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参考資料

TEST DATA OF TUHS25F12

Regulated DC Power Supply
February 28, 2014

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Sakae Minamide Design Engineer

COSEL CO.,LTD.

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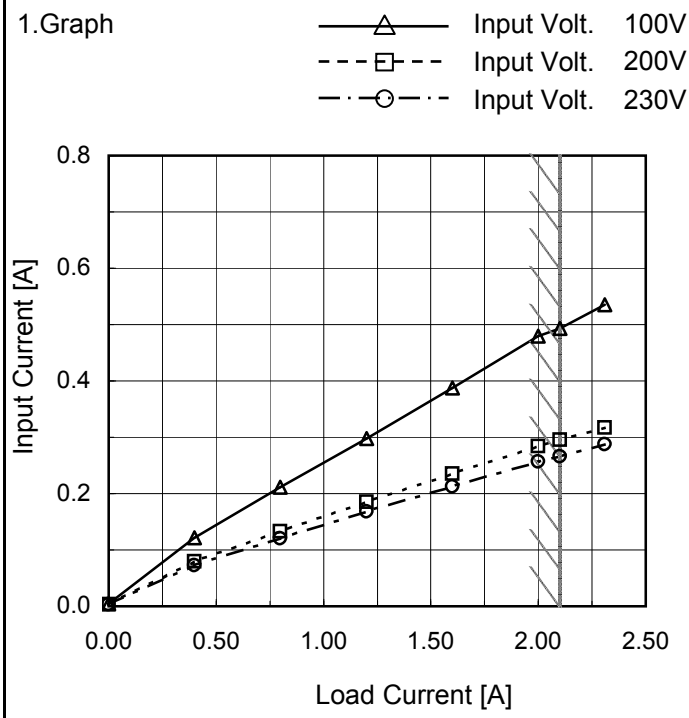
Model	TUHS25F12
Item	Input Current (by Load Current)
Object	————————

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	0.004	0.003	0.003
0.40	0.122	0.080	0.073
0.80	0.211	0.133	0.120
1.20	0.298	0.185	0.168
1.60	0.388	0.235	0.212
2.00	0.479	0.284	0.257
2.10	0.493	0.295	0.266
2.31	0.535	0.317	0.288
--	-	-	-
--	-	-	-
--	-	-	-

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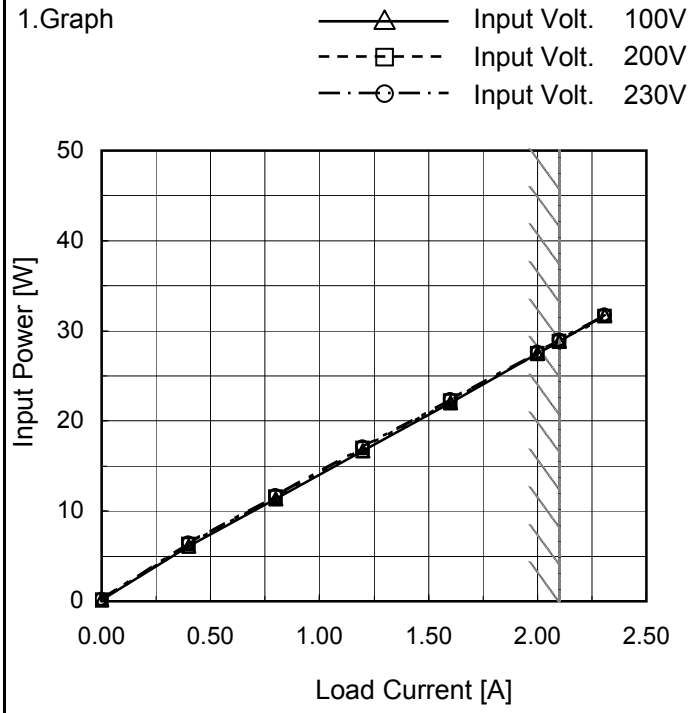
Model	TUHS25F12
Item	Input Power (by Load Current)
Object	————————

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	0.13	0.17	0.19
0.40	6.12	6.34	6.44
0.80	11.36	11.61	11.70
1.20	16.67	16.98	17.10
1.60	22.05	22.23	22.34
2.00	27.49	27.51	27.64
2.10	28.86	28.85	28.96
2.31	31.75	31.64	31.76
--	-	-	-
--	-	-	-
--	-	-	-

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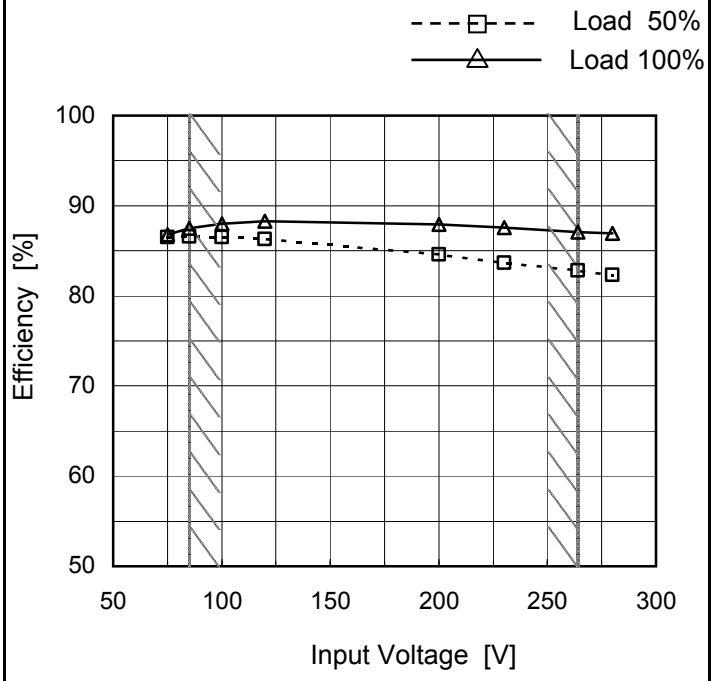
Model	TUHS25F12
Item	Efficiency (by Input Voltage)
Object	――――――――――

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	86.5	86.8
85	86.6	87.5
100	86.5	88.0
120	86.3	88.3
200	84.6	87.9
230	83.7	87.6
264	82.8	87.1
280	82.3	86.9
--	-	-

