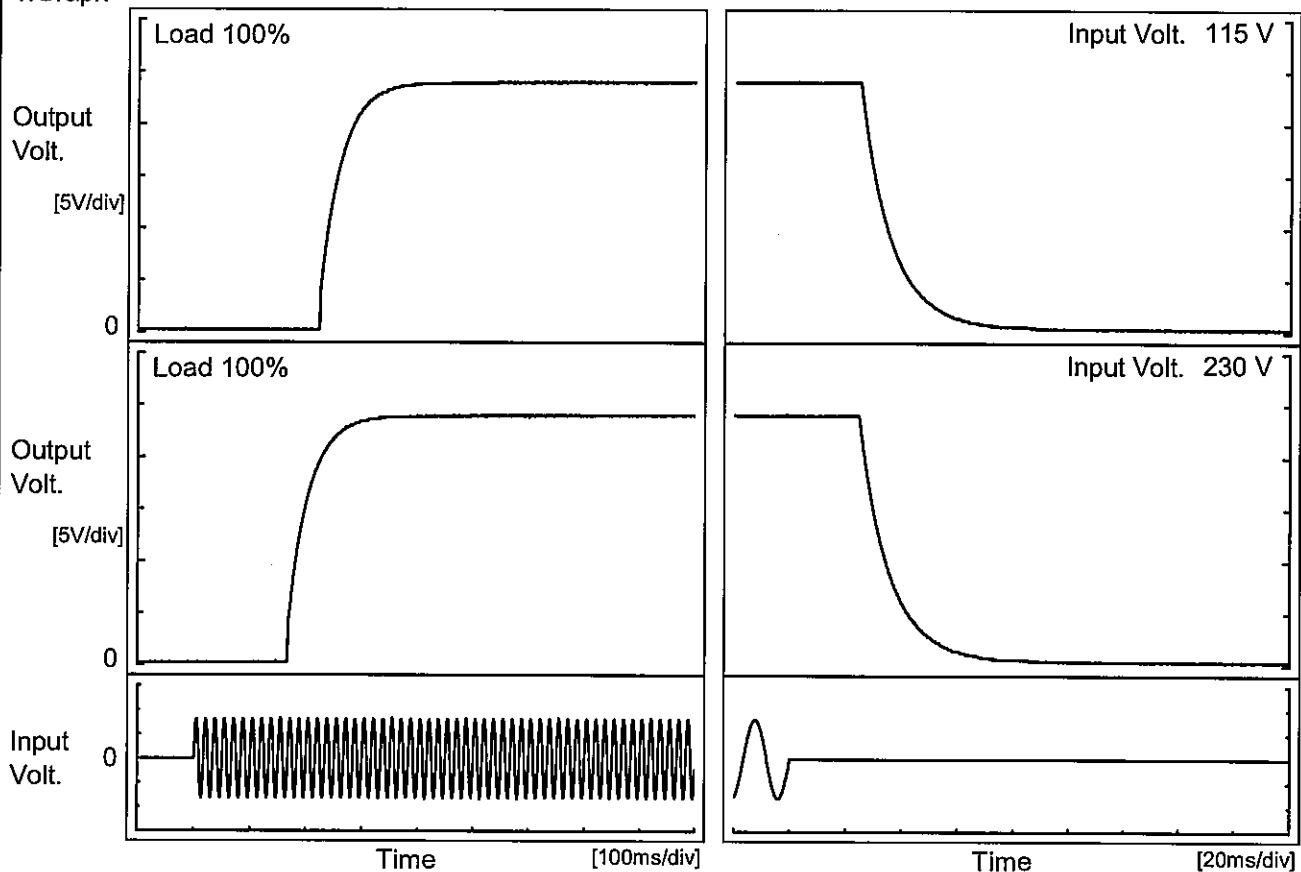
2.Values

[ms]

