

TEST DATA OF KHNA240F-24

Regulated DC Power Supply
July 6, 2012

Approved by : Yukihiro Takehashi
Yukihiro Takehashi Design Manager

Prepared by : Seiya Shimada
Seiya Shimada Design Engineer

COSEL CO.,LTD.

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

KHNA240F-24

Item

Input Current (by Load Current)

Object

Temperature

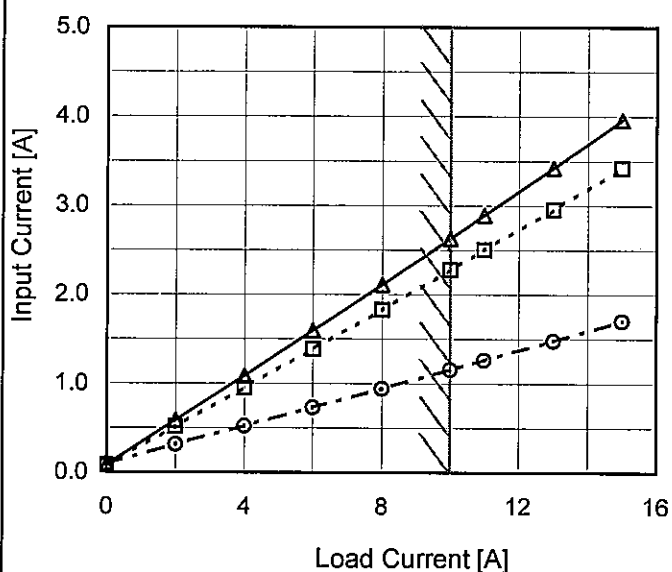
25°C

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]	Input Current [A]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	0.084	0.081	0.088
2.0	0.585	0.514	0.314
4.0	1.086	0.948	0.520
6.0	1.594	1.385	0.729
8.0	2.108	1.828	0.941
10.0	2.628	2.276	1.155
11.0	2.892	2.502	1.263
13.0	3.422	2.957	1.481
15.0	3.960	3.418	1.704
--	-	-	-
--	-	-	-

COSEL

Model KHNA240F-24

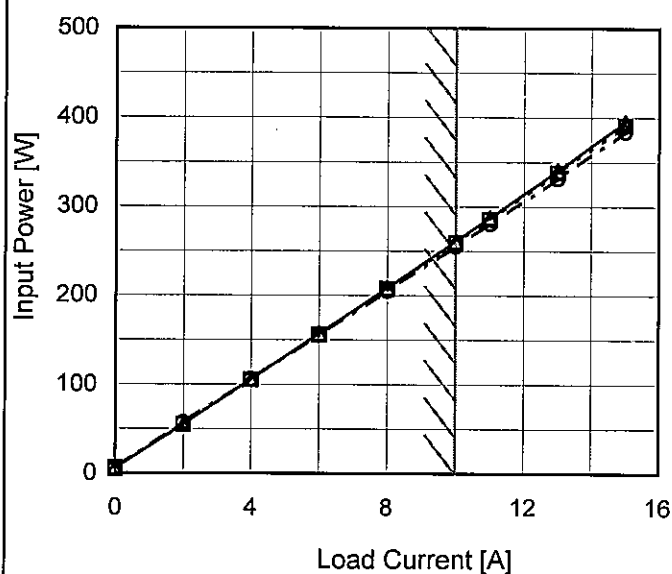
Item Input Power (by Load Current)

Object

Temperature 25°C
Testing Circuitry Figure A

1. Graph

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



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. 115[V]	Input Volt. 230[V]
0.0	5.5	5.6	5.3
2.0	55.0	55.0	57.0
4.0	105.5	105.2	106.0
6.0	156.9	155.8	155.2
8.0	208.5	207.6	205.2
10.0	260.7	259.2	255.4
11.0	287.3	285.3	280.6
13.0	340.5	338.1	331.4
15.0	395.0	391.2	384.0
--	-	-	-
--	-	-	-

BC-10675

Model

KHNA240F-24

Item

Efficiency (by Load Current)

Object

1.Graph

—△—

Input Volt.

100V

---□---

Input Volt.

115V

-○-

Input Volt.

230V

Efficiency [%]

100

96

92

88

84

80

76

72

0

4

8

12

16

Load Current [A]

0.0

2.0

4.0

6.0

8.0

10.0

11.0

13.0

15.0

--

--

86.7

86.6

84.1

90.5

90.7

90.5

91.3

91.9

92.8

91.6

92.0

93.6

91.6

92.1

94.0

91.4

92.1

94.1

91.2

91.8

94.2

90.7

91.6

93.8

-

-

-

-

-

-

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

2.Values

Load Current [A]	Efficiency [%]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	-	-	-
2.0	86.7	86.6	84.1
4.0	90.5	90.7	90.5
6.0	91.3	91.9	92.8
8.0	91.6	92.0	93.6
10.0	91.6	92.1	94.0
11.0	91.4	92.1	94.1
13.0	91.2	91.8	94.2
15.0	90.7	91.6	93.8
--	-	-	-
--	-	-	-

