COSEL

参考資料

TEST DATA OF TUHS3F12

Regulated DC Power Supply
February 28, 2014

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COSEL CO.,LTD.

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Object	————————

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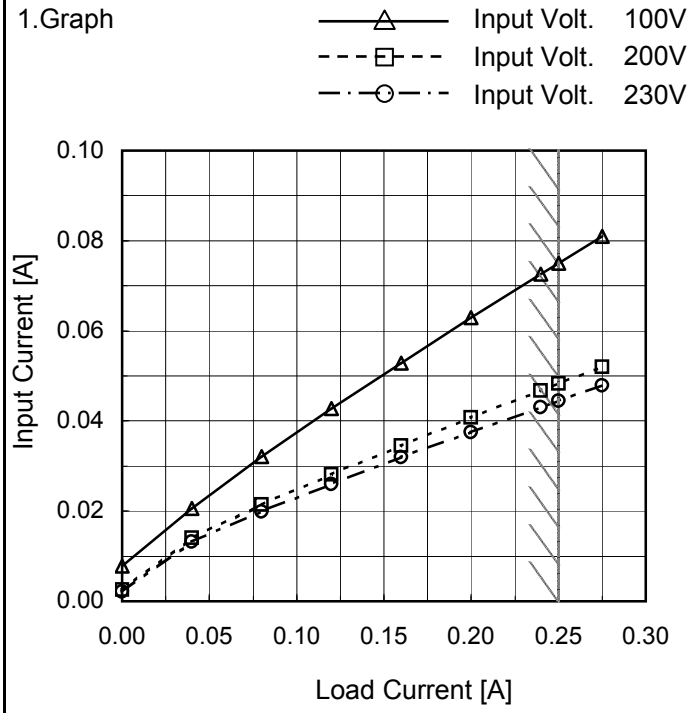
Testing Circuitry Figure A

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	0.008	0.003	0.002
0.04	0.021	0.014	0.013
0.08	0.032	0.021	0.020
0.12	0.043	0.028	0.026
0.16	0.053	0.035	0.032
0.20	0.063	0.041	0.038
0.24	0.073	0.047	0.043
0.25	0.075	0.048	0.045
0.28	0.081	0.052	0.048
--	-	-	-
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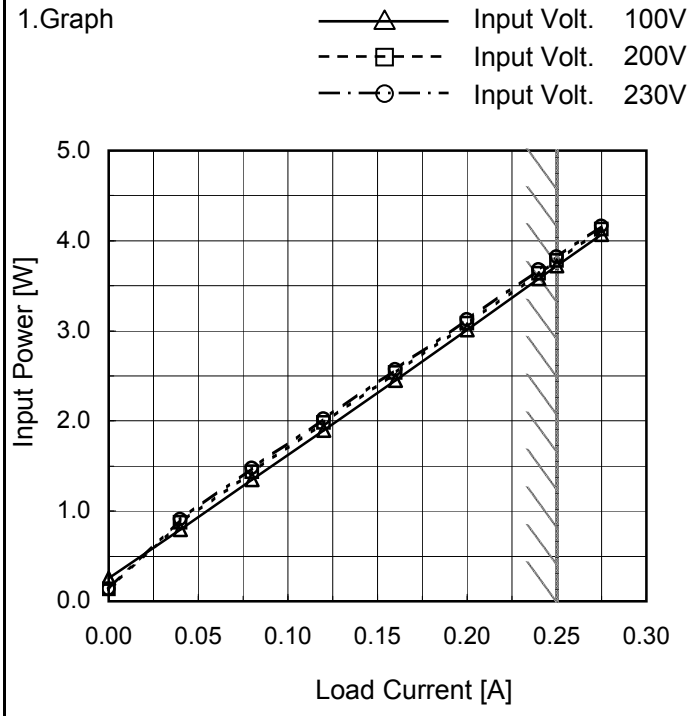
Model	TUHS3F12
Item	Input Power (by Load Current)
Object	————————

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	0.26	0.14	0.13
0.04	0.80	0.88	0.91
0.08	1.35	1.44	1.47
0.12	1.90	1.98	2.02
0.16	2.45	2.53	2.57
0.20	3.01	3.08	3.12
0.24	3.58	3.63	3.68
0.25	3.72	3.78	3.82
0.28	4.07	4.13	4.16
--	-	-	-
--	-	-	-

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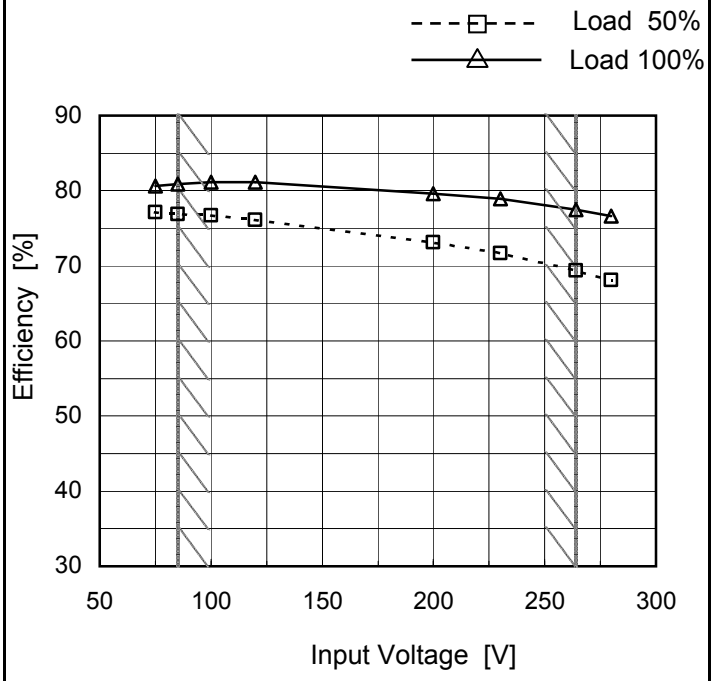
Model	TUHS3F12
Item	Efficiency (by Input Voltage)
Object	――――――――――

