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.

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CONTENTS

(Final Page 25)

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Model	KHNA240F-24
Item	Input Current (by Load Current)
Object	
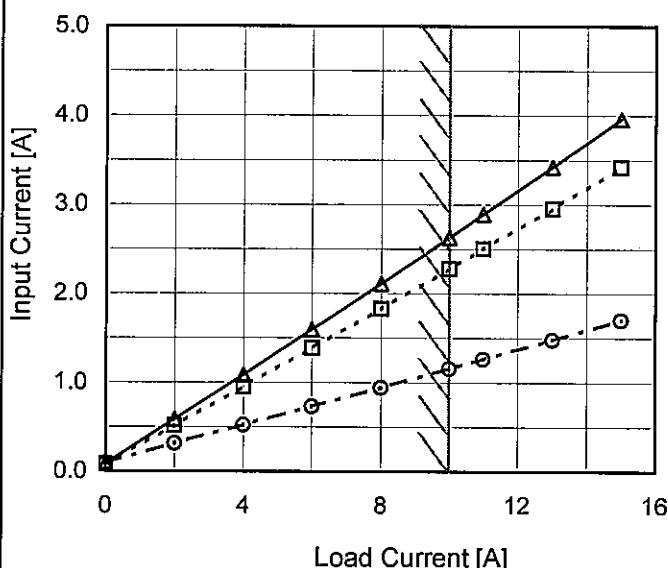
Temperature 25°C
Testing Circuitry Figure A

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
--	-	-	-
--	-	-	-

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| 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.
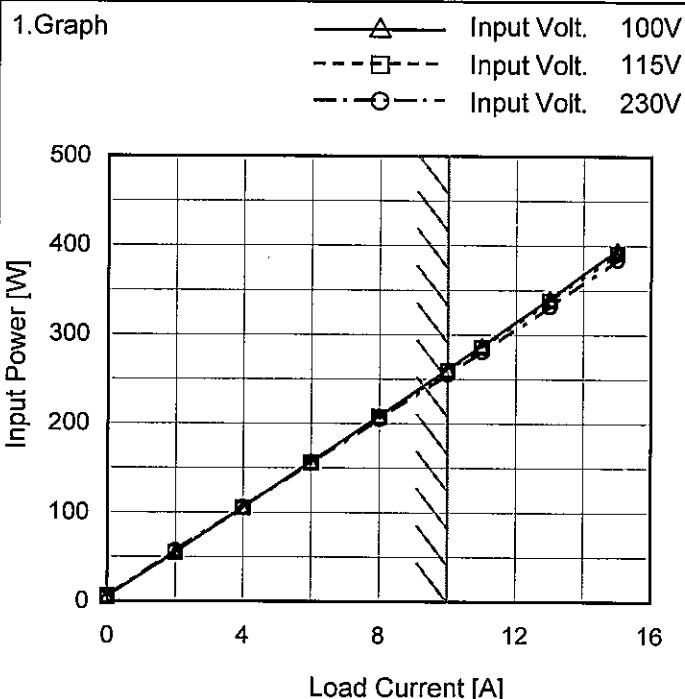
2.Values

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
--	-	-	-
--	-	-	-

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Model	KHNA240F-24
Item	Efficiency (by Input Voltage)
Object	
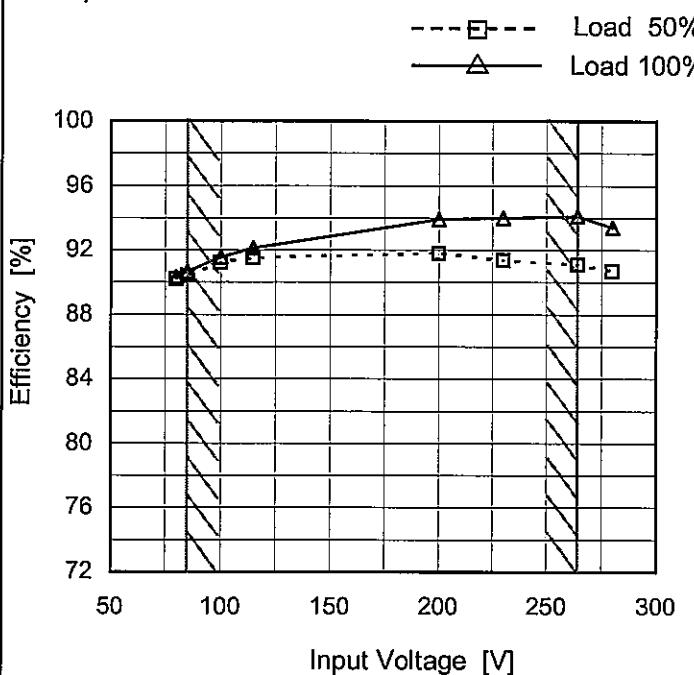
Temperature 25°C
Testing Circuitry Figure A

