COSEL

参考資料

TEST DATA OF KHEA60F-24

Regulated DC Power Supply
November 15, 2013

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COSEL CO.,LTD.

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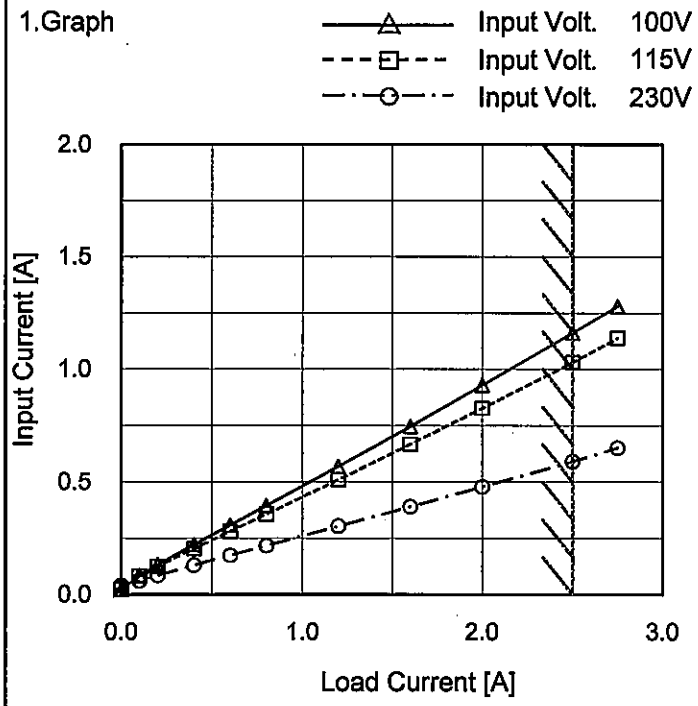

Note: Slanted line shows the range of the rated load current.

2.Values

Load Current [A]	Input Current [A]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.00	0.021	0.023	0.041
0.10	0.085	0.082	0.061
0.20	0.134	0.125	0.086
0.40	0.222	0.204	0.131
0.60	0.308	0.281	0.175
0.80	0.395	0.358	0.218
1.20	0.568	0.511	0.304
1.60	0.747	0.668	0.391
2.00	0.930	0.828	0.479
2.50	1.162	1.031	0.592
2.75	1.280	1.139	0.652

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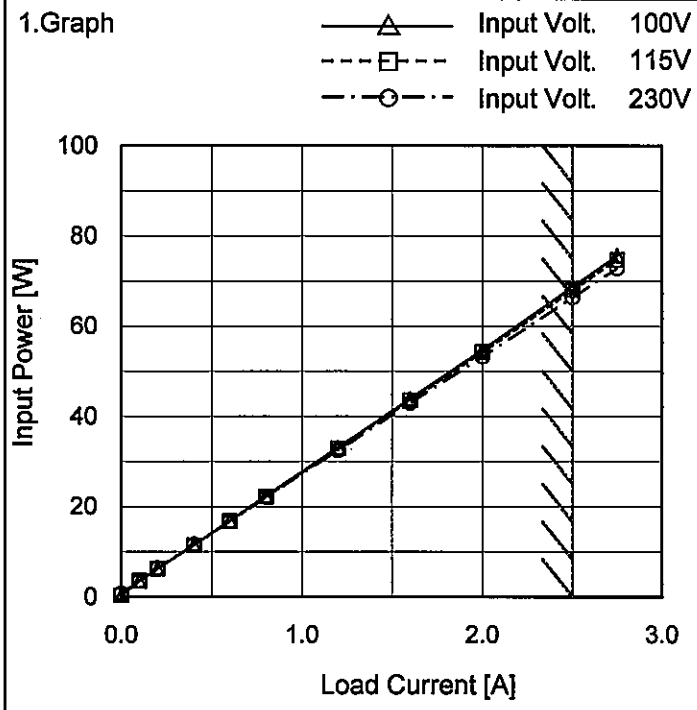
Model	KHEA60F-24
Item	Input Power (by Load Current)
Object	———————

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]	Input Power [W]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.00	0.37	0.39	0.84
0.10	3.52	3.59	3.52
0.20	6.27	6.25	6.44
0.40	11.55	11.49	11.70
0.60	16.93	16.80	16.87
0.80	22.37	22.19	22.10
1.20	33.14	32.90	32.50
1.60	43.90	43.55	43.00
2.00	54.80	54.30	53.30
2.50	68.70	68.00	66.40
2.75	75.70	74.80	72.90

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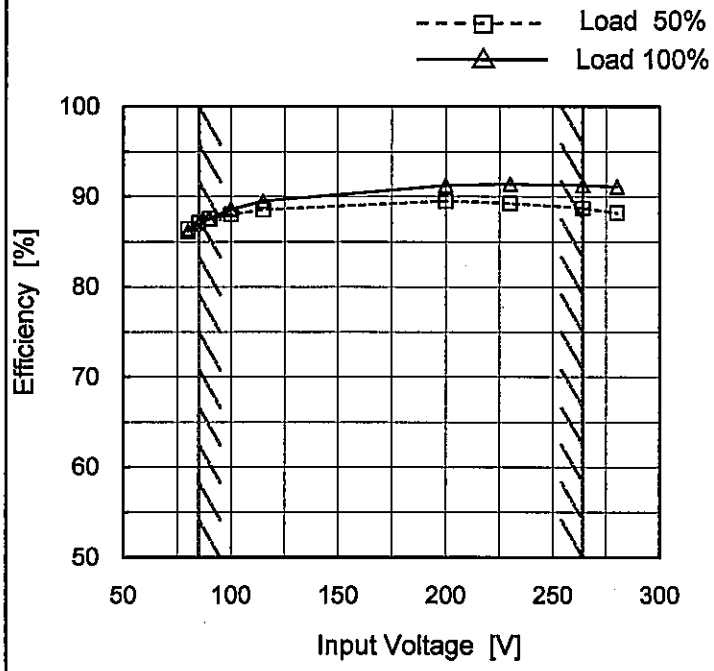
Model	KHEA60F-24
Item	Efficiency (by Input Voltage)
Object	

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]	Efficiency [%]	
	Load 50%	Load 100%
80	86.4	86.2
85	87.1	87.1
90	87.5	87.6
100	88.0	88.6
115	88.5	89.5
200	89.5	91.2
230	89.2	91.4
264	88.7	91.2
280	88.2	91.1

