

TEST DATA OF KHEA120F-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		KHEA120F-24	
Item		Input Current (by Load Current)	
Object		_____	

1.Graph

—△—

Input Volt.

100V

---□---

Input Volt.

115V

-○-

Input Volt.

230V

Input Current [A]

5.0

4.0

3.0

2.0

1.0

0.0

0

2

4

6

8

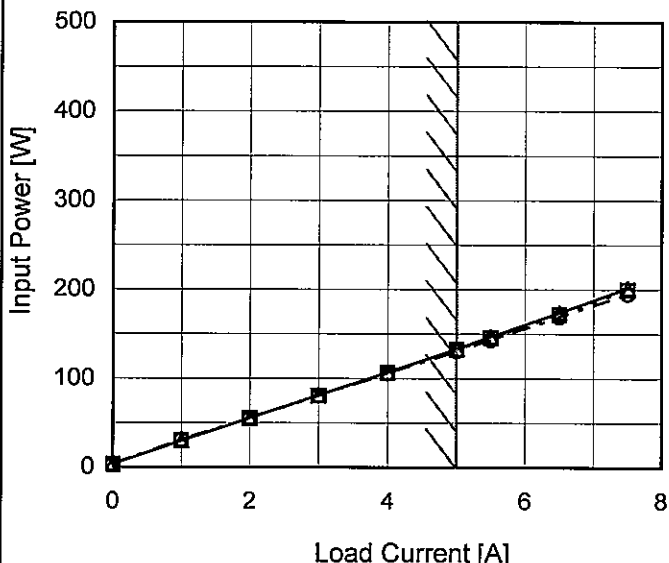
Load Current [A]

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

2.Values

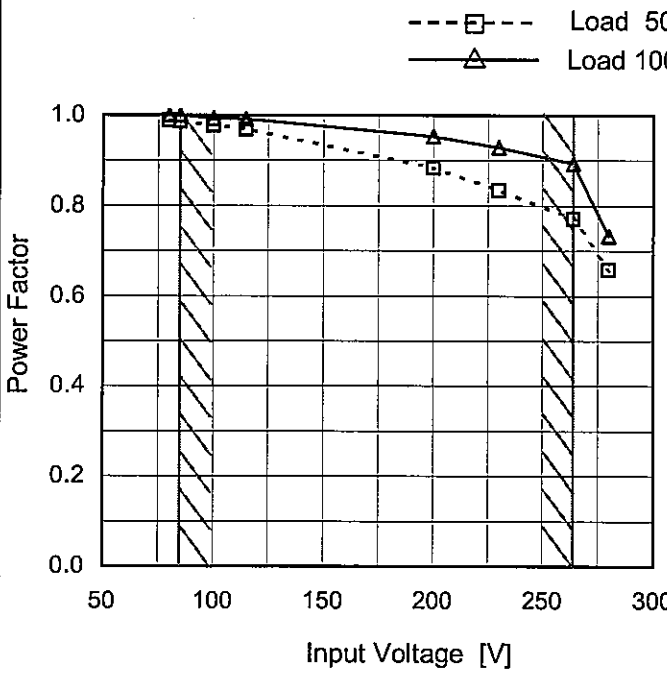
Load Current [A]	Input Current [A]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	0.066	0.067	0.095
1.0	0.321	0.286	0.209
2.0	0.570	0.500	0.304
3.0	0.823	0.718	0.404
4.0	1.081	0.939	0.507
5.0	1.342	1.164	0.611
5.5	1.478	1.277	0.664
6.5	1.746	1.506	0.772
7.5	2.022	1.742	0.881
--	-	-	-
--	-	-	-

COSEL

Model		KHEA120F-24		Temperature		25°C																																																				
Item		Input Power (by Load Current)		Testing Circuitry		Figure A																																																				
Object																																																										
1.Graph				2.Values																																																						
<div><div><div>—△—</div><div>---□---</div><div>-·-○-·-</div></div><div><div>Input Volt. 100V</div><div>Input Volt. 115V</div><div>Input Volt. 230V</div></div></div> <div></div> <div>Note: Slanted line shows the range of the rated load current.</div>				<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Input Power [W]</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>3.3</td><td>3.3</td><td>3.1</td></tr><tr><td>1.0</td><td>29.8</td><td>29.9</td><td>30.9</td></tr><tr><td>2.0</td><td>55.2</td><td>55.0</td><td>55.4</td></tr><tr><td>3.0</td><td>81.0</td><td>80.5</td><td>80.4</td></tr><tr><td>4.0</td><td>107.0</td><td>106.4</td><td>105.5</td></tr><tr><td>5.0</td><td>133.4</td><td>132.5</td><td>130.6</td></tr><tr><td>5.5</td><td>147.3</td><td>145.7</td><td>143.4</td></tr><tr><td>6.5</td><td>174.3</td><td>172.2</td><td>169.2</td></tr><tr><td>7.5</td><td>201.9</td><td>199.8</td><td>194.9</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]	Input Power [W]			Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]	0.0	3.3	3.3	3.1	1.0	29.8	29.9	30.9	2.0	55.2	55.0	55.4	3.0	81.0	80.5	80.4	4.0	107.0	106.4	105.5	5.0	133.4	132.5	130.6	5.5	147.3	145.7	143.4	6.5	174.3	172.2	169.2	7.5	201.9	199.8	194.9	--	-	-	-	--	-	-	-
Load Current [A]	Input Power [W]																																																									
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]																																																							
0.0	3.3	3.3	3.1																																																							
1.0	29.8	29.9	30.9																																																							
2.0	55.2	55.0	55.4																																																							
3.0	81.0	80.5	80.4																																																							
4.0	107.0	106.4	105.5																																																							
5.0	133.4	132.5	130.6																																																							
5.5	147.3	145.7	143.4																																																							
6.5	174.3	172.2	169.2																																																							
7.5	201.9	199.8	194.9																																																							
--	-	-	-																																																							
--	-	-	-																																																							
				BC-10672																																																						

