COSEL

参考資料

TEST DATA OF TUHS10F24

Regulated DC Power Supply
February 28, 2014

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Sakae Minamide Design Engineer

COSEL CO.,LTD.

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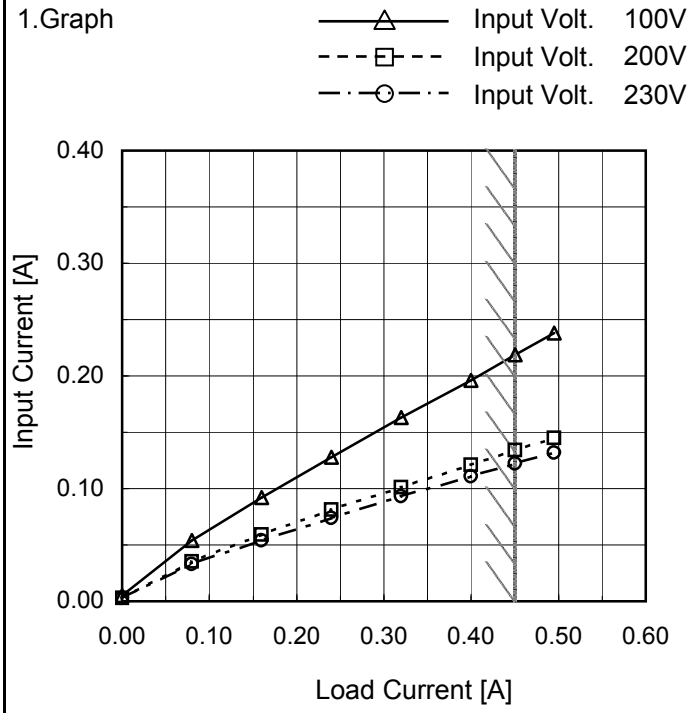
Model	TUHS10F24
Item	Input Current (by Load Current)
Object	————————

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 Current [A]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	0.005	0.003	0.003
0.08	0.054	0.035	0.033
0.16	0.092	0.059	0.054
0.24	0.128	0.081	0.074
0.32	0.163	0.101	0.093
0.40	0.196	0.121	0.111
0.45	0.219	0.134	0.122
0.50	0.238	0.145	0.132
--	-	-	-
--	-	-	-
--	-	-	-

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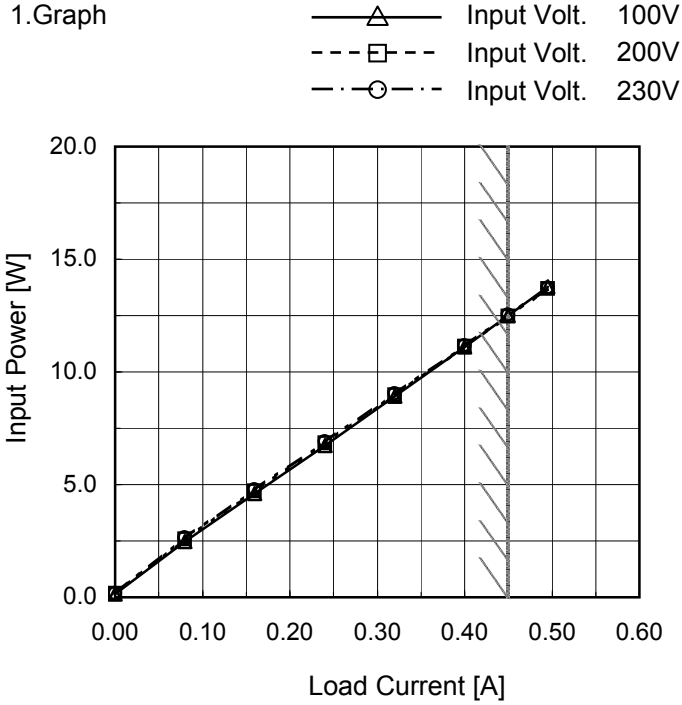
Model	TUHS10F24
Item	Input Power (by Load Current)
Object	————————

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. 200[V]	Input Volt. 230[V]
0.00	0.14	0.17	0.18
0.08	2.47	2.58	2.64
0.16	4.60	4.73	4.79
0.24	6.75	6.85	6.90
0.32	8.92	8.99	9.04
0.40	11.12	11.13	11.17
0.45	12.51	12.47	12.52
0.50	13.77	13.69	13.73
--	-	-	-
--	-	-	-
--	-	-	-

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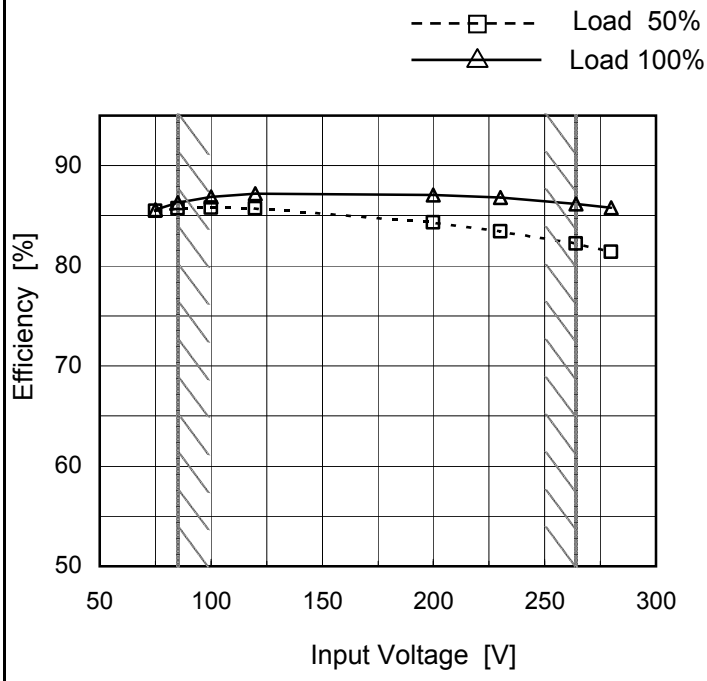
Model	TUHS10F24
Item	Efficiency (by Input Voltage)
Object	――――――――――――

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%
75	85.5	85.6
85	85.7	86.3
100	85.8	86.9
120	85.7	87.2
200	84.3	87.1
230	83.4	86.8
264	82.2	86.2
280	81.4	85.8
--	-	-

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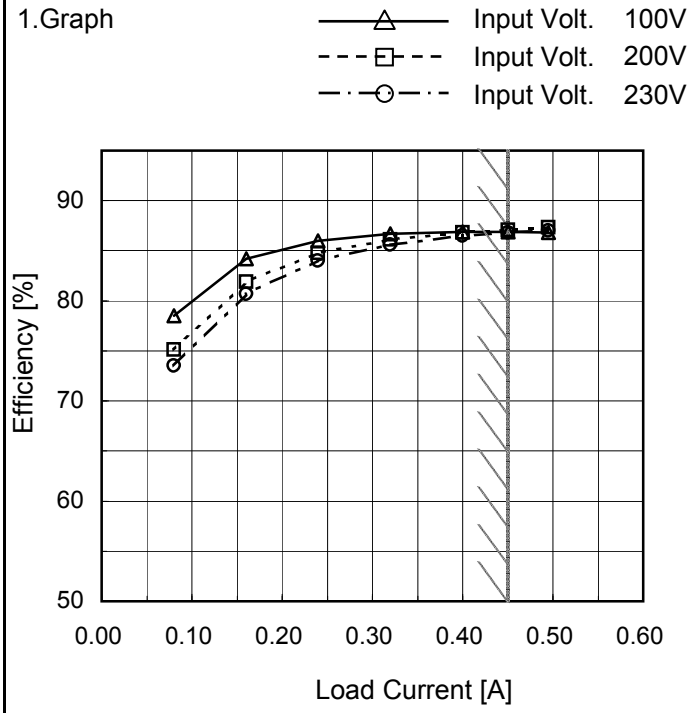
Model	TUHS10F24
Item	Efficiency (by Load Current)
Object	————————