- 4 -

BC-10675

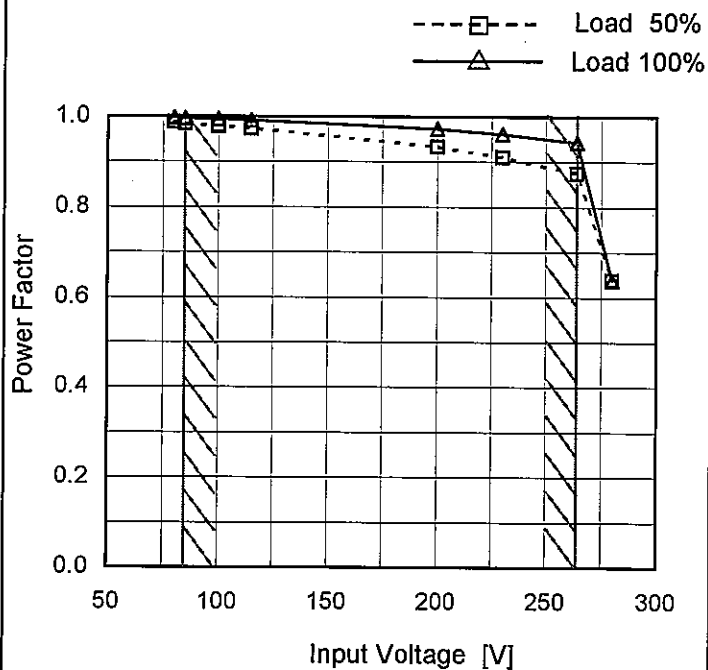
Model KHNA240F-24

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	0.987	0.997
85	0.985	0.996
100	0.978	0.994
115	0.973	0.992
200	0.933	0.973
230	0.910	0.961
264	0.876	0.943
280	0.638	0.638
--	-	-

Model

KHNA240F-24

Item

Power Factor (by Load Current)

Object

1.Graph

—△—

Input Volt. 100V

---□---

Input Volt. 115V

---○---

Input Volt. 230V

Power Factor

1.0

0.8

0.6

0.4

0.2

0.0

0

4

8

12

16

Load Current [A]

0

4

8

12

16

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

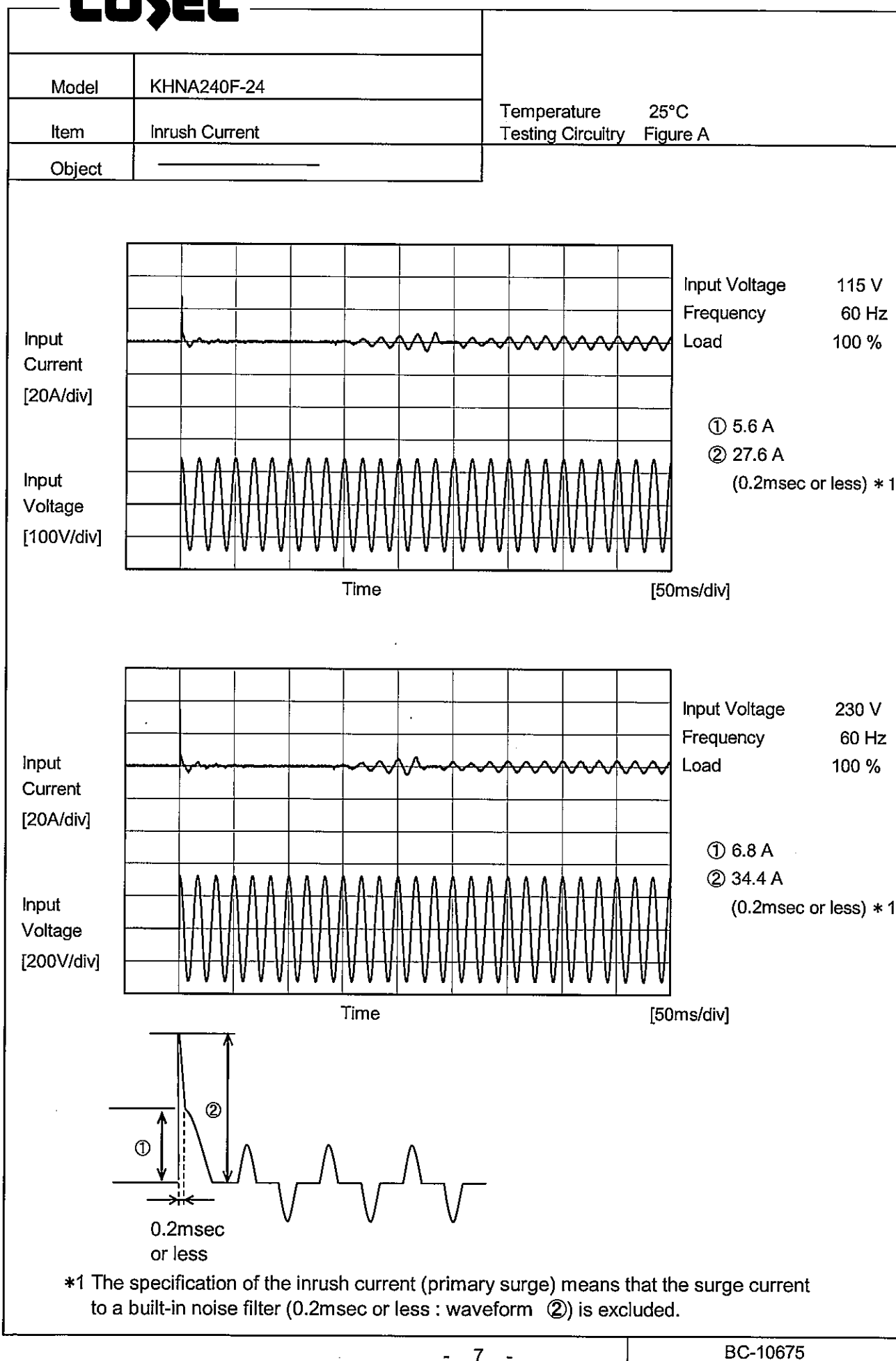
Temperature25°C

Testing CircuitryFigure A

2.Values

Load Current [A]	Power Factor		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	0.654	0.600	0.261
2.0	0.940	0.931	0.788
4.0	0.971	0.965	0.886
6.0	0.986	0.979	0.926
8.0	0.990	0.989	0.948
10.0	0.994	0.992	0.961
11.0	0.996	0.993	0.966
13.0	0.997	0.996	0.973
15.0	0.997	0.996	0.980
--	-	-	-
--	-	-	-

COSEL





		Temperature 25°C Testing Circuitry Figure B
Model	KHNA240F-24	
Item	Leakage Current	
Object		

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.