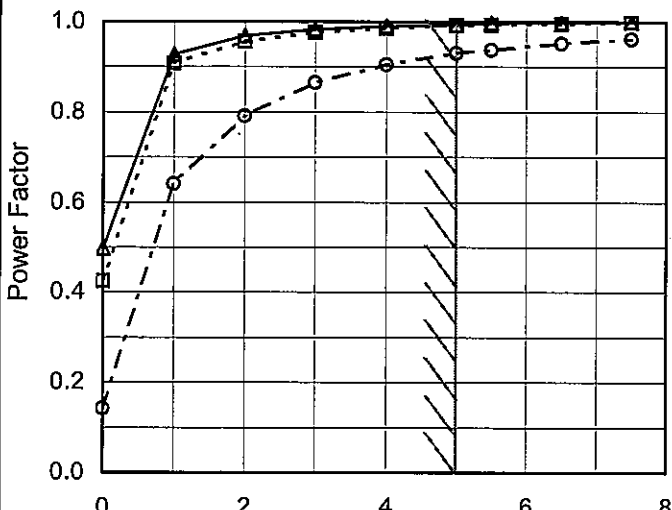
Model		KHEA120F-24																																	
Item		Efficiency (by Input Voltage)																																	
Object																																			
1.Graph		2.Values																																	
<div><div><div><div>---</div><div>□</div><div>---</div></div><div>Load 50%</div></div><div><div>---</div><div>△</div><div>---</div></div><div>Load 100%</div></div> <table><thead><tr><th rowspan="2">Input Voltage [V]</th><th colspan="2">Efficiency [%]</th></tr><tr><th>Load 50%</th><th>Load 100%</th></tr></thead><tbody><tr><td>80</td><td>87.4</td><td>88.0</td></tr><tr><td>85</td><td>87.7</td><td>88.4</td></tr><tr><td>100</td><td>88.3</td><td>89.9</td></tr><tr><td>115</td><td>88.5</td><td>90.5</td></tr><tr><td>200</td><td>88.6</td><td>91.7</td></tr><tr><td>230</td><td>88.4</td><td>91.8</td></tr><tr><td>264</td><td>88.1</td><td>91.8</td></tr><tr><td>280</td><td>87.9</td><td>91.8</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></tbody></table>		Input Voltage [V]	Efficiency [%]		Load 50%	Load 100%	80	87.4	88.0	85	87.7	88.4	100	88.3	89.9	115	88.5	90.5	200	88.6	91.7	230	88.4	91.8	264	88.1	91.8	280	87.9	91.8	--	-	-		
Input Voltage [V]	Efficiency [%]																																		
	Load 50%	Load 100%																																	
80	87.4	88.0																																	
85	87.7	88.4																																	
100	88.3	89.9																																	
115	88.5	90.5																																	
200	88.6	91.7																																	
230	88.4	91.8																																	
264	88.1	91.8																																	
280	87.9	91.8																																	
--	-	-																																	
Note: Slanted line shows the range of the rated input voltage.																																			

Model		KHEA120F-24		Temperature 25°C																																																				
Item		Efficiency (by Load Current)		Testing Circuitry Figure A																																																				
Object																																																								
1.Graph		<div><div><div>—△—</div><div>Input Volt.</div><div>100V</div></div><div><div>---□---</div><div>Input Volt.</div><div>115V</div></div><div><div>-·-○-·-</div><div>Input Volt.</div><div>230V</div></div></div> <div>Efficiency [%]</div> <div>Load Current [A]</div>		2.Values																																																				
		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Efficiency [%]</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>-</td><td>-</td><td>-</td></tr><tr><td>1.0</td><td>80.9</td><td>80.8</td><td>78.2</td></tr><tr><td>2.0</td><td>87.1</td><td>87.4</td><td>86.8</td></tr><tr><td>3.0</td><td>88.9</td><td>89.5</td><td>89.6</td></tr><tr><td>4.0</td><td>89.6</td><td>90.2</td><td>90.9</td></tr><tr><td>5.0</td><td>89.9</td><td>90.5</td><td>91.8</td></tr><tr><td>5.5</td><td>89.5</td><td>90.5</td><td>92.0</td></tr><tr><td>6.5</td><td>89.4</td><td>90.5</td><td>92.1</td></tr><tr><td>7.5</td><td>89.0</td><td>89.9</td><td>92.2</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]	Efficiency [%]			Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]	0.0	-	-	-	1.0	80.9	80.8	78.2	2.0	87.1	87.4	86.8	3.0	88.9	89.5	89.6	4.0	89.6	90.2	90.9	5.0	89.9	90.5	91.8	5.5	89.5	90.5	92.0	6.5	89.4	90.5	92.1	7.5	89.0	89.9	92.2	--	-	-	-	--	-	-	-
Load Current [A]	Efficiency [%]																																																							
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]																																																					
0.0	-	-	-																																																					
1.0	80.9	80.8	78.2																																																					
2.0	87.1	87.4	86.8																																																					
3.0	88.9	89.5	89.6																																																					
4.0	89.6	90.2	90.9																																																					
5.0	89.9	90.5	91.8																																																					
5.5	89.5	90.5	92.0																																																					
6.5	89.4	90.5	92.1																																																					
7.5	89.0	89.9	92.2																																																					
--	-	-	-																																																					
--	-	-	-																																																					
Note: Slanted line shows the range of the rated load current.																																																								

Model	KHEA120F-24																																		
Item	Power Factor (by Input Voltage)	Temperature	25°C																																
		Testing Circuitry	Figure A																																
Object																																			
1.Graph		2.Values																																	
<div><div><div>---□--- Load 50%</div><div>—△— Load 100%</div></div><p>Power Factor</p><p>Input Voltage [V]</p><p>Note: Slanted line shows the range of the rated input voltage.</p></div>		<table><tr><th rowspan="2">Input Voltage [V]</th><th colspan="2">Power Factor</th></tr><tr><th>Load 50%</th><th>Load 100%</th></tr><tr><td>80</td><td>0.988</td><td>0.999</td></tr><tr><td>85</td><td>0.986</td><td>0.999</td></tr><tr><td>100</td><td>0.977</td><td>0.993</td></tr><tr><td>115</td><td>0.969</td><td>0.991</td></tr><tr><td>200</td><td>0.884</td><td>0.953</td></tr><tr><td>230</td><td>0.834</td><td>0.930</td></tr><tr><td>264</td><td>0.771</td><td>0.893</td></tr><tr><td>280</td><td>0.658</td><td>0.733</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Input Voltage [V]	Power Factor		Load 50%	Load 100%	80	0.988	0.999	85	0.986	0.999	100	0.977	0.993	115	0.969	0.991	200	0.884	0.953	230	0.834	0.930	264	0.771	0.893	280	0.658	0.733	--	-	-
Input Voltage [V]	Power Factor																																		
	Load 50%	Load 100%																																	
80	0.988	0.999																																	
85	0.986	0.999																																	
100	0.977	0.993																																	
115	0.969	0.991																																	
200	0.884	0.953																																	
230	0.834	0.930																																	
264	0.771	0.893																																	
280	0.658	0.733																																	
--	-	-																																	