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. 200[V]	Input Volt. 230[V]
0.00	-	-	-
0.08	78.5	75.1	73.5
0.16	84.2	81.9	80.7
0.24	86.0	84.8	84.0
0.32	86.7	86.1	85.6
0.40	86.9	86.8	86.5
0.45	86.9	87.1	86.8
0.50	86.8	87.3	87.0
--	-	-	-
--	-	-	-
--	-	-	-

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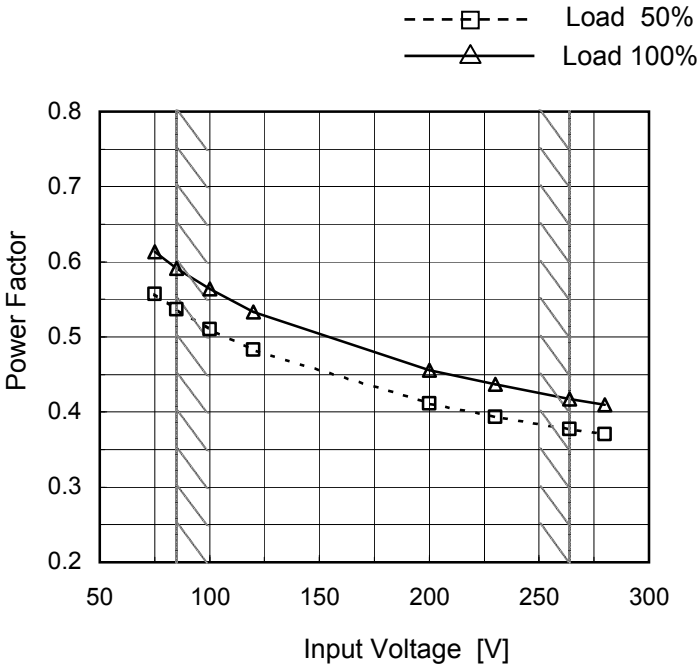
Model	TUHS10F24
Item	Power Factor (by Input Voltage)
Object	――――――――――

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%
75	0.557	0.613
85	0.537	0.591
100	0.510	0.564
120	0.483	0.534
200	0.411	0.456
230	0.394	0.437
264	0.378	0.417
280	0.371	0.410
--	-	-

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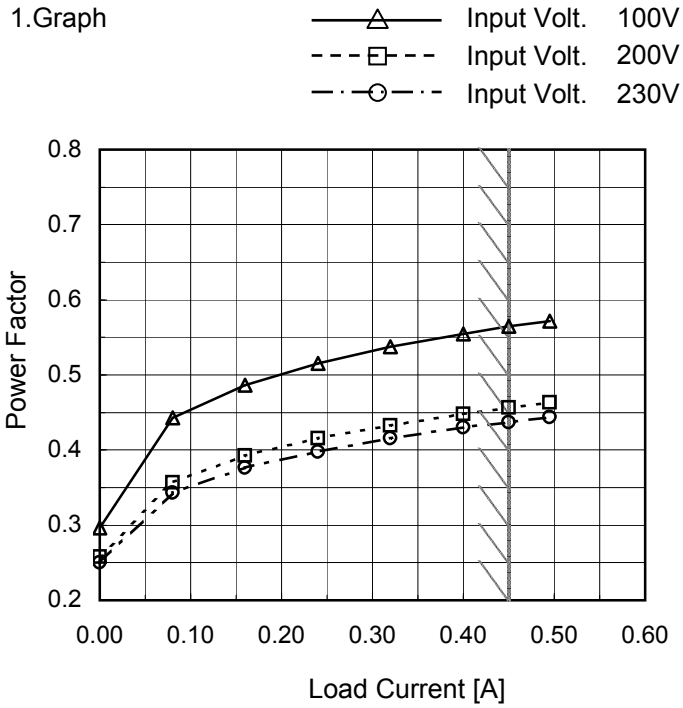
Model	TUHS10F24
Item	Power Factor (by Load Current)
Object	————————

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. 200[V]	Input Volt. 230[V]
0.00	0.297	0.258	0.250
0.08	0.443	0.357	0.343
0.16	0.486	0.393	0.376
0.24	0.515	0.416	0.398
0.32	0.537	0.433	0.415
0.40	0.555	0.448	0.430
0.45	0.564	0.456	0.437
0.50	0.572	0.463	0.443
--	-	-	-
--	-	-	-
--	-	-	-

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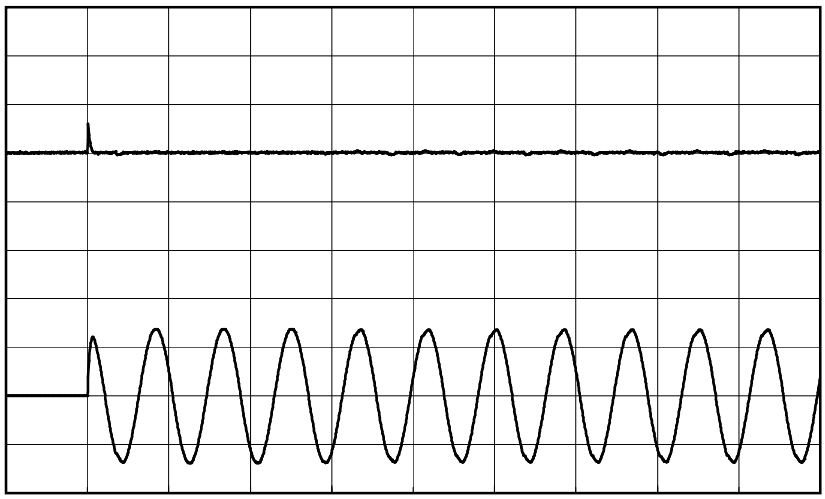
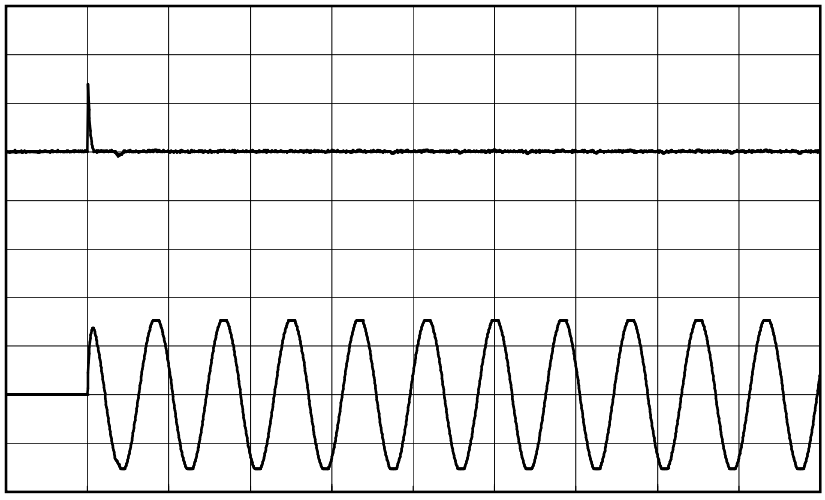
Model	TUHS10F24
Item	Inrush Current
Object	————————