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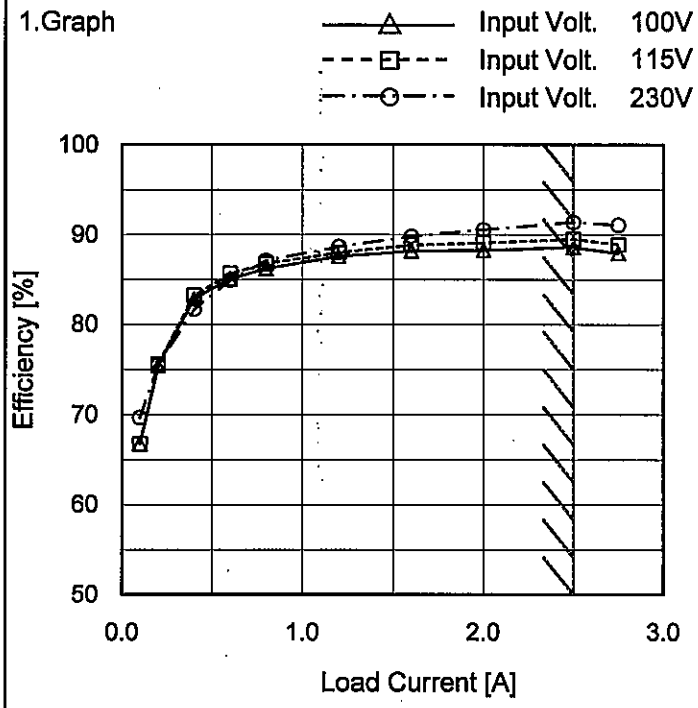
Model	KHEA60F-24
Item	Efficiency (by Load Current)
Object	———————

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]	Efficiency [%] Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.00	2.1	4.1	1.7
0.10	66.8	66.8	69.7
0.20	75.4	75.6	75.6
0.40	82.9	83.3	81.7
0.60	85.1	85.7	85.0
0.80	86.2	86.8	87.1
1.20	87.6	88.0	88.7
1.60	88.2	88.8	89.8
2.00	88.3	89.1	90.6
2.50	88.6	89.5	91.4
2.75	88.0	88.9	91.1

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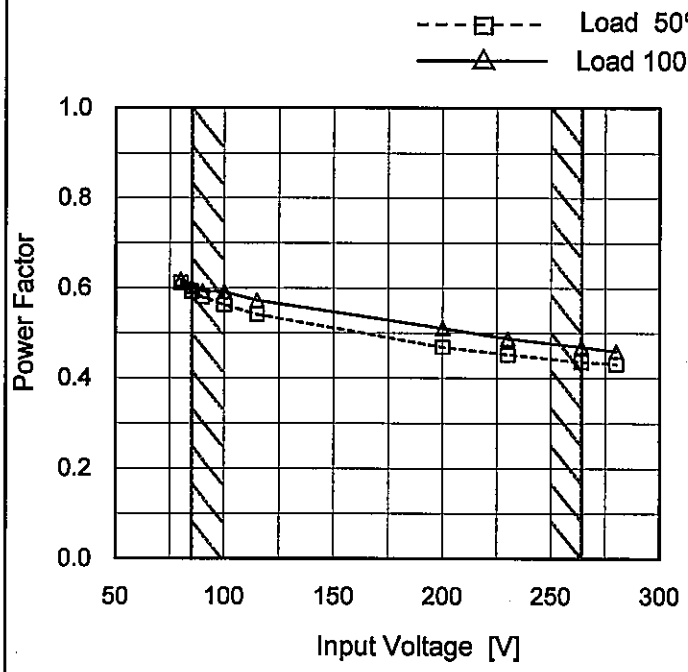
Model	KHEA60F-24
Item	Power Factor (by Input Voltage)
Object	

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	0.611	0.619
85	0.593	0.603
90	0.580	0.593
100	0.563	0.591
115	0.542	0.573
200	0.469	0.511
230	0.452	0.488
264	0.436	0.470
280	0.431	0.460

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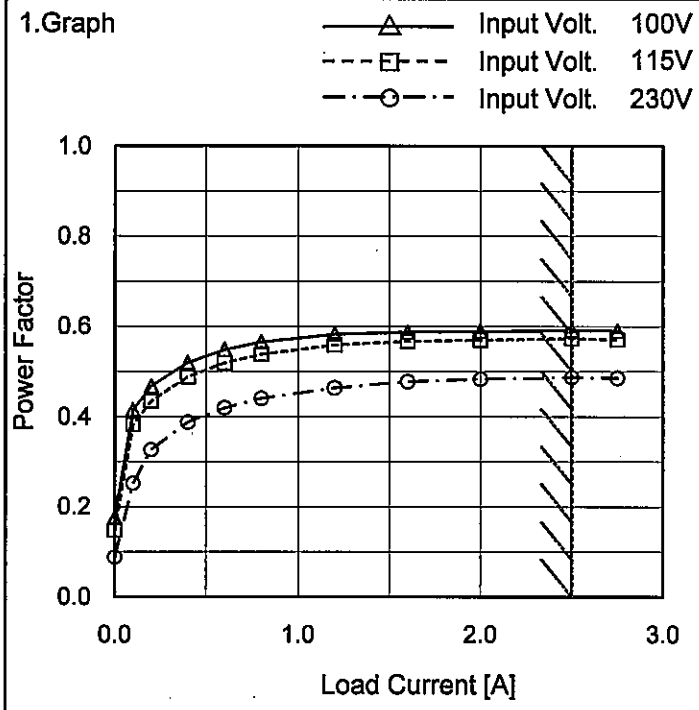
Model	KHEA60F-24
Item	Power Factor (by Load Current)
Object	

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]	Power Factor		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.00	0.176	0.149	0.089
0.10	0.416	0.383	0.252
0.20	0.468	0.435	0.327
0.40	0.520	0.489	0.388
0.60	0.549	0.520	0.420
0.80	0.566	0.539	0.441
1.20	0.583	0.560	0.464
1.60	0.588	0.567	0.478
2.00	0.589	0.570	0.484
2.50	0.591	0.573	0.488
2.75	0.590	0.571	0.486

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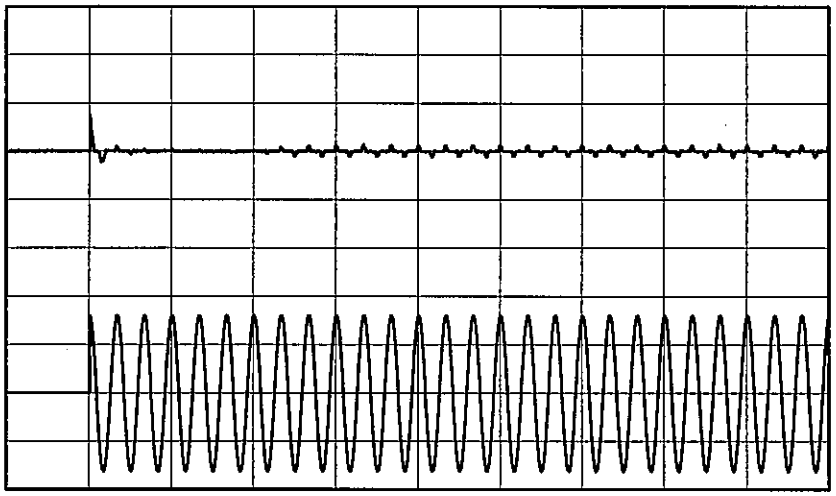
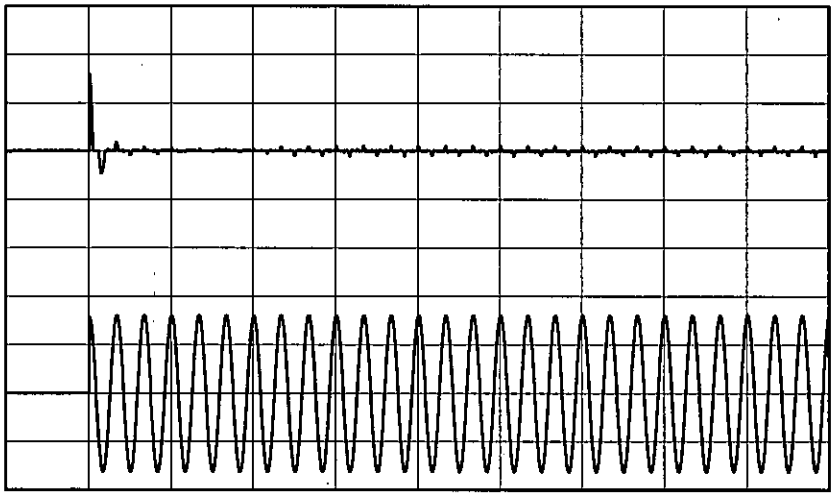
Model	KHEA60F-24
Item	Inrush Current
Object	———————