- 5 -

BC-10672

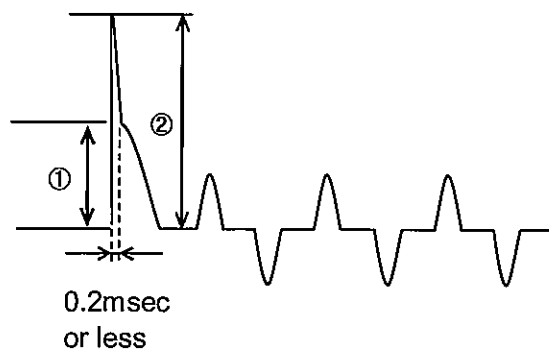
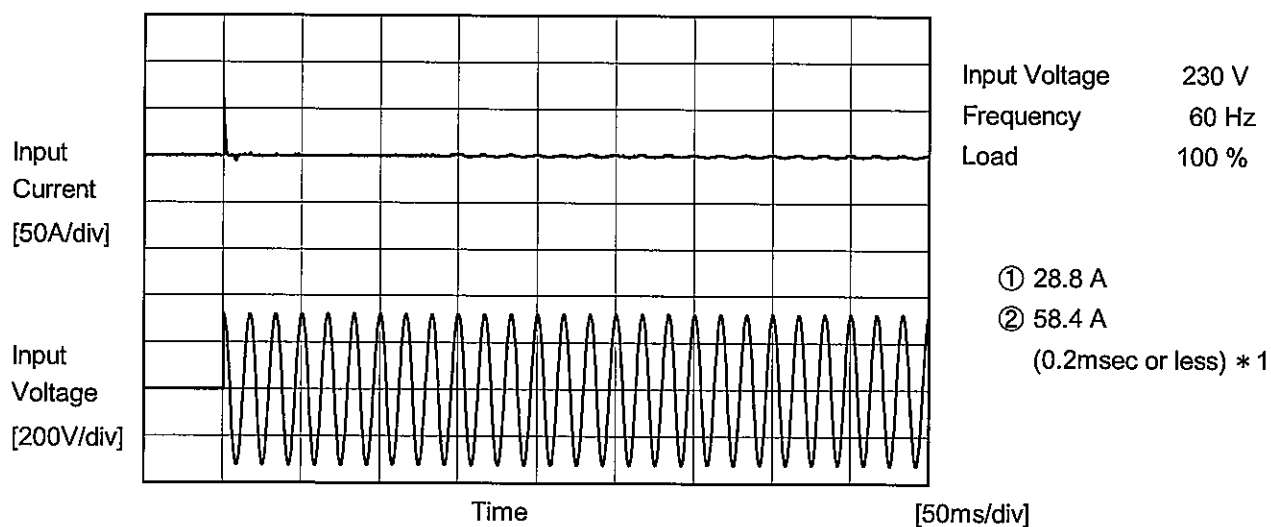
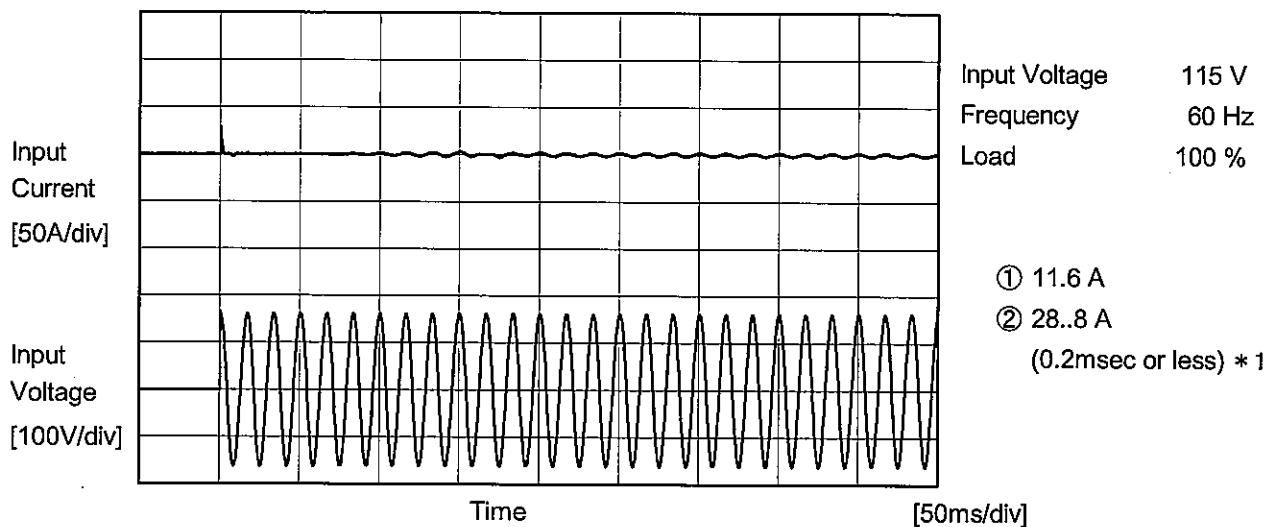
Model		KHEA120F-24																																																				
Item		Power Factor (by Load Current)																																																				
Object																																																						
1.Graph																																																						
		—△— Input Volt. 100V																																																				
		---□--- Input Volt. 115V																																																				
		-·-○-·- Input Volt. 230V																																																				
																																																						