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	77.1	80.6
85	76.9	80.9
100	76.7	81.1
120	76.1	81.1
200	73.1	79.6
230	71.7	78.9
264	69.4	77.5
280	68.1	76.6
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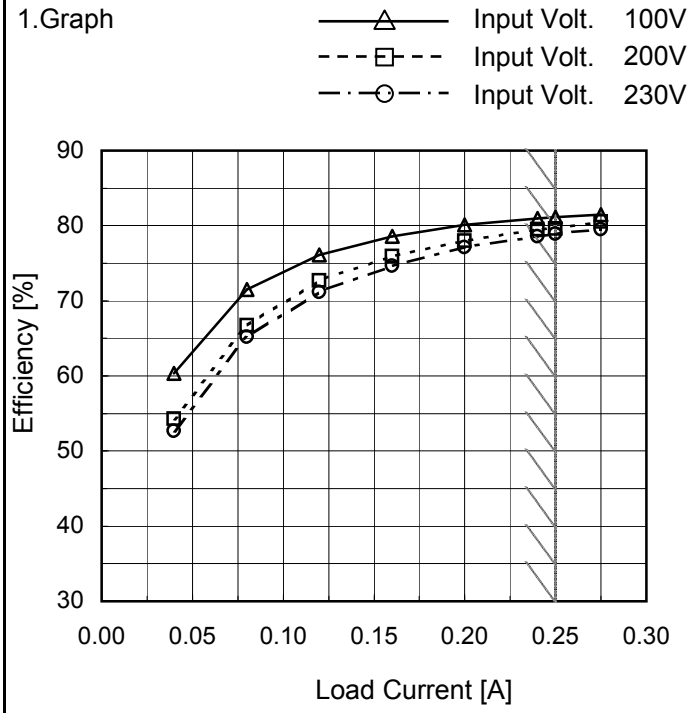
Model	TUHS3F12
Item	Efficiency (by Load Current)
Object	————————

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	-	-	-
0.04	60.3	54.3	52.7
0.08	71.5	66.7	65.2
0.12	76.1	72.7	71.2
0.16	78.6	75.9	74.7
0.20	80.1	78.0	77.1
0.24	81.0	79.5	78.6
0.25	81.1	79.6	78.9
0.28	81.5	80.5	79.5
--	-	-	-
--	-	-	-

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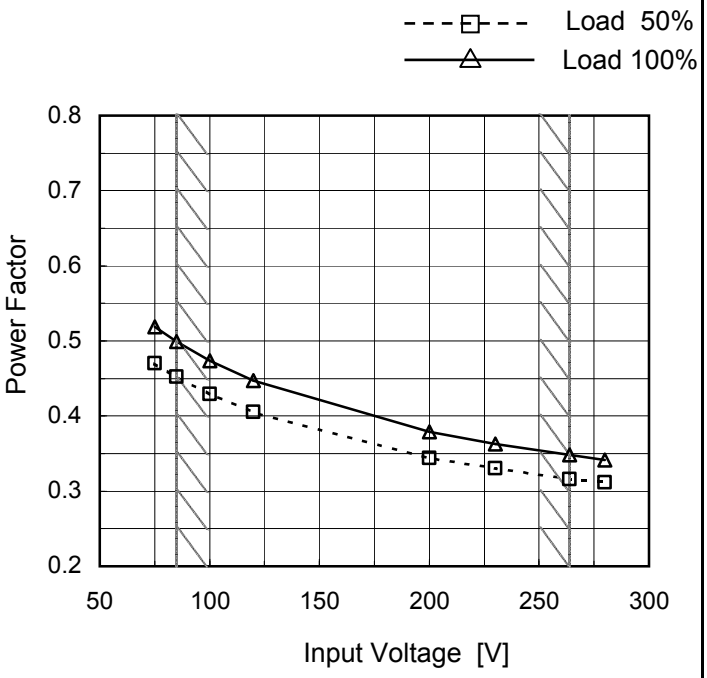
Model	TUHS3F12
Item	Power Factor (by Input Voltage)
Object	――――――――――

