CO$EL

TEST DATA OF KHNA120F-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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Model	KHNA120F-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

Load Current [A]

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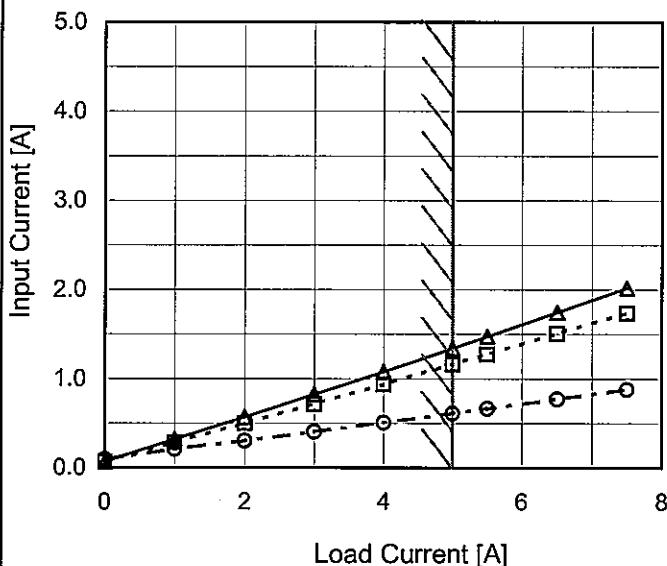
2.Values

Load Current [A]	Input Current [A]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	0.065	0.066	0.095
1.0	0.319	0.284	0.208
2.0	0.568	0.498	0.303
3.0	0.822	0.716	0.403
4.0	1.079	0.938	0.506
5.0	1.341	1.162	0.610
5.5	1.474	1.275	0.663
6.5	1.744	1.508	0.771
7.5	2.020	1.740	0.879
--	-	-	-
--	-	-	-

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Model	KHNA120F-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.
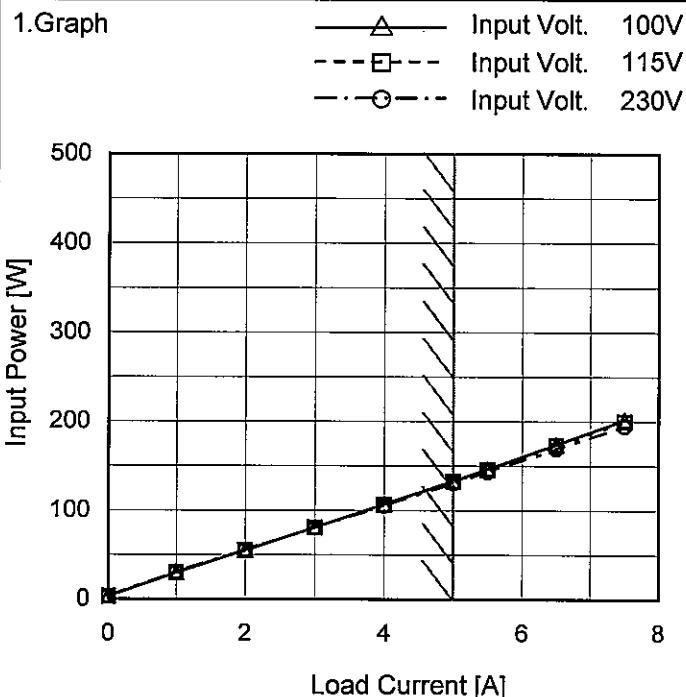
2.Values

Load Current [A]	Input Power [W]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	3.2	3.2	3.1
1.0	29.6	29.6	30.7
2.0	55.1	54.9	55.3
3.0	80.9	80.4	80.4
4.0	106.9	106.3	105.4
5.0	133.3	132.4	130.6
5.5	146.6	145.4	143.2
6.5	174.3	172.8	169.2
7.5	201.9	199.6	194.6
--	-	-	-
--	-	-	-

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Model	KHNA120F-24
Item	Efficiency (by Input Voltage)
Object	————————
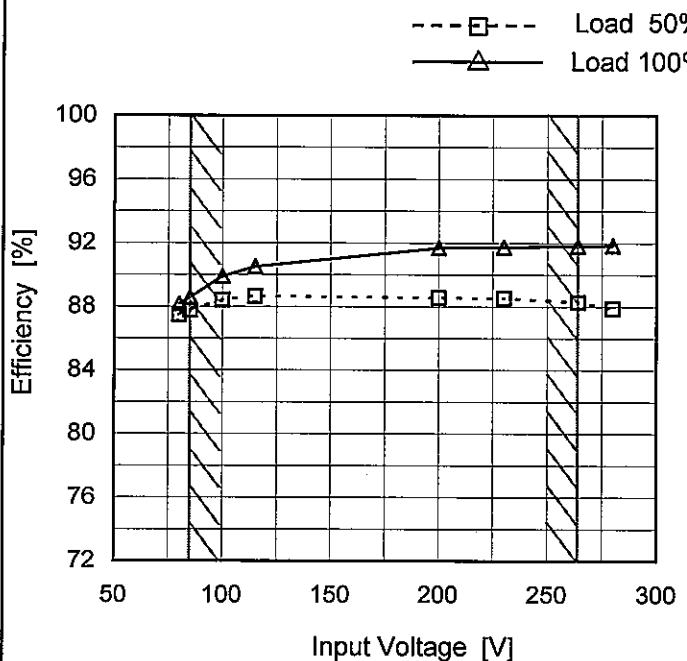
Temperature 25°C
Testing Circuitry Figure A

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	87.5	88.2
85	87.8	88.6
100	88.4	89.9
115	88.7	90.5
200	88.6	91.7
230	88.5	91.8
264	88.3	91.8
280	87.9	91.8
---	–	–

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Model	KHNA120F-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

Load Current [A]