Note: Slanted line shows the range of the rated load current.																																																						
2.Values																																																						
<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Power Factor</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>0.497</td><td>0.425</td><td>0.142</td></tr><tr><td>1.0</td><td>0.928</td><td>0.907</td><td>0.641</td></tr><tr><td>2.0</td><td>0.968</td><td>0.957</td><td>0.791</td></tr><tr><td>3.0</td><td>0.983</td><td>0.976</td><td>0.865</td></tr><tr><td>4.0</td><td>0.990</td><td>0.985</td><td>0.905</td></tr><tr><td>5.0</td><td>0.993</td><td>0.991</td><td>0.930</td></tr><tr><td>5.5</td><td>0.997</td><td>0.993</td><td>0.938</td></tr><tr><td>6.5</td><td>0.999</td><td>0.994</td><td>0.952</td></tr><tr><td>7.5</td><td>0.999</td><td>0.998</td><td>0.962</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]	Power Factor			Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]	0.0	0.497	0.425	0.142	1.0	0.928	0.907	0.641	2.0	0.968	0.957	0.791	3.0	0.983	0.976	0.865	4.0	0.990	0.985	0.905	5.0	0.993	0.991	0.930	5.5	0.997	0.993	0.938	6.5	0.999	0.994	0.952	7.5	0.999	0.998	0.962	--	-	-	-	--	-	-	-
Load Current [A]	Power Factor																																																					
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]																																																			
0.0	0.497	0.425	0.142																																																			
1.0	0.928	0.907	0.641																																																			
2.0	0.968	0.957	0.791																																																			
3.0	0.983	0.976	0.865																																																			
4.0	0.990	0.985	0.905																																																			
5.0	0.993	0.991	0.930																																																			
5.5	0.997	0.993	0.938																																																			
6.5	0.999	0.994	0.952																																																			
7.5	0.999	0.998	0.962																																																			
--	-	-	-																																																			
--	-	-	-																																																			

- 6 -

BC-10672

COSEL

Model	KHEA120F-24	Temperature	25°C
Item	Inrush Current	Testing Circuitry	Figure A
Object	_____		



*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.

COSEL

Model	KHEA120F-24	Temperature 25°C Testing Circuitry Figure B	
Item	Leakage Current		
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.

Model	KHEA120F-24																																		
Item	Line Regulation	Temperature	25°C																																
Object	+24V5A	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> <p>Output Voltage [V]</p> <p>Input Voltage [V]</p>		<table><tr><th rowspan="2">Input Voltage [V]</th><th colspan="2">Output Voltage [V]</th></tr><tr><th>Load 50%</th><th>Load 100%</th></tr><tr><td>80</td><td>24.026</td><td>24.023</td></tr><tr><td>85</td><td>24.026</td><td>24.023</td></tr><tr><td>100</td><td>24.026</td><td>24.023</td></tr><tr><td>115</td><td>24.026</td><td>24.023</td></tr><tr><td>200</td><td>24.026</td><td>24.023</td></tr><tr><td>230</td><td>24.026</td><td>24.023</td></tr><tr><td>264</td><td>24.026</td><td>24.023</td></tr><tr><td>280</td><td>24.026</td><td>24.023</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Input Voltage [V]	Output Voltage [V]		Load 50%	Load 100%	80	24.026	24.023	85	24.026	24.023	100	24.026	24.023	115	24.026	24.023	200	24.026	24.023	230	24.026	24.023	264	24.026	24.023	280	24.026	24.023	--	-	-
Input Voltage [V]	Output Voltage [V]																																		
	Load 50%	Load 100%																																	
80	24.026	24.023																																	
85	24.026	24.023																																	
100	24.026	24.023																																	
115	24.026	24.023																																	
200	24.026	24.023																																	
230	24.026	24.023																																	
264	24.026	24.023																																	
280	24.026	24.023																																	
--	-	-																																	
Note: Slanted line shows the range of the rated input voltage.																																			

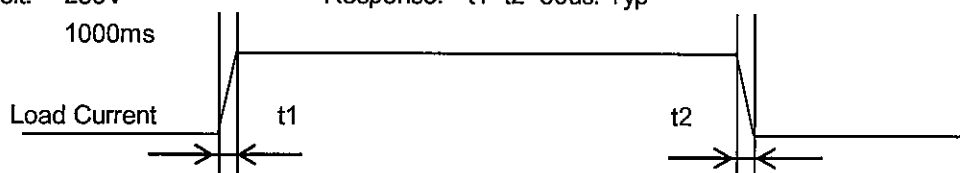
Model	KHEA120F-24																																																					
Item	Load Regulation	Temperature	25°C																																																			
Object	+24V5A	Testing Circuitry	Figure A																																																			
1.Graph		2.Values																																																				
<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>24.028</td><td>24.051</td><td>24.038</td></tr><tr><td>1.0</td><td>24.028</td><td>24.029</td><td>24.028</td></tr><tr><td>2.0</td><td>24.027</td><td>24.027</td><td>24.027</td></tr><tr><td>3.0</td><td>24.025</td><td>24.026</td><td>24.025</td></tr><tr><td>4.0</td><td>24.024</td><td>24.024</td><td>24.024</td></tr><tr><td>5.0</td><td>24.023</td><td>24.023</td><td>24.023</td></tr><tr><td>5.5</td><td>24.022</td><td>24.023</td><td>24.022</td></tr><tr><td>6.5</td><td>24.021</td><td>24.021</td><td>24.021</td></tr><tr><td>7.5</td><td>24.020</td><td>24.020</td><td>24.020</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	24.028	24.051	24.038	1.0	24.028	24.029	24.028	2.0	24.027	24.027	24.027	3.0	24.025	24.026	24.025	4.0	24.024	24.024	24.024	5.0	24.023	24.023	24.023	5.5	24.022	24.023	24.022	6.5	24.021	24.021	24.021	7.5	24.020	24.020	24.020	--	-	-	-	--	-	-	-
Load Current [A]	Output Voltage [V]																																																					
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]																																																			
0.0	24.028	24.051	24.038																																																			
1.0	24.028	24.029	24.028																																																			
2.0	24.027	24.027	24.027																																																			
3.0	24.025	24.026	24.025																																																			
4.0	24.024	24.024	24.024																																																			
5.0	24.023	24.023	24.023																																																			
5.5	24.022	24.023	24.022																																																			
6.5	24.021	24.021	24.021																																																			
7.5	24.020	24.020	24.020																																																			
--	-	-	-																																																			
--	-	-	-																																																			
Note: Slanted line shows the range of the rated load current.																																																						