COSEL

Model	KHNA240F-24																																
Item	Line Regulation	Temperature	25°C																														
Object	+24V10A	Testing Circuitry	Figure A																														
1.Graph		2.Values																															
<div><div><div>---□---</div><div>Load 50%</div></div><div><div>—△—</div><div>Load 100%</div></div></div> <table><thead><tr><th>Input Voltage [V]</th><th>Output Voltage [V] Load 50%</th><th>Output Voltage [V] Load 100%</th></tr></thead><tbody><tr><td>80</td><td>24.044</td><td>24.037</td></tr><tr><td>85</td><td>24.044</td><td>24.037</td></tr><tr><td>100</td><td>24.044</td><td>24.037</td></tr><tr><td>115</td><td>24.044</td><td>24.037</td></tr><tr><td>200</td><td>24.044</td><td>24.037</td></tr><tr><td>230</td><td>24.044</td><td>24.037</td></tr><tr><td>264</td><td>24.044</td><td>24.037</td></tr><tr><td>280</td><td>24.043</td><td>24.037</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></tbody></table> <p>Note: Slanted line shows the range of the rated input voltage.</p>		Input Voltage [V]	Output Voltage [V] Load 50%	Output Voltage [V] Load 100%	80	24.044	24.037	85	24.044	24.037	100	24.044	24.037	115	24.044	24.037	200	24.044	24.037	230	24.044	24.037	264	24.044	24.037	280	24.043	24.037	--	-	-		
Input Voltage [V]	Output Voltage [V] Load 50%	Output Voltage [V] Load 100%																															
80	24.044	24.037																															
85	24.044	24.037																															
100	24.044	24.037																															
115	24.044	24.037																															
200	24.044	24.037																															
230	24.044	24.037																															
264	24.044	24.037																															
280	24.043	24.037																															
--	-	-																															

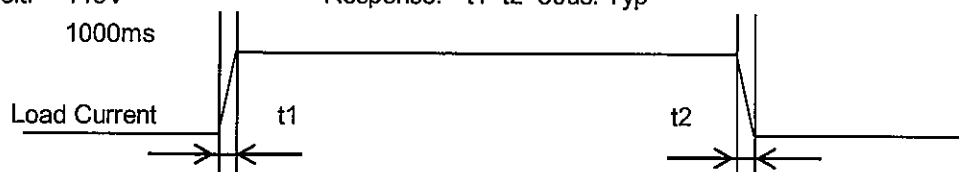
Model	KHNA240F-24																																																					
Item	Load Regulation	Temperature	25°C																																																			
Object	+24V10A	Testing Circuitry	Figure A																																																			
1.Graph		2.Values																																																				
<div><div><div>—△—</div><div>Input Volt. 100V</div></div><div><div>---□---</div><div>Input Volt. 115V</div></div><div><div>---○---</div><div>Input Volt. 230V</div></div></div> <p>Output Voltage [V]</p> <p>Load Current [A]</p>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Output Voltage [V]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 115[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.0</td><td>24.057</td><td>24.058</td><td>24.057</td></tr><tr><td>2.0</td><td>24.047</td><td>24.047</td><td>24.047</td></tr><tr><td>4.0</td><td>24.044</td><td>24.044</td><td>24.044</td></tr><tr><td>6.0</td><td>24.041</td><td>24.042</td><td>24.041</td></tr><tr><td>8.0</td><td>24.039</td><td>24.039</td><td>24.038</td></tr><tr><td>10.0</td><td>24.037</td><td>24.037</td><td>24.037</td></tr><tr><td>11.0</td><td>24.035</td><td>24.035</td><td>24.035</td></tr><tr><td>13.0</td><td>24.033</td><td>24.033</td><td>24.032</td></tr><tr><td>15.0</td><td>24.031</td><td>24.031</td><td>24.030</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]	0.0	24.057	24.058	24.057	2.0	24.047	24.047	24.047	4.0	24.044	24.044	24.044	6.0	24.041	24.042	24.041	8.0	24.039	24.039	24.038	10.0	24.037	24.037	24.037	11.0	24.035	24.035	24.035	13.0	24.033	24.033	24.032	15.0	24.031	24.031	24.030	--	-	-	-	--	-	-	-
Load Current [A]	Output Voltage [V]																																																					
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]																																																			
0.0	24.057	24.058	24.057																																																			
2.0	24.047	24.047	24.047																																																			
4.0	24.044	24.044	24.044																																																			
6.0	24.041	24.042	24.041																																																			
8.0	24.039	24.039	24.038																																																			
10.0	24.037	24.037	24.037																																																			
11.0	24.035	24.035	24.035																																																			
13.0	24.033	24.033	24.032																																																			
15.0	24.031	24.031	24.030																																																			
--	-	-	-																																																			
--	-	-	-																																																			
Note: Slanted line shows the range of the rated load current.																																																						

COSEL

Model	KHNA240F-24	
Item	Dynamic Load Response	Temperature 25°C Testing Circuitry Figure A
Object	+24V10A	

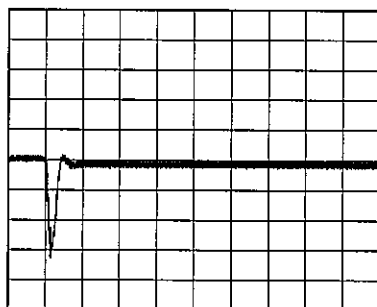
Input Volt. 115V
Cycle 1000ms

Response. $t_1=t_2=50\mu\text{s}$. Typ

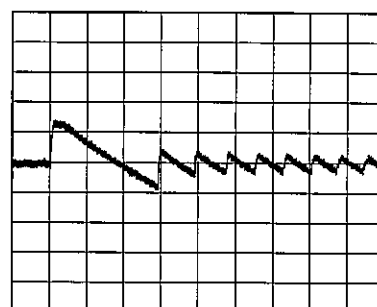


Min. Load (0A) \longleftrightarrow
Load 100% (10.0A)