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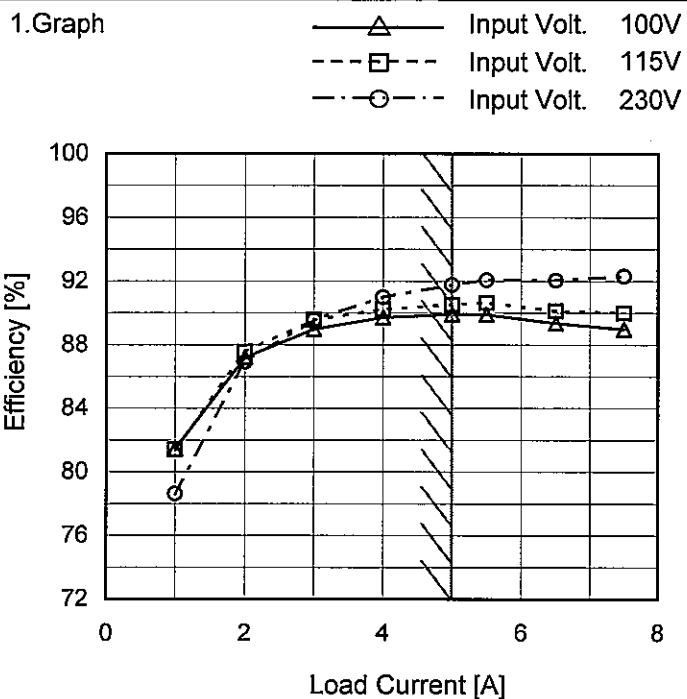
2.Values

Load Current [A]	Efficiency [%]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	-	-	-
1.0	81.5	81.4	78.6
2.0	87.2	87.5	86.9
3.0	89.0	89.6	89.6
4.0	89.7	90.2	91.0
5.0	89.9	90.5	91.8
5.5	89.9	90.6	92.1
6.5	89.4	90.1	92.1
7.5	89.0	90.0	92.3
---	-	-	-
--	-	-	-

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Model	KHNA120F-24
Item	Power Factor (by Input Voltage)
Object	
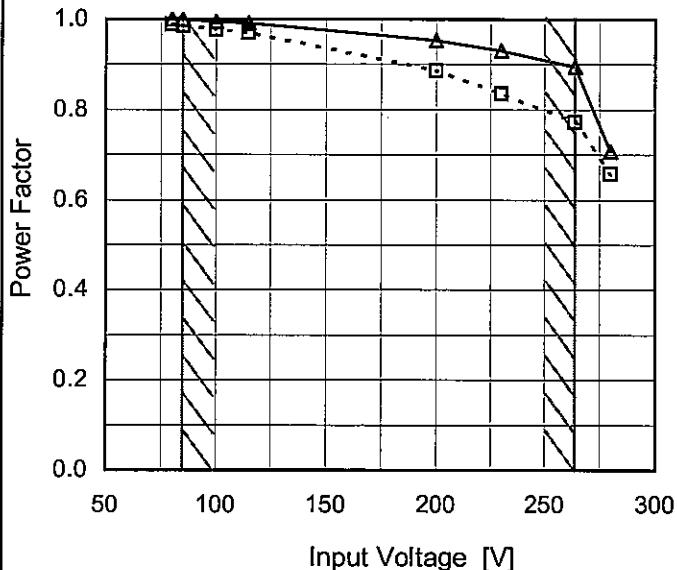
Temperature	25°C
Testing Circuitry	Figure A

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%
80	0.988	0.999
85	0.986	0.999
100	0.977	0.995
115	0.970	0.991
200	0.886	0.953
230	0.835	0.930
264	0.773	0.895
280	0.658	0.708
---	-	-

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Model	KHNA120F-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	0.489	0.420	0.142
1.0	0.928	0.907	0.641
2.0	0.968	0.958	0.793
3.0	0.984	0.976	0.867
4.0	0.991	0.986	0.905
5.0	0.995	0.991	0.930
5.5	0.995	0.992	0.938
6.5	0.999	0.997	0.954
7.5	0.999	0.998	0.962
--	-	-	-
--	-	-	-

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Model	KHNA120F-24
Item	Inrush Current
Object	

Temperature   25°C
Testing Circuitry   Figure A

Input Current [50A/div]

Input Voltage [100V/div]

Time   [50ms/div]

Input Voltage   115 V
Frequency   60 Hz
Load   100 %

① 12.0 A
② 30.0 A
  (0.2msec or less) ＊1

Input Current [50A/div]

Input Voltage [200V/div]

Time   [50ms/div]