COSEL

Model	KHEA120F-24	Temperature	25°C
Item	Dynamic Load Response	Testing Circuitry	Figure A
Object	+24V5A		

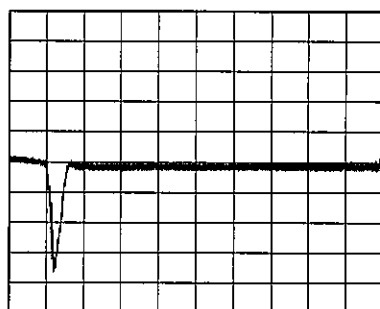
Input Volt. 230V
Cycle 1000ms

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

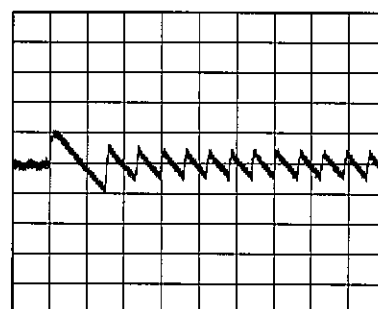


Min. Load (0A) \longleftrightarrow
Load 100% (5.0A)

200 mV/div



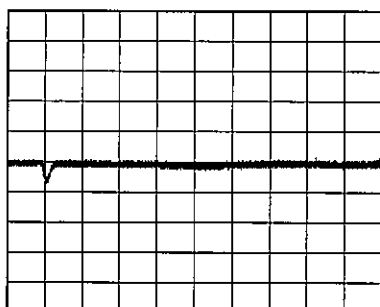
2 ms/div



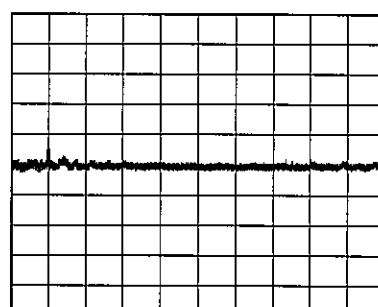
20 ms/div

Load 20% (1.0A) \longleftrightarrow
Load 100% (5.0A)

200 mV/div



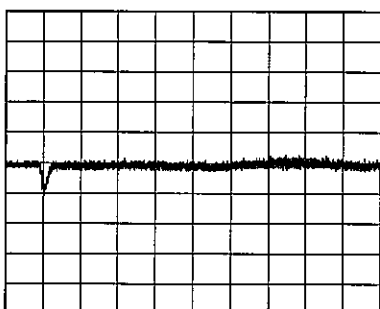
2 ms/div



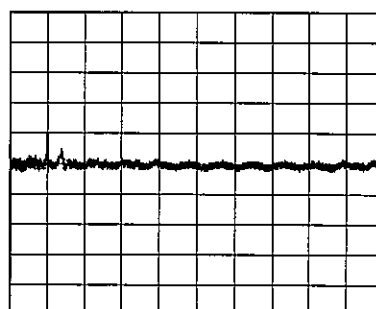
20 ms/div

Load 20% (1.0A) \longleftrightarrow
Load 150% (7.5A)

200 mV/div



2 ms/div



20 ms/div

* The characteristic of AC115V is equal.

COSEL

Model		KHEA120F-24
Item		Ripple Voltage (by Load Current)
Object		+24V5A

1.Graph

△

Input Volt. 115V

○

Input Volt. 230V

300

250

200

150

100

50

0

0

2

4

6

8

0

2

4

6

8

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.

T1: Due to AC Input Line

T2: Due to Switching

Ripple [mVp-p]

T2

T1

Fig. Complex Ripple Wave Form

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
--	-	-
--	-	-

COSEL

Model		KHEA120F-24	
Item		Ripple-Noise	
Object		+24V5A	

1.Graph

△

Input Volt. 115V

○

Input Volt. 230V

300

250

200

150

100

50

0

0

2

4

6

8

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

△

Input Volt. 115V

○

Input Volt. 230V

<

COSEL

Model		KHEA120F-24
Item		Ripple Voltage (by Ambient Temp.)
Object		+24V5A

1.Graph

Input Volt 115V

Input Volt 230V

Model		KHEA120F-24																																																				
Item		Ambient Temperature Drift																																																				
Object		+24V5A																																																				
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>Ambient Temperature [°C]</p> <p>Load 100%</p>		<table><tr><th rowspan="2">Ambient Temperature [°C]</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>-30</td><td>23.947</td><td>23.947</td><td>23.947</td></tr><tr><td>-25</td><td>23.955</td><td>23.955</td><td>23.955</td></tr><tr><td>-10</td><td>23.973</td><td>23.973</td><td>23.973</td></tr><tr><td>0</td><td>23.986</td><td>23.986</td><td>23.986</td></tr><tr><td>10</td><td>24.000</td><td>24.000</td><td>24.000</td></tr><tr><td>25</td><td>24.023</td><td>24.023</td><td>24.023</td></tr><tr><td>40</td><td>24.027</td><td>24.027</td><td>24.027</td></tr><tr><td>50</td><td>24.031</td><td>24.031</td><td>24.031</td></tr><tr><td>60</td><td>24.032</td><td>24.032</td><td>24.032</td></tr><tr><td>70</td><td>24.030</td><td>24.030</td><td>24.030</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Ambient Temperature [°C]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]	-30	23.947	23.947	23.947	-25	23.955	23.955	23.955	-10	23.973	23.973	23.973	0	23.986	23.986	23.986	10	24.000	24.000	24.000	25	24.023	24.023	24.023	40	24.027	24.027	24.027	50	24.031	24.031	24.031	60	24.032	24.032	24.032	70	24.030	24.030	24.030	--	-	-	-
Ambient Temperature [°C]	Output Voltage [V]																																																					
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]																																																			
-30	23.947	23.947	23.947																																																			
-25	23.955	23.955	23.955																																																			
-10	23.973	23.973	23.973																																																			
0	23.986	23.986	23.986																																																			
10	24.000	24.000	24.000																																																			
25	24.023	24.023	24.023																																																			
40	24.027	24.027	24.027																																																			
50	24.031	24.031	24.031																																																			
60	24.032	24.032	24.032																																																			
70	24.030	24.030	24.030																																																			
--	-	-	-																																																			
Note: Slanted line shows the range of the rated ambient temperature.																																																						