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	0.470	0.518
85	0.452	0.499
100	0.429	0.473
120	0.406	0.447
200	0.344	0.379
230	0.331	0.363
264	0.316	0.348
280	0.311	0.341
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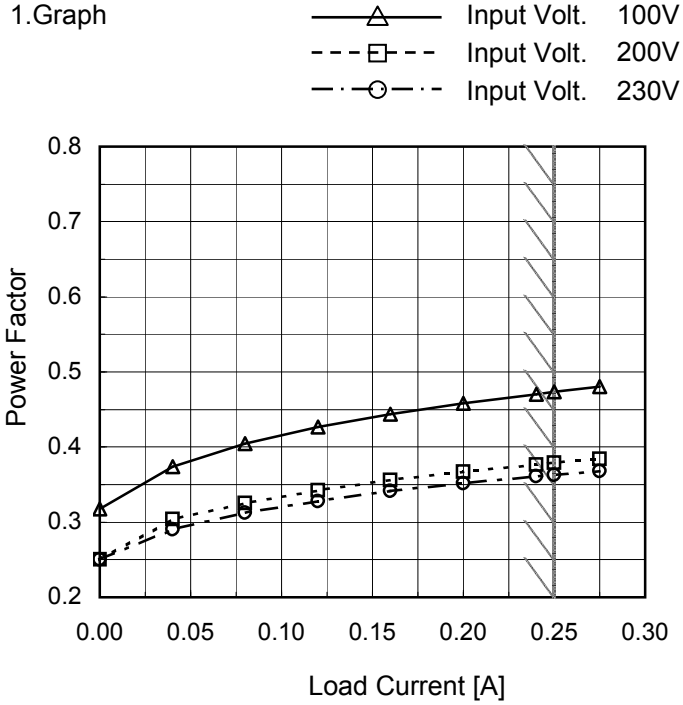
Model	TUHS3F12
Item	Power Factor (by Load Current)
Object	————————

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	0.317	0.250	0.250
0.04	0.374	0.304	0.290
0.08	0.404	0.326	0.312
0.12	0.427	0.342	0.328
0.16	0.443	0.356	0.341
0.20	0.458	0.367	0.352
0.24	0.470	0.376	0.361
0.25	0.473	0.379	0.363
0.28	0.480	0.384	0.368
--	-	-	-
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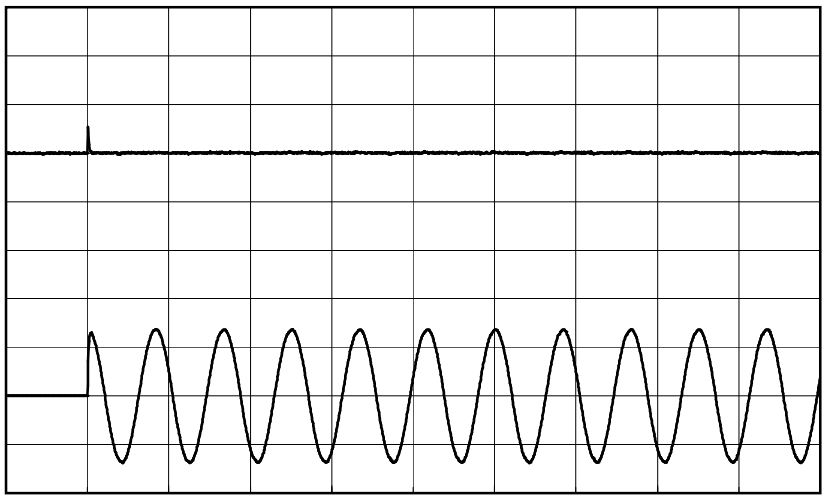
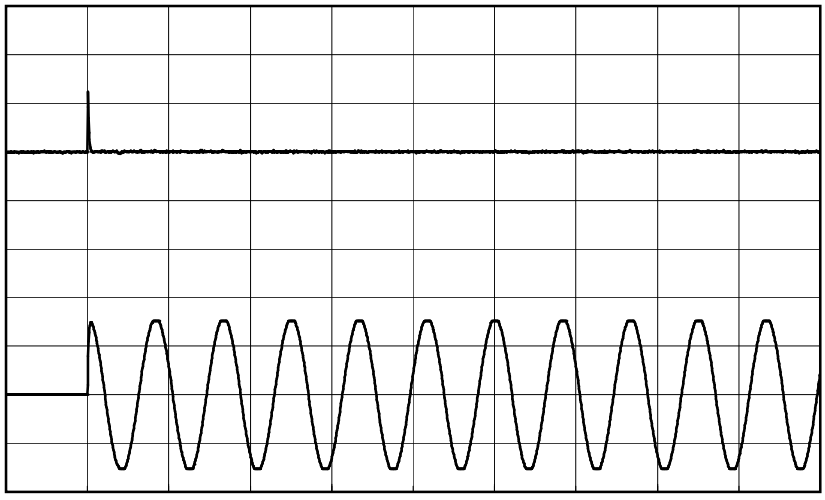
Model	TUHS3F12
Item	Inrush Current
Object	————————

Temperature 25°C
Testing Circuitry Figure A



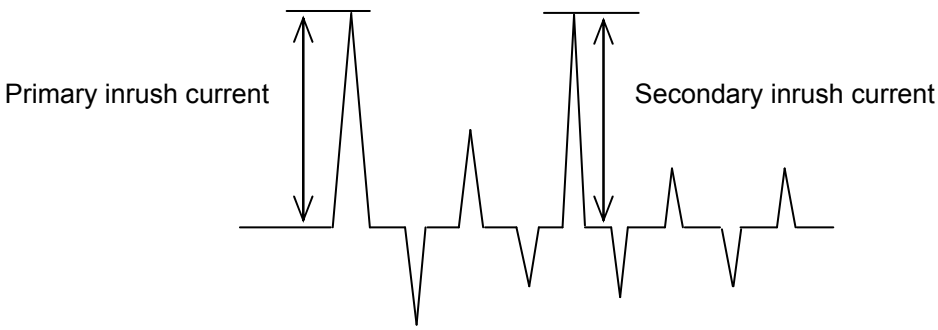
Input Voltage 100 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
10.8 A
Secondary inrush current :
0.6 A