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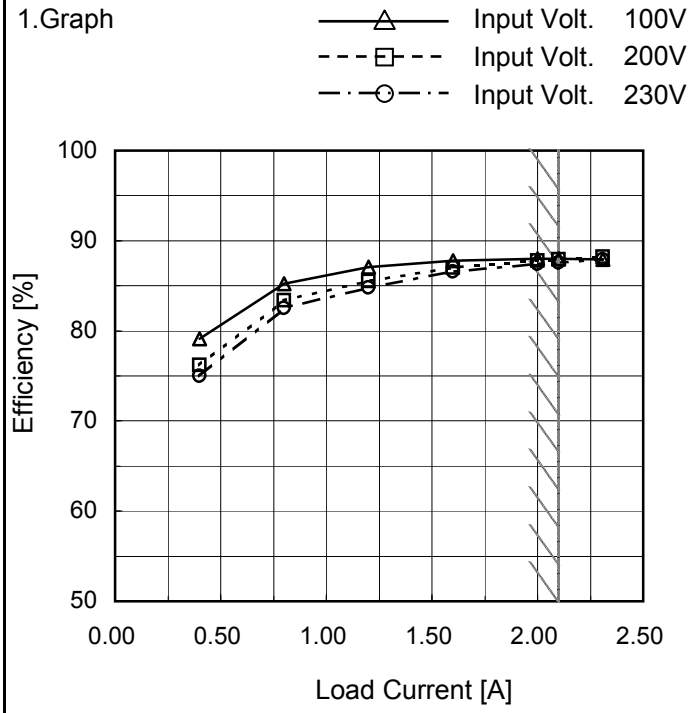
Model	TUHS25F12
Item	Efficiency (by Load Current)
Object	————————

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	-	-	-
0.40	79.1	76.2	75.0
0.80	85.2	83.4	82.5
1.20	87.1	85.5	84.8
1.60	87.8	87.0	86.6
2.00	88.0	87.8	87.4
2.10	88.0	87.9	87.6
2.31	87.9	88.2	87.9
--	-	-	-
--	-	-	-
--	-	-	-

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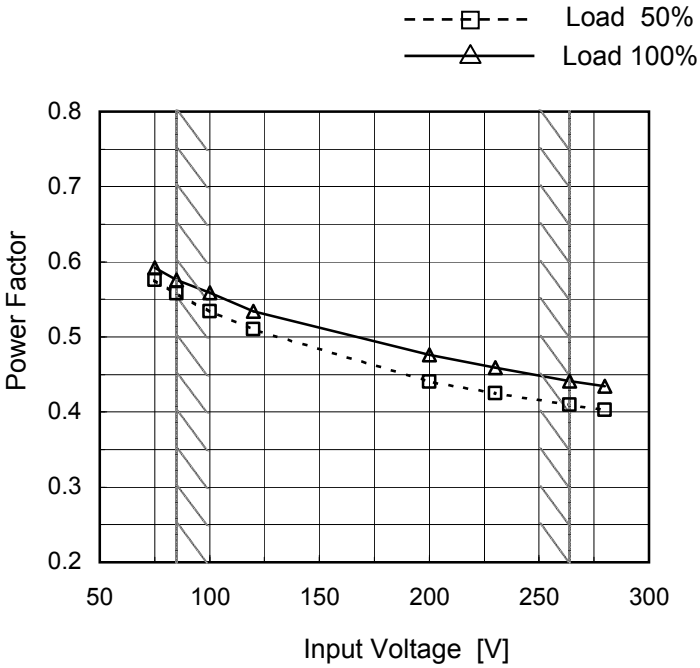
Model	TUHS25F12
Item	Power Factor (by Input Voltage)
Object	――――――――――

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	0.576	0.592
85	0.558	0.576
100	0.534	0.559
120	0.510	0.534
200	0.440	0.476
230	0.425	0.459
264	0.409	0.441
280	0.403	0.435
--	-	-

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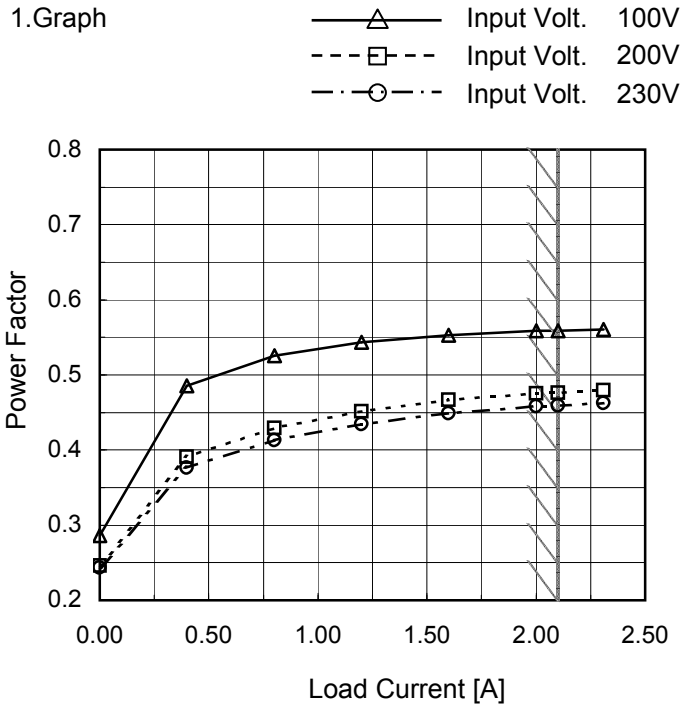
Model	TUHS25F12
Item	Power Factor (by Load Current)
Object	————————

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	0.286	0.246	0.243
0.40	0.486	0.391	0.377
0.80	0.526	0.429	0.413
1.20	0.544	0.452	0.435
1.60	0.553	0.466	0.449
2.00	0.559	0.475	0.458
2.10	0.559	0.476	0.459
2.31	0.560	0.480	0.463
--	-	-	-
--	-	-	-
--	-	-	-

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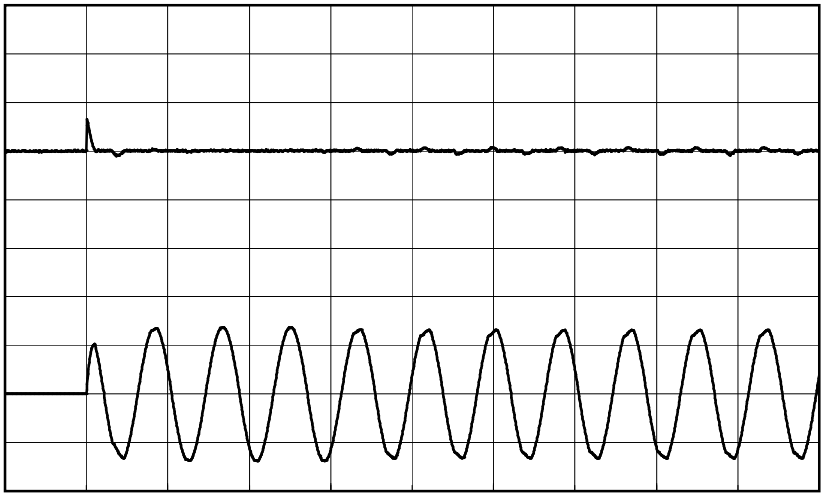
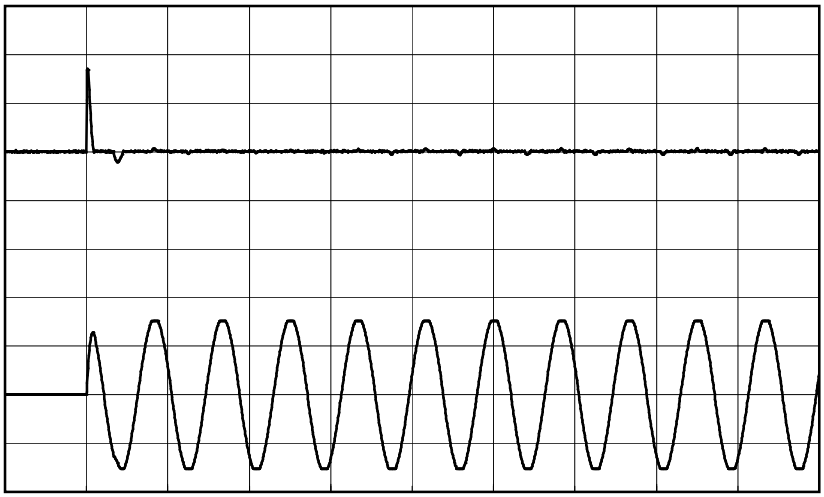
Model	TUHS25F12
Item	Inrush Current
Object	————————