- 15 -

BC-10672



		Testing Circuitry Figure A
Model	KHEA120F-24	
Item	Output Voltage Accuracy	
Object	+24V5A	

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

* 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	60	115	0	24.075	±61	±0.3
Minimum Voltage	-25	85	5	23.954		

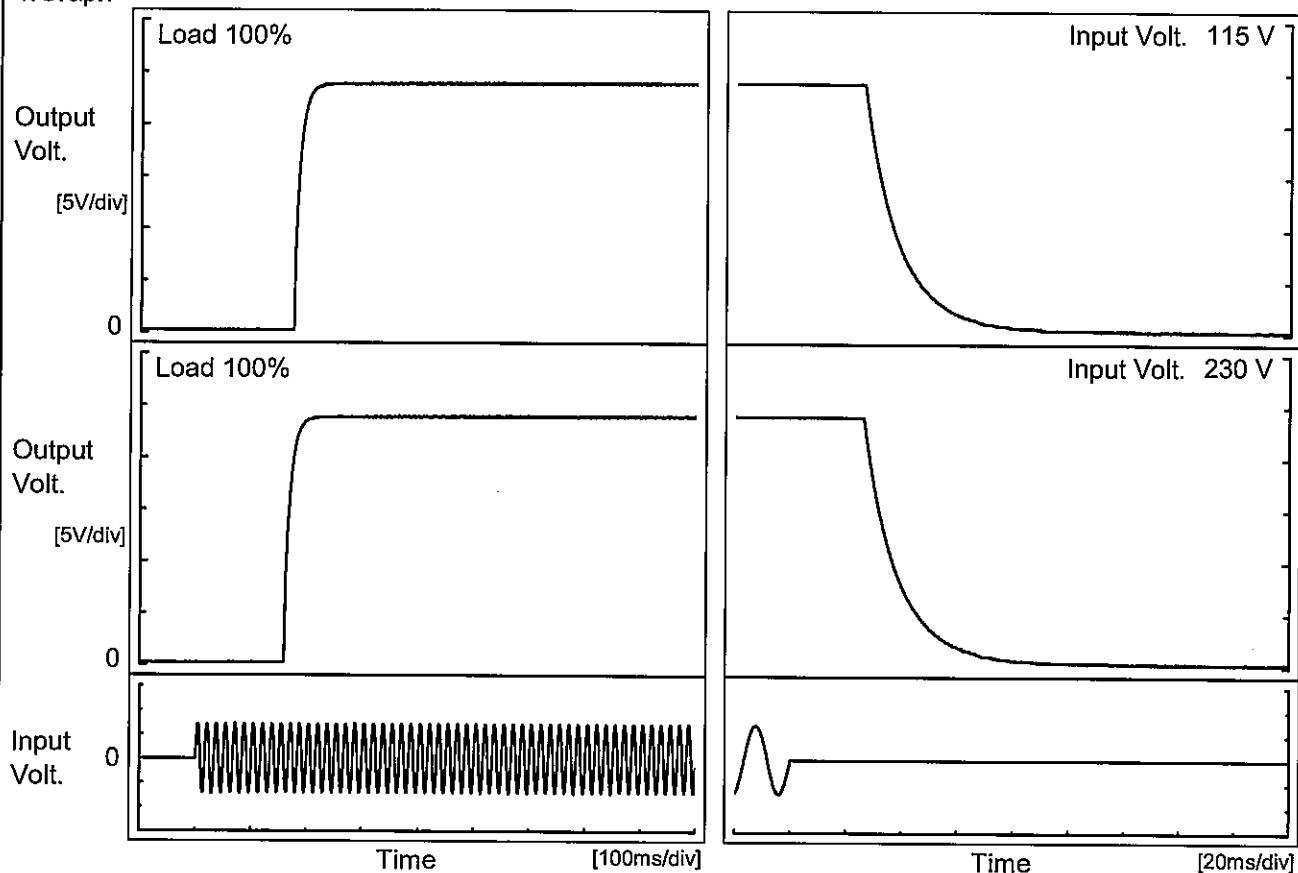
COSEL

Model	KHEA120F-24		
Item	Time Lapse Drift	Temperature	25°C
		Testing Circuitry	Figure A
Object	+24V5A		
1.Graph		2.Values	
<div><div><div>Output Voltage [V]</div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div></div></div></div>			

COSEL

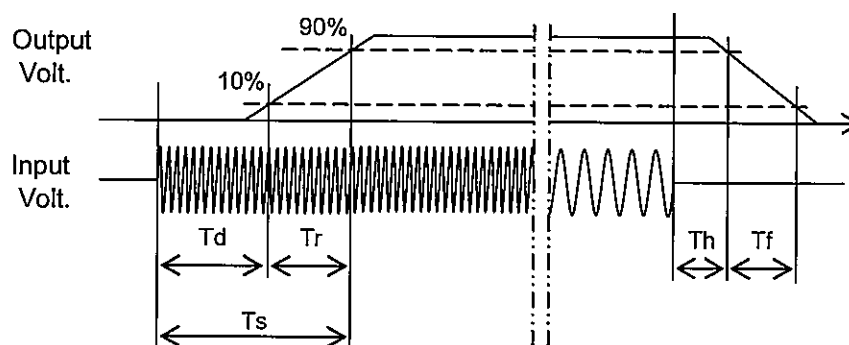
Model	KHEA120F-24	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+24V5A		