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	90.3
85	90.4	90.6
100	91.2	91.6
115	91.5	92.1
200	91.8	93.9
230	91.4	94.0
264	91.1	94.1
280	90.7	93.4
--	-	-

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Model	KHNA240F-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	86.6	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
--	-	-	-
--	-	-	-

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

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Model	KHNA240F-24
Item	Power Factor (by Input Voltage)
Object	

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.
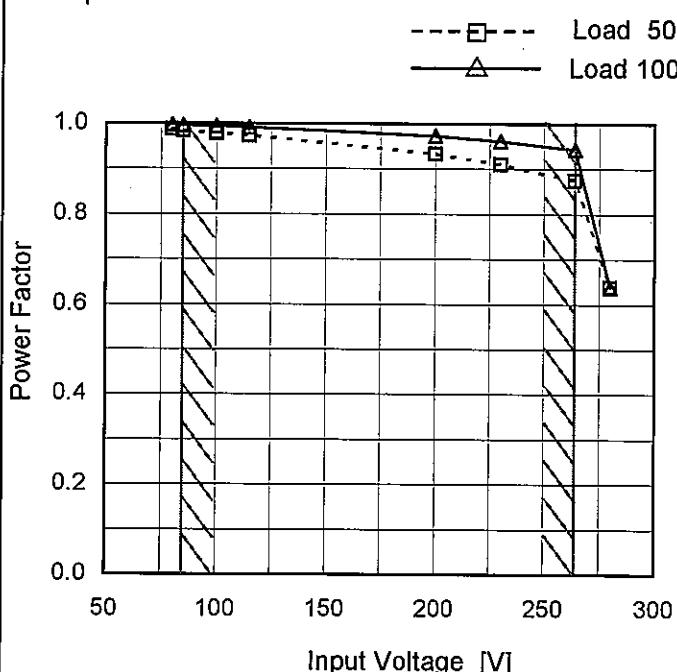
2.Values

Input Voltage [V]	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
--	-	-

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Model	KHNA240F-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

Power Factor vs Load Current [A]

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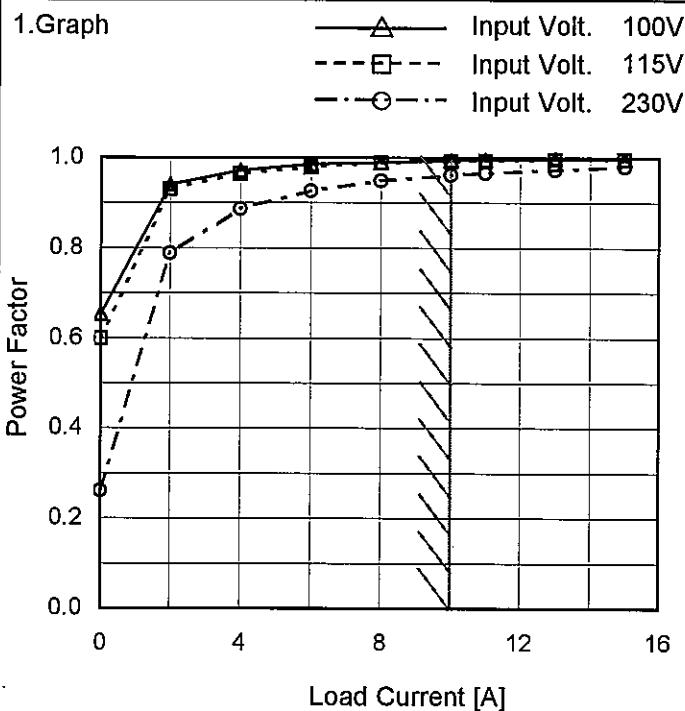
2.Values

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
--	-	-	-
--	-	-	-

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Model	KHNA240F-24
Item	Inrush Current
Object	————————

Temperature 25°C
Testing Circuitry Figure A

Input Current [20A/div]

Input Voltage [100V/div]

Time [50ms/div]
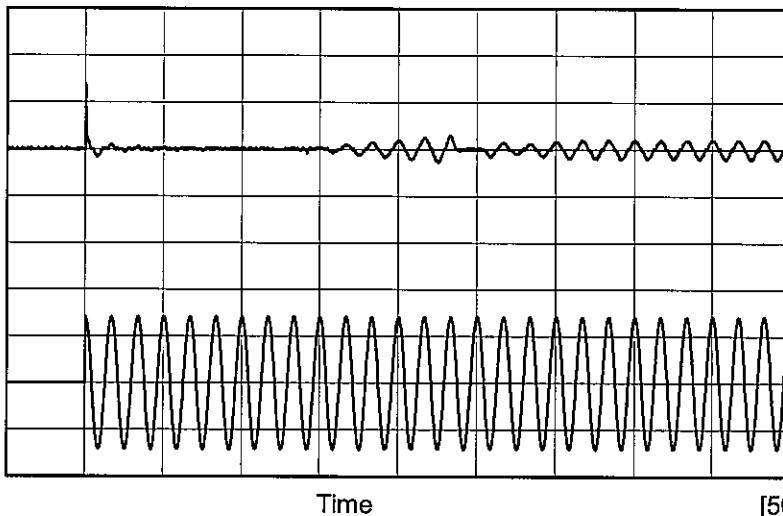
Input Voltage 115 V
Frequency 60 Hz
Load 100 %