Temperature 25°C
Testing Circuitry Figure A



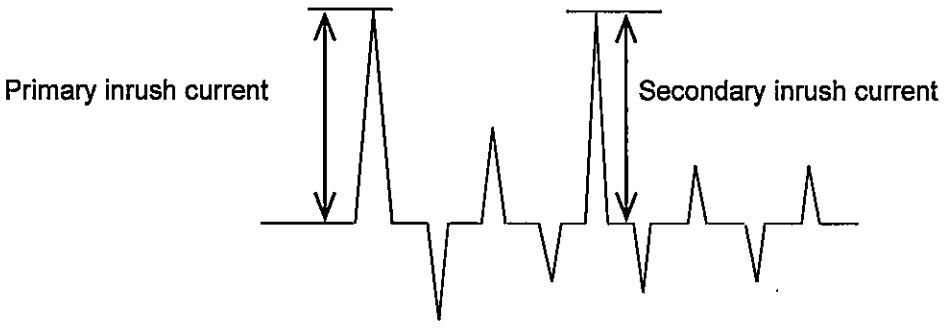
Input Voltage 115 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
15.2 A
Secondary inrush current :
2.8 A



Input Voltage 230 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
32.0 A
Secondary inrush current :
2.0 A



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Model	KHEA60F-24		
Item	Leakage Current	Temperature	25°C
Object	———————	Testing Circuitry	Figure B

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	115 [V]	240 [V]	
DEN-AN	Both phases	0.07	0.08	0.21	Operation
	One of phases	0.13	0.14	0.35	Stand by
IEC60950-1	Both phases	0.07	0.07	0.22	Operation
	One of phases	0.12	0.13	0.33	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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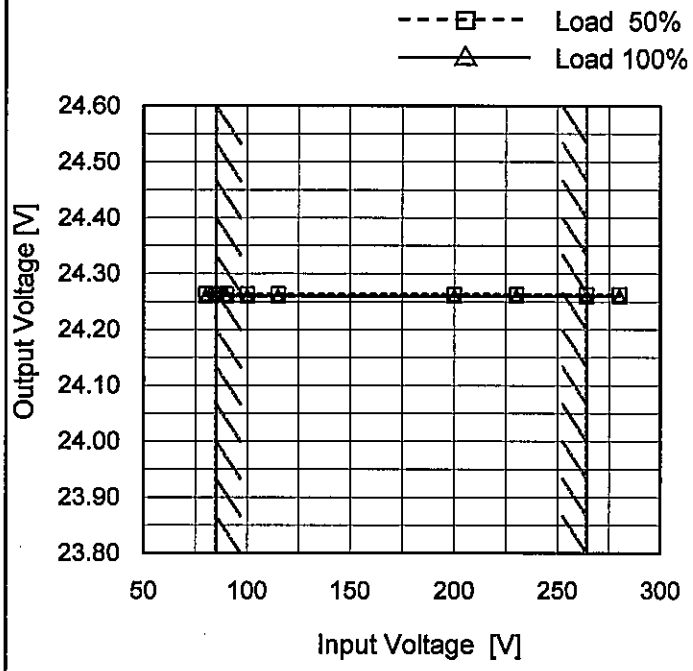
Model	KHEA60F-24
Item	Line Regulation
Object	+24V2.5A

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]	Output Voltage [V]	
	Load 50%	Load 100%
80	24.264	24.260
85	24.264	24.260
90	24.264	24.260
100	24.264	24.260
115	24.264	24.260
200	24.263	24.260
230	24.263	24.260
264	24.263	24.260
280	24.263	24.260

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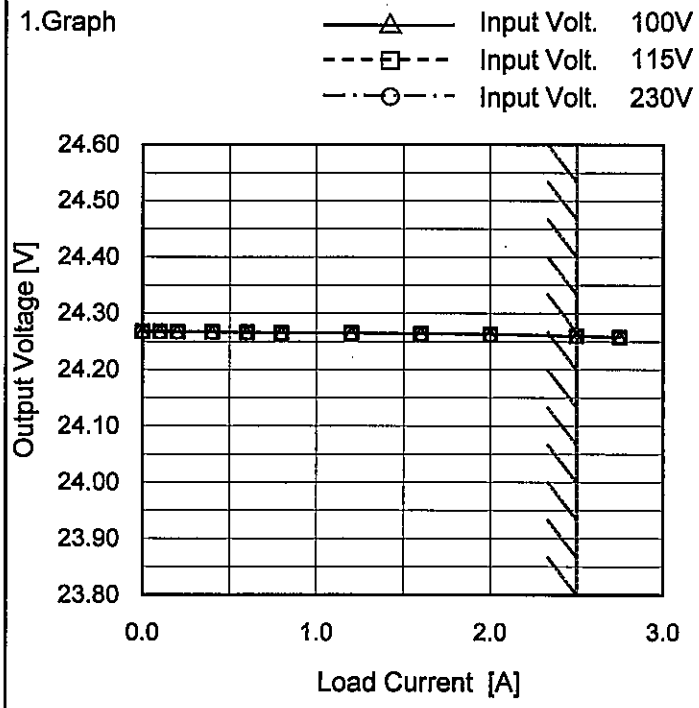
Model	KHEA60F-24
Item	Load Regulation
Object	+24V2.5A

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]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 115[V]	Input Volt. 230[V]
0.00	24.268	24.268	24.268
0.10	24.268	24.268	24.268
0.20	24.268	24.267	24.268
0.40	24.267	24.267	24.267
0.60	24.266	24.266	24.266
0.80	24.266	24.266	24.266
1.20	24.265	24.265	24.265
1.60	24.264	24.265	24.264
2.00	24.263	24.263	24.263
2.50	24.260	24.260	24.260
2.75	24.258	24.258	24.258