Temperature 25°C
Testing Circuitry Figure A



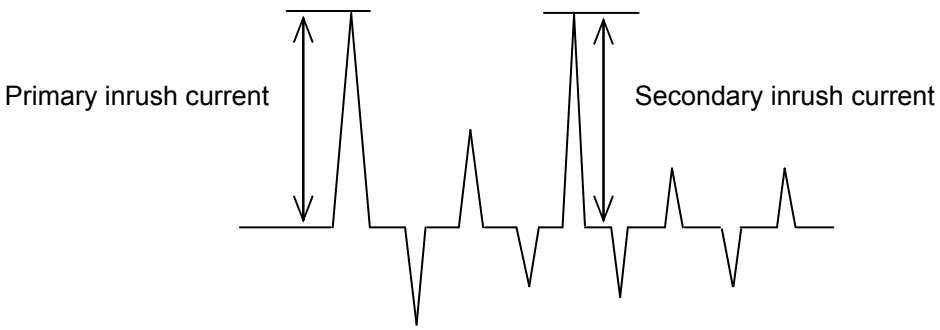
Input Voltage 100 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
13.1 A
Secondary inrush current :
1.9 A



Input Voltage 230 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
34.0 A
Secondary inrush current :
1.7 A



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Model	TUHS25F12	
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	0.008	0.009	0.010	Operation
	One of phases	0.008	0.017	0.020	Stand by
IEC60950-1	Both phases	0.006	0.011	0.014	Operation
	One of phases	0.008	0.016	0.020	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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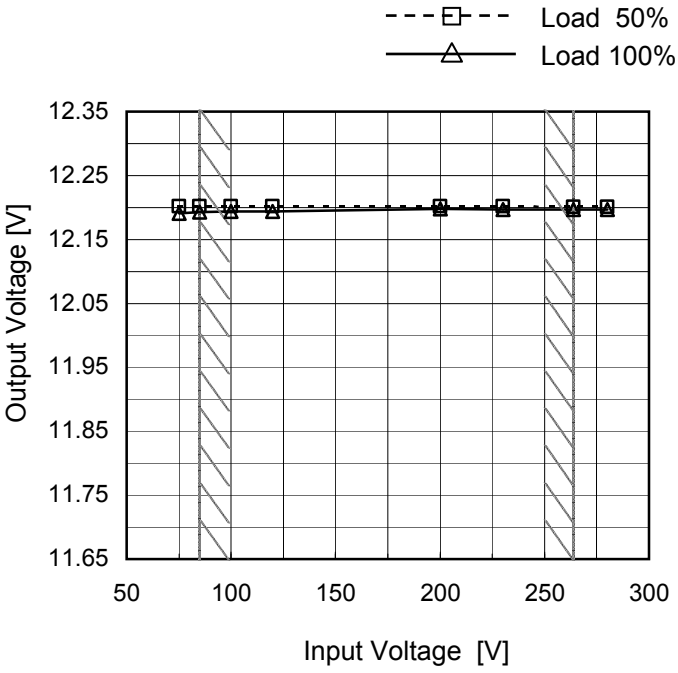
Model	TUHS25F12
Item	Line Regulation
Object	+12V2.1A

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	12.202	12.190
85	12.202	12.192
100	12.202	12.194
120	12.202	12.194
200	12.202	12.197
230	12.201	12.197
264	12.201	12.197
280	12.201	12.197
--	-	-

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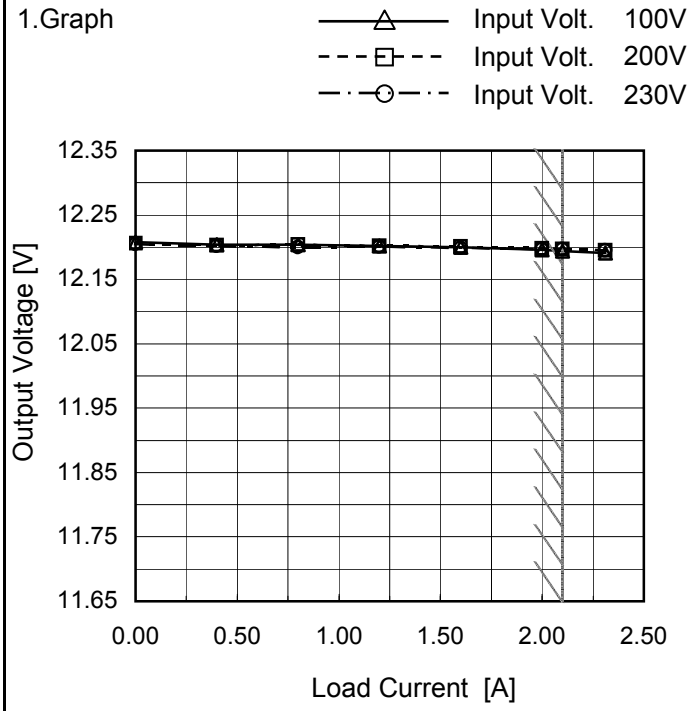
Model	TUHS25F12
Item	Load Regulation
Object	+12V2.1A

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	12.208	12.206	12.205
0.40	12.204	12.203	12.202
0.80	12.204	12.203	12.200
1.20	12.202	12.202	12.201
1.60	12.200	12.201	12.199
2.00	12.196	12.198	12.197
2.10	12.194	12.197	12.197
2.31	12.191	12.195	12.195
--	-	-	-
--	-	-	-
--	-	-	-

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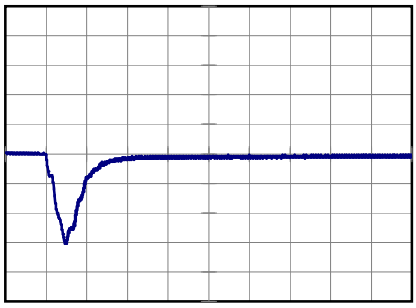
Model	TUHS25F12		
Item	Dynamic Load Response	Temperature Testing Circuitry	25℃ Figure A
Object	+12V 2.1A		

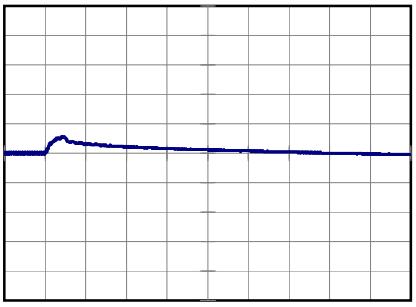
Input Volt. 230V
Cycle 500ms

Load Current

2.1A / 100us

Min.Load (0A)←→
Load 100%(2.1A)