1. Graph



2. Values

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



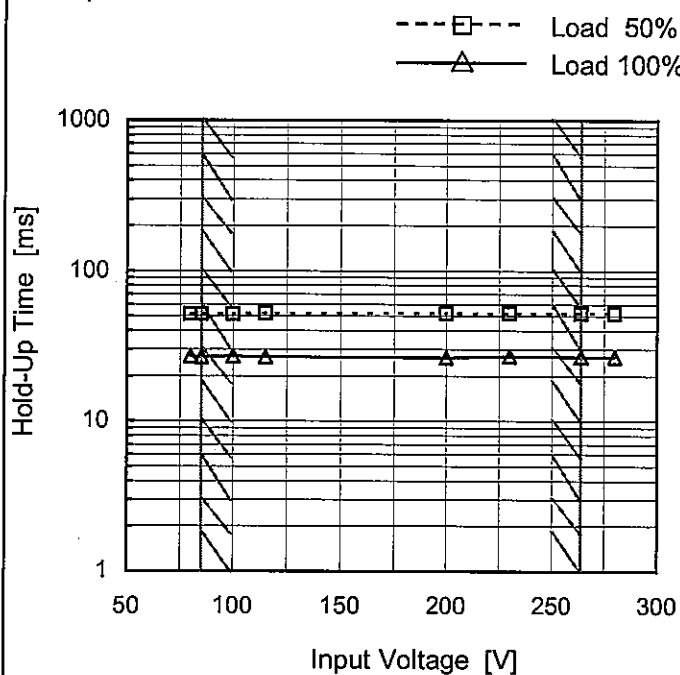
Model KHEA120F-24

Item Hold-Up Time

Object +24V5A

Temperature 25°C
Testing Circuitry Figure A

1. Graph



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	52	27
85	52	27
100	52	27
115	52	27
200	52	27
230	52	27
264	52	27
280	52	27
--	-	-

Model KHEA120F-24

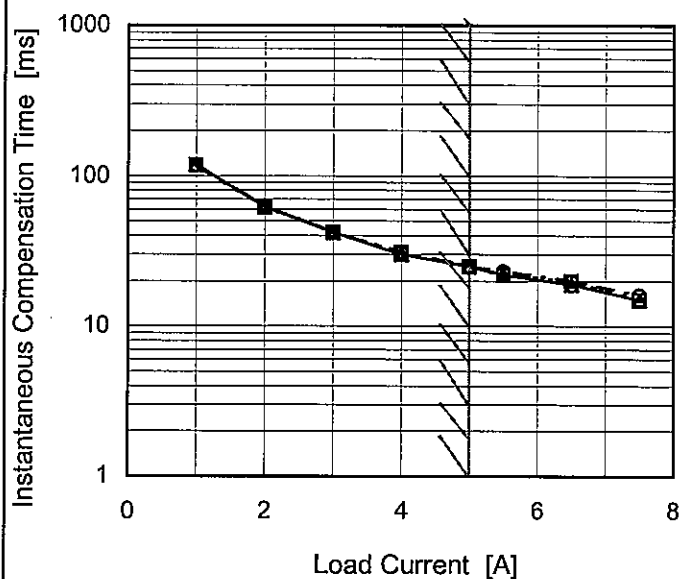
Item Instantaneous Interruption Compensation

Object +24V5A

Temperature 25°C
Testing Circuitry Figure A

1. Graph

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



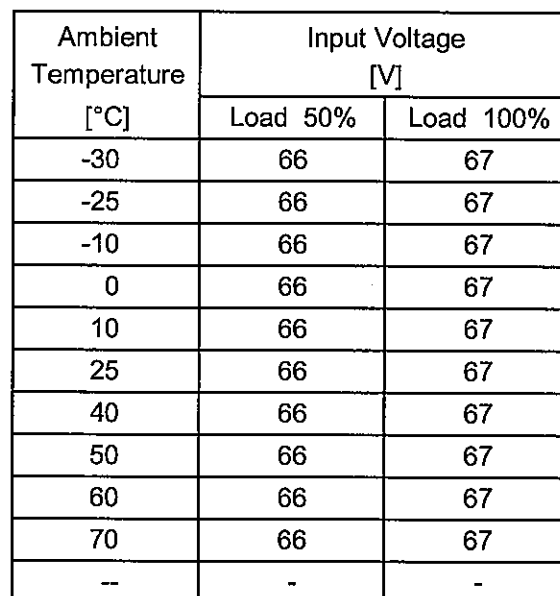
Note: Slanted line shows the range of the rated load current.

2. Values

Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.0	-	-	-
1.0	119	118	118
2.0	62	62	63
3.0	42	42	42
4.0	30	31	31
5.0	25	25	25
5.5	22	22	23
6.5	19	20	20
7.5	15	15	16
--	-	-	-
--	-	-	-

Testing Circuitry Figure A

2.Values



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

COSEL

Model		KHEA120F-24	
Item		Overcurrent Protection	
Object		+24V5A	

1.Graph

Input Volt. 115V

Input Volt. 230V

Output Voltage [V]