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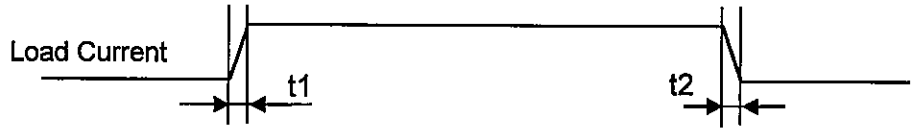
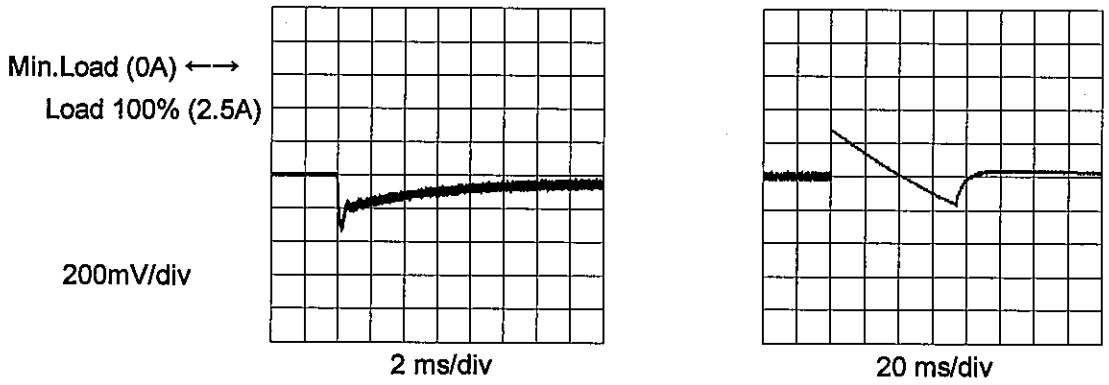
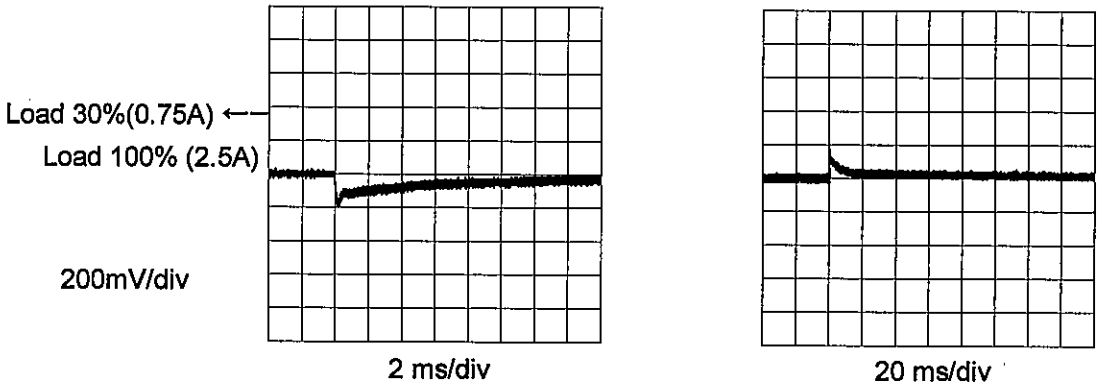
Model	KHEA60F-24		
Item	Dynamic Load Response	Temperature	25˚C
Object	+24V2.5A	Testing Circuitry	Figure A

Input Volt. 230 V
Cycle 1000 ms

Response. t1=t2=50us. Typ







* The characteristic of AC115V is equal.

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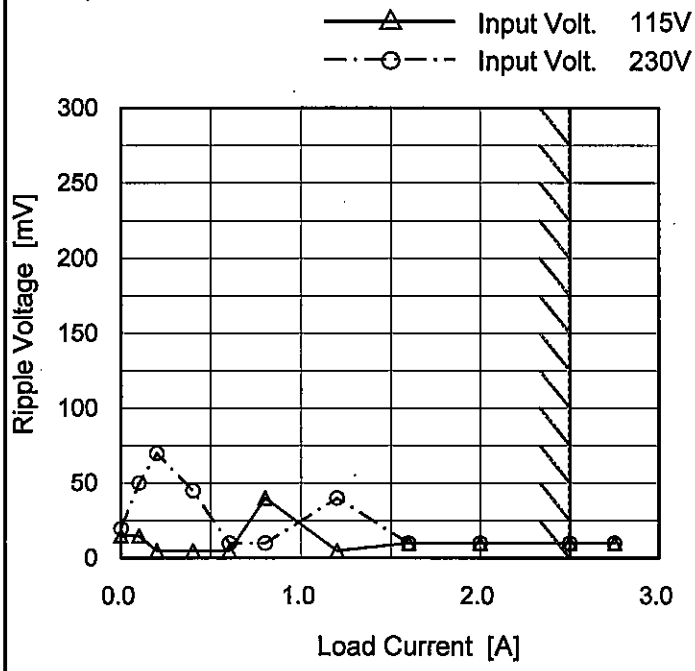
Model	KHEA60F-24
Item	Ripple Voltage (by Load Current)
Object	+24V2.5A

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.

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

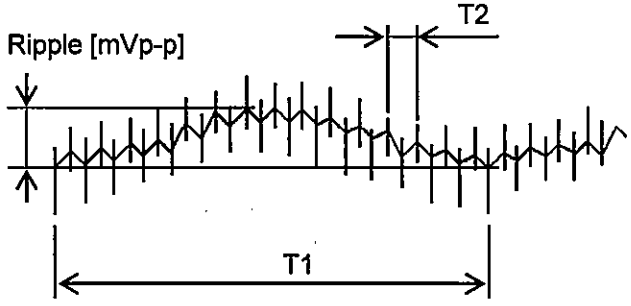


Fig. Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 115 [V]	Input Volt. 230 [V]
0.00	15	20
0.10	15	50
0.20	5	70
0.40	5	45
0.60	5	10
0.80	40	10
1.20	5	40
1.60	10	10
2.00	10	10
2.50	10	10
2.75	10	10

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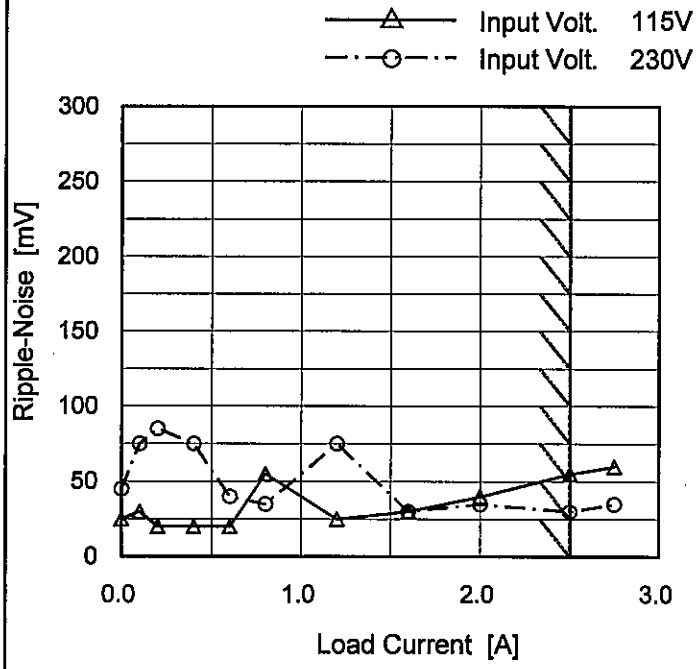
Model	KHEA60F-24
Item	Ripple-Noise
Object	+24V2.5A

Temperature 25°C
Testing Circuitry Figure C

1.Graph



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]
0.00	25	45
0.10	30	75
0.20	20	85
0.40	20	75
0.60	20	40
0.80	55	35
1.20	25	75
1.60	30	30
2.00	40	35
2.50	55	30
2.75	60	35