Temperature 25°C
Testing Circuitry Figure A



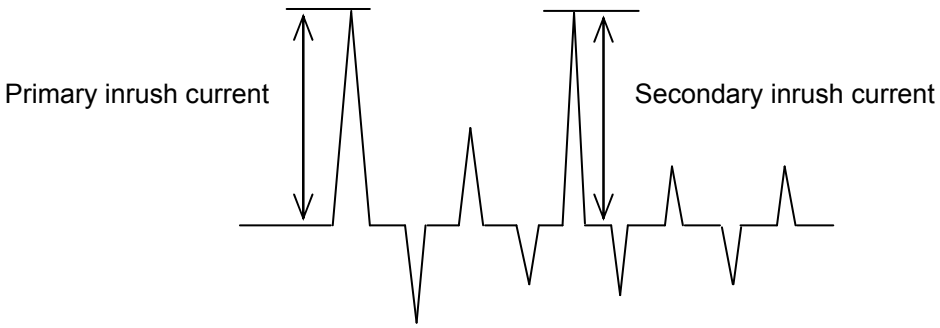
Input Voltage 100 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
11.8 A
Secondary inrush current :
1.1 A



Input Voltage 230 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
27.7 A
Secondary inrush current :
0.9 A



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Model	TUHS10F24	
Item	Leakage Current	Temperature 25°C Testing Circuitry Figure B
Object	――――――――――	

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	200 [V]	230 [V]	
DEN-AN	Both phases	0.005	0.008	0.008	Operation
	One of phases	0.004	0.010	0.011	Stand by
IEC60950-1	Both phases	0.003	0.006	0.007	Operation
	One of phases	0.004	0.009	0.010	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.
There is no FG in TUHS series and it is a reinforced insulation power supply of the class 2.

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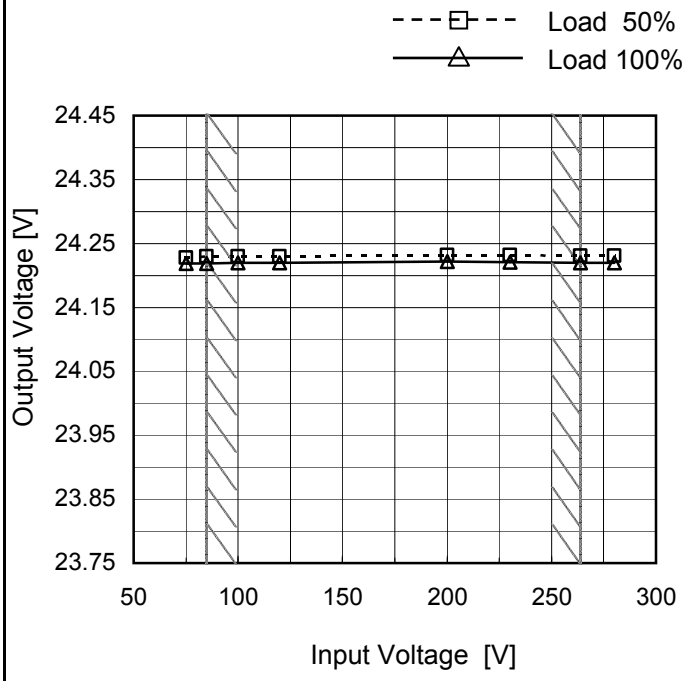
Model	TUHS10F24
Item	Line Regulation
Object	+24V0.45A

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%
75	24.228	24.219
85	24.229	24.219
100	24.230	24.219
120	24.230	24.219
200	24.232	24.221
230	24.231	24.221
264	24.231	24.220
280	24.230	24.220
--	-	-

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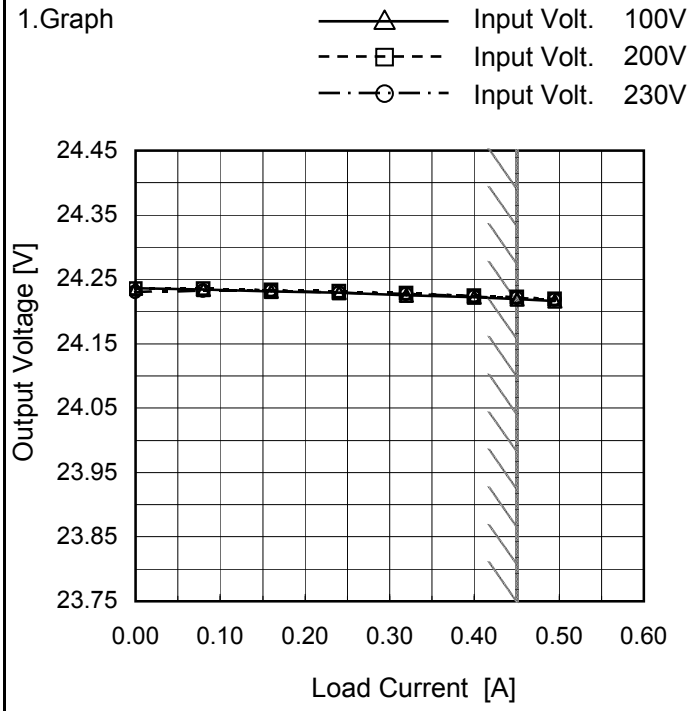
Model	TUHS10F24
Item	Load Regulation
Object	+24V0.45A

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. 200[V]	Input Volt. 230[V]
0.00	24.236	24.235	24.230
0.08	24.234	24.235	24.232
0.16	24.231	24.234	24.232
0.24	24.229	24.231	24.230
0.32	24.226	24.228	24.227
0.40	24.222	24.225	24.224
0.45	24.219	24.222	24.221
0.50	24.216	24.219	24.219
--	-	-	-
--	-	-	-
--	-	-	-

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Model	TUHS10F24		
Item	Dynamic Load Response	Temperature Testing Circuitry	25℃ Figure A
Object	+24V 0.45A		

Input Volt. 230V
Cycle 500ms

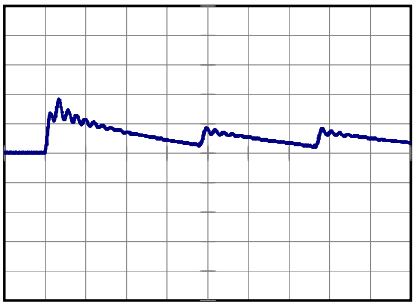
Load Current

0.45A / 100us

Min.Load (0A)←→
Load 100%(0.45A)