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
115 V	224.0	82.5	306.5	26.0	24.8
230 V	167.0	82.0	249.0	25.7	25.1

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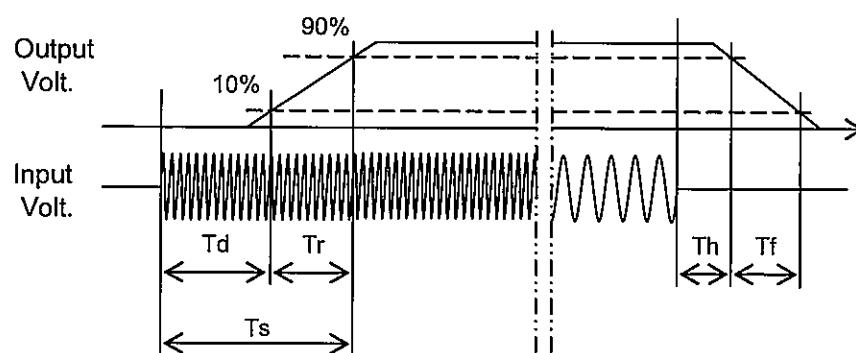
COSEL

Model	KHEA240F-24
Item	Hold-Up Time
Object	+24V10A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

--- ⊟ --- Load 50%
—— △ —— Load 100%

Hold-Up Time [ms]

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.
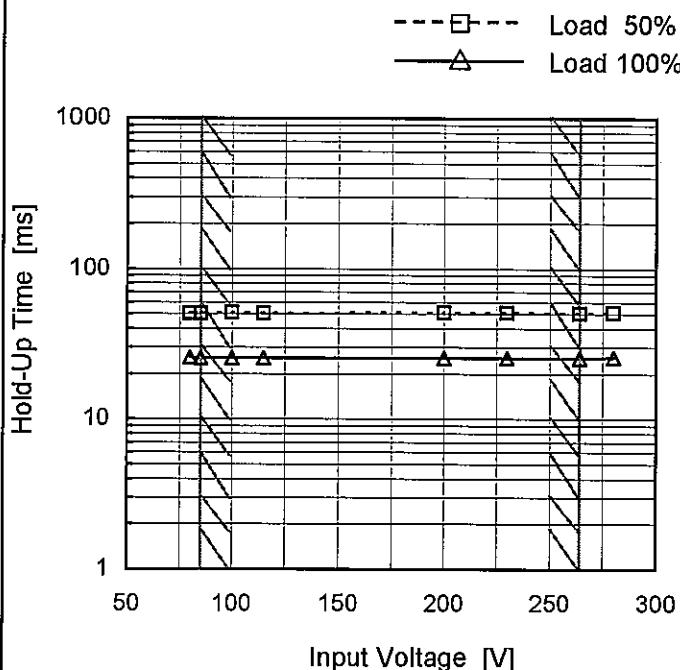
2.Values

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
80	51	26
85	51	26
100	51	26
115	51	26
200	51	26
230	51	26
264	51	26
280	51	26
--	-	-

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CO$EL

Model	KHEA240F-24
Item	Instantaneous Interruption Compensation
Object	+24V10A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

———△——— Input Volt.   100V
---⊟--- Input Volt.   115V
—·—○—·— Input Volt.   230V

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

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. 115[V]	Input Volt. 230[V]
0.0	-	-	-
2.0	122	121	121
4.0	62	62	62
6.0	40	40	41
8.0	30	31	31
10.0	23	23	25
11.0	22	22	22
13.0	19	19	19
15.0	14	15	15
--	-	-	-
--	-	-	-

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参考資料

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Model	KHEA240F-24
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+24V10A

Testing Circuitry　Figure A

1.Graph

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

Input Voltage [V]

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	67	67
-25	67	67
-10	67	67
0	67	67
10	67	67
25	67	67
40	67	67
50	67	67
60	67	67
70	67	67
--	-	-