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

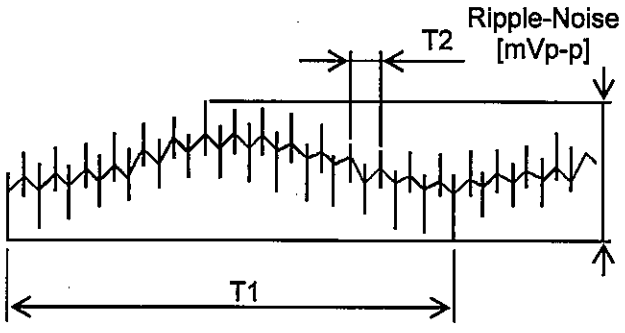


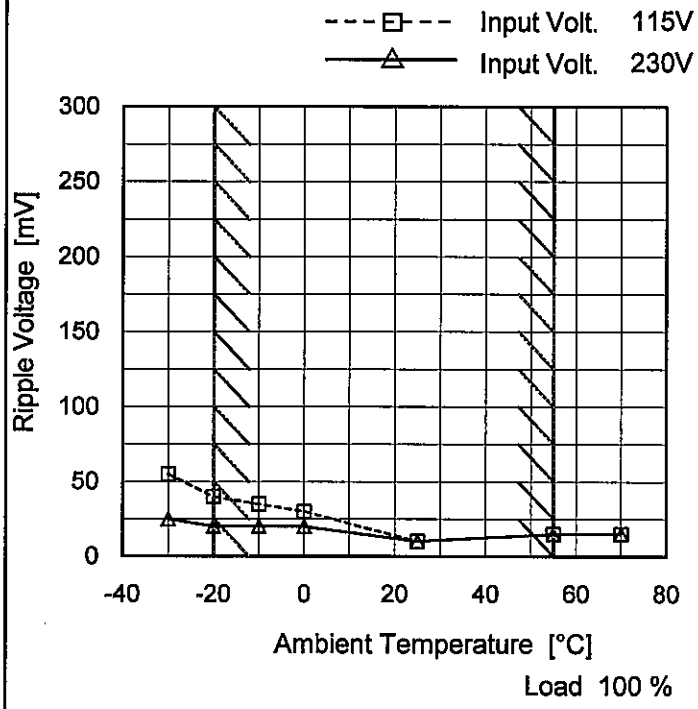
Fig. Complex Ripple Wave Form

COSEL

Model	KHEA60F-24
Item	Ripple Voltage (by Ambient Temp.)
Object	+24V2.5A

Testing Circuitry Figure C

1.Graph



Measured by 20 MHz Oscilloscope.

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

2.Values

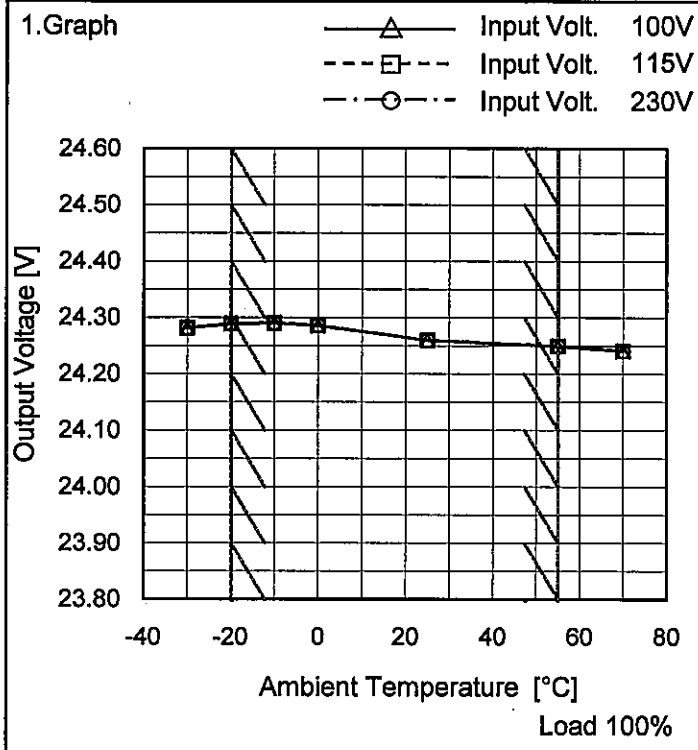
Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 115 [V]	Input Volt. 230 [V]
-30	55	25
-20	40	20
-10	35	20
0	30	20
25	10	10
55	15	15
70	15	15
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	KHEA60F-24
Item	Ambient Temperature Drift
Object	+24V2.5A

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	24.281	24.282	24.282
-20	24.289	24.289	24.289
-10	24.290	24.291	24.290
0	24.286	24.286	24.286
25	24.260	24.260	24.260
55	24.249	24.250	24.250
70	24.241	24.242	24.241
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	KHEA60F-24	
Item	Output Voltage Accuracy	Testing Circuitry Figure A
Object	+24V2.5A	

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 : -20 - 55°C
Input Voltage : 85 - 264V
Load Current : 0 - 2.5A

* 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	-10	230	0	24.323	±37	±0.2
Minimum Voltage	55	100	2.5	24.249		

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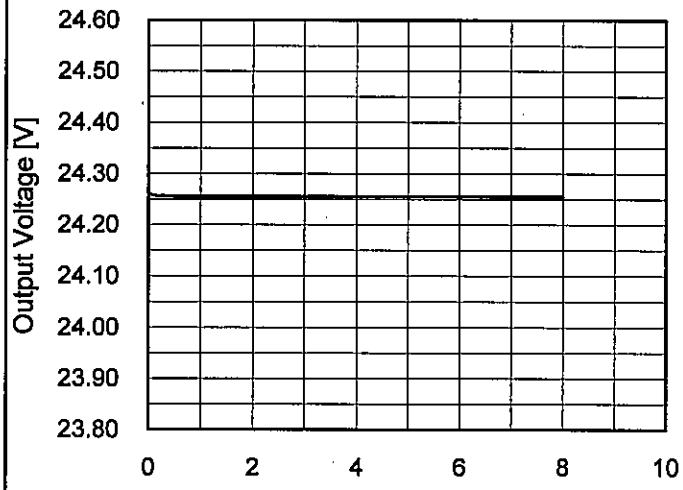
Model	KHEA60F-24
Item	Time Lapse Drift
Object	+24V2.5A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



Input Volt. 230V
Load 100%

* The characteristic of AC115V is equal.