① 5.6 A
② 27.6 A
(0.2msec or less) *1

Input Current [20A/div]

Input Voltage [200V/div]

Time [50ms/div]
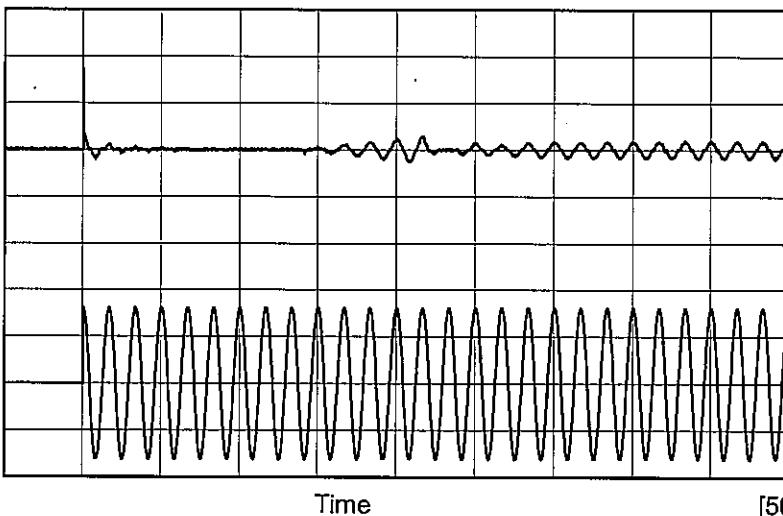
Input Voltage 230 V
Frequency 60 Hz
Load 100 %

① 6.8 A
② 34.4 A
(0.2msec or less) *1
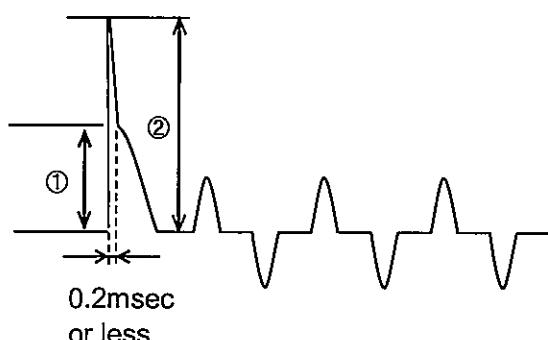
0.2msec or less

*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	KHNA240F-24		
Item	Leakage Current	Temperature	25°C
		Testing Circuitry	Figure B
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.

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Model	KHNA240F-24
Item	Line Regulation
Object	+24V10A

Temperature 25°C
Testing Circuitry Figure A

1.Graph
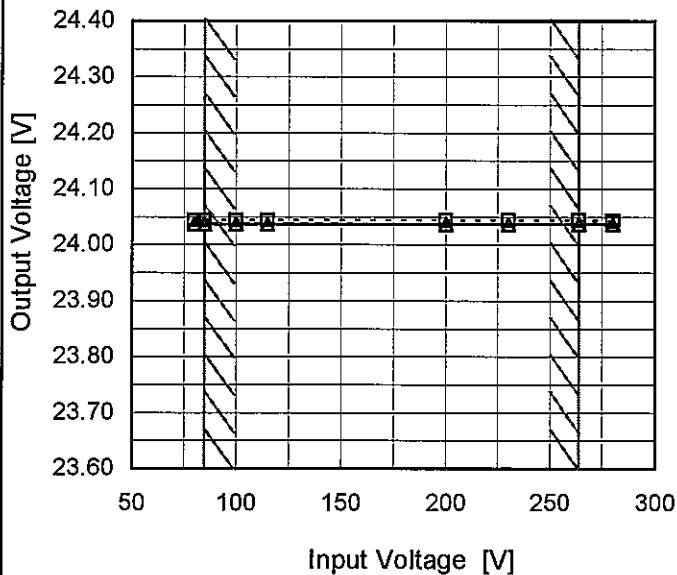
- - -☐- - - Load 50%
———△——— Load 100%

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

2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	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
--	-	-

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Model	KHNA240F-24
Item	Load Regulation
Object	+24V10A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

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

Load Current [A]