Input Voltage 230 V
Frequency 60 Hz
Load 100 %

Primary inrush current :
24.5 A
Secondary inrush current :
0.7 A



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Model	TUHS3F12	
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	0.003	0.004	0.004	Operation
	One of phases	0.003	0.005	0.006	Stand by
IEC60950-1	Both phases	0.002	0.005	0.005	Operation
	One of phases	0.003	0.005	0.005	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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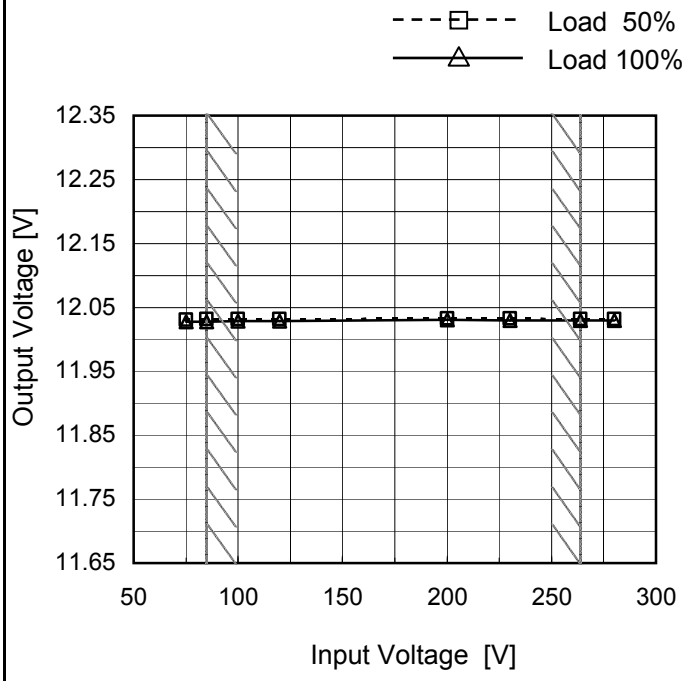
Model	TUHS3F12
Item	Line Regulation
Object	+12V0.25A

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	12.031	12.028
85	12.031	12.028
100	12.032	12.029
120	12.032	12.029
200	12.033	12.030
230	12.033	12.030
264	12.032	12.030
280	12.032	12.030
--	-	-

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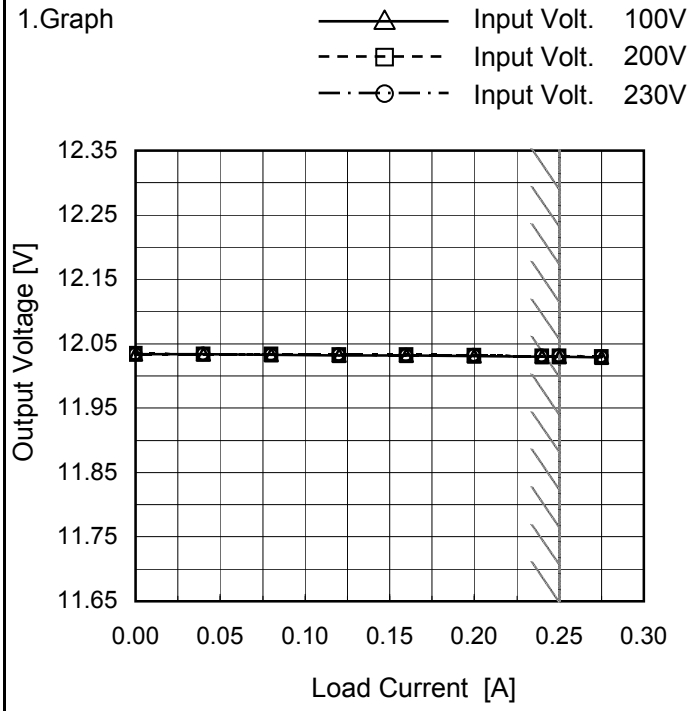
Model	TUHS3F12
Item	Load Regulation
Object	+12V0.25A

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	12.034	12.034	12.034
0.04	12.034	12.034	12.034
0.08	12.033	12.034	12.033
0.12	12.032	12.033	12.033
0.16	12.032	12.032	12.032
0.20	12.031	12.032	12.031
0.24	12.030	12.031	12.031
0.25	12.029	12.030	12.030
0.28	12.029	12.030	12.030
--	-	-	-
--	-	-	-

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Model	TUHS3F12		
Item	Dynamic Load Response	Temperature Testing Circuitry	25℃ Figure A
Object	+12V 0.25A		

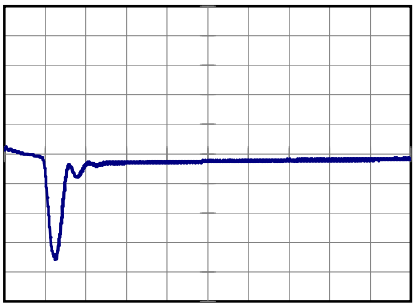
Input Volt. 230V
Cycle 500ms

Load Current

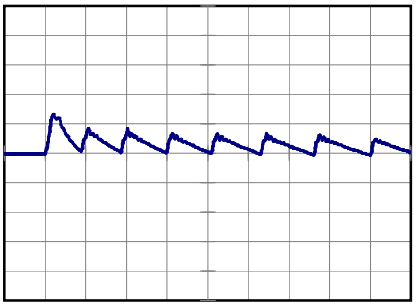
0.25A / 100us

Min.Load (0A)←→
Load 100%(0.25A)