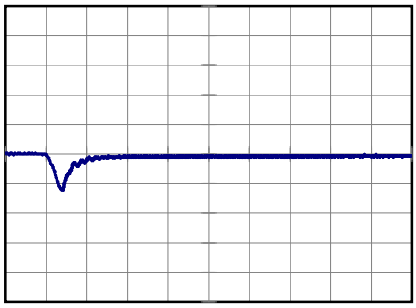


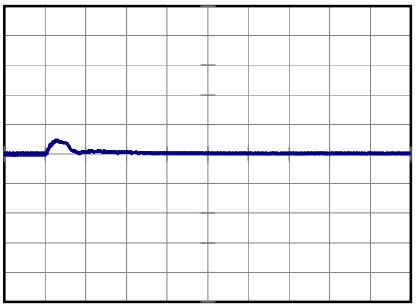
1 V/div

200 us/div

200 us/div

Load 20% (0.42A)←→
Load 100%(2.1A)



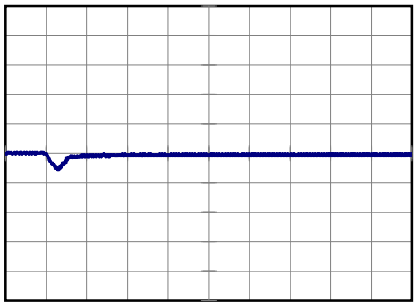


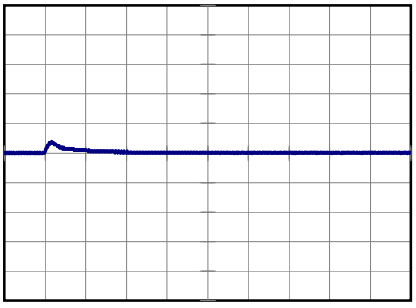
1 V/div

200 us/div

200 us/div

Load 50% (1.05A)←→
Load 100% (2.1A)





1 V/div

200 us/div

200 us/div

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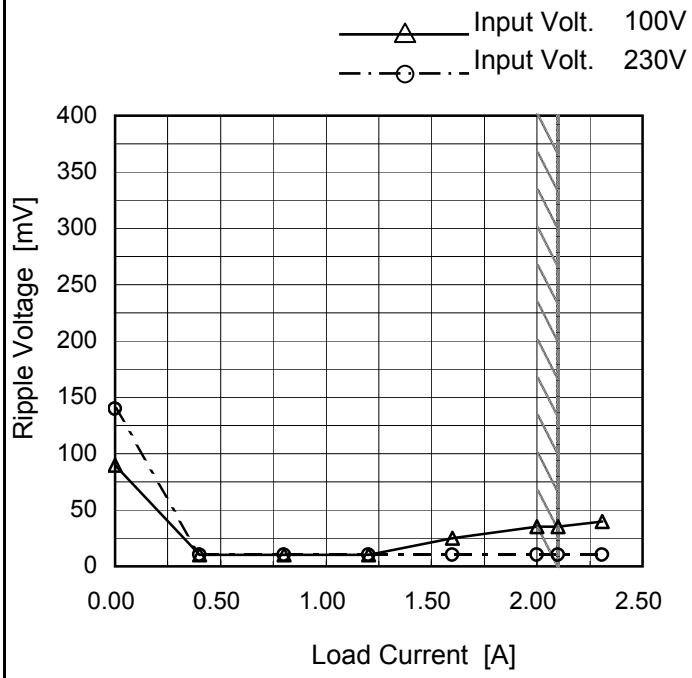
Model	TUHS25F12
Item	Ripple Voltage (by Load Current)
Object	+12V2.1A

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

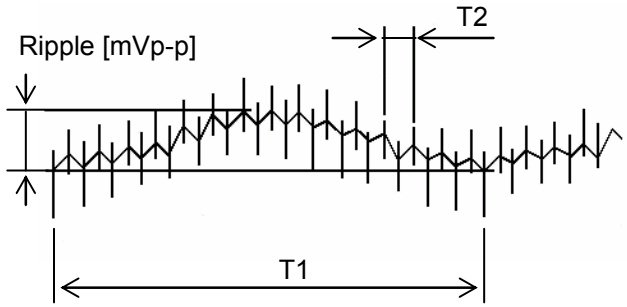


Fig. Complex Ripple Wave Form

2.Values

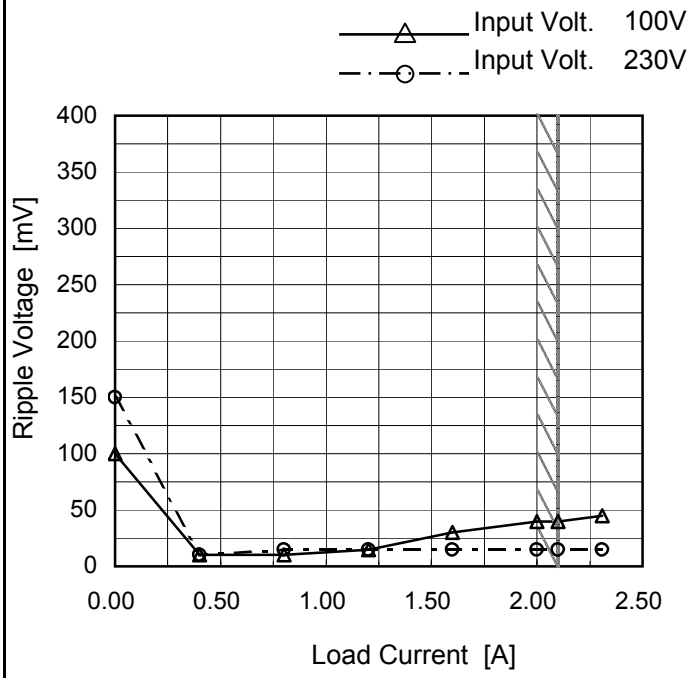
Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0.00	90	140
0.40	10	10
0.80	10	10
1.20	10	10
1.60	25	10
2.00	35	10
2.10	35	10
2.31	40	10
--	-	-
--	-	-
--	-	-

COSEL

Model	TUHS25F12
Item	Ripple-Noise
Object	+12V2.1A

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

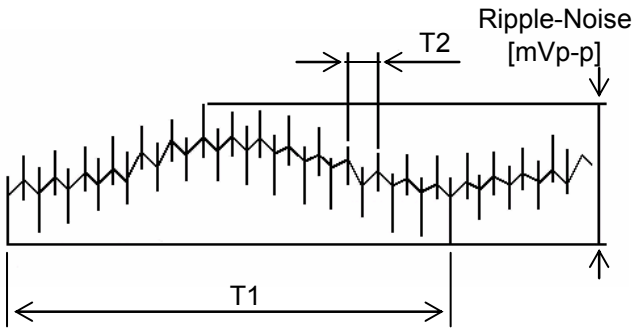


Fig. Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0.00	100	150
0.40	10	10
0.80	10	15
1.20	15	15
1.60	30	15
2.00	40	15
2.10	40	15
2.31	45	15
--	-	-
--	-	-
--	-	-