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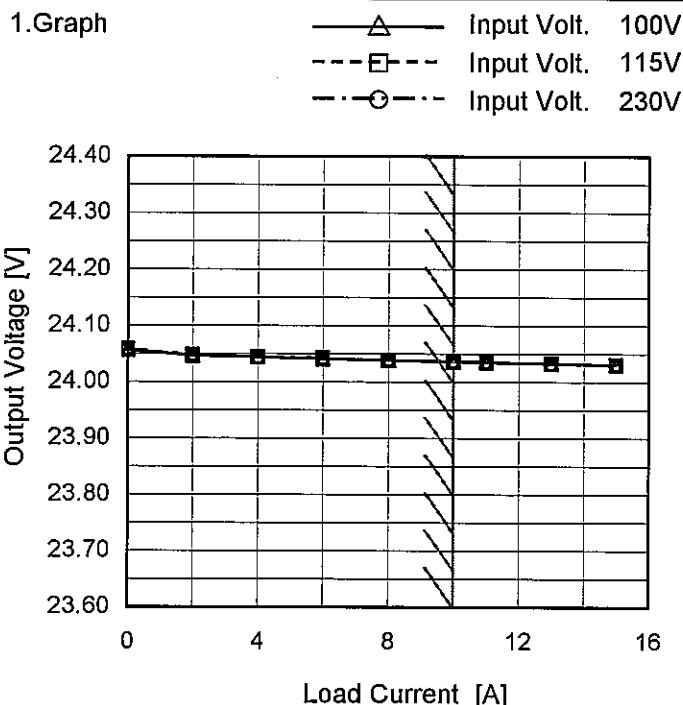
2.Values

Load Current [A]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 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
--	-	-	-
--	-	-	-

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Model	KHNA240F-24
Item	Dynamic Load Response
Object	+24V10A

Temperature   25°C
Testing Circuitry   Figure A

Input Volt.   115V   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 AC230V is equal.

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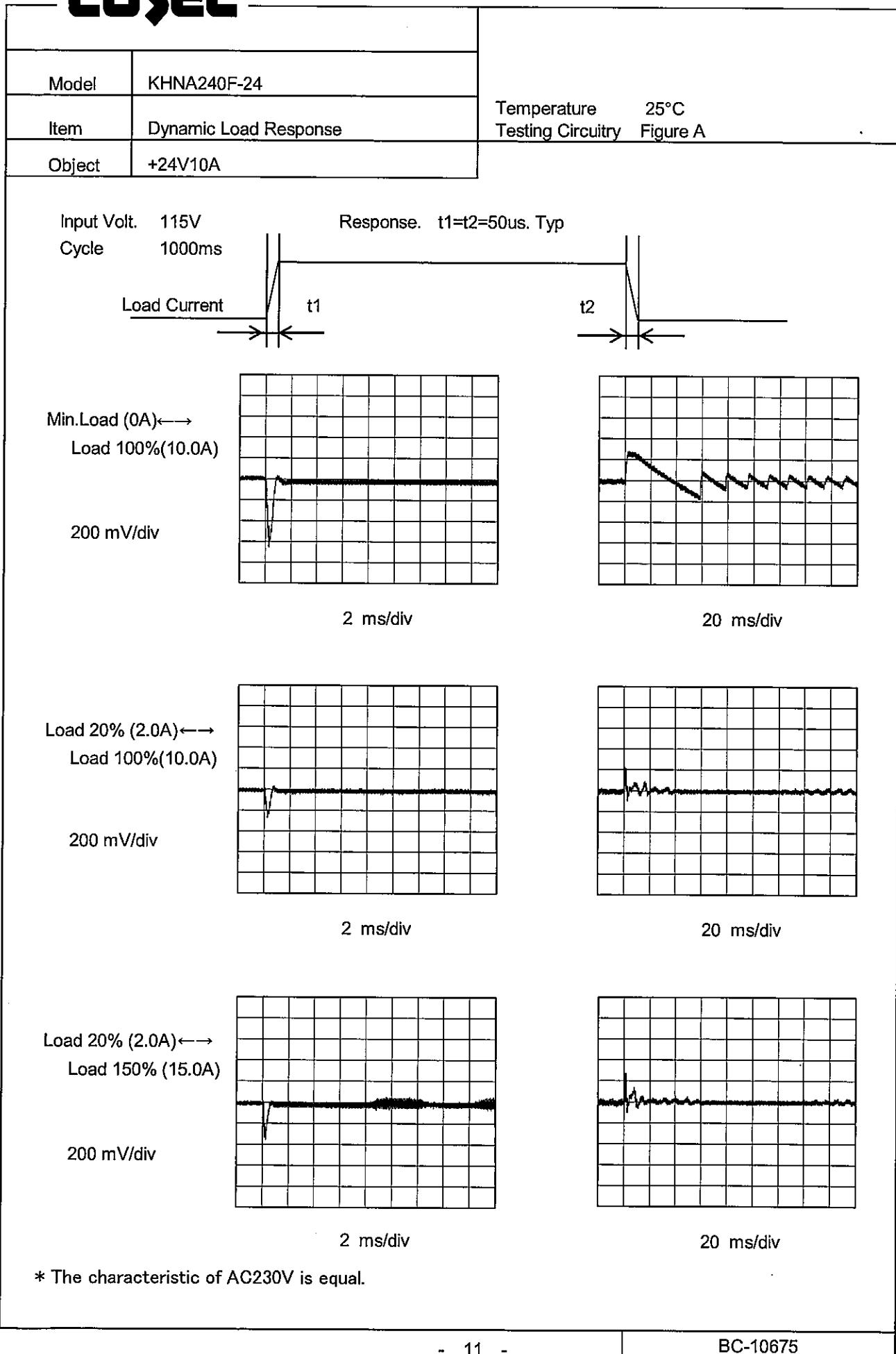
Model	KHNA240F-24
Item	Ripple Voltage (by Load Current)
Object	+24V10A