2.Values

Time since start [H]	Output Voltage [V]
0.0	24.260
0.5	24.256
1.0	24.256
2.0	24.256
3.0	24.255
4.0	24.256
5.0	24.256
6.0	24.256
7.0	24.256
8.0	24.256

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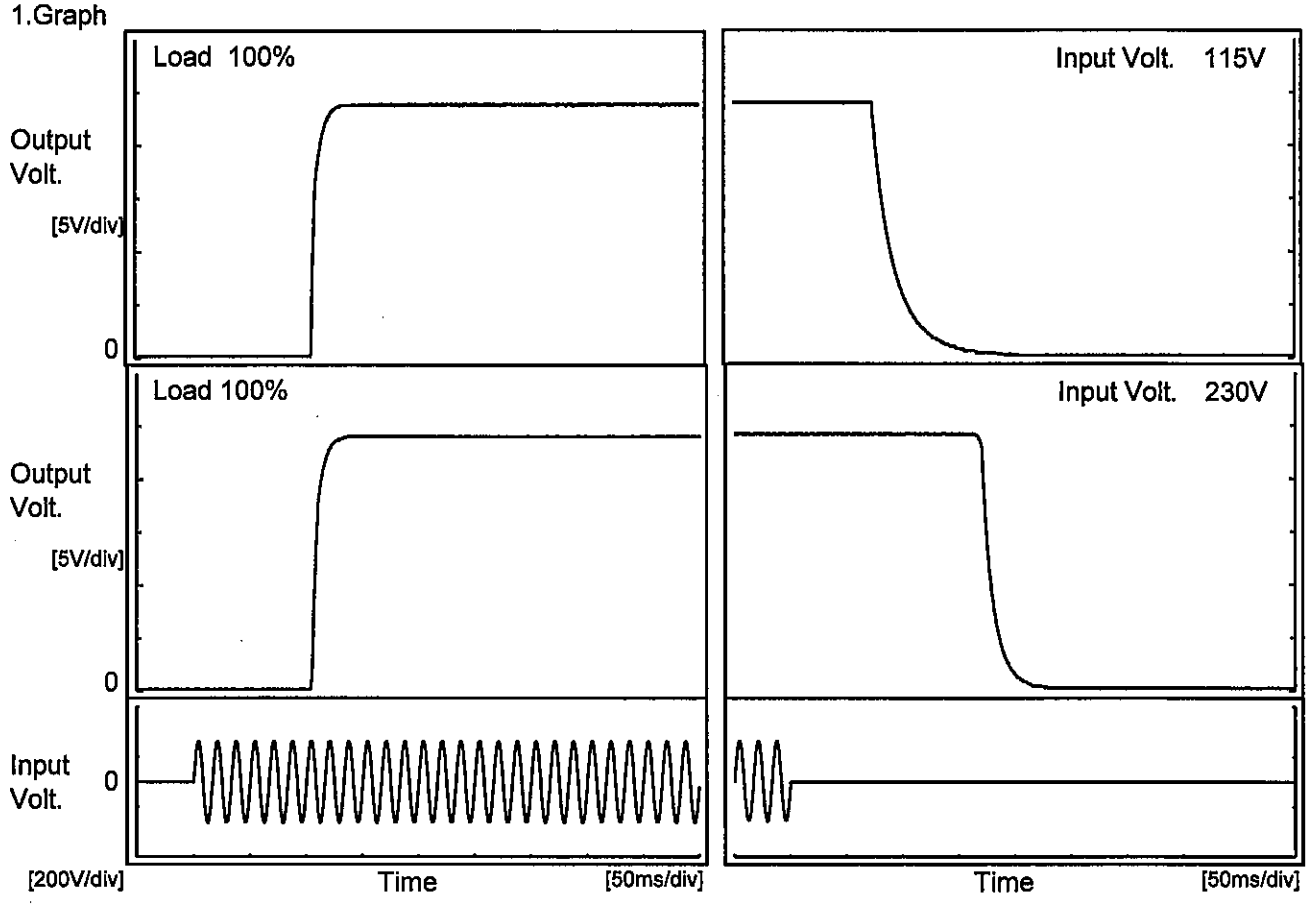
Model	KHEA60F-24	
Item	Rise and Fall Time	Temperature 25°C Testing Circuitry Figure A
Object	+24V2.5A	

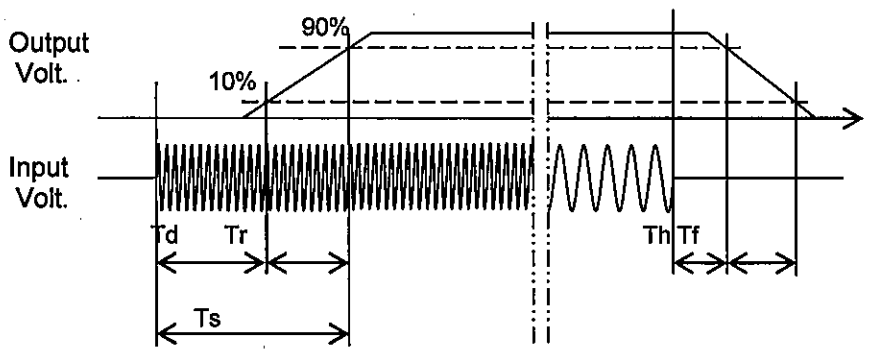
1.Graph



2.Values

[ms]

Load \ Time	Td	Tr	Ts	Th	Tf
115 V	106.3	12.0	118.3	36.0	22.5
230 V	105.3	12.0	117.3	171.0	23.3



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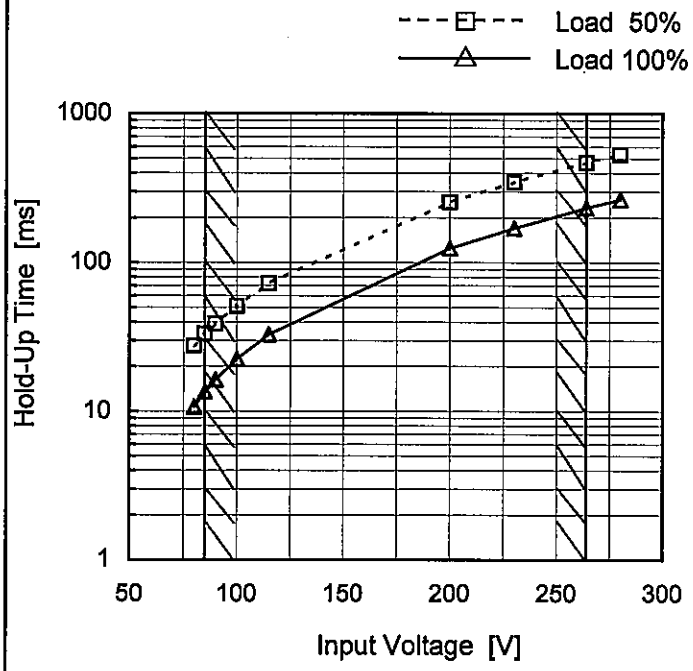
Model	KHEA60F-24
Item	Hold-Up Time
Object	+24V2.5A

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

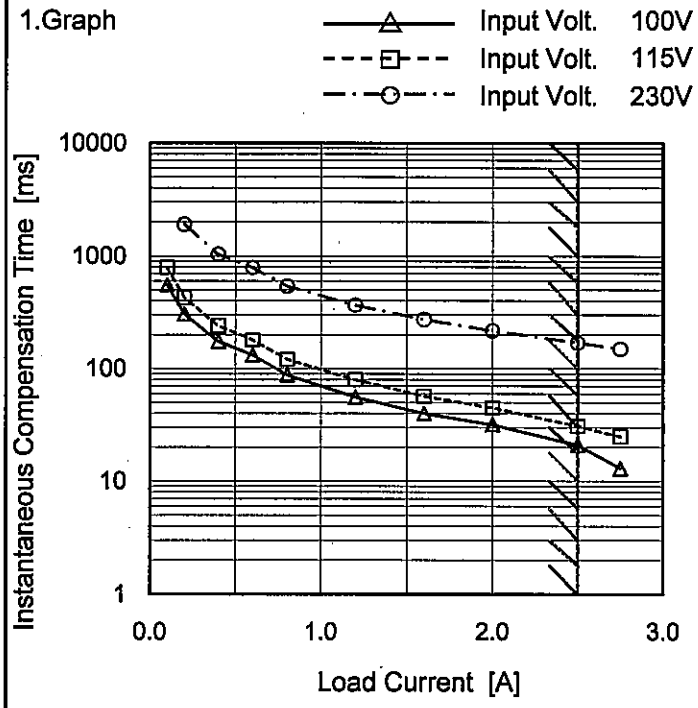
Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
80	28	11
85	33	14
90	39	16
100	51	22
115	72	33
200	256	125
230	347	171
264	470	234
280	533	266