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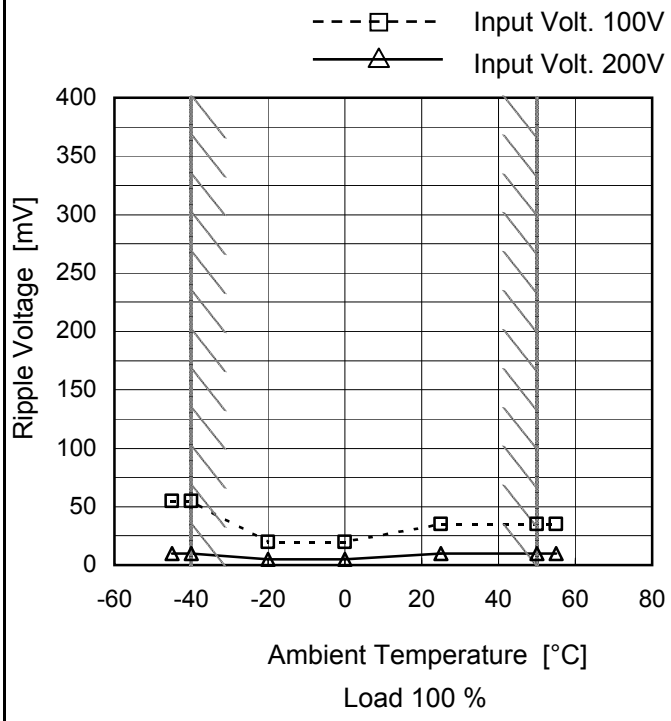
Model	TUHS25F12
Item	Ripple Voltage (by Ambient Temp.)
Object	+12V2.1A

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	55	10
-40	55	10
-20	20	5
0	20	5
25	35	10
50	35	10
55	35	10
--	-	-
--	-	-
--	-	-
--	-	-

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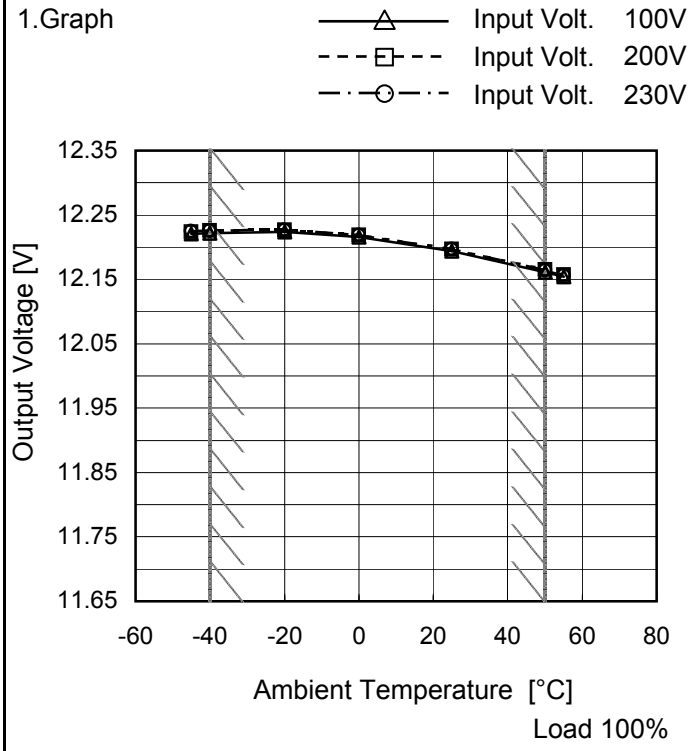
Model	TUHS25F12
Item	Ambient Temperature Drift
Object	+12V2.1A

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	12.220	12.224	12.225
-40	12.222	12.225	12.226
-20	12.224	12.227	12.227
0	12.216	12.219	12.219
25	12.194	12.197	12.197
50	12.161	12.165	12.164
55	12.154	12.157	12.157
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	TUHS25F12	
Item	Output Voltage Accuracy	Testing Circuitry Figure A
Object	+12V2.1A	

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 - 50°C
Input Voltage : 85 - 264V
Load Current : 0 - 2.1A

* 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

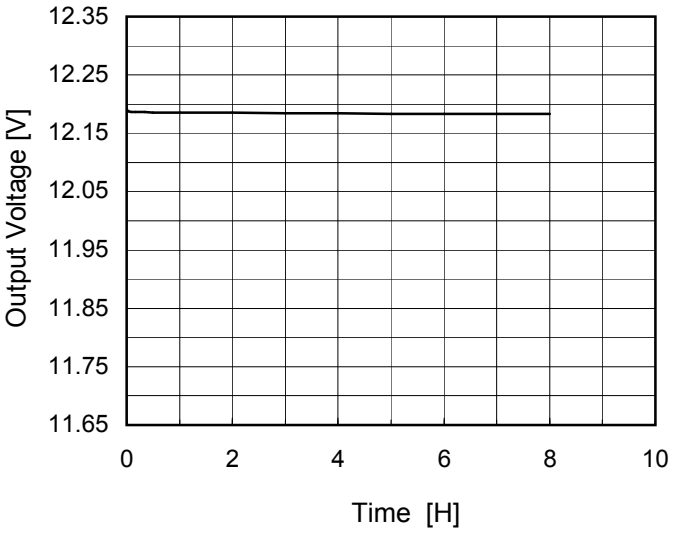
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	-20	85	0	12.235	±37	±0.3
Minimum Voltage	50	85	2.1	12.161		

COSEL

Model	TUHS25F12
Item	Time Lapse Drift
Object	+12V2.1A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



Input Volt. 100V
Load 100%

* The characteristic of AC230V is equal.