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.
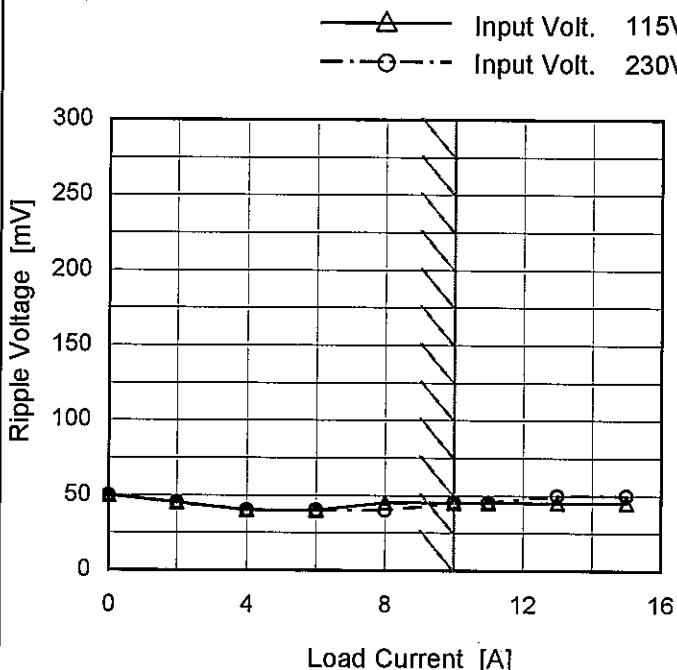
2.Values

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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CO$EL
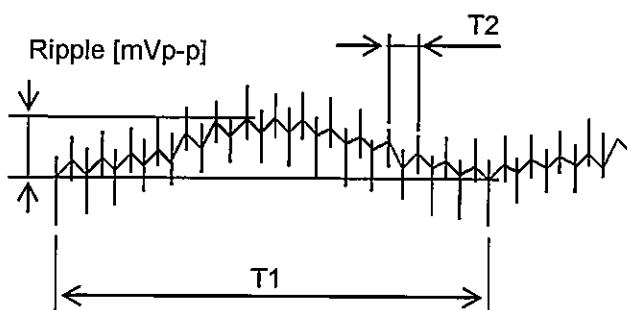
Model	KHNA240F-24
Item	Ripple-Noise
Object	+24V10A

Temperature 25°C
Testing Circuitry Figure C

1.Graph

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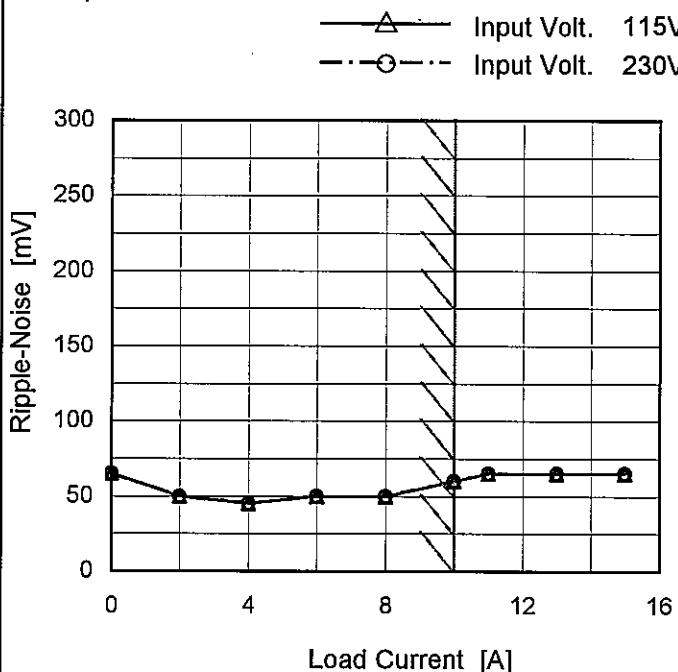
Load Current [A]