COSEL

Model	KHEA60F-24
Item	Instantaneous Interruption Compensation
Object	+24V2.5A

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]
0.00	-	-	-
0.10	554	795	-
0.20	305	425	1906
0.40	175	239	1040
0.60	132	180	790
0.80	88	121	540
1.20	56	80	365
1.60	40	57	273
2.00	32	45	217
2.50	21	31	170
2.75	13	25	150

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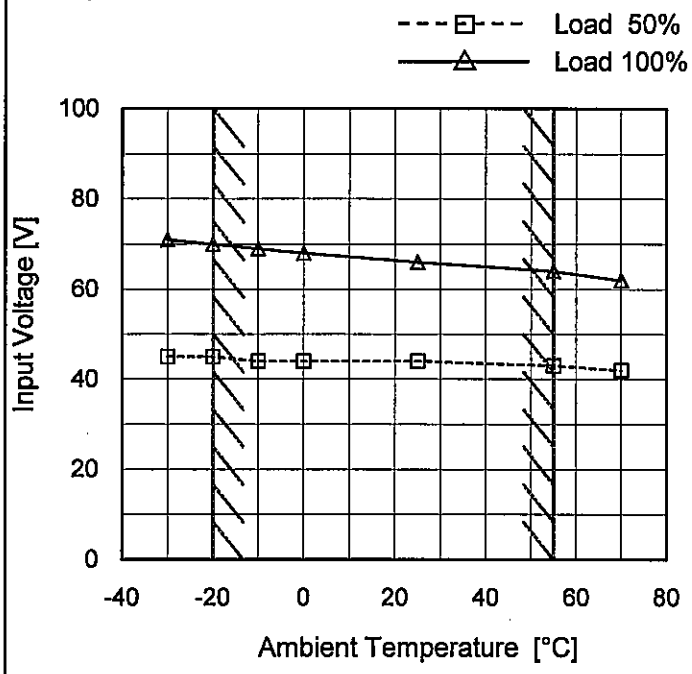
Model	KHEA60F-24
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+24V2.5A

Testing Circuitry Figure A

1.Graph



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

2.Values

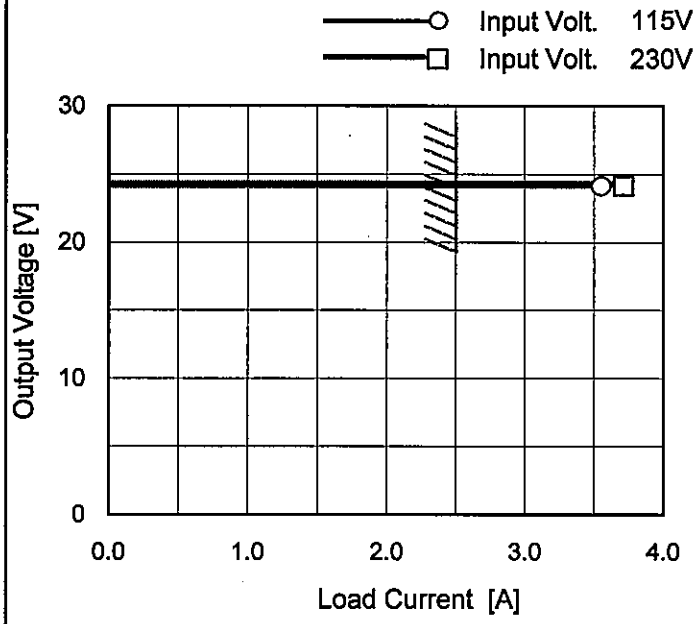
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-30	45	71
-20	45	70
-10	44	69
0	44	68
25	44	66
55	43	64
70	42	62
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	KHEA60F-24
Item	Overcurrent Protection
Object	+24V2.5A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



Note: Slanted line shows the range of the rated load current.
Intermittent operation occurs when overcurrent protection is activated

2.Values

Output Voltage [V]	Load Current [A]	
	Input Volt. 115[V]	Input Volt. 230[V]
24.3	3.55	3.66
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

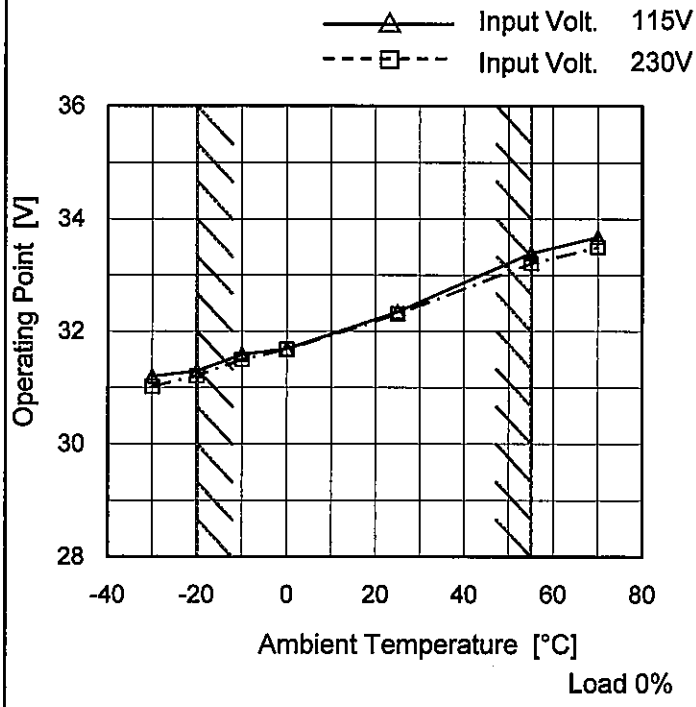
BC-10774

COSEL

Model	KHEA60F-24
Item	Overvoltage Protection
Object	+24V2.5A

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]	Operating Point [V] Input Volt. 230[V]
-30	31.20	31.02
-20	31.30	31.21
-10	31.59	31.50
0	31.69	31.68
25	32.35	32.31
55	33.39	33.21
70	33.68	33.50
---	-	-
---	-	-
---	-	-
---	-	-