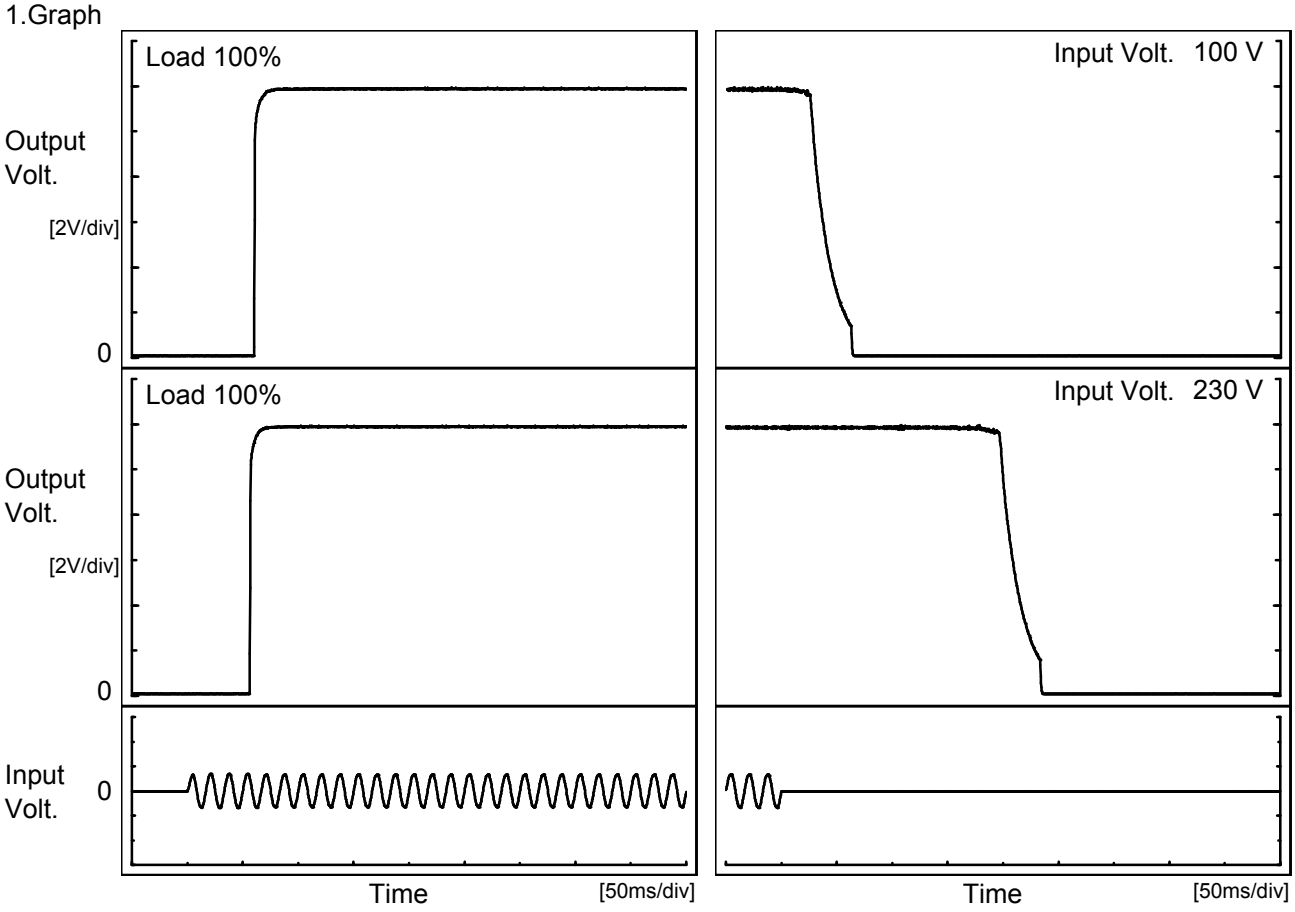
2.Values

Time since start [H]	Output Voltage [V]
0.0	12.194
0.5	12.186
1.0	12.186
2.0	12.185
3.0	12.184
4.0	12.184
5.0	12.184
6.0	12.184
7.0	12.183
8.0	12.183

COSEL

Model	TUHS25F12	
Item	Rise and Fall Time	Temperature 25°C Testing Circuitry Figure A
Object	+12V2.1A	

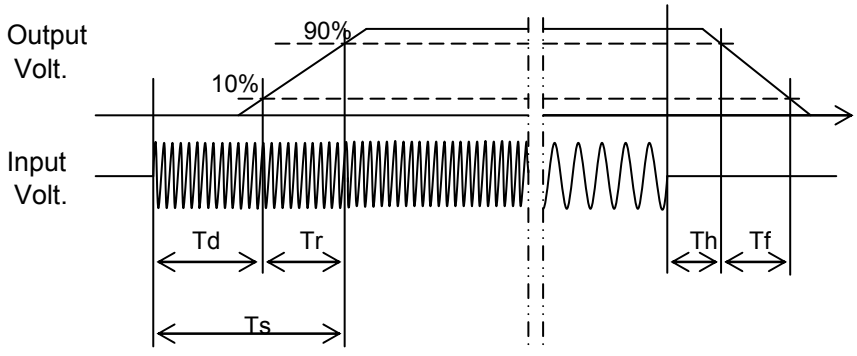
1.Graph



2.Values

[ms]

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	57.3	2.8	60.1	24.8	35.8
230 V	59.0	2.3	61.3	195.0	35.8

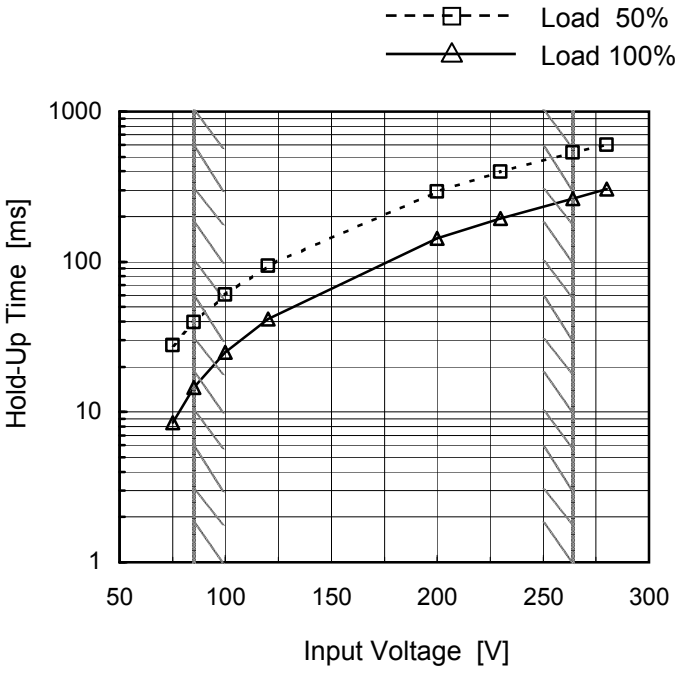


COSEL

Model	TUHS25F12
Item	Hold-Up Time
Object	+12V2.1A

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

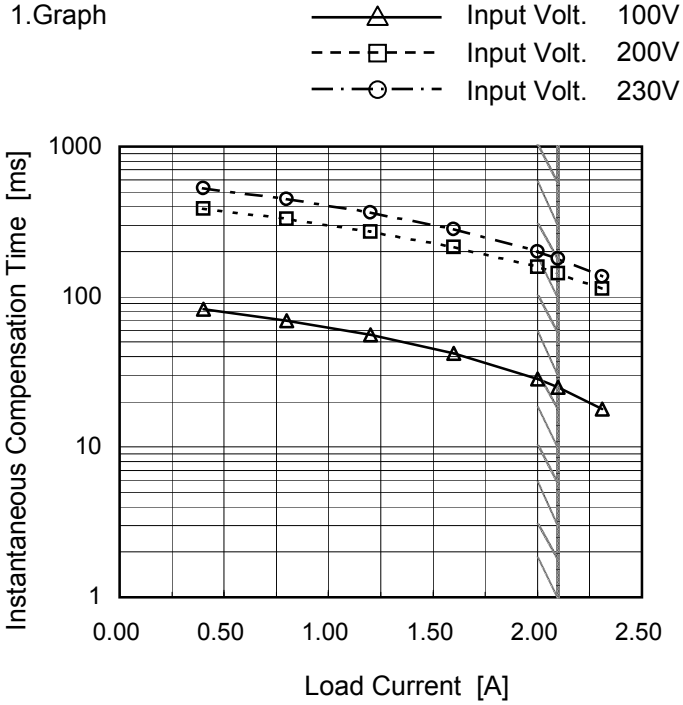
Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
75	28	9
85	40	15
100	61	25
120	94	42
200	294	143
230	397	195
264	533	264
280	603	305
--	-	-