Input Voltage   230 V
Frequency   60 Hz
Load   100 %

① 28.8 A
② 60.0 A
  (0.2msec or less) ＊1

②
①
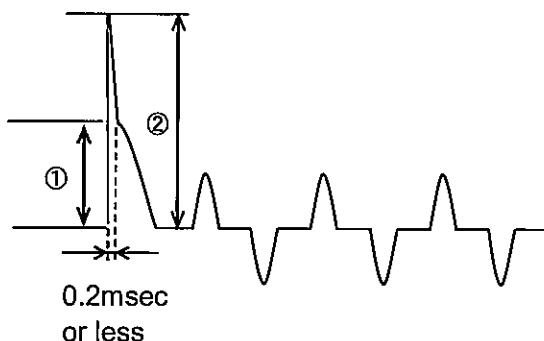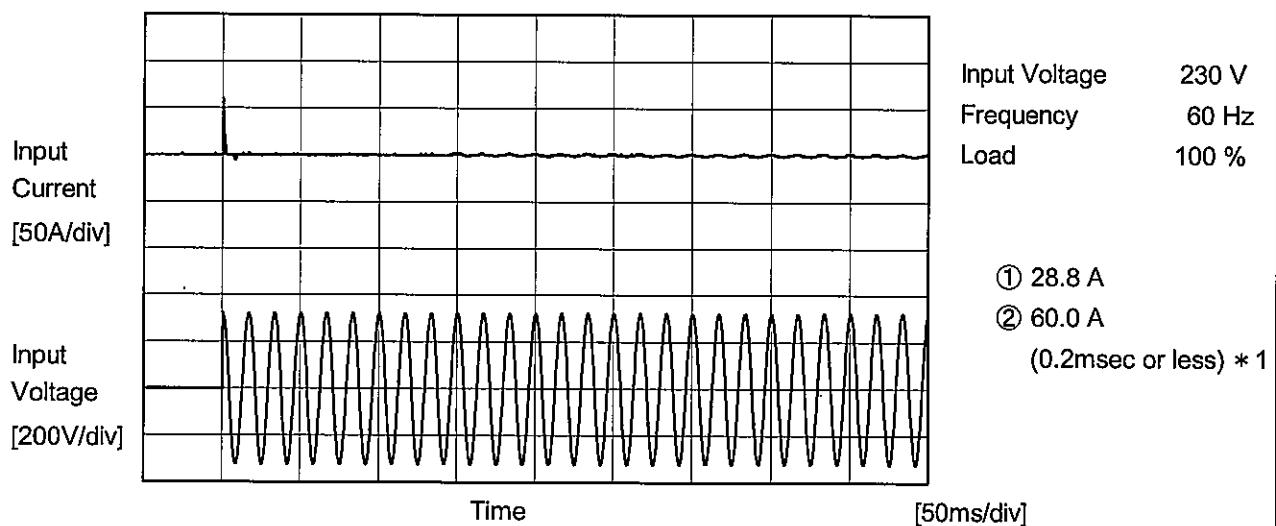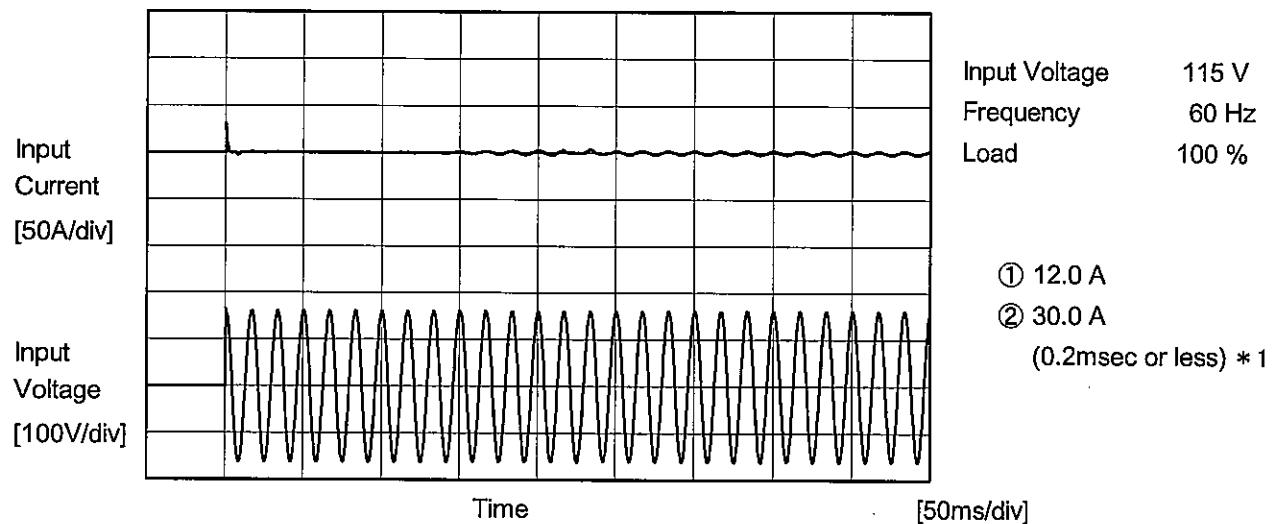
0.2msec
or less

＊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	KHNA120F-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	0.14	0.17	0.37	Operation
	One of phases	0.28	0.33	0.73	Stand by
IEC60950-1	Both phases	0.14	0.16	0.36	Operation
	One of phases	0.27	0.32	0.71	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	KHNA120F-24
Item	Line Regulation
Object	+24V5A

Temperature 25°C
Testing Circuitry Figure A

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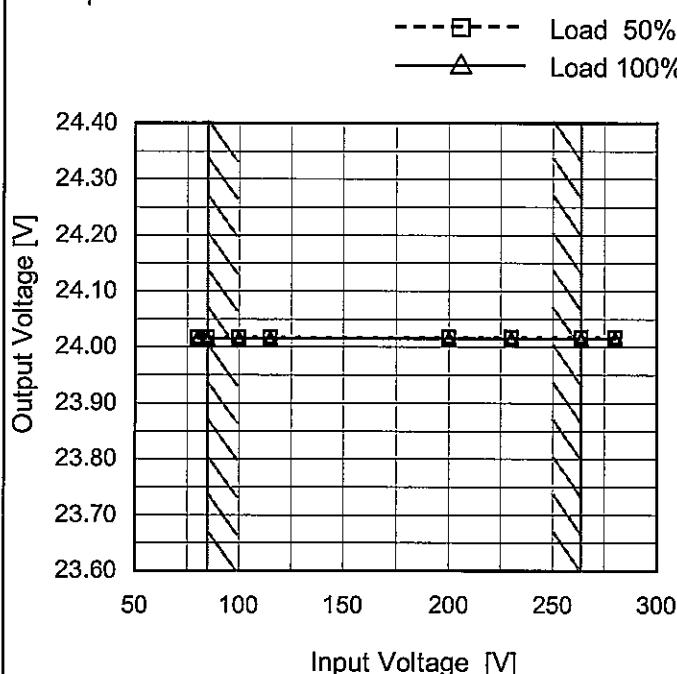
--- 🖽 --- Load 50%
—△— Load 100%

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

2.Values

Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
80	24.018	24.015
85	24.018	24.015
100	24.018	24.015
115	24.018	24.015
200	24.018	24.015
230	24.018	24.015
264	24.018	24.015
280	24.018	24.015
---	-	-

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Model	KHNA120F-24
Item	Load Regulation
Object	+24V5A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

———△——— Input Volt.   100V
– – –日– – – Input Volt.   115V
—·—○—·— Input Volt.   230V

Output Voltage [V] vs 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	24.040	24.027	24.054
1.0	24.021	24.021	24.021
2.0	24.019	24.019	24.019
3.0	24.017	24.017	24.018
4.0	24.016	24.016	24.017
5.0	24.015	24.015	24.015
5.5	24.015	24.015	24.015
6.5	24.014	24.014	24.014
7.5	24.013	24.013	24.013
--	-	-	-
--	-	-	-

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Model	KHNA120F-24
Item	Dynamic Load Response
Object	+24V5A

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%(5.0A)

200 mV/div

2 ms/div   20 ms/div

Load 20% (1.0A)←→
Load 100%(5.0A)

200 mV/div

2 ms/div   20 ms/div

Load 20% (1.0A)←→
Load 150% (7.5A)

200 mV/div

2 ms/div   20 ms/div

＊ The characteristic of AC230V is equal.