200 mV/div



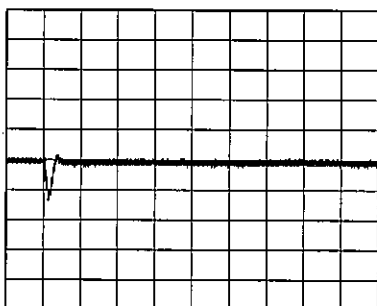
2 ms/div



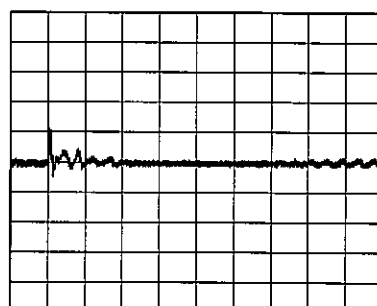
20 ms/div

Load 20% (2.0A) \longleftrightarrow
Load 100% (10.0A)

200 mV/div



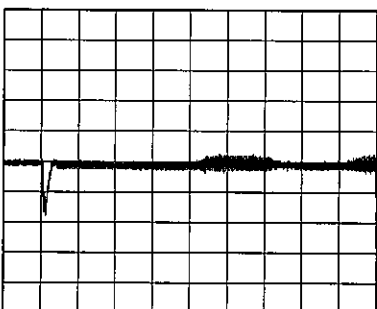
2 ms/div



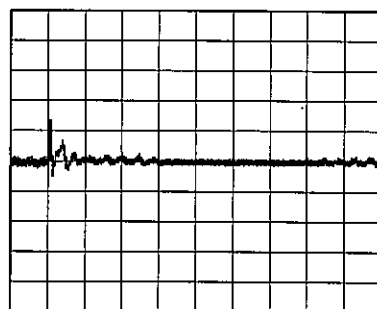
20 ms/div

Load 20% (2.0A) \longleftrightarrow
Load 150% (15.0A)

200 mV/div



2 ms/div



20 ms/div

* The characteristic of AC230V is equal.

COSEL

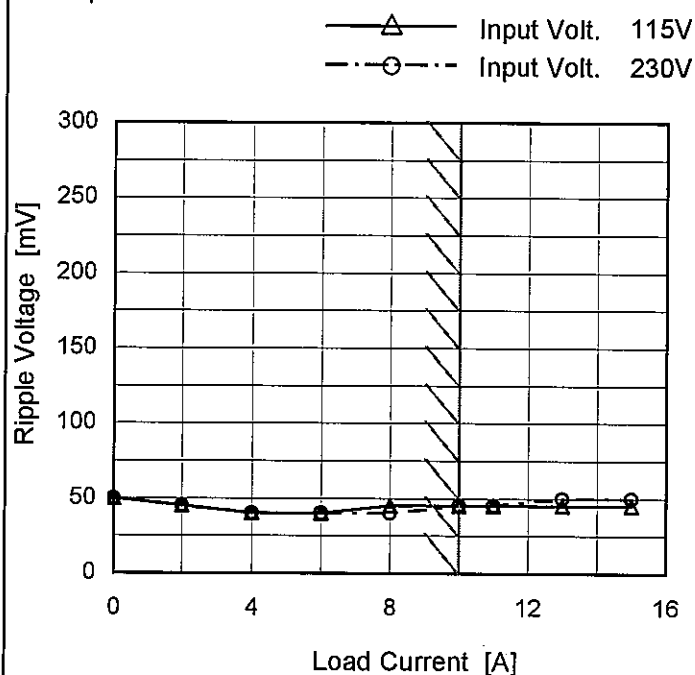
Model KHNA240F-24

Item Ripple Voltage (by Load Current)

Object +24V10A

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.

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

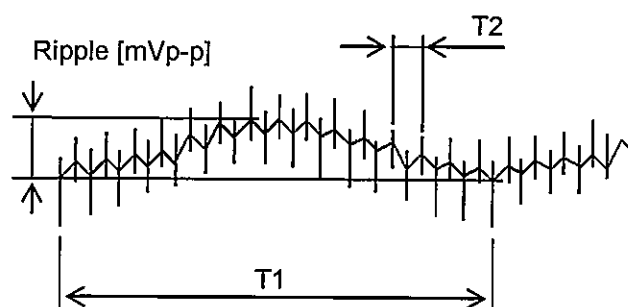


Fig. Complex Ripple Wave Form

COSEL

Model		KHNA240F-24	
Item		Ripple-Noise	
Object		+24V10A	
1.Graph		2.Values	

—△— Input Volt. 115V
- - -○- - - Input Volt. 230V

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
--	-	-
--	-	-

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.