500 mV/div

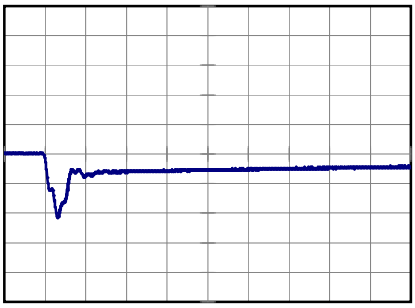
200 us/div



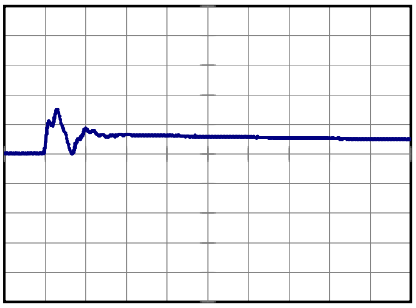
200 us/div

Load 20% (0.09A)←→
Load 100%(0.45A)

500 mV/div



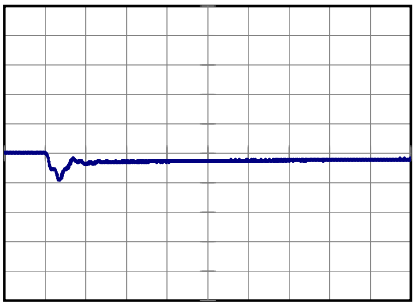
200 us/div



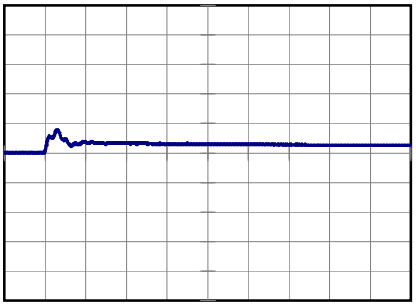
200 us/div

Load 50% (0.225A)←→
Load 100% (0.45A)

500 mV/div



200 us/div



200 us/div

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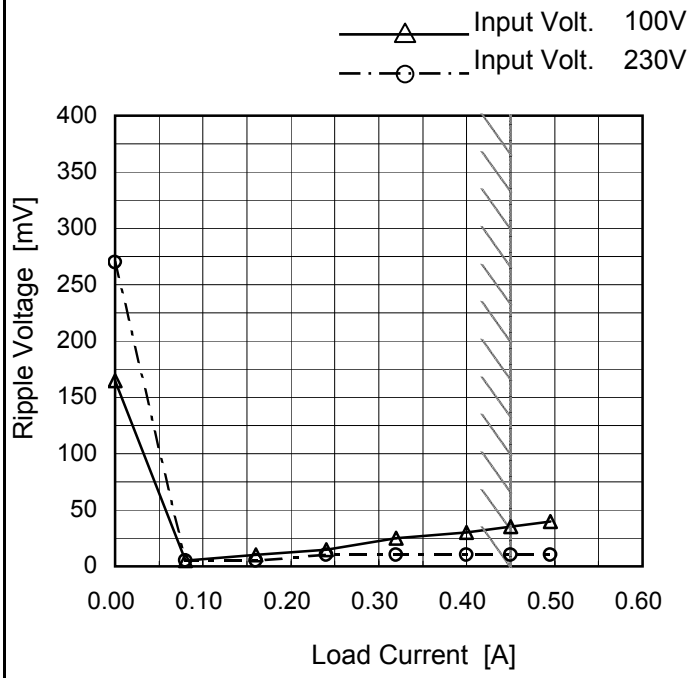
Model	TUHS10F24
Item	Ripple Voltage (by Load Current)
Object	+24V0.45A

Temperature 25°C
Testing Circuitry Figure C

1.Graph



Measured by 100 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

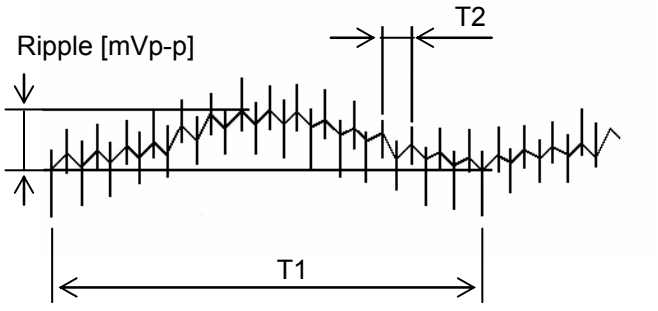


Fig. Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0	165	270
0.08	5	5
0.16	10	5
0.24	15	10
0.32	25	10
0.40	30	10
0.45	35	10
0.50	40	10
--	-	-
--	-	-
--	-	-

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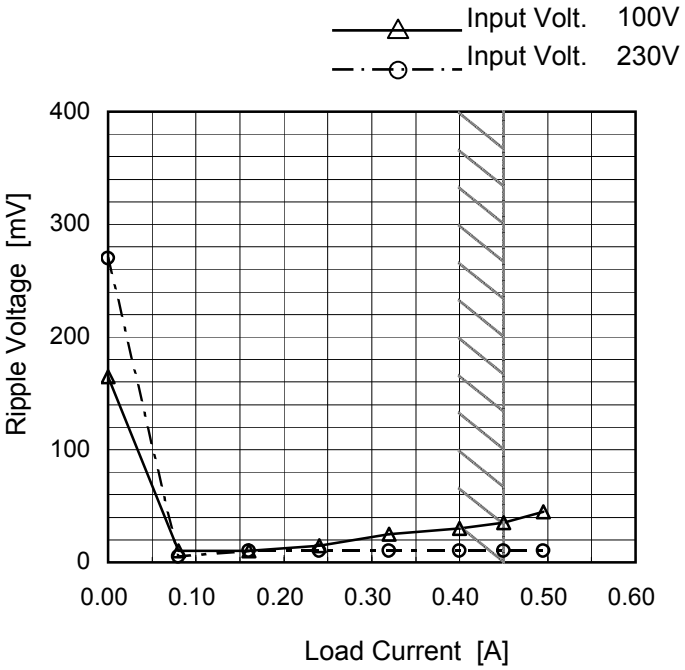
Model	TUHS10F24
Item	Ripple-Noise
Object	+24V0.45A

Temperature 25°C
Testing Circuitry Figure C

1.Graph



Measured by 100 MHz Oscilloscope.
Ripple-Noise is shown as p-p in the figure below.
Note: Slanted line shows the range of the rated load current.