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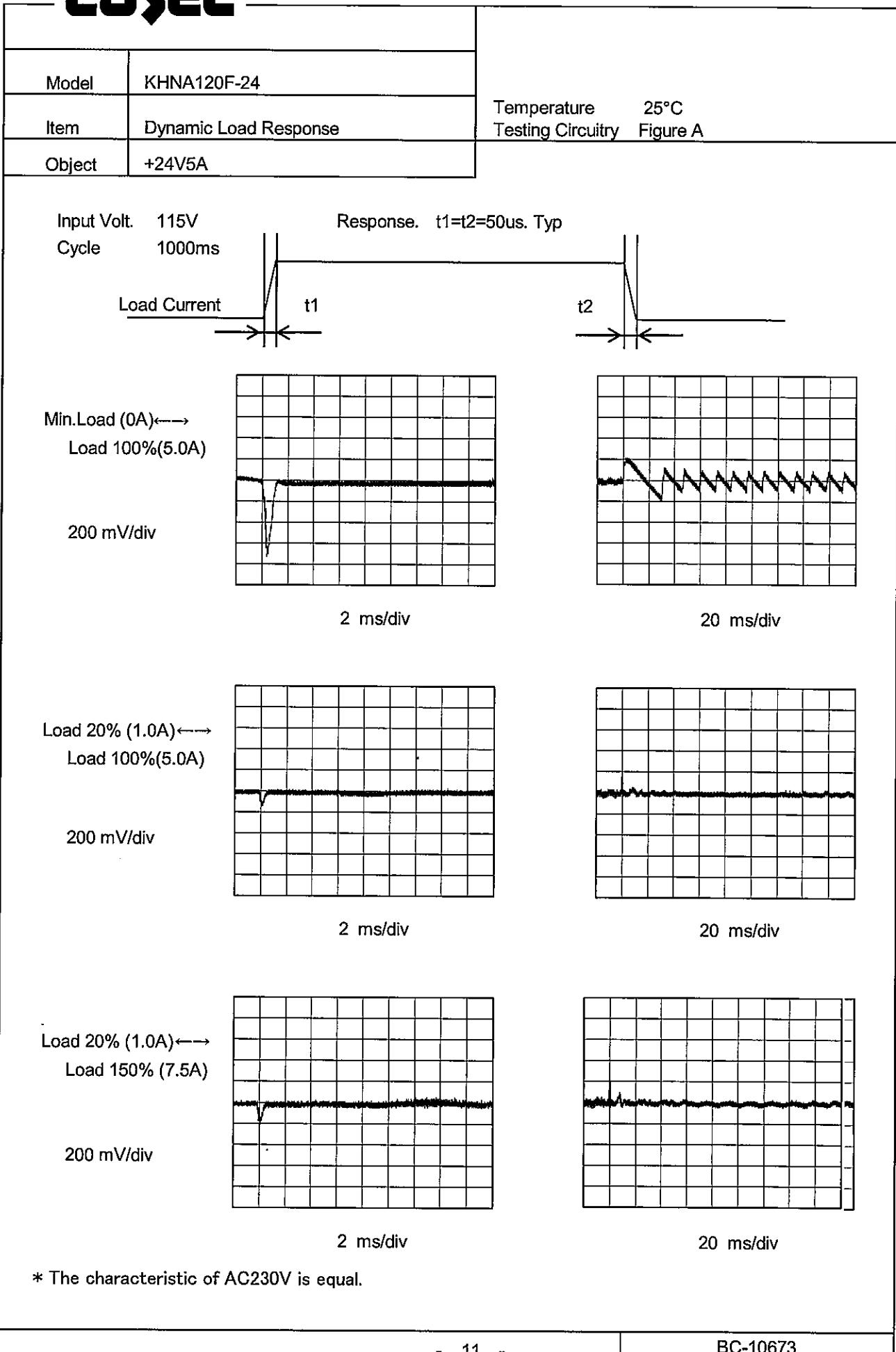
Model	KHNA120F-24
Item	Ripple Voltage (by Load Current)
Object	+24V5A

Temperature   25°C
Testing Circuitry   Figure C

1.Graph

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

Ripple Voltage [mV] vs 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.
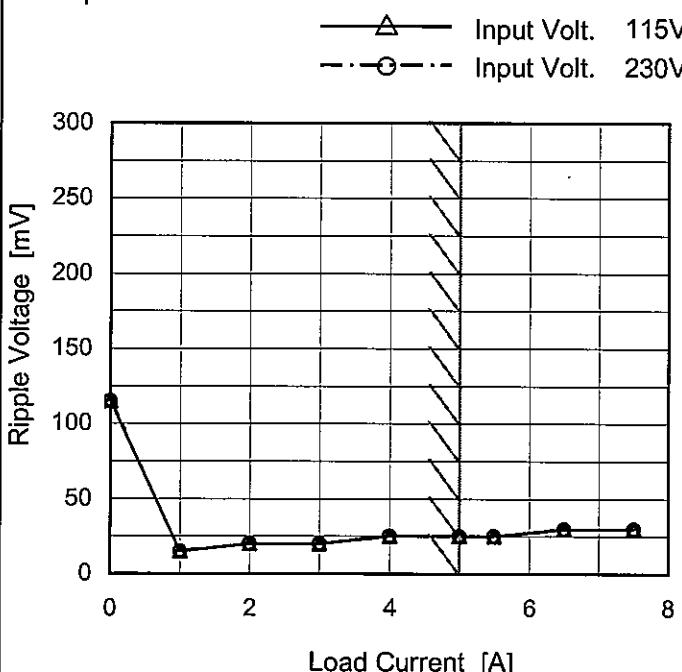
2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 115 [V]	Input Volt. 230 [V]
0.0	115	115
1.0	15	15
2.0	20	20
3.0	20	20
4.0	25	25
5.0	25	25
5.5	25	25
6.5	30	30
7.5	30	30
--	-	-
--	-	-

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

Ripple [mVp-p]

T2

T1

Fig. Complex Ripple Wave Form

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Model	KHNA120F-24
Item	Ripple-Noise
Object	+24V5A