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

Fig. Complex Ripple Wave Form

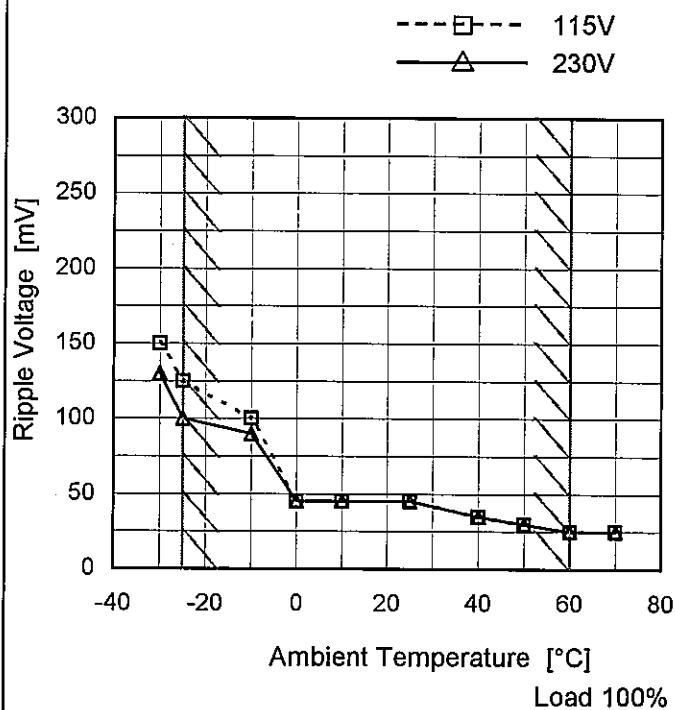
Model KHNA240F-24

Item Ripple Voltage (by Ambient Temp.)

Object +24V10A

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]	
	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
--	-	-

COSEL

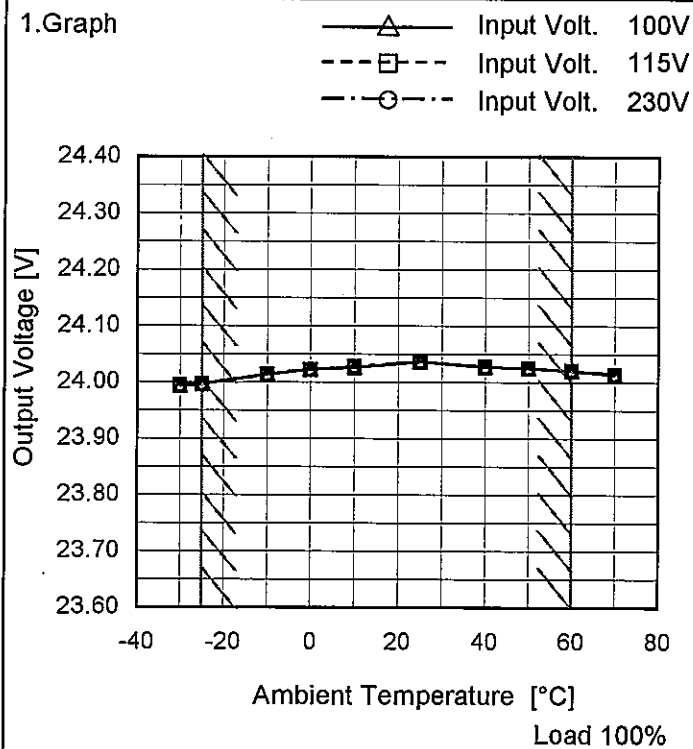
Model KHNA240F-24

Item Ambient Temperature Drift

Object +24V10A

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. 115[V]	Input Volt. 230[V]
-30	23.994	23.994	23.994
-25	23.997	23.997	23.997
-10	24.013	24.014	24.014
0	24.022	24.022	24.022
10	24.027	24.027	24.027
25	24.037	24.037	24.037
40	24.028	24.028	24.028
50	24.025	24.025	24.025
60	24.021	24.020	24.020
70	24.013	24.013	24.013
--	-	-	-



		Testing Circuitry Figure A
Model	KHNA240F-24	
Item	Output Voltage Accuracy	
Object	+24V10A	

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 = $\pm(\text{Maximum of Output Voltage} - \text{Minimum of Output Voltage}) / 2$

* 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	25	264	0	24.058	±32	±0.1
Minimum Voltage	-25	85	10	23.994		

COSEL

Model

KHNA240F-24

Item

Time Lapse Drift

Object

+24V10A

Temperature

25°C

Testing Circuitry

Figure A

1.Graph

Output Voltage [V]

24.40

24.30

24.20

24.10

24.00

23.90

23.80

23.70

23.60

0

2

4

6

8

10

Time [H]