COSEL

Model	TUHS25F12
Item	Instantaneous Interruption Compensation
Object	+12V2.1A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

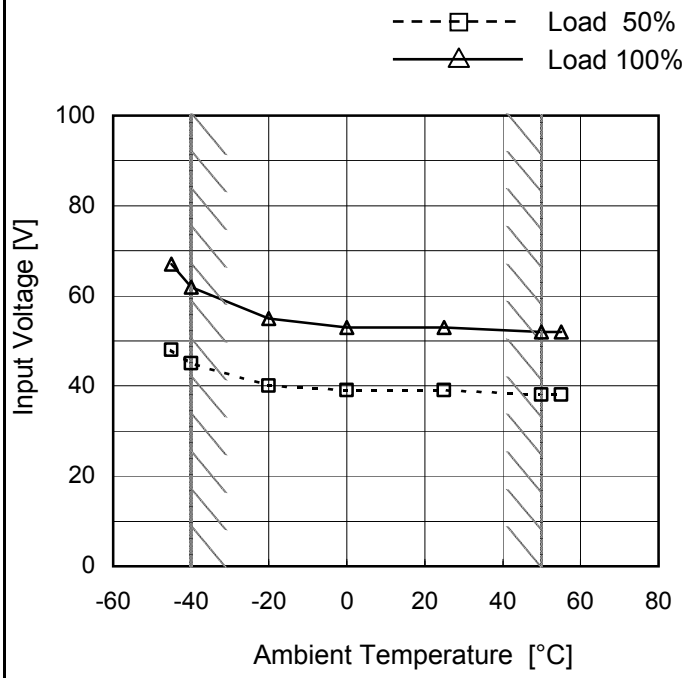
Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	-	-	-
0.40	83	387	530
0.80	69	330	448
1.20	56	272	366
1.60	42	215	283
2.00	28	158	201
2.10	25	143	180
2.31	18	113	137
--	-	-	-
--	-	-	-
--	-	-	-

COSEL

Model	TUHS25F12
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+12V2.1A

Testing Circuitry Figure A

1.Graph



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

2.Values

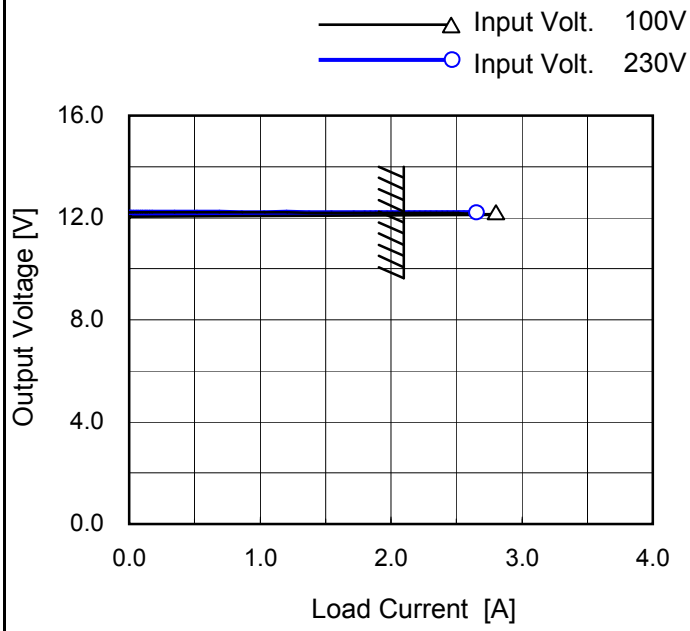
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-45	48	67
-40	45	62
-20	40	55
0	39	53
25	39	53
50	38	52
55	38	52
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	TUHS25F12
Item	Overcurrent Protection
Object	+12V2.1A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

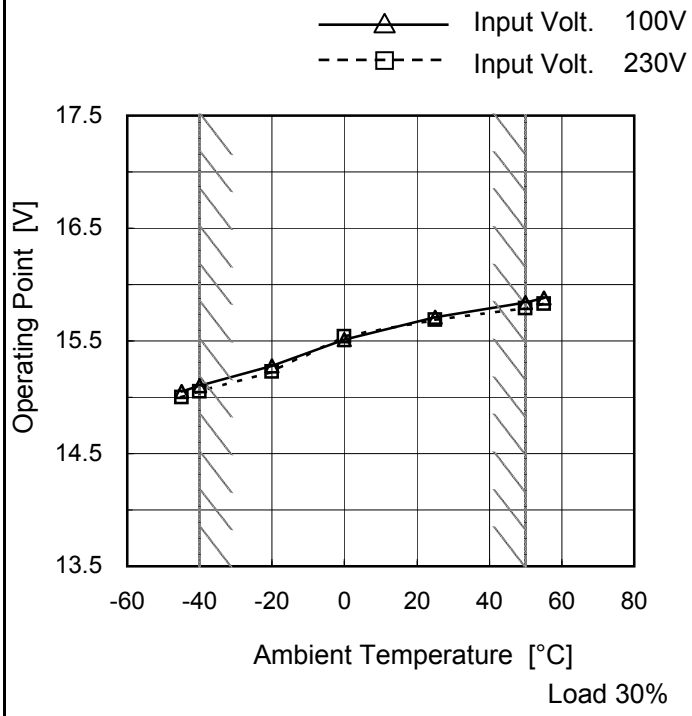
Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 230[V]
12.0	2.84	2.69
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	TUHS25F12
Item	Overvoltage Protection
Object	+12V2.1A

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	15.05	15.00
-40	15.10	15.05
-20	15.28	15.23
0	15.51	15.54
25	15.71	15.69
50	15.84	15.79
55	15.88	15.83
--	-	-
--	-	-
--	-	-
--	-	-