Temperature	25°C
Testing Circuitry	Figure C

1.Graph

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

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 115 [V]	Input Volt. 230 [V]
0.0	125	125
1.0	20	20
2.0	30	30
3.0	35	35
4.0	35	35
5.0	40	40
5.5	45	45
6.5	50	50
7.5	50	50
--	-	-
--	-	-
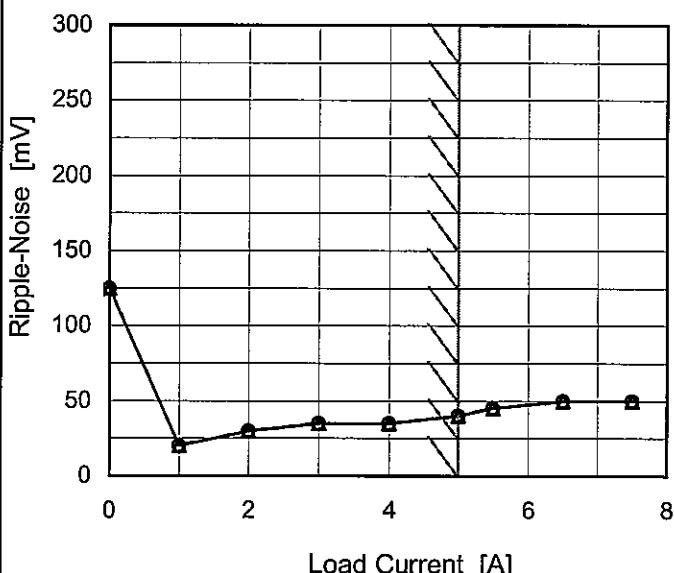
Measured by 20 MHz Oscilloscope.
Ripple-Noise is shown as p-p in the figure below.
Note: Slanted line shows the range of the rated
　　　load current.

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

Ripple-Noise
[mVp-p]

T2

T1

Fig. Complex Ripple Wave Form

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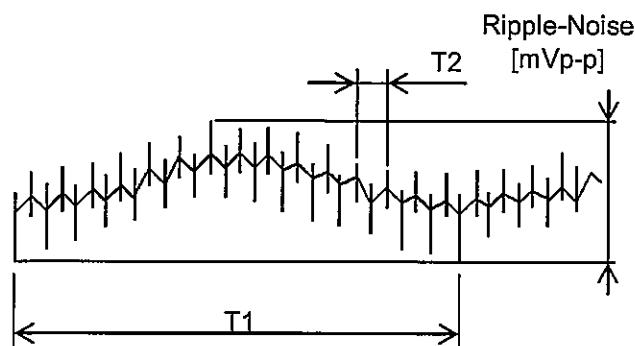
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Model	KHNA120F-24
Item	Ripple Voltage (by Ambient Temp.)
Object	+24V5A

Testing Circuitry   Figure C

1.Graph

- - -⊟- - -   Input Volt 115V
——△——   Input Volt 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]	
	Input Volt 115[V]	Input Volt 230[V]
-30	75	75
-25	60	60
-10	45	45
0	35	35
10	30	30
25	25	25
40	25	25
50	25	25
60	25	25
70	25	25
--	-	-

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Model	KHNA120F-24
Item	Ambient Temperature Drift
Object	+24V5A

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.
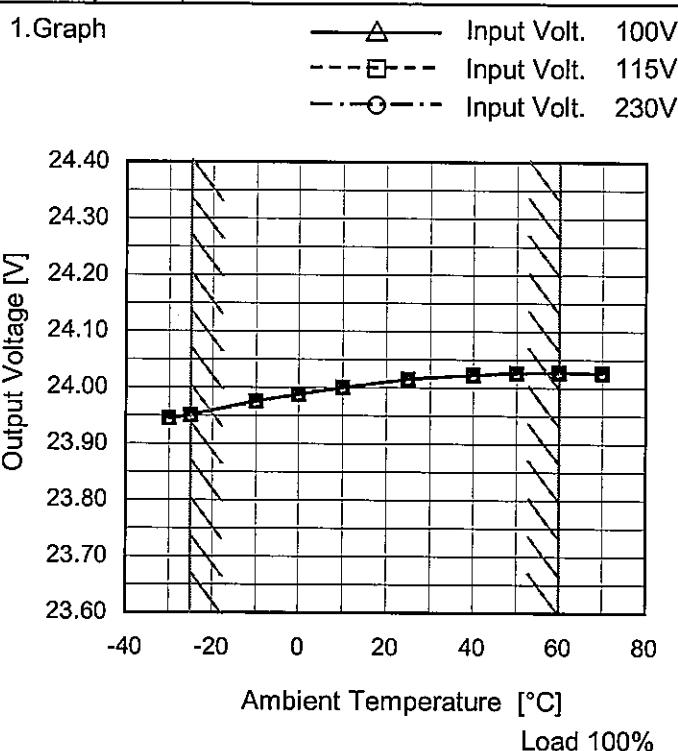
2.Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
-30	23.945	23.945	23.945
-25	23.951	23.950	23.950
-10	23.976	23.975	23.975
0	23.988	23.987	23.987
10	24.000	24.000	24.000
25	24.015	24.015	24.015
40	24.023	24.023	24.023
50	24.026	24.026	24.026
60	24.027	24.027	24.027
70	24.026	24.026	24.026
--	-	-	-

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Model	KHNA120F-24
Item	Output Voltage Accuracy
Object	+24V5A

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 - 5A

* Output Voltage Accuracy = ±(Maximum of Output Voltage - Minimum of Output Voltage) / 2

* Output Voltage Accuracy (Ration) = $\dfrac{\text{Output Voltage Accuracy}}{\text{Rated Output Voltage}}$ × 100

2.Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	60	85	0	24.058	±54	±0.2
Minimum Voltage	-25	115	5	23.950		

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Model	KHNA120F-24
Item	Time Lapse Drift
Object	+24V5A

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	24.015
0.5	24.014
1.0	24.014
2.0	24.014
3.0	24.014
4.0	24.014
5.0	24.013
6.0	24.013
7.0	24.013
8.0	24.013

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Model	KHNA120F-24
Item	Rise and Fall Time
Object	+24V5A