200 mV/div



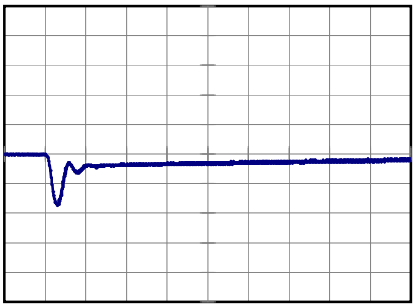
200 us/div



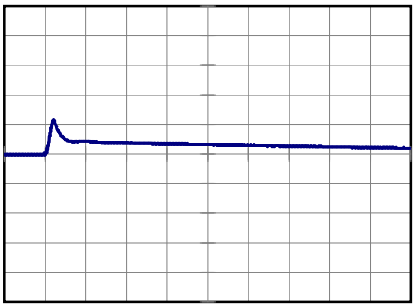
200 us/div

Load 20% (0.05A)←→
Load 100%(0.25A)

200 mV/div



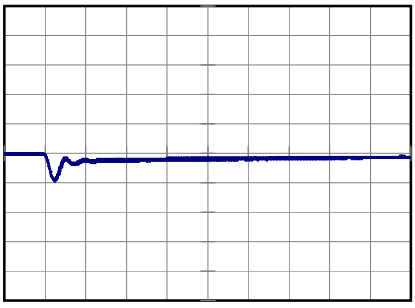
200 us/div



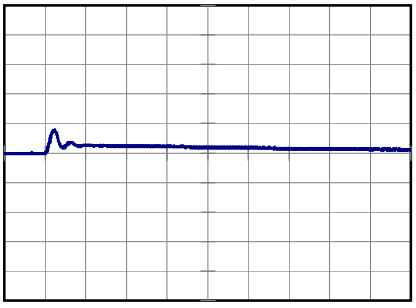
200 us/div

Load 50% (0.125A)←→
Load 100% (0.25A)

200 mV/div



200 us/div



200 us/div

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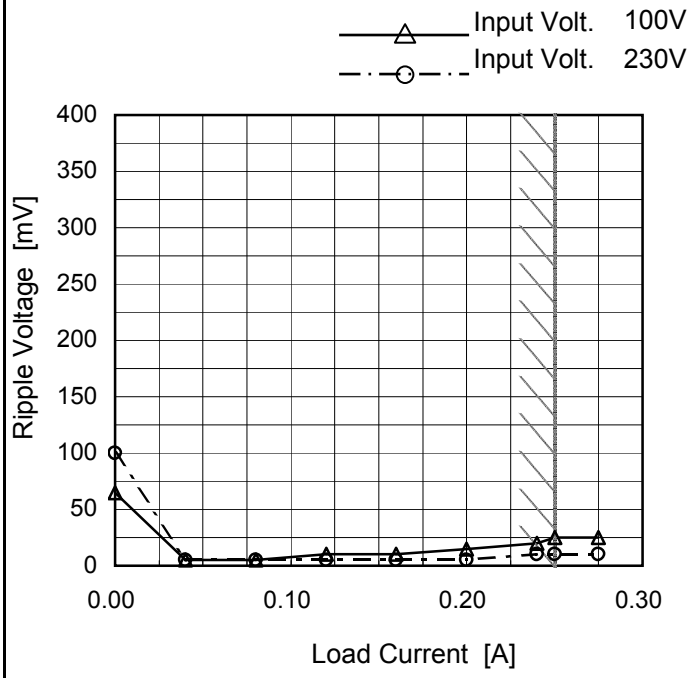
Model	TUHS3F12
Item	Ripple Voltage (by Load Current)
Object	+12V0.25A

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

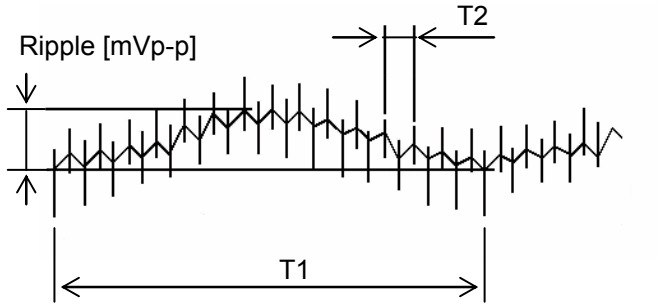


Fig. Complex Ripple Wave Form

2.Values

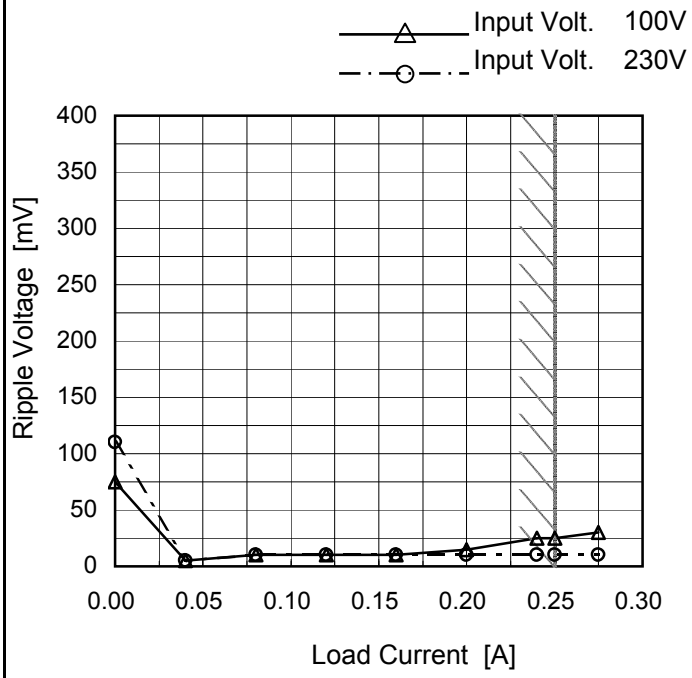
Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0	65	100
0.04	5	5
0.08	5	5
0.12	10	5
0.16	10	5
0.20	15	5
0.24	20	10
0.25	25	10
0.28	25	10
--	-	-
--	-	-