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

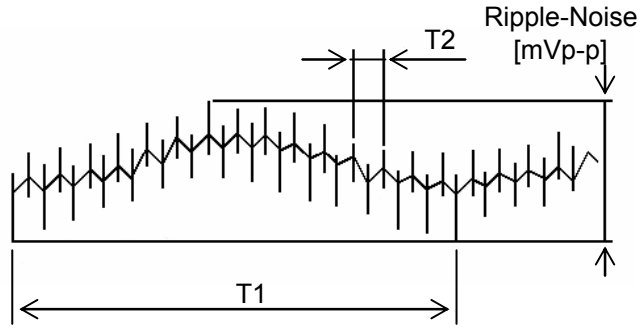


Fig. Complex Ripple Wave Form

2.Values

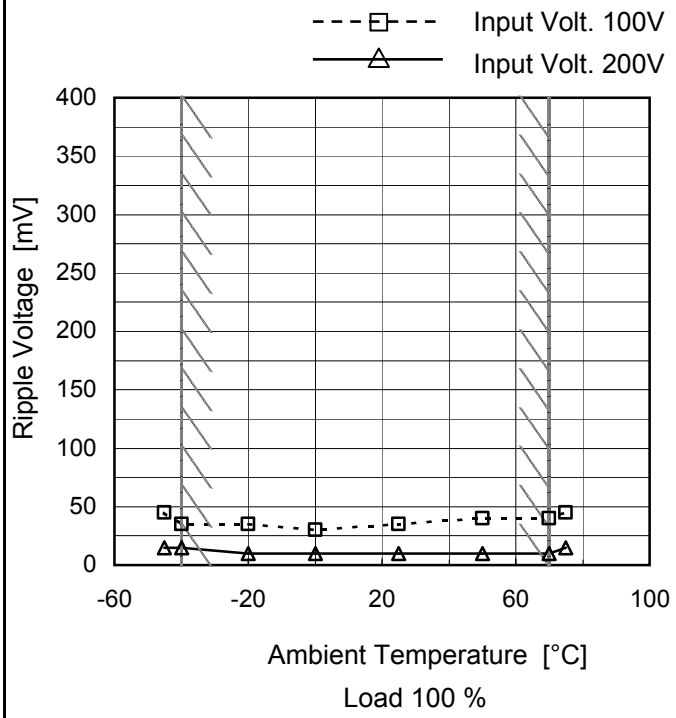
Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0	165	270
0.08	10	5
0.16	10	10
0.24	15	10
0.32	25	10
0.40	30	10
0.45	35	10
0.50	45	10
--	-	-
--	-	-
--	-	-

COSEL

Model	TUHS10F24
Item	Ripple Voltage (by Ambient Temp.)
Object	+24V0.45A

Testing Circuitry Figure C

1.Graph



Load 100 %

Measured by 100 MHz Oscilloscope.
Note: Slanted line shows the range of the rated ambient temperature.

2.Values

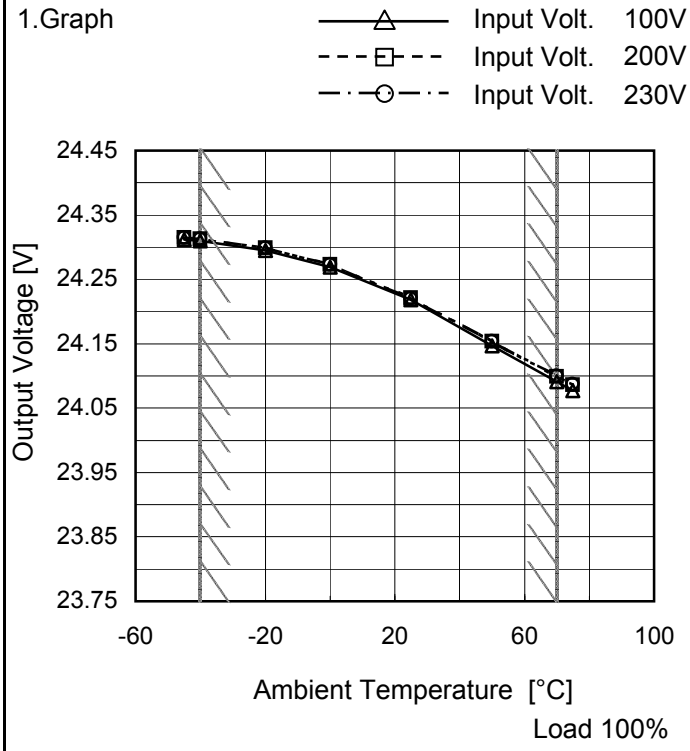
Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100V	Input Volt. 230V
-45	45	15
-40	35	15
-20	35	10
0	30	10
25	35	10
50	40	10
70	40	10
75	45	15
--	-	-
--	-	-
--	-	-

COSEL

Model	TUHS10F24
Item	Ambient Temperature Drift
Object	+24V0.45A

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. 200[V]	Input Volt. 230[V]
-45	24.311	24.315	24.315
-40	24.310	24.313	24.313
-20	24.295	24.298	24.299
0	24.269	24.273	24.273
25	24.219	24.222	24.221
50	24.147	24.153	24.154
70	24.091	24.099	24.100
75	24.077	24.086	24.087
--	-	-	-
--	-	-	-
--	-	-	-

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COSEL

Model	TUHS10F24	
Item	Output Voltage Accuracy	Testing Circuitry Figure A
Object	+24V0.45A	

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 : -40 - 70°C
Input Voltage : 85 - 264V
Load Current : 0 - 0.45A

* 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	-40	264	0	24.321	±115	±0.5
Minimum Voltage	70	85	0.45	24.091		

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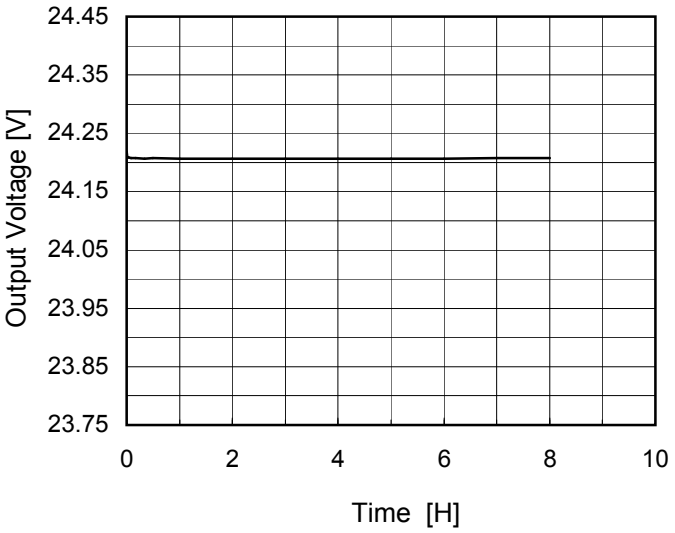
Model	TUHS10F24
Item	Time Lapse Drift
Object	+24V0.45A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



Input Volt. 100V
Load 100%

* The characteristic of AC230V is equal.