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]
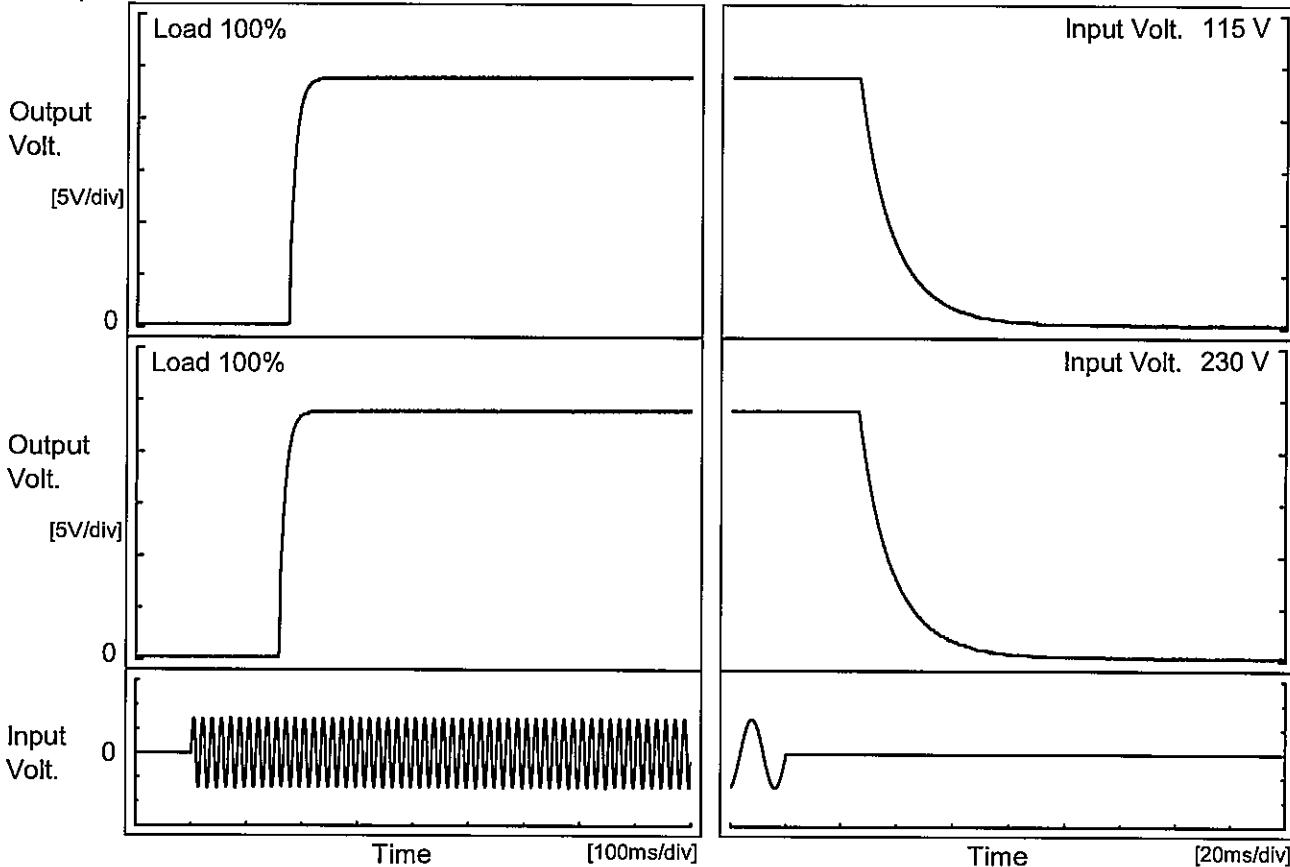
2.Values [ms]

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
115 V	175.5	23.5	199.0	27.2	28.2
230 V	159.5	22.5	182.0	27.3	28.0

Output Volt. — 90% — 10%

Input Volt.

Td Tr Th Tf

Ts

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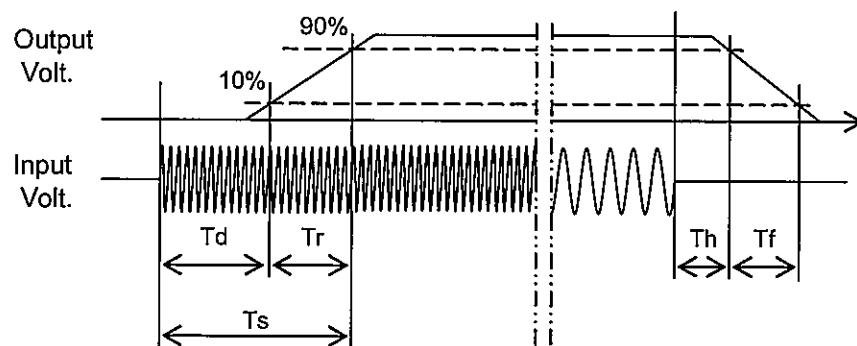
COSEL

Model	KHNA120F-24
Item	Hold-Up Time
Object	+24V5A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

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

Hold-Up Time [ms] vs Input Voltage [V]
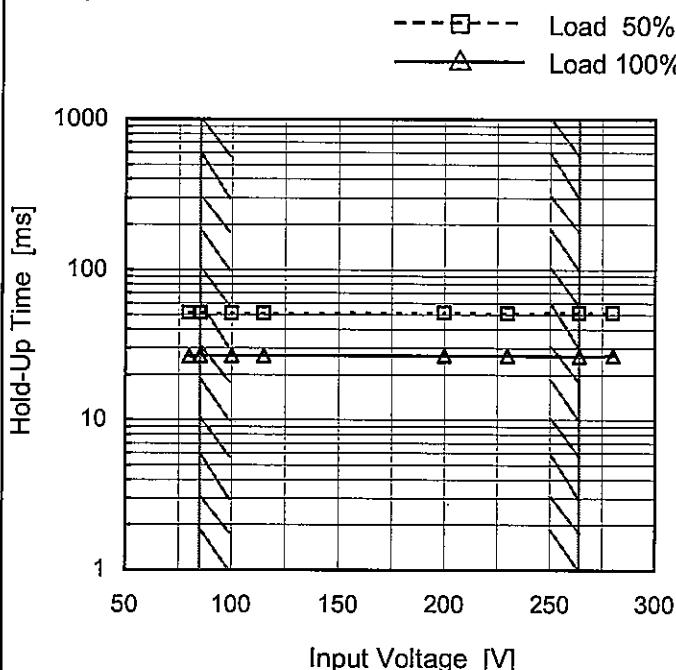
This duration covers from Shut-off of input voltage to the moment when output voltage descends to the rated range of voltage accuracy.
Note: Slanted line shows the range of the rated input voltage.