COSEL

Model	TUHS3F12
Item	Ripple-Noise
Object	+12V0.25A

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

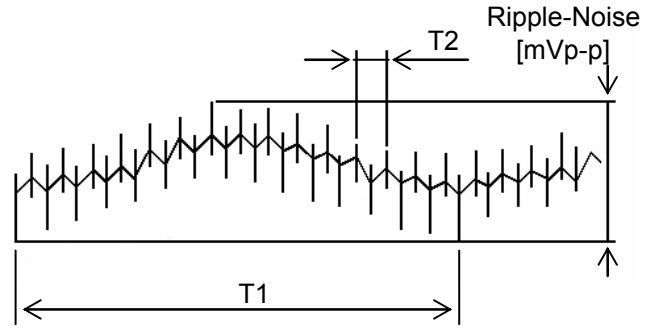


Fig. Complex Ripple Wave Form

2.Values

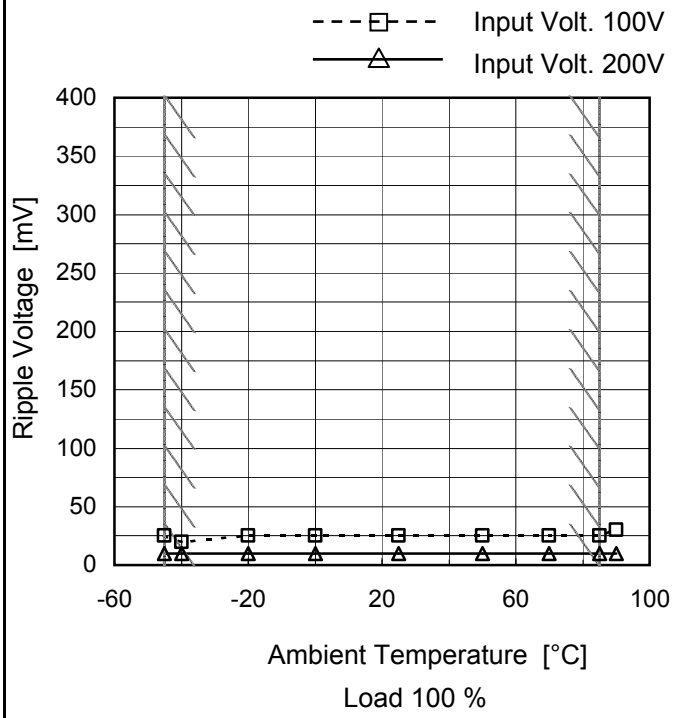
Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0	75	110
0.04	5	5
0.08	10	10
0.12	10	10
0.16	10	10
0.20	15	10
0.24	25	10
0.25	25	10
0.28	30	10
--	-	-
--	-	-

COSEL

Model	TUHS3F12
Item	Ripple Voltage (by Ambient Temp.)
Object	+12V0.25A

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

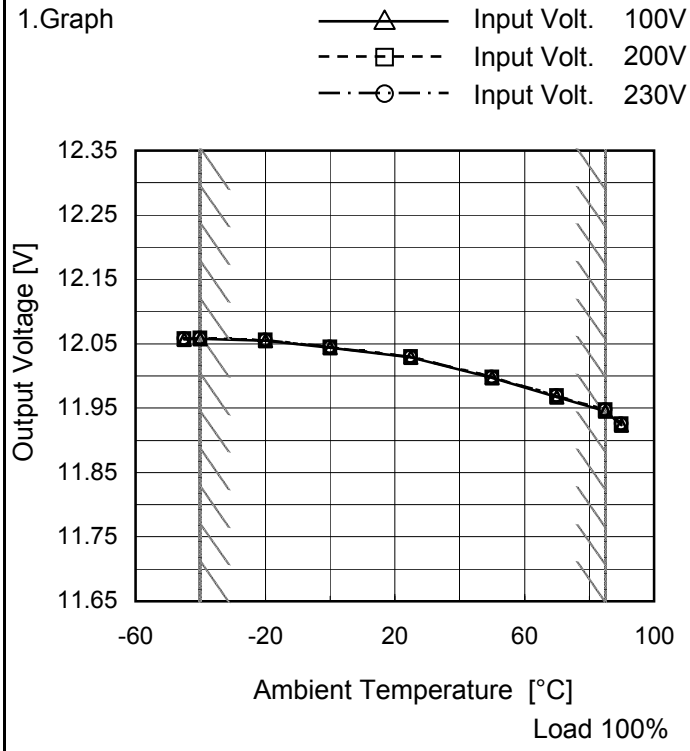
Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100V	Input Volt. 230V
-45	25	10
-40	20	10
-20	25	10
0	25	10
25	25	10
50	25	10
70	25	10
85	25	10
90	30	10
--	-	-
--	-	-