2.Values

Time since start [H]	Output Voltage [V]
0.0	24.219
0.5	24.207
1.0	24.207
2.0	24.207
3.0	24.206
4.0	24.206
5.0	24.206
6.0	24.207
7.0	24.207
8.0	24.207

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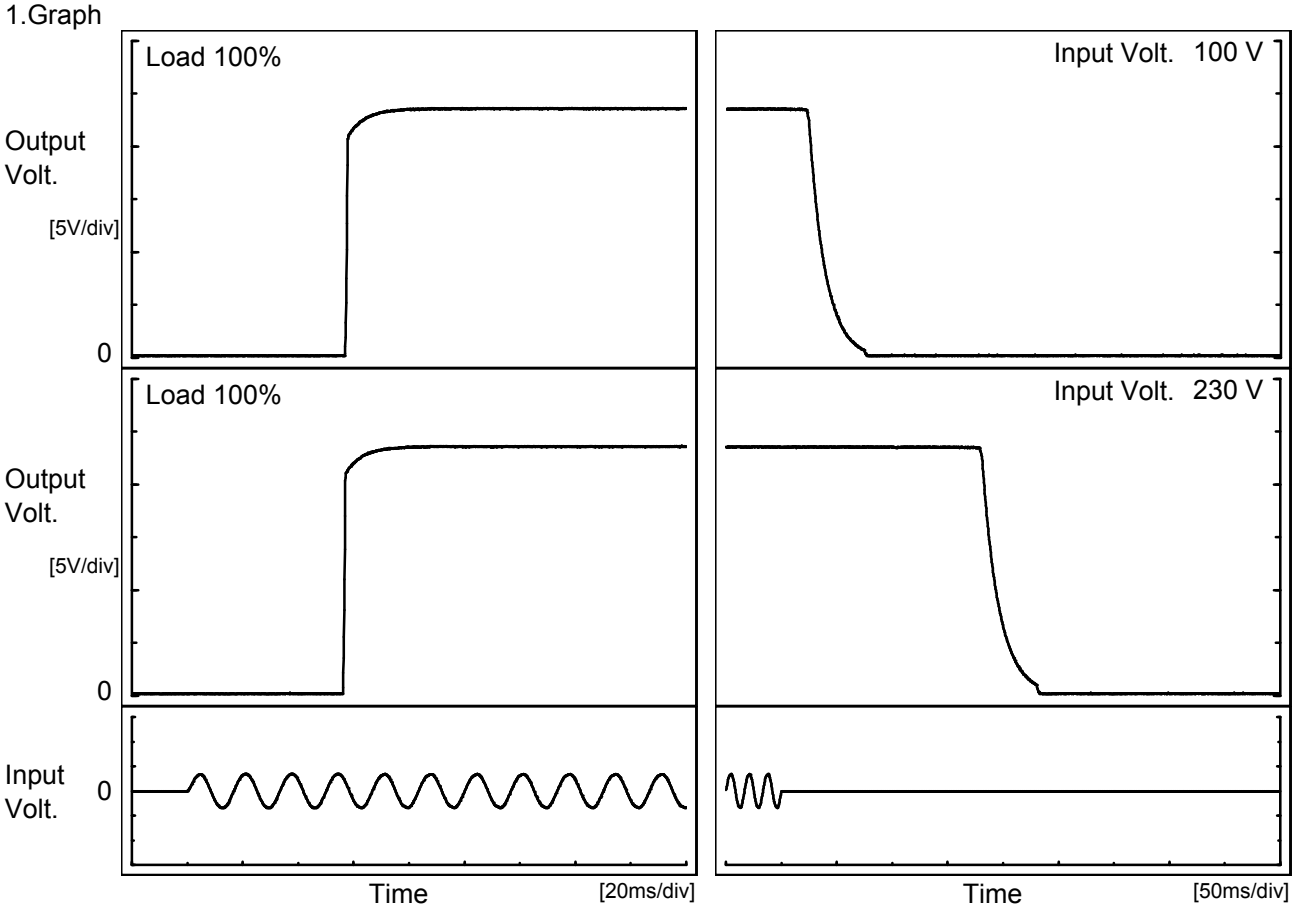
Model	TUHS10F24	
Item	Rise and Fall Time	Temperature 25°C Testing Circuitry Figure A
Object	+24V0.45A	

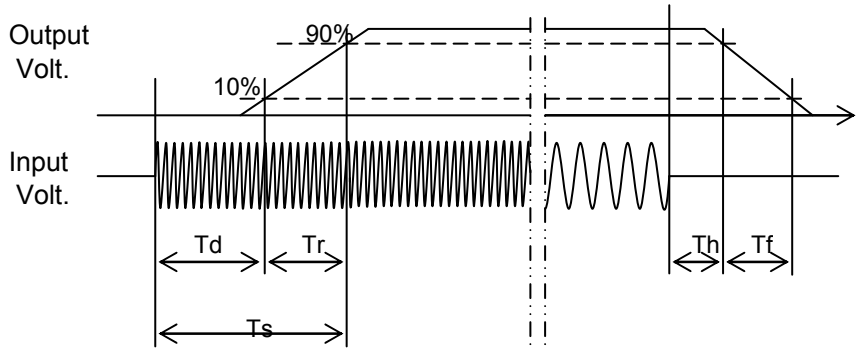
1.Graph



2.Values

[ms]

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	57.2	3.1	60.3	22.8	30.8
230 V	56.4	2.7	59.1	182.5	33.0



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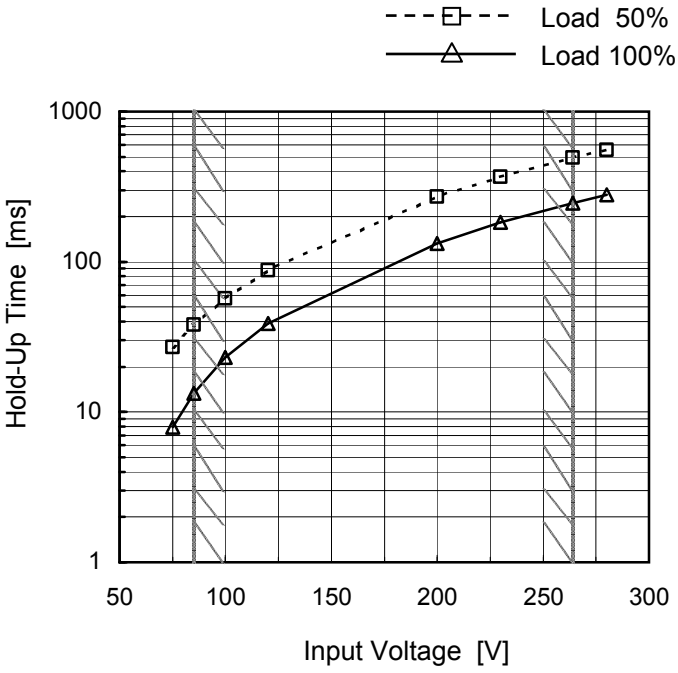
Model	TUHS10F24
Item	Hold-Up Time
Object	+24V0.45A

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%
75	27	8
85	38	13
100	57	23
120	88	39
200	272	133
230	366	183
264	492	245
280	557	280
--	-	-

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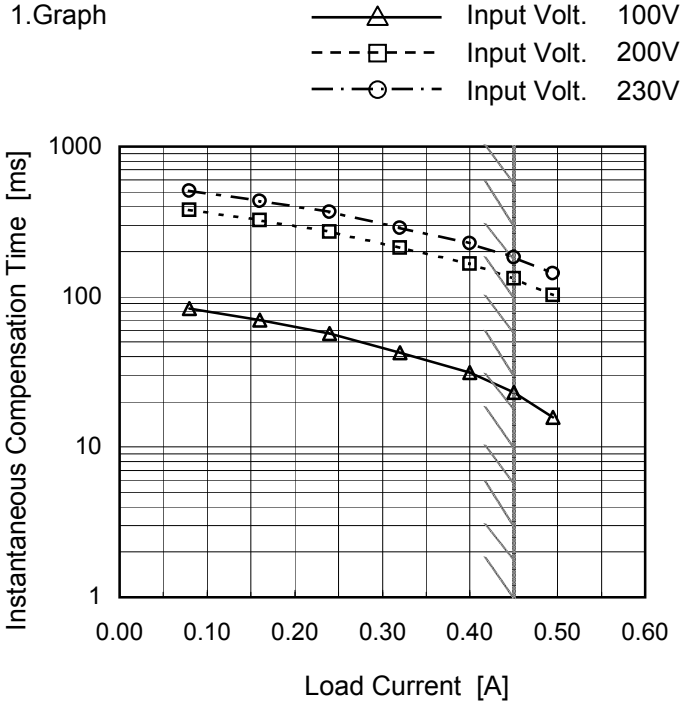
Model	TUHS10F24
Item	Instantaneous Interruption Compensation
Object	+24V0.45A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