2.Values

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
80	51	27
85	51	27
100	51	27
115	51	27
200	51	27
230	51	27
264	52	27
280	52	27
--	-	-

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Model	KHNA120F-24
Item	Instantaneous Interruption Compensation
Object	+24V5A

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]

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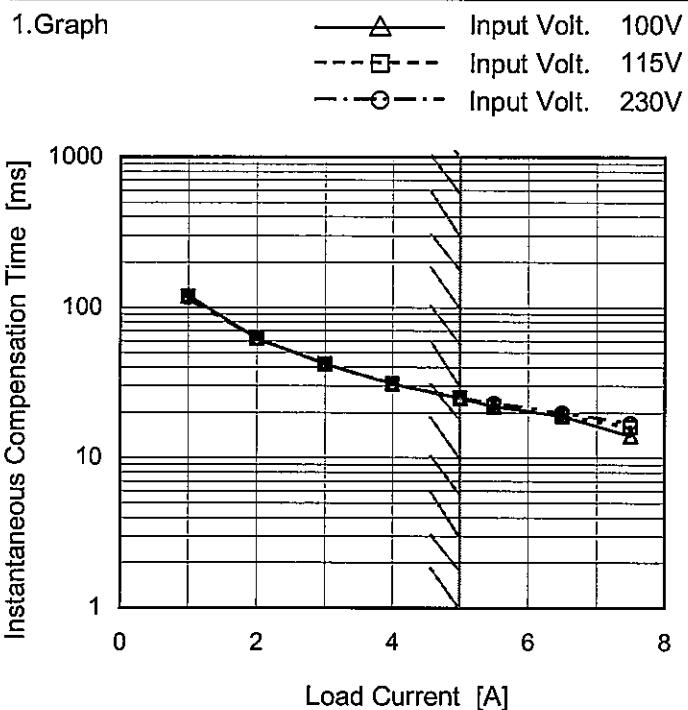
2.Values

Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	-	-	-
1.0	120	118	116
2.0	62	62	62
3.0	42	42	42
4.0	31	31	31
5.0	25	25	25
5.5	22	22	23
6.5	19	19	20
7.5	14	16	17
--	-	-	-
--	-	-	-

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Model	KHNA120F-24
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+24V5A
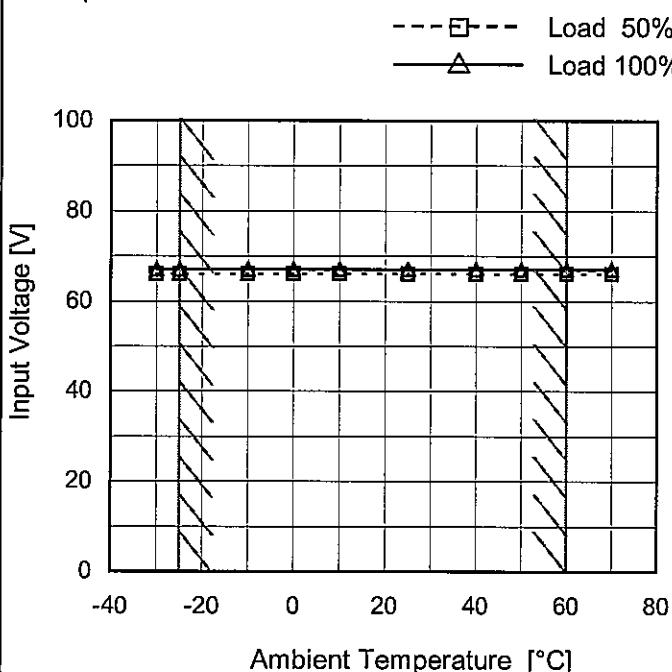
Testing Circuitry   Figure A

1.Graph

--- 日 --- 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%
-30	66	67
-25	66	67
-10	66	67
0	66	67
10	66	67
25	66	67
40	66	67
50	66	67
60	66	67
70	66	67
--	-	-

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Model	KHNA120F-24
Item	Overcurrent Protection
Object	+24V5A

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	9.40	9.35
21.6	9.41	9.38
19.2	9.40	9.37
16.8	9.50	9.49
14.4	9.94	9.90
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

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CO$EL

Model	KHNA120F-24
Item	Overvoltage Protection
Object	+24V5A
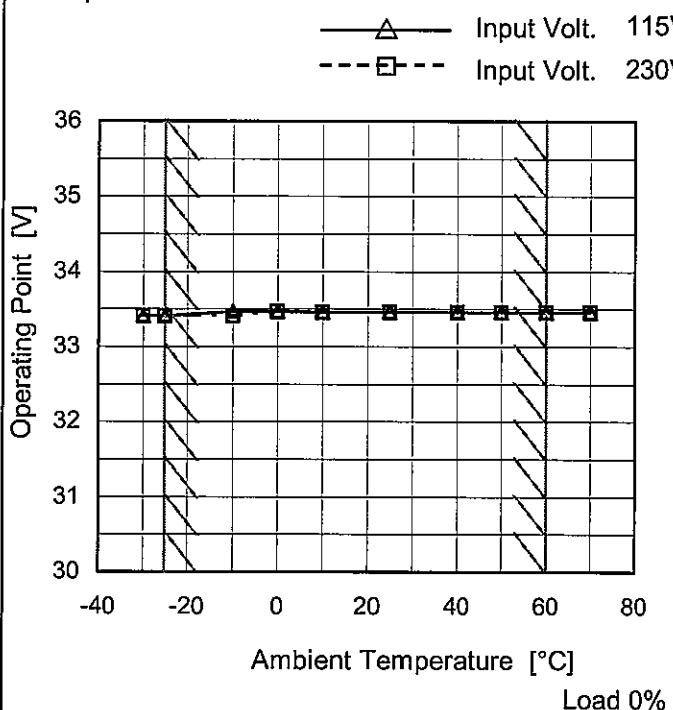
Testing Circuitry   Figure A

1.Graph

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

Operating Point [V] vs 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	33.47	33.41
0	33.47	33.47
10	33.46	33.46
25	33.46	33.46
40	33.46	33.46
50	33.46	33.46
60	33.46	33.46
70	33.46	33.46
--	-	-

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Figure A

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

Figure B (DEN-AN)

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

Figure B (IEC60950-1)

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Temperature Chamber Measuring board