COSEL

Model	TUHS3F12
Item	Ambient Temperature Drift
Object	+12V0.25A

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	12.057	12.058	12.058
-40	12.058	12.059	12.059
-20	12.055	12.055	12.055
0	12.044	12.045	12.045
25	12.029	12.030	12.030
50	11.997	11.998	11.998
70	11.968	11.969	11.969
85	11.945	11.947	11.947
90	11.923	11.926	11.925
--	-	-	-
--	-	-	-

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Model	TUHS3F12	
Item	Output Voltage Accuracy	Testing Circuitry Figure A
Object	+12V0.25A	

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 - 85°C
Input Voltage : 85 - 264V
Load Current : 0 - 0.25A

* 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	85	0	12.060	±58	±0.5
Minimum Voltage	85	85	0.25	11.945		

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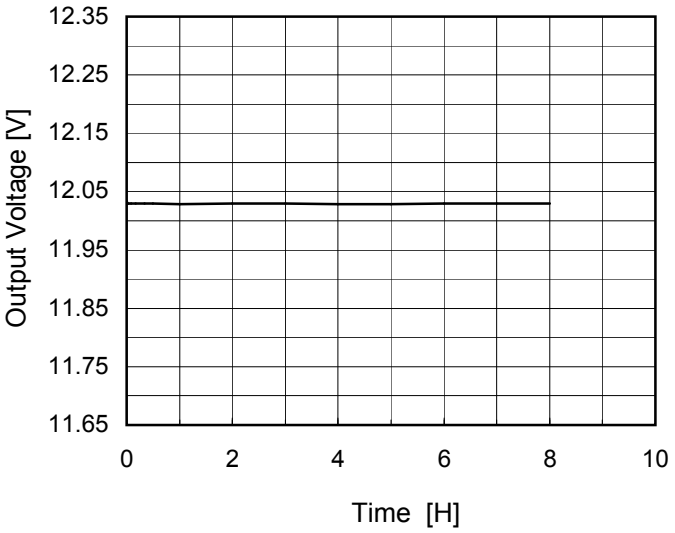
Model	TUHS3F12
Item	Time Lapse Drift
Object	+12V0.25A

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	12.034
0.5	12.030
1.0	12.029
2.0	12.029
3.0	12.029
4.0	12.029
5.0	12.029
6.0	12.029
7.0	12.029
8.0	12.029

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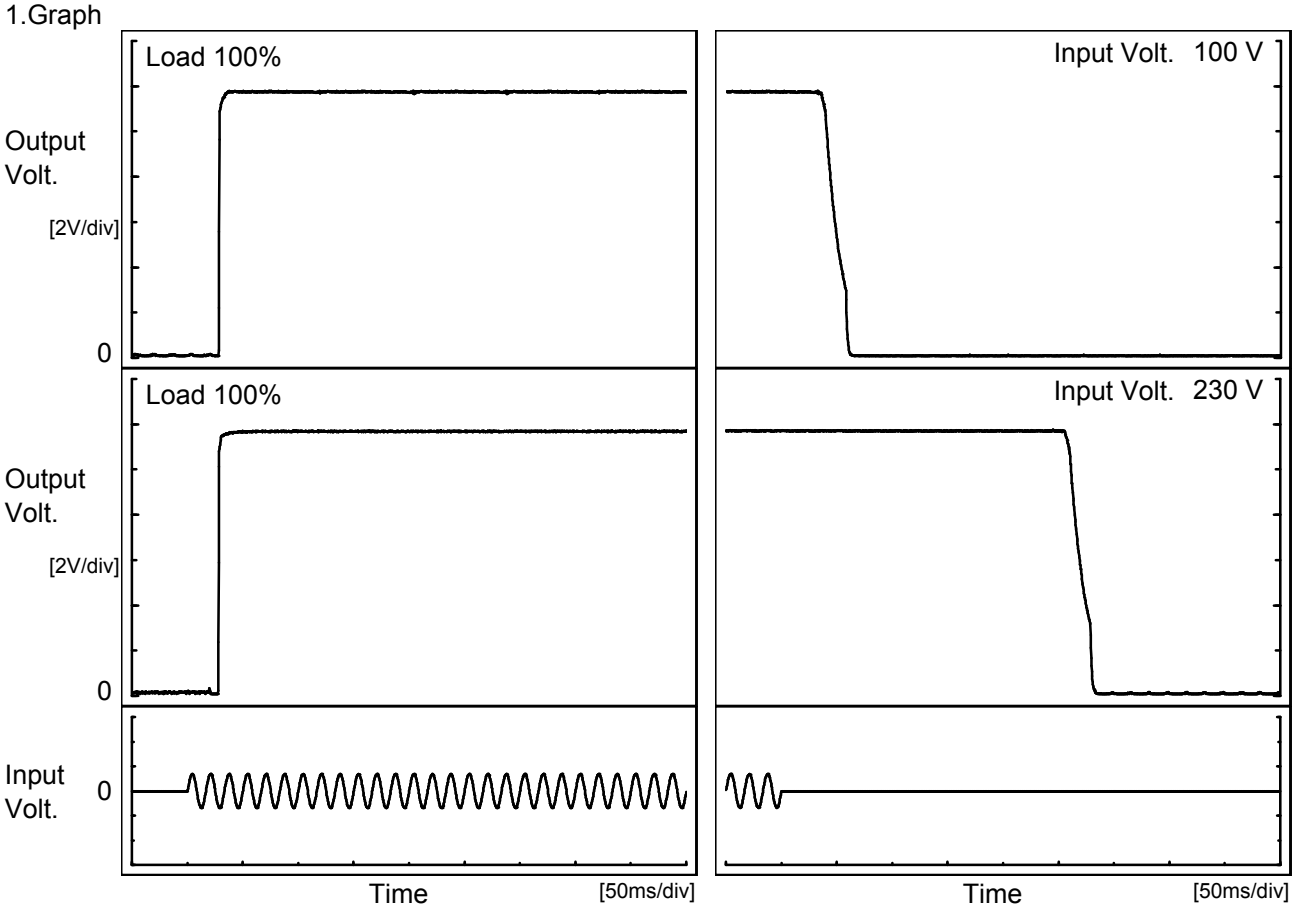
Model	TUHS3F12	
Item	Rise and Fall Time	Temperature 25°C Testing Circuitry Figure A
Object	+12V0.25A	