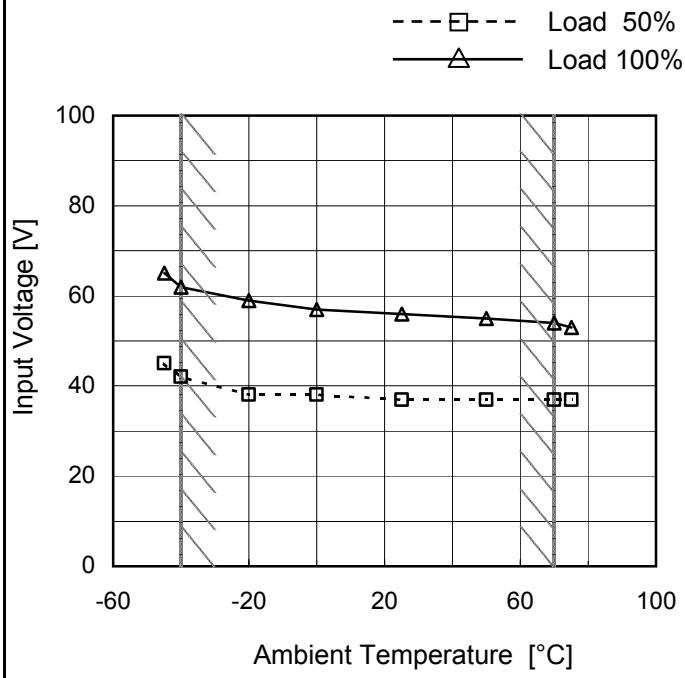
Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	-	-	-
0.08	83	378	506
0.16	70	325	436
0.24	57	272	366
0.32	43	212	288
0.40	31	166	226
0.45	23	133	183
0.50	16	103	143
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	TUHS10F24
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+24V0.45A

Testing Circuitry Figure A

1.Graph



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

2.Values

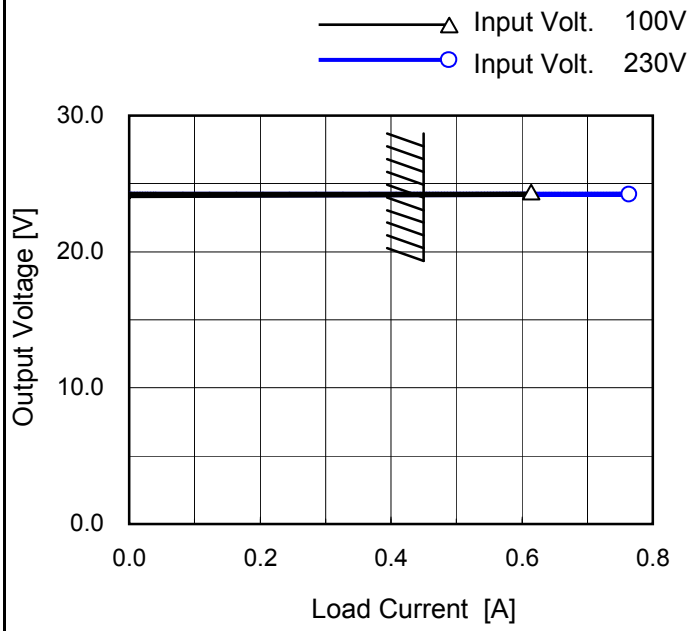
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-45	45	65
-40	42	62
-20	38	59
0	38	57
25	37	56
50	37	55
70	37	54
75	37	53
--	-	-
--	-	-
--	-	-

COSEL

Model	TUHS10F24
Item	Overcurrent Protection
Object	+24V0.45A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

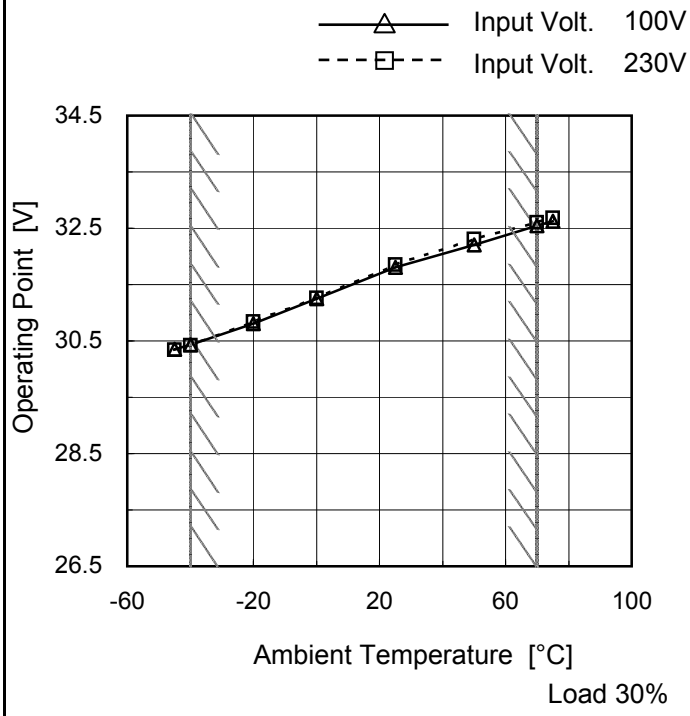
Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 230[V]
24.0	0.62	0.76
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	TUHS10F24
Item	Overvoltage Protection
Object	+24V0.45A

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. 100[V]	Input Volt. 230[V]
-45	30.35	30.34
-40	30.43	30.42
-20	30.81	30.84
0	31.25	31.26
25	31.81	31.85
50	32.21	32.31
70	32.55	32.61
75	32.63	32.68
--	-	-
--	-	-
--	-	-