Input Volt. 115V

Load 100%

2.Values

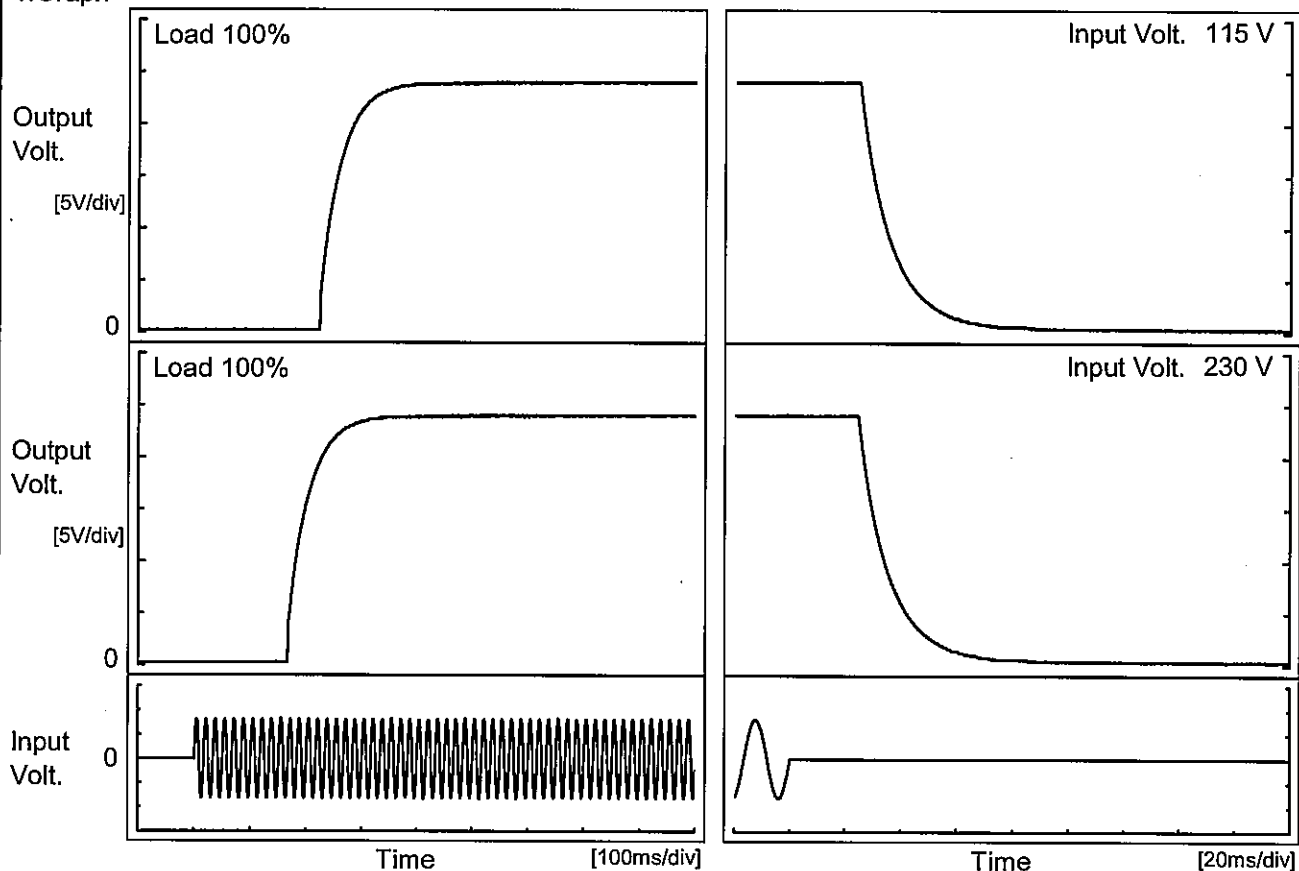
Time since start [H]	Output Voltage [V]
0.0	24.037
0.5	24.030
1.0	24.028
2.0	24.028
3.0	24.028
4.0	24.028
5.0	24.028
6.0	24.028
7.0	24.028
8.0	24.028

* The characteristic of AC230V is equal.

COSEL

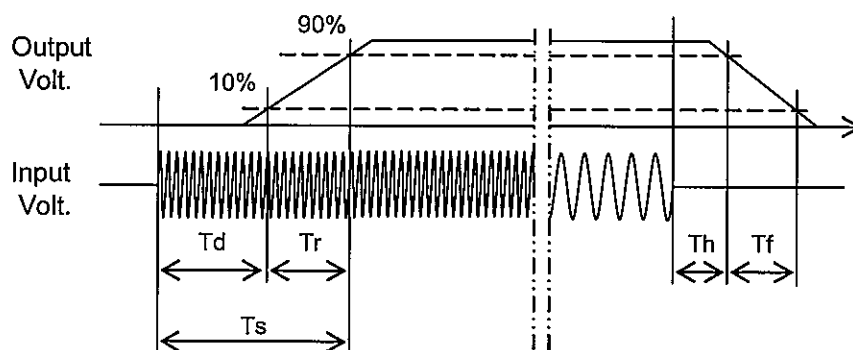
Model	KHNA240F-24	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+24V10A		

1. Graph



2. Values

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



Model		KHNA240F-24	
Item		Hold-Up Time	
Object		+24V10A	
1.Graph		2.Values	

□

Load 50%

—

△

—

Load 100%

Hold-Up Time [ms]

1000

100

10

1

50

100

150

200

250

300

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.

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

-

19

-

BC-10675

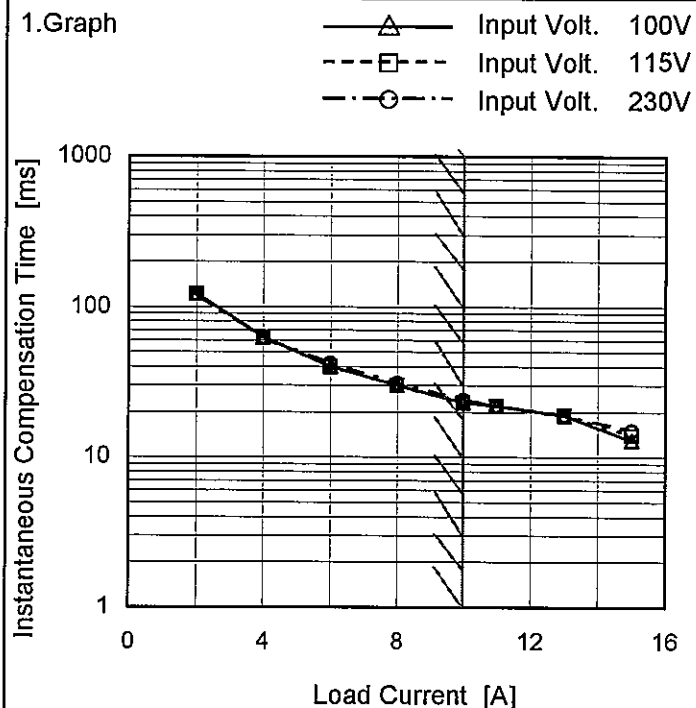
Model KHNA240F-24

Item Instantaneous Interruption Compensation

Object +24V10A

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. 115[V]	Input Volt. 230[V]
0.0	-	-	-
2.0	122	121	121
4.0	63	62	62
6.0	40	40	42
8.0	30	30	31
10.0	23	23	24
11.0	22	22	22
13.0	19	19	19
15.0	13	14	15
--	-	-	-
--	-	-	-