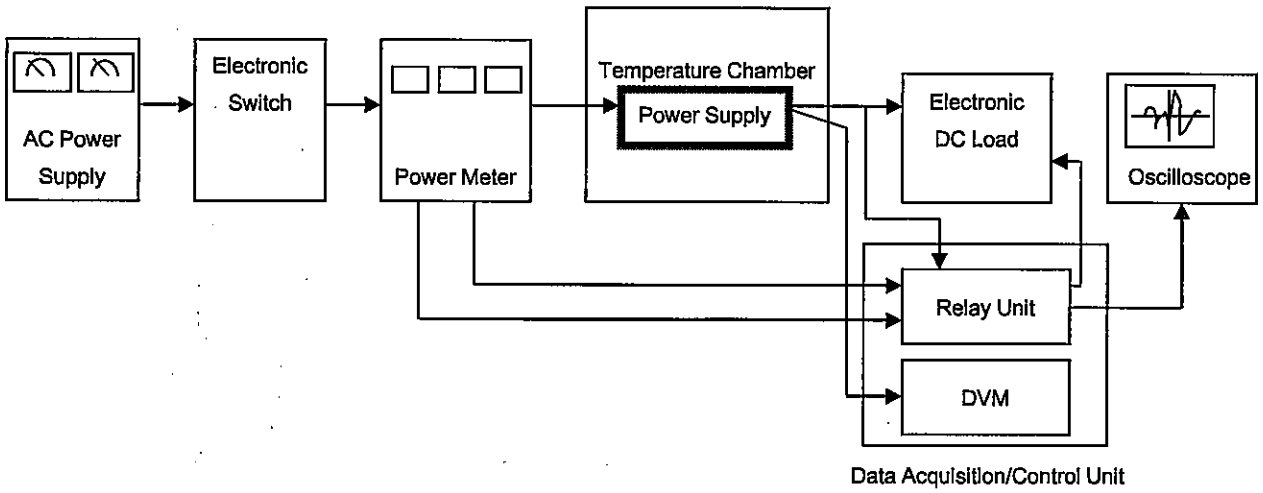


Figure A

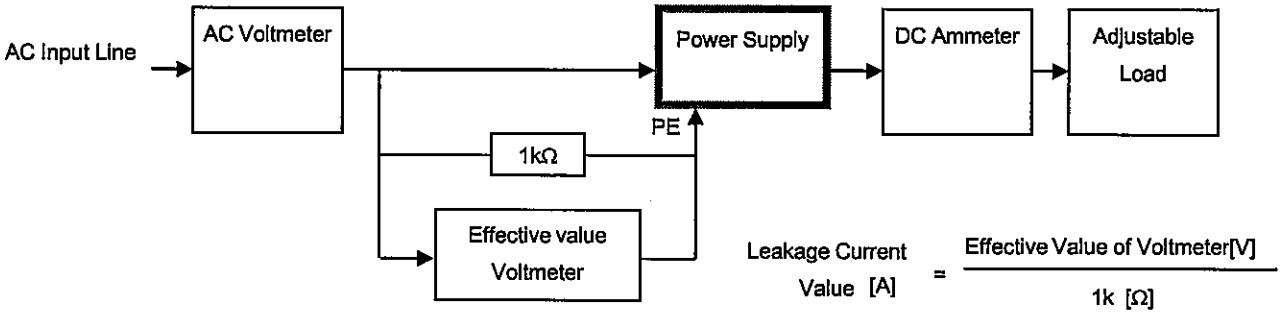


Figure B (DEN-AN)

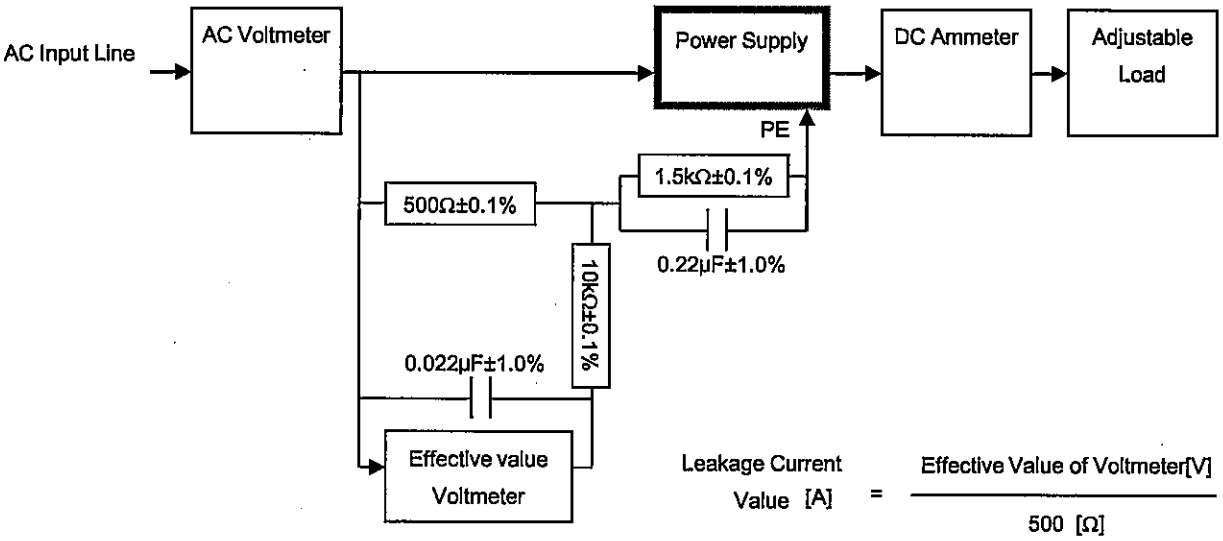
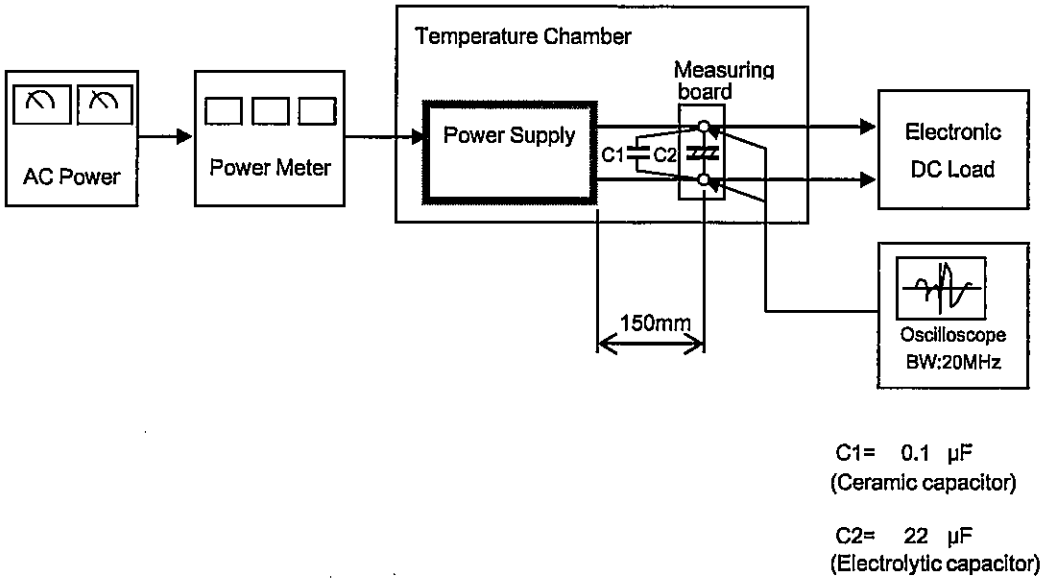


Figure B (IEC60950-1)



C1= 0.1 μF
(Ceramic capacitor)

C2= 22 μF
(Electrolytic capacitor)

Figure C