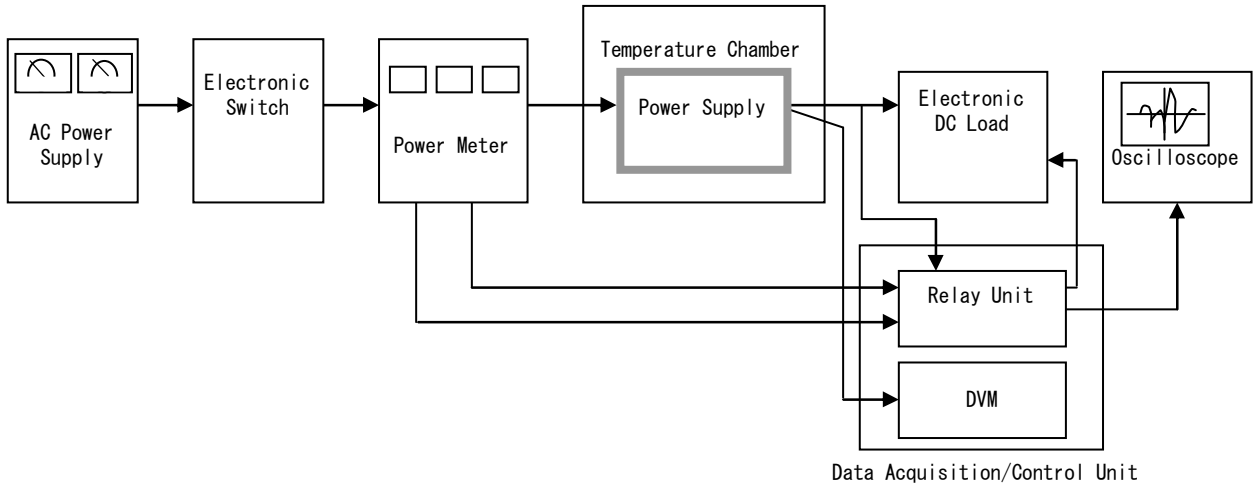


Figure A

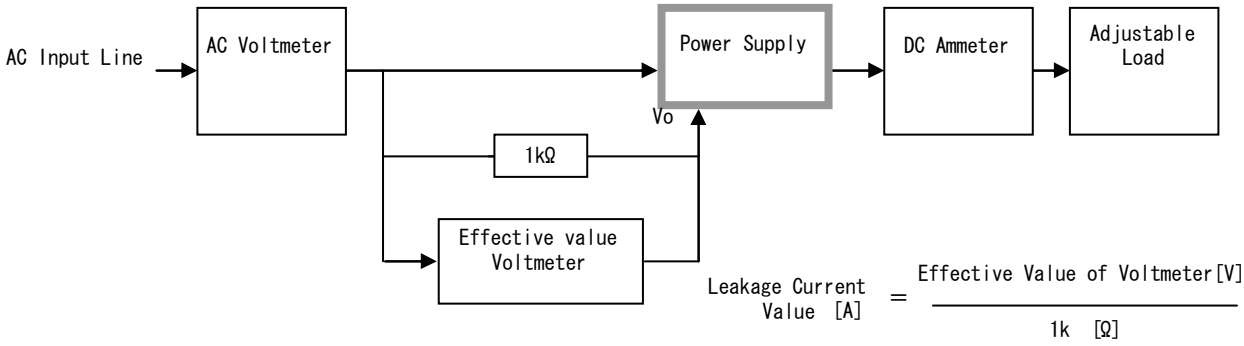


Figure B (DEN-AN)

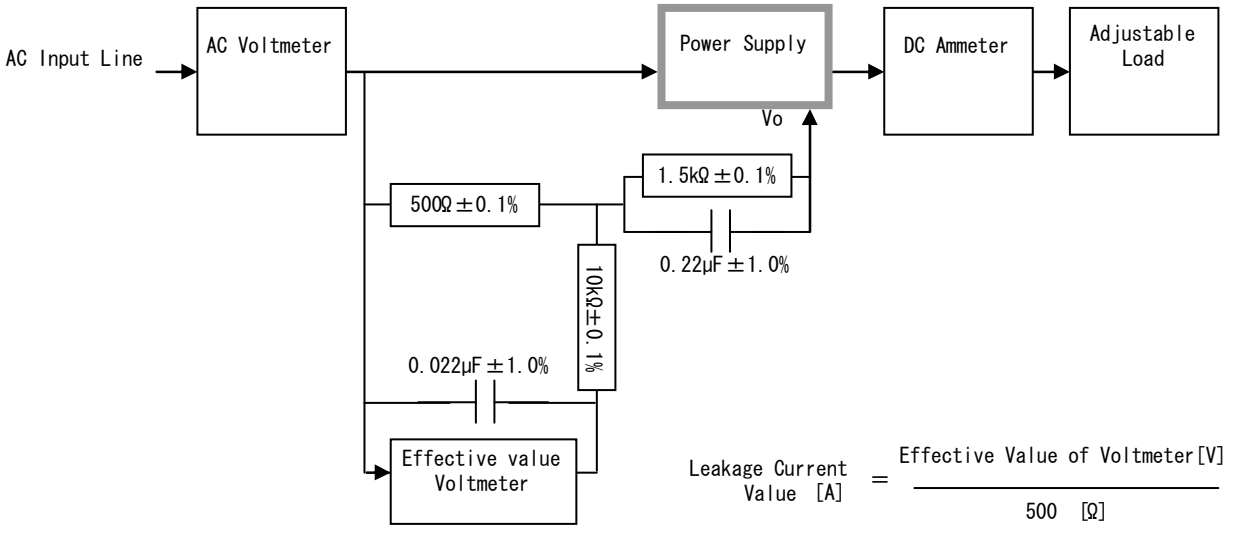
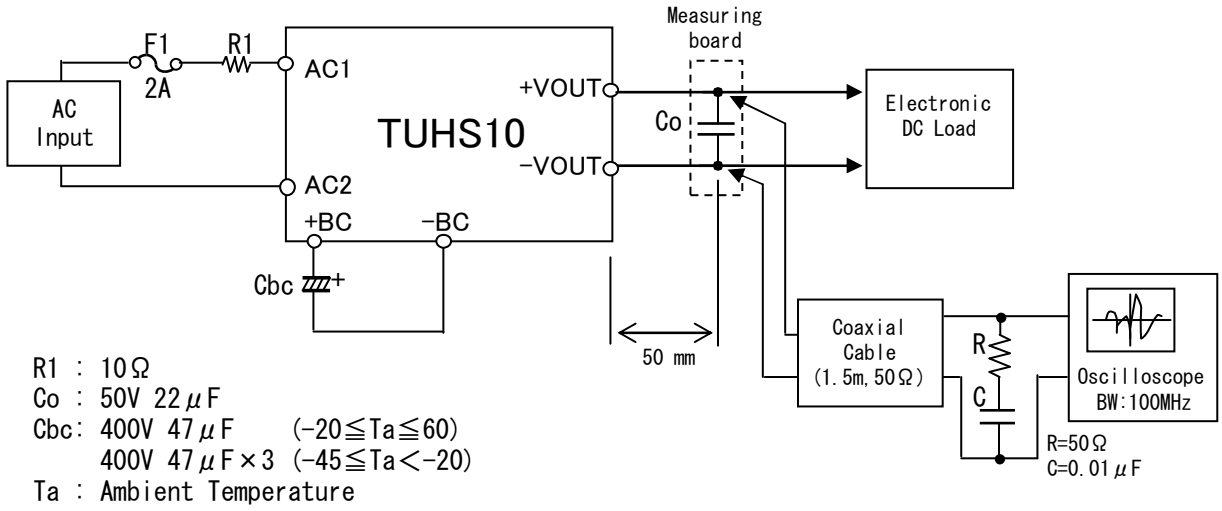


Figure B (IEC60950-1)



R1 : 10Ω
Co : 50V 22μF
Cbc: 400V 47μF (-20≦Ta≦60)
400V 47μF×3 (-45≦Ta<-20)
Ta : Ambient Temperature

Figure C