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

Fig. Complex Ripple Wave Form

BC-10675

CO$EL
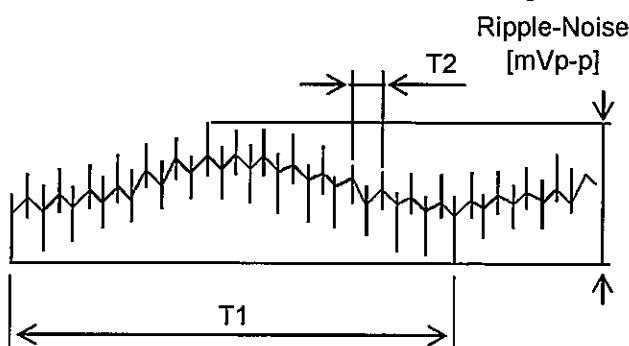
Model	KHNA240F-24
Item	Ripple Voltage (by Ambient Temp.)
Object	+24V10A

Testing Circuitry   Figure C

1.Graph

2.Values

--- ⊟ --- 115V
——— △ ——— 230V

Ambient Temperature [°C]

Load 100%

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
--	-	-
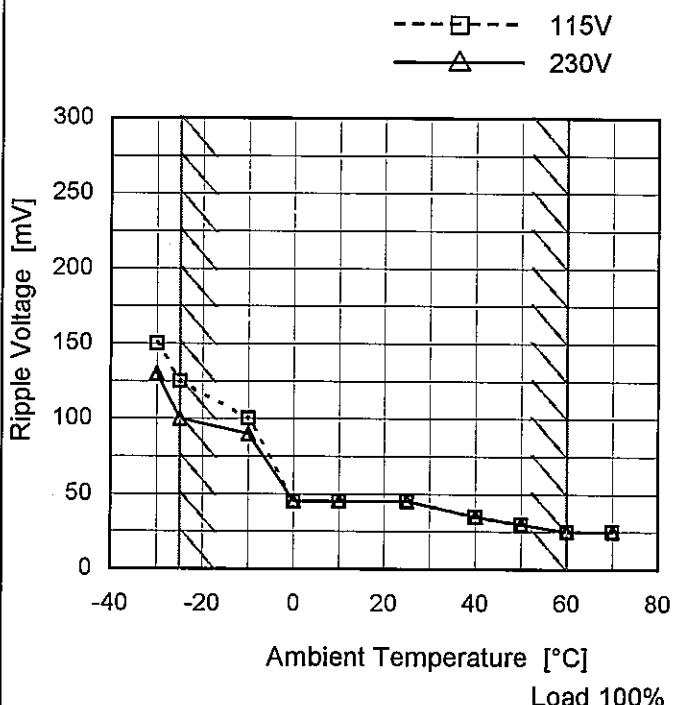
Measured by 20 MHz Oscilloscope.

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

BC-10675

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Model	KHNA240F-24
Item	Ambient Temperature Drift
Object	+24V10A
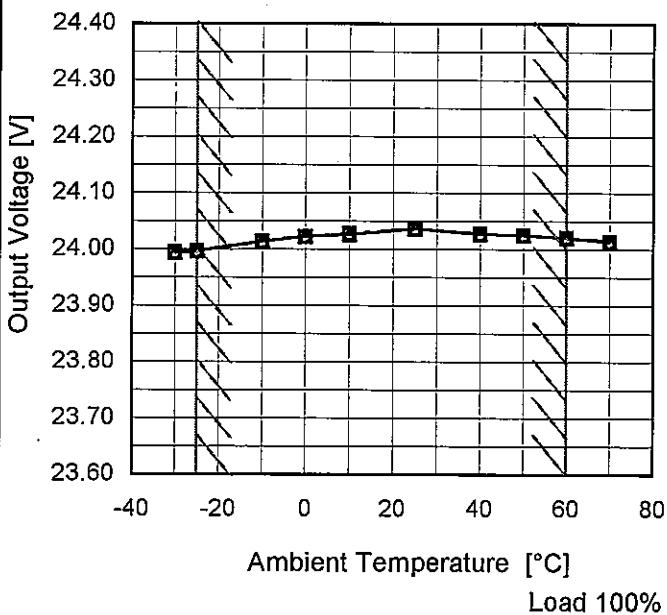
Testing Circuitry   Figure A

1.Graph

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

Output Voltage [V]

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	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
--	-	-	-

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Model	KHNA240F-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	25	264	0	24.058	±32	±0.1
Minimum Voltage	-25	85	10	23.994		

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Model	KHNA240F-24
Item	Time Lapse Drift
Object	+24V10A

Temperature	25°C
Testing Circuitry	Figure A

1.Graph

Input Volt.   115V
Load   100%

* The characteristic of AC230V is equal.