Model

KHNA240F-24

Item

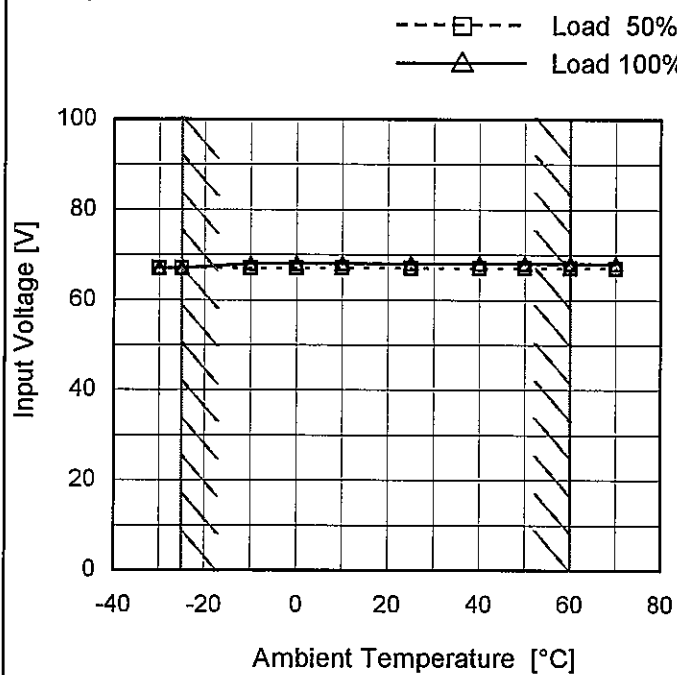
Minimum Input Voltage
for Regulated Output Voltage

Object

+24V10A

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	67	67
-25	67	67
-10	67	68
0	67	68
10	67	68
25	67	68
40	67	68
50	67	68
60	67	68
70	67	68
--	-	-

COSEL

Model

KHNA240F-24

Item

Overcurrent Protection

Object

+24V10A

1.Graph

Input Volt. 115V

Input Volt. 230V

Output Voltage [V]

30

20

10

0

0

5

10

15

20

25

Load Current [A]

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	17.80	17.71
21.6	17.95	17.84
19.2	18.73	18.63
16.8	19.29	19.18
14.4	19.71	19.62
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

- 22 -

BC-10675

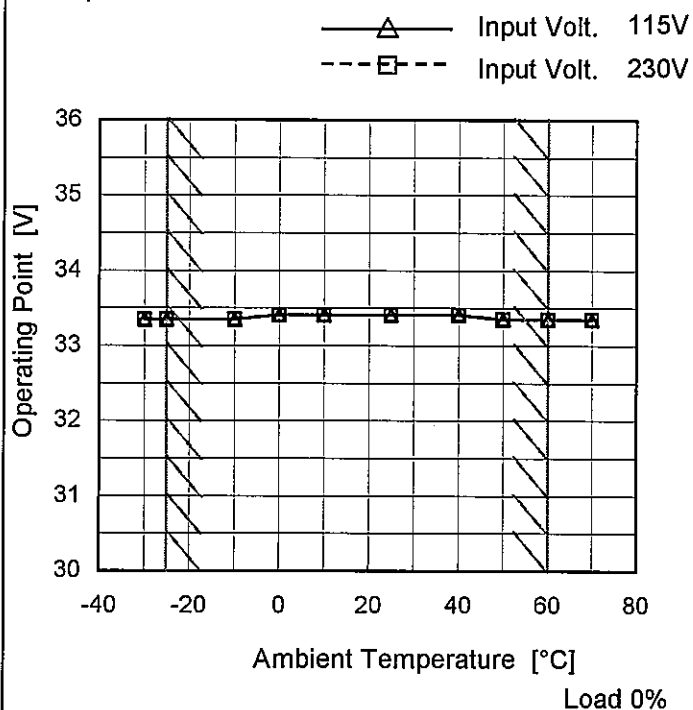
Model KHNA240F-24

Item Overvoltage Protection

Object +24V10A

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. 115[V]	Input Volt. 230[V]
-30	33.35	33.35
-25	33.35	33.35
-10	33.35	33.35
0	33.41	33.41
10	33.41	33.41
25	33.41	33.41
40	33.41	33.41
50	33.35	33.35
60	33.35	33.35
70	33.35	33.35
--	-	-