Power Supply

C1 C2

Electronic DC Load

Oscilloscope BW:20MHz

150mm
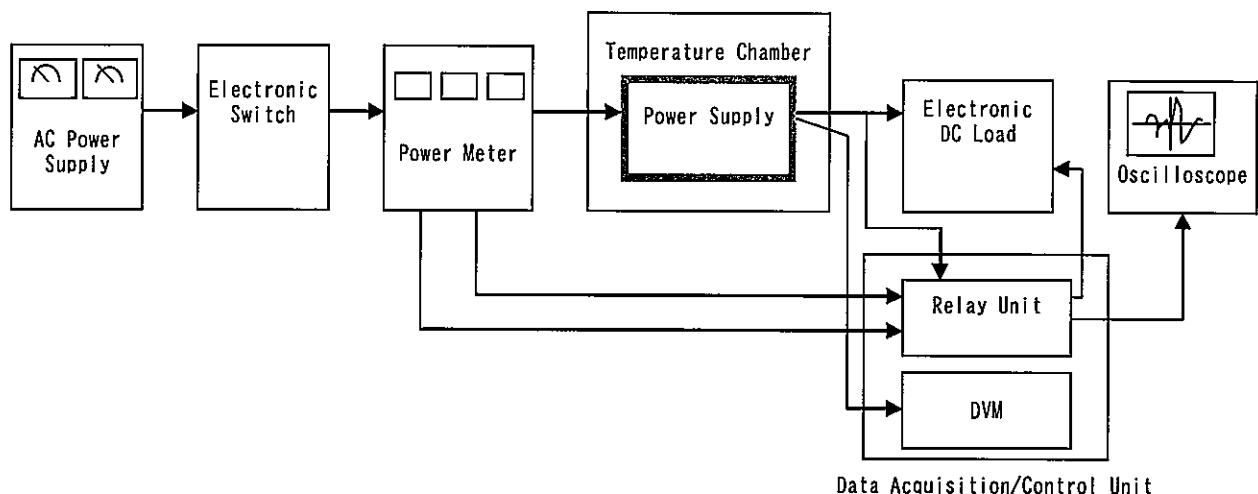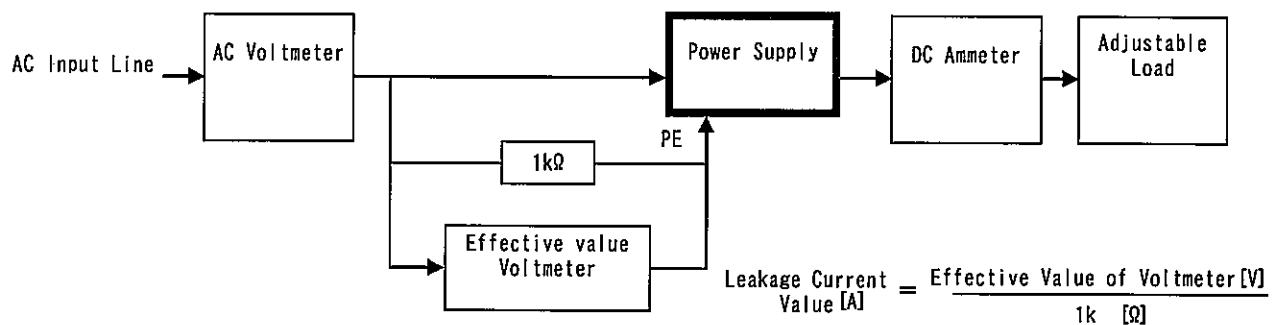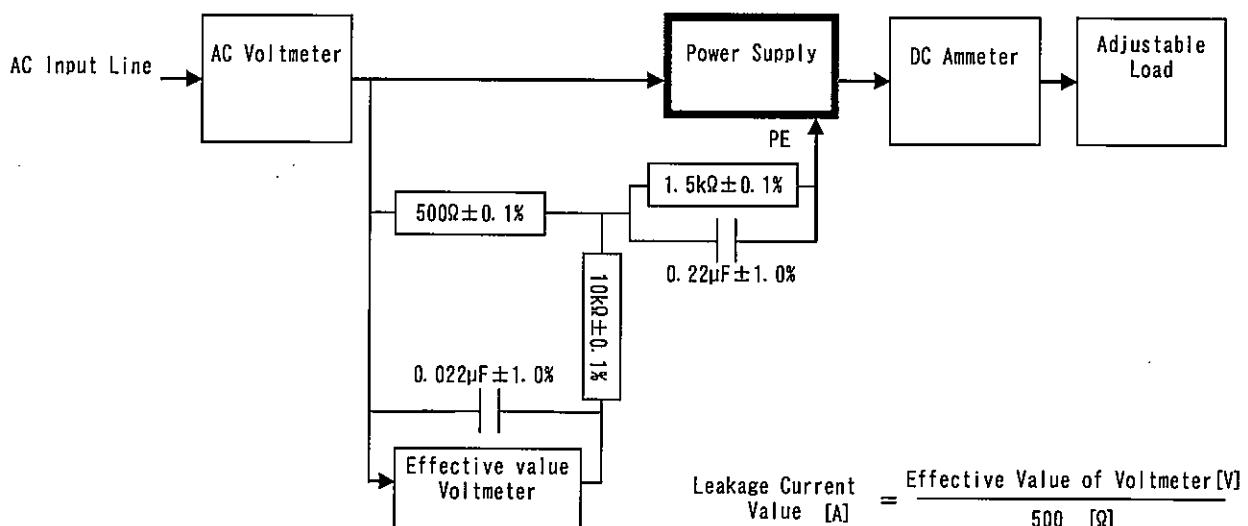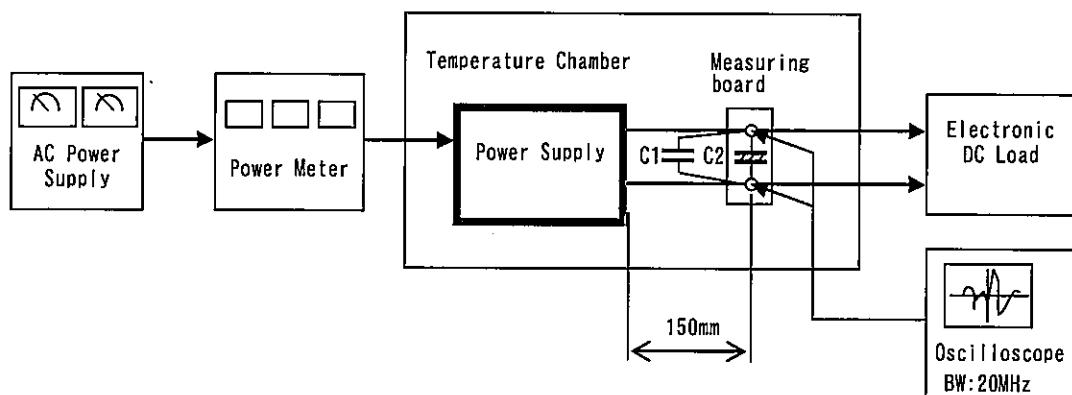
C1= 0.1 μF
(Ceramic capacitor)

C2= 22 μF
(Electrolytic capacitor)

Figure C

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