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

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Model	KHNA240F-24
Item	Rise and Fall Time
Object	+24V10A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

Load 100%

Output Volt.
[5V/div]

0

Load 100%

Output Volt.
[5V/div]

0

Input Volt.

0

Time [100ms/div]

Input Volt. 115 V

Input Volt. 230 V

Time [20ms/div]
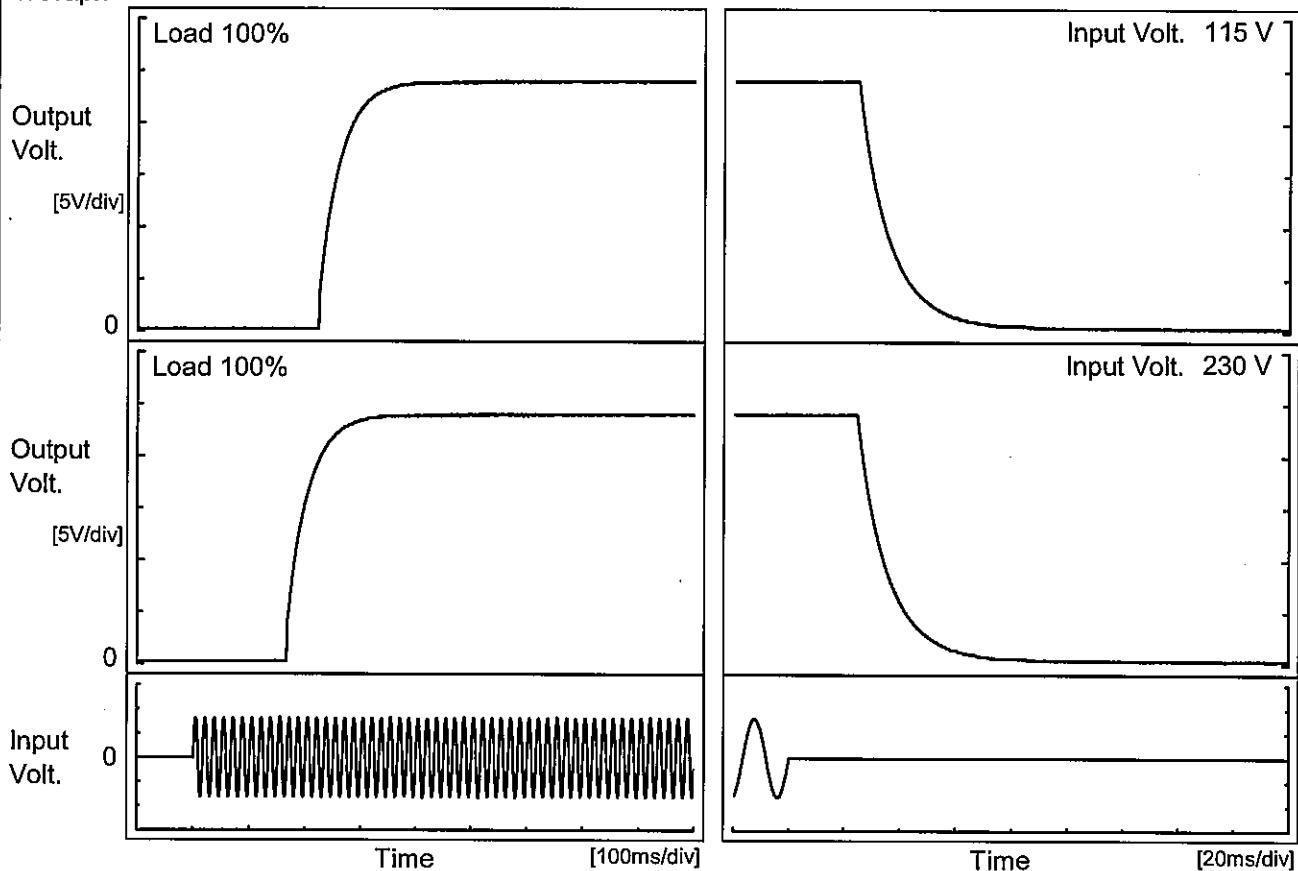
2.Values

[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

Output Volt.
90%
10%

Input Volt.