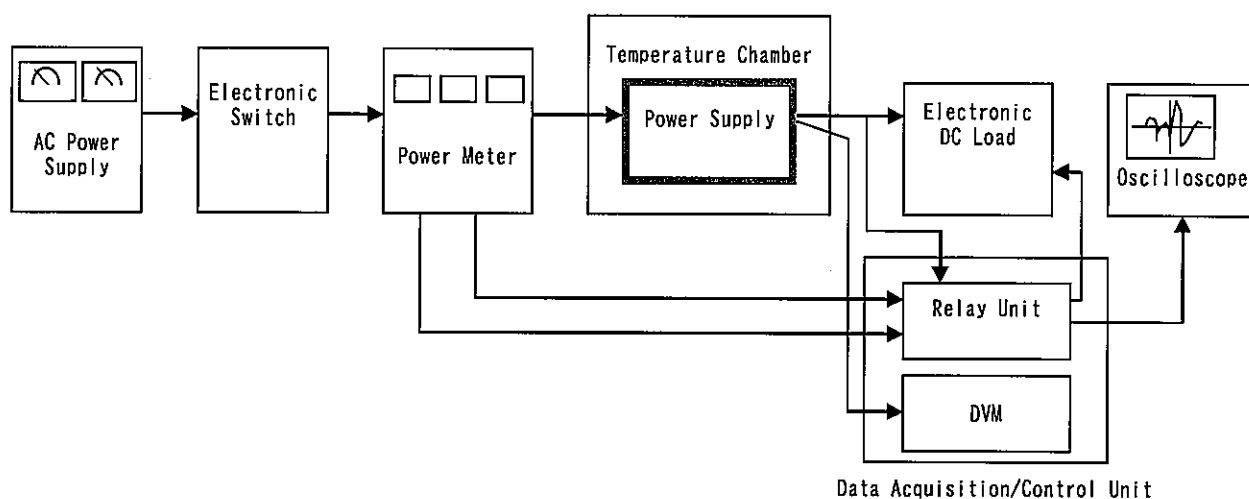


Figure A

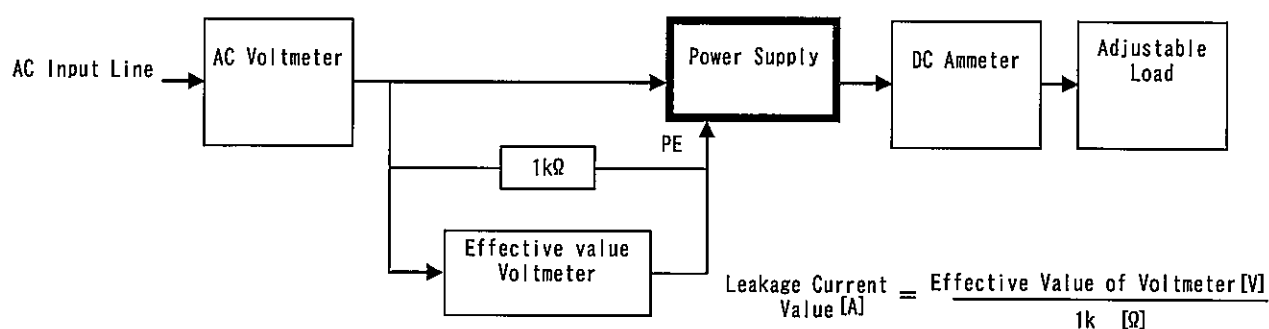


Figure B (DEN-AN)

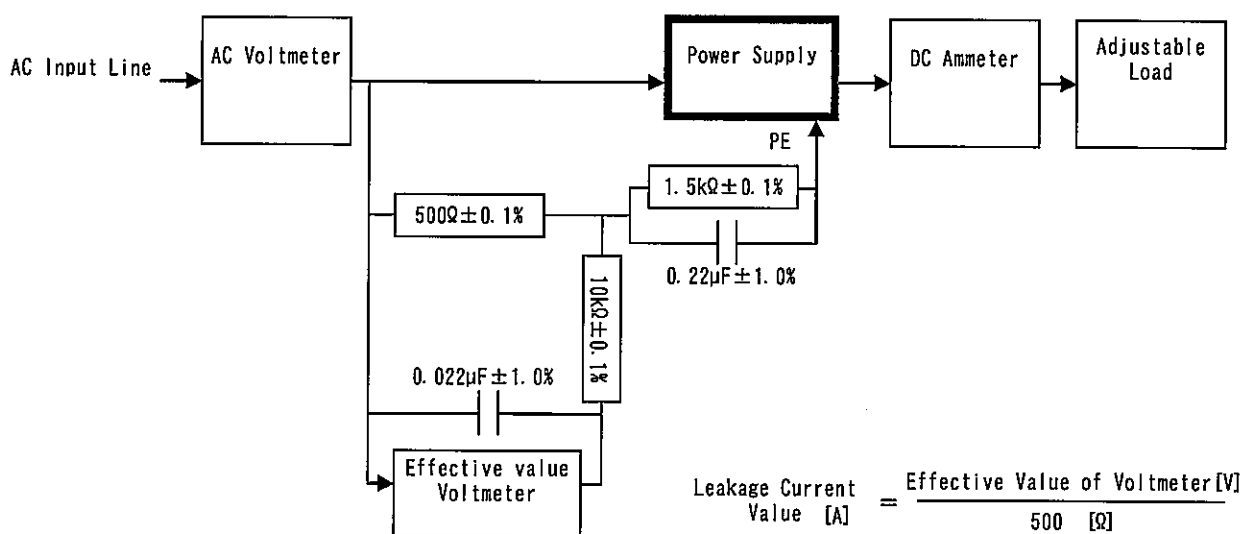
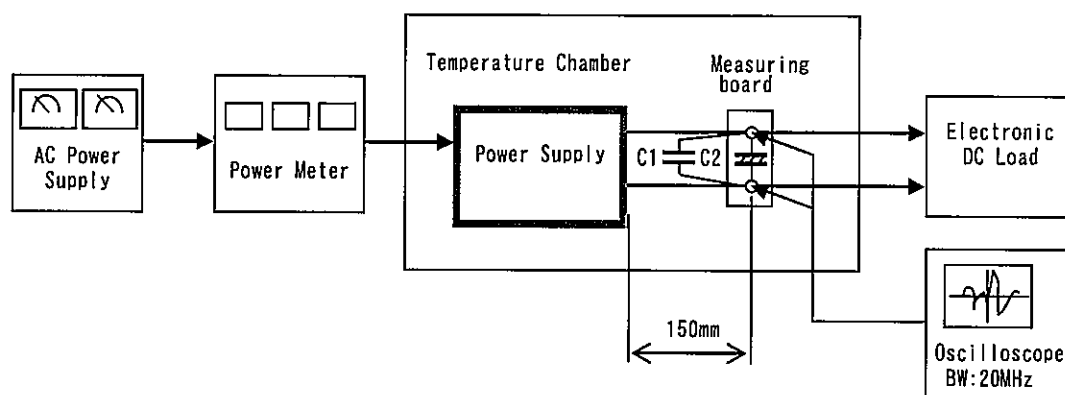


Figure B (IEC60950-1)



C1= 0.1 μ F
(Ceramic capacitor)

C2= 22 μ F
(Electrolytic capacitor)

Figure C