COSEL

Model	KHEA240F-24
Item	Overcurrent Protection
Object	+24V10A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

———— Input Volt. 115V
———— Input Volt. 230V
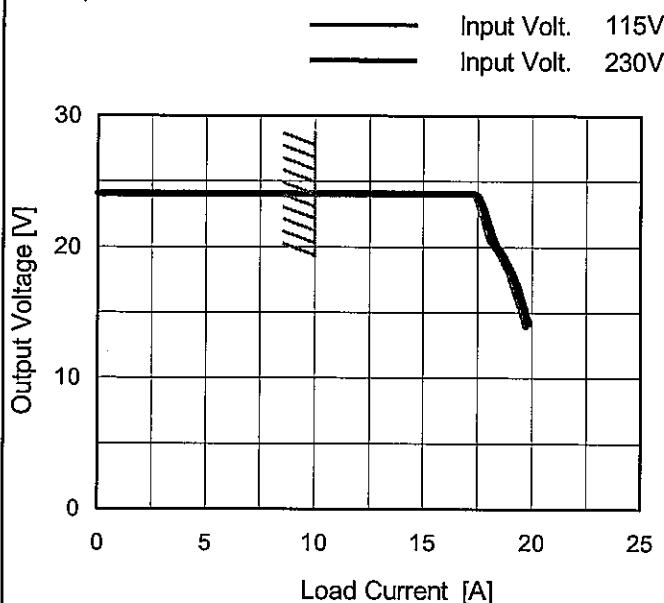
Note: Slanted line shows the range of the rated load current.

Intermittent operation occurs when the output voltage is from 14V to 0V.

2.Values

Output Voltage [V]	Load Current [A]	
	Input Volt. 115[V]	Input Volt. 230[V]
22.8	17.75	17.66
21.6	17.97	17.88
19.2	18.70	18.59
16.8	19.29	19.20
14.4	19.74	19.65
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

BC-10674

COSEL

Model	KHEA240F-24
Item	Overvoltage Protection
Object	+24V10A
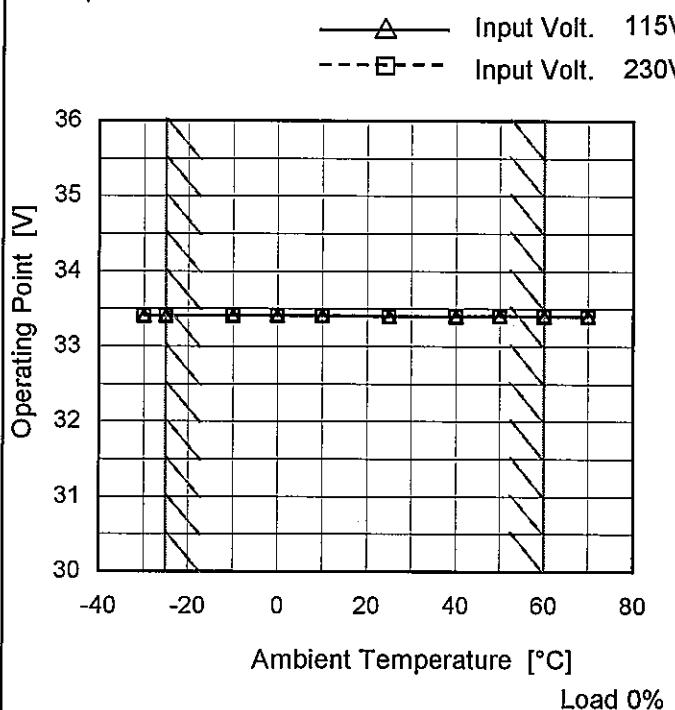
Testing Circuitry   Figure A