Td Tr Th Tf

Ts

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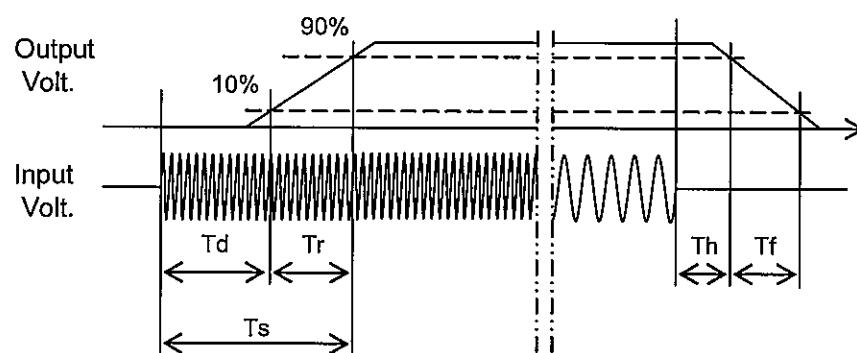
COSEL

Model	KHNA240F-24
Item	Hold-Up Time
Object	+24V10A

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	50	26
85	50	26
100	50	26
115	50	26
200	50	26
230	50	26
264	50	26
280	51	26
--	-	-

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Model	KHNA240F-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

Load Current [A]

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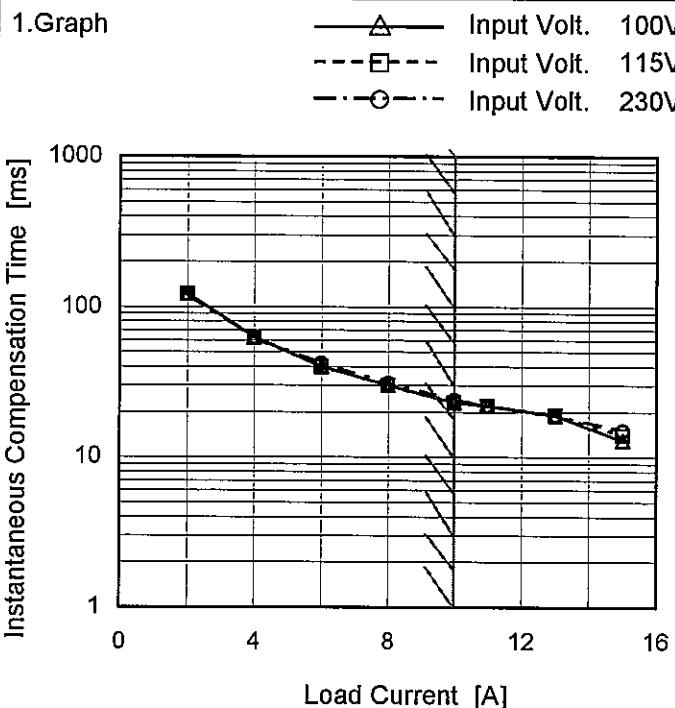
2.Values

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	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
--	-	-	-
--	-	-	-

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Model	KHNA240F-24
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+24V10A
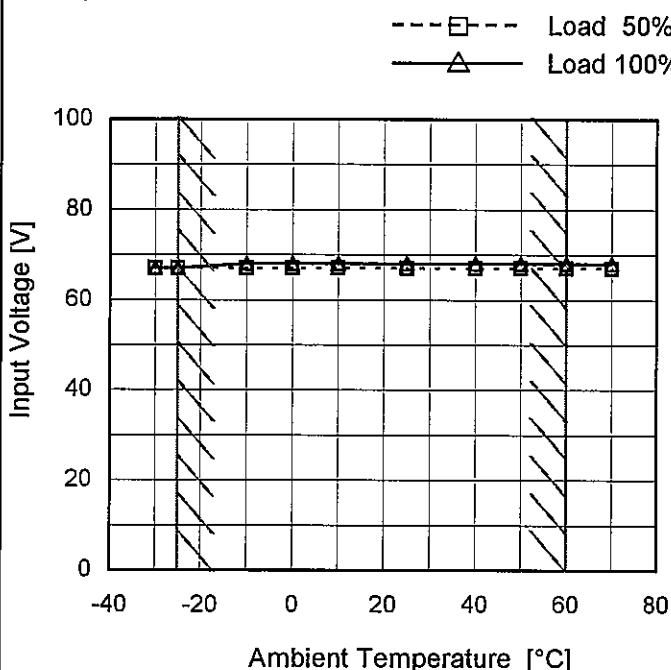
Testing Circuitry   Figure A

1.Graph

--- ⊟ --- Load 50%
—— △ —— Load 100%

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
--	-	-

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CO$EL

Model	KHNA240F-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	17.80	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
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

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CO$EL

Model	KHNA240F-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	33.35	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
--	-	-

BC-10675

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

1kΩ   PE

Effective value Voltmeter

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

Figure B (DEN-AN)

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

PE

500Ω±0.1%   1.5kΩ±0.1%

0.22µF±1.0%

10kΩ±0.1%

0.022µF±1.0%

Effective value Voltmeter

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

Figure B (IEC60950-1)

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C1= 0.1 μF
(Ceramic capacitor)

C2= 22 μF
(Electrolytic capacitor)

Figure C