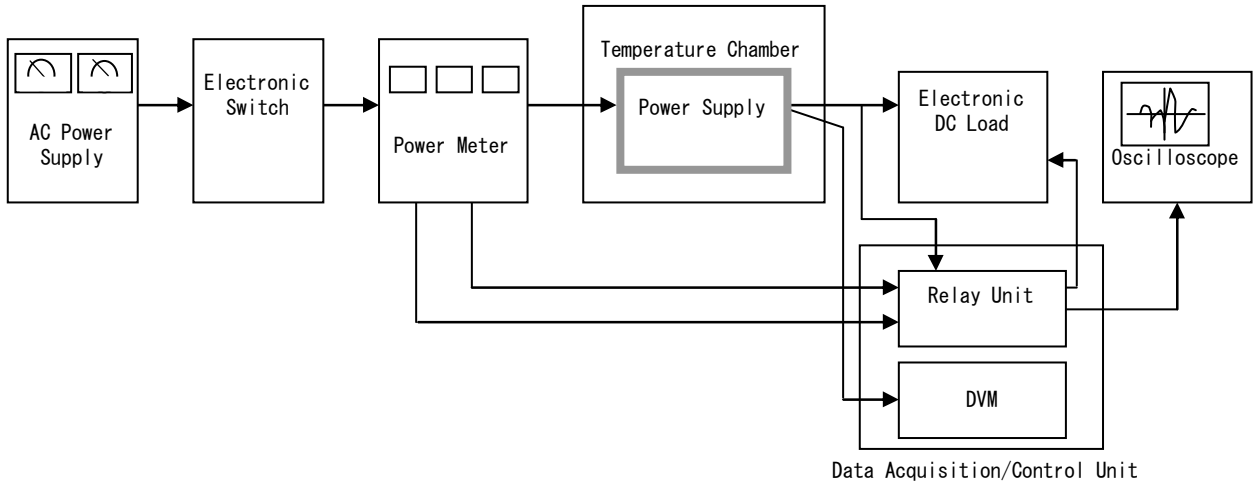


Figure A

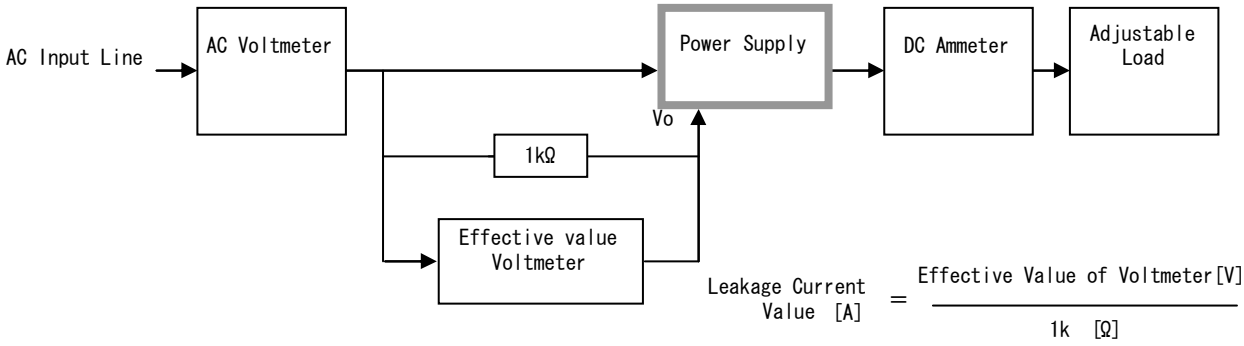


Figure B (DEN-AN)

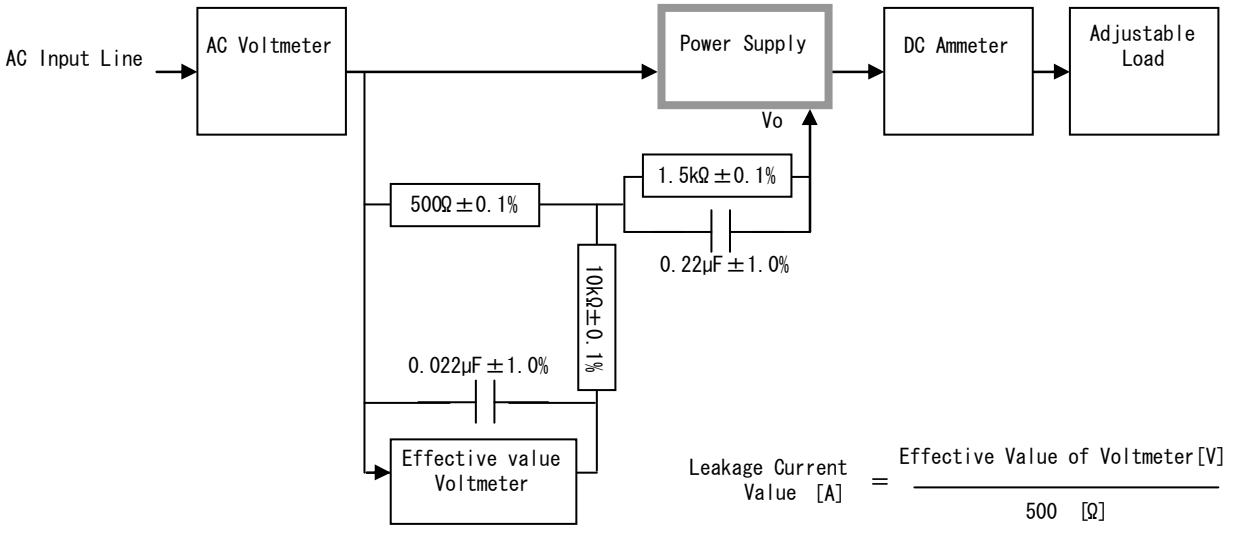
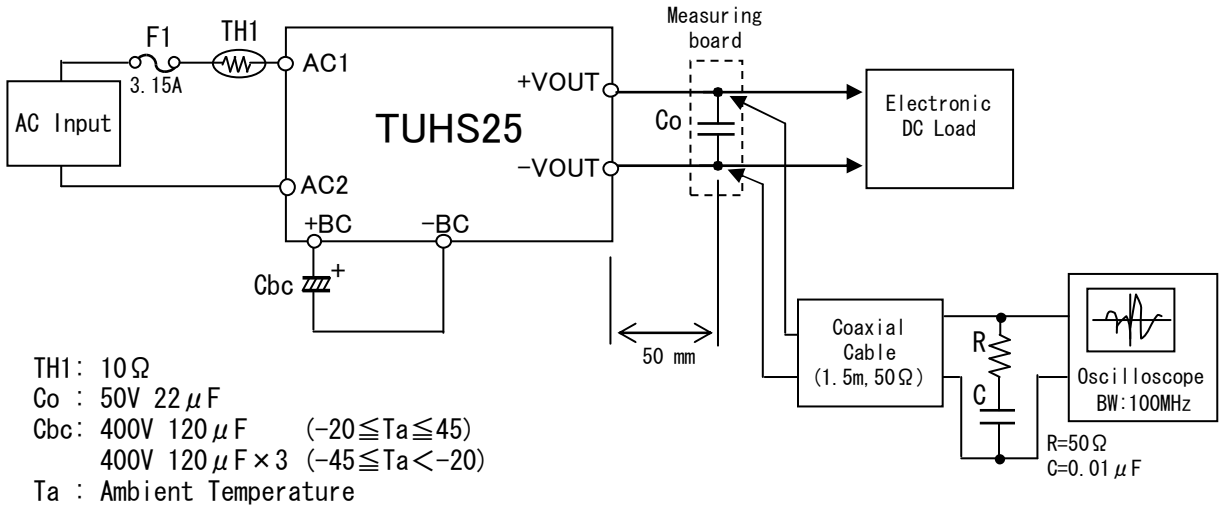


Figure B (IEC60950-1)



TH1: 10Ω
Co : 50V 22μF
Cbc: 400V 120μF (-20≦Ta≦45)
400V 120μF×3 (-45≦Ta<-20)
Ta : Ambient Temperature

Figure C