1.Graph

— △ — Input Volt.   115V
--- ⊟ --- 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. 115[V]	Input Volt. 230[V]
-30	33.41	33.41
-25	33.41	33.41
-10	33.41	33.41
0	33.41	33.41
10	33.41	33.41
25	33.40	33.40
40	33.40	33.40
50	33.41	33.40
60	33.40	33.40
70	33.40	33.40
--	-	-

BC-10674

COSEL

Figure A

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

Figure B (DEN-AN)

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

Figure B (IEC60950-1)

BC-10674

CO$EL

Temperature Chamber

Measuring board

AC Power Supply → Power Meter → Power Supply

C1 ⊥ C2

150mm

Electronic DC Load

Oscilloscope BW:20MHz
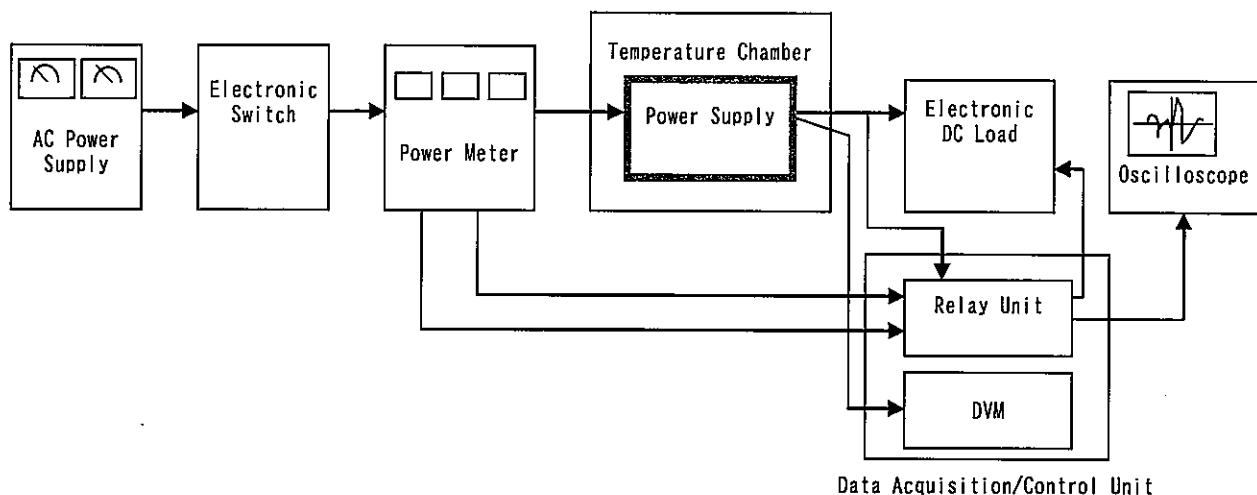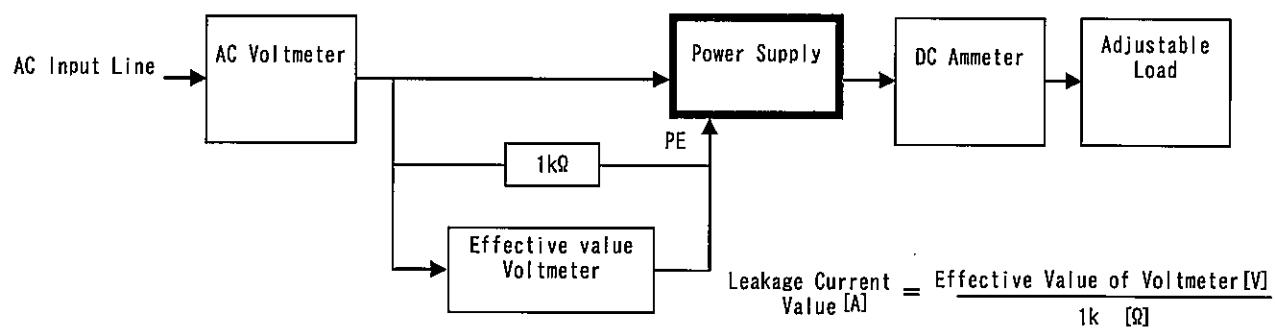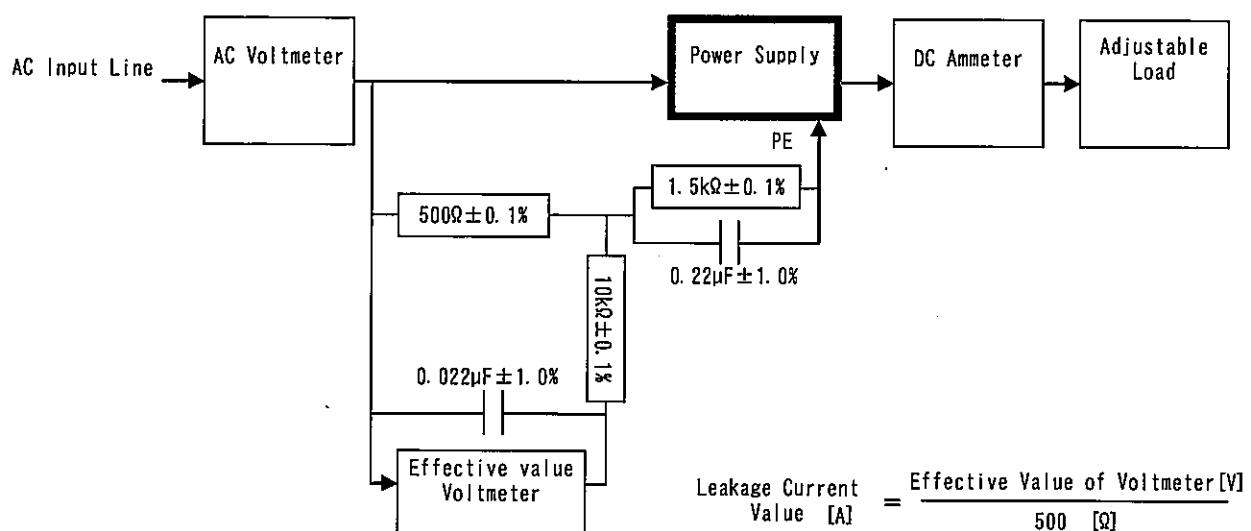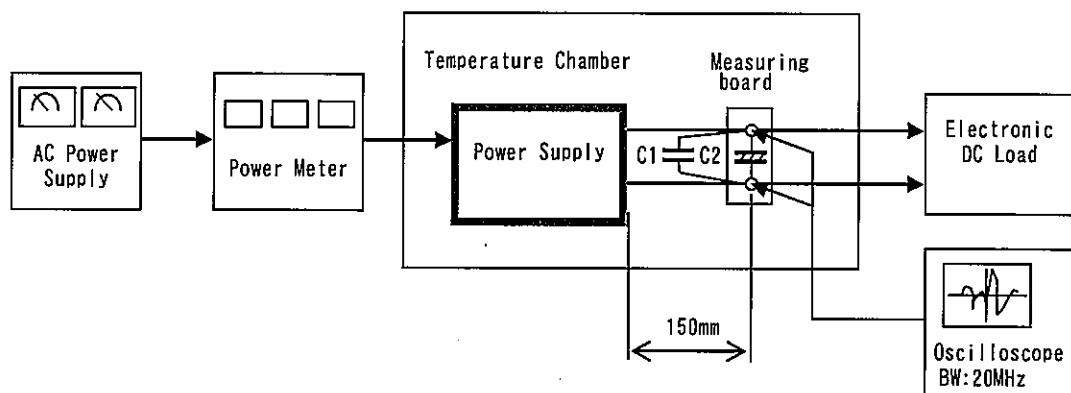
C1= 0.1 μF
(Ceramic capacitor)

C2= 22 μF
(Electrolytic capacitor)

Figure C