30

20

10

0

0

4

8

12

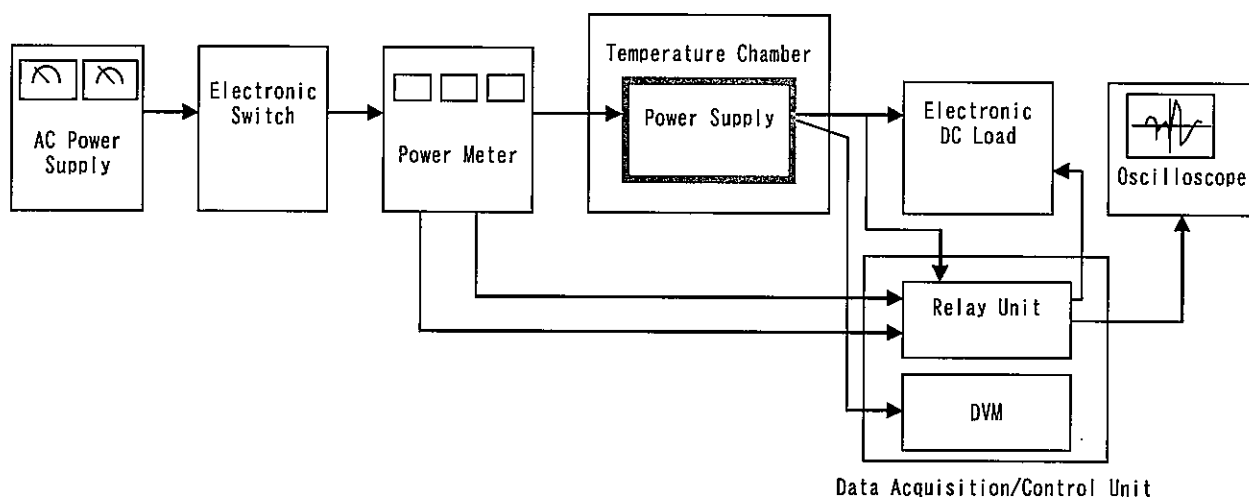


Figure A

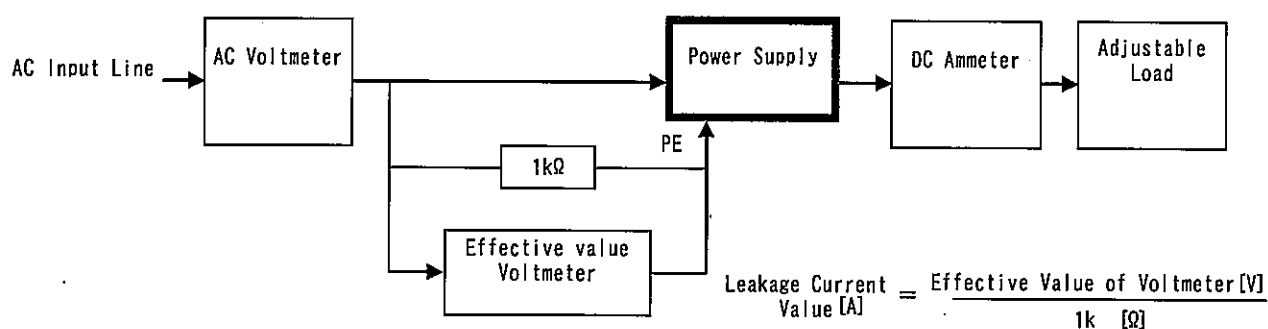


Figure B (DEN-AN)

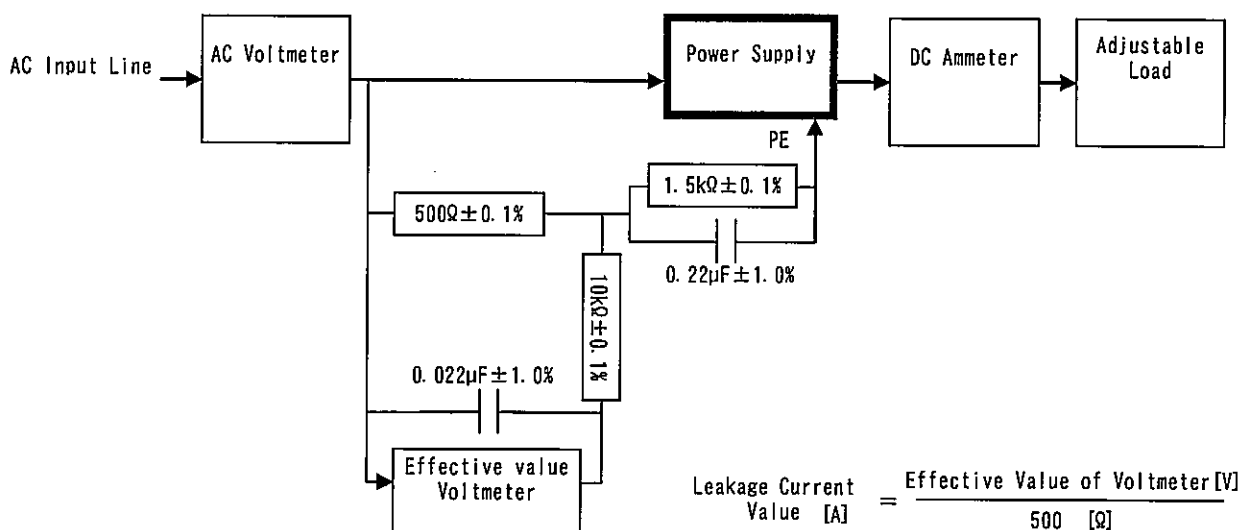
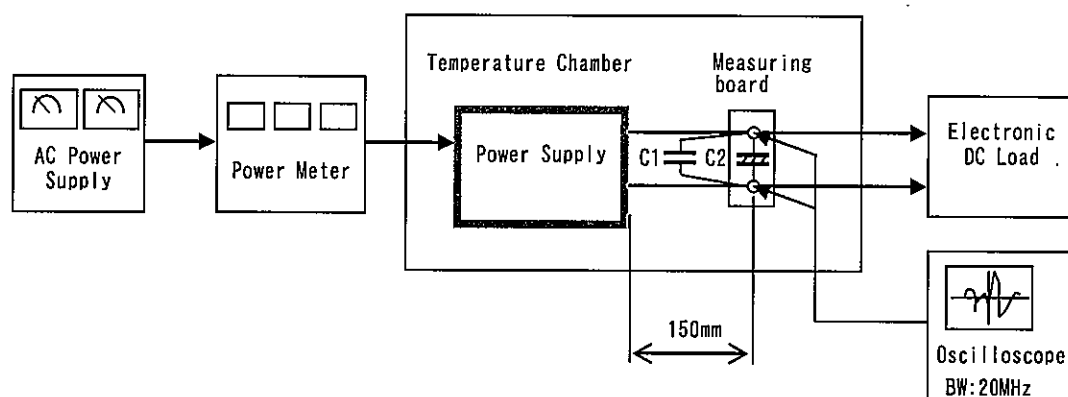


Figure B (IEC60950-1)



C1= 0.1 μ F
(Ceramic capacitor)

C2= 22 μ F
(Electrolytic capacitor)

Figure C