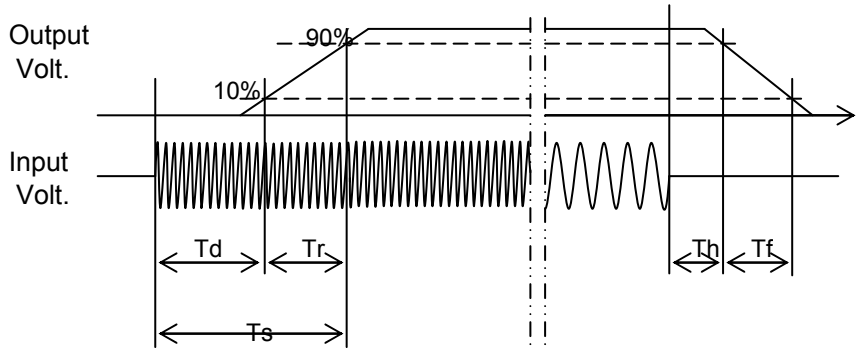
1.Graph



2.Values

[ms]

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	28.5	0.8	29.3	37.0	19.8
230 V	28.0	1.0	29.0	257.8	20.0



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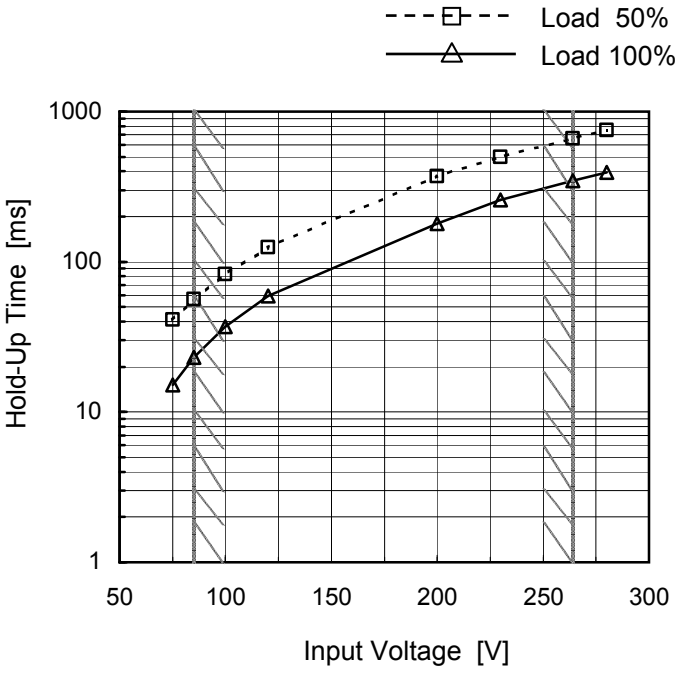
Model	TUHS3F12
Item	Hold-Up Time
Object	+12V0.25A

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

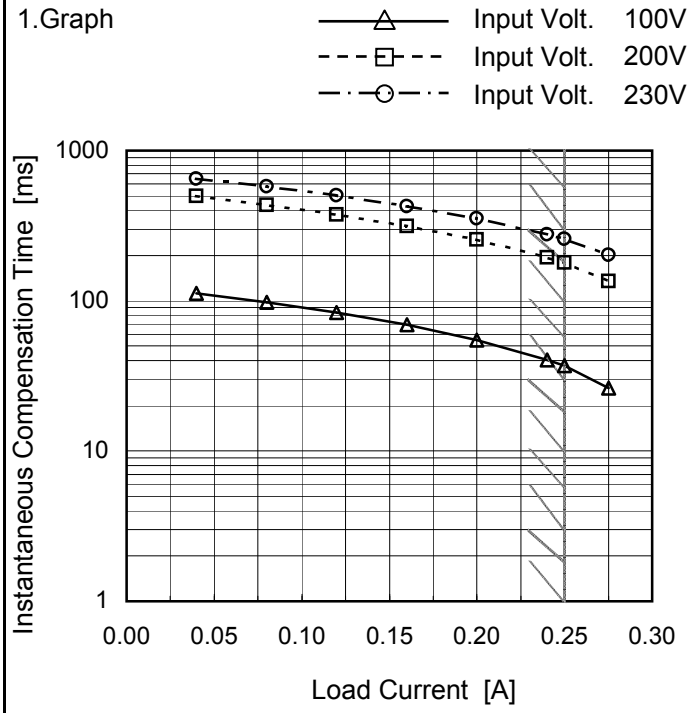
Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
75	41	15
85	57	23
100	83	37
120	125	59
200	373	180
230	499	258
264	664	348
280	750	395
--	-	-

COSEL

Model	TUHS3F12
Item	Instantaneous Interruption Compensation
Object	+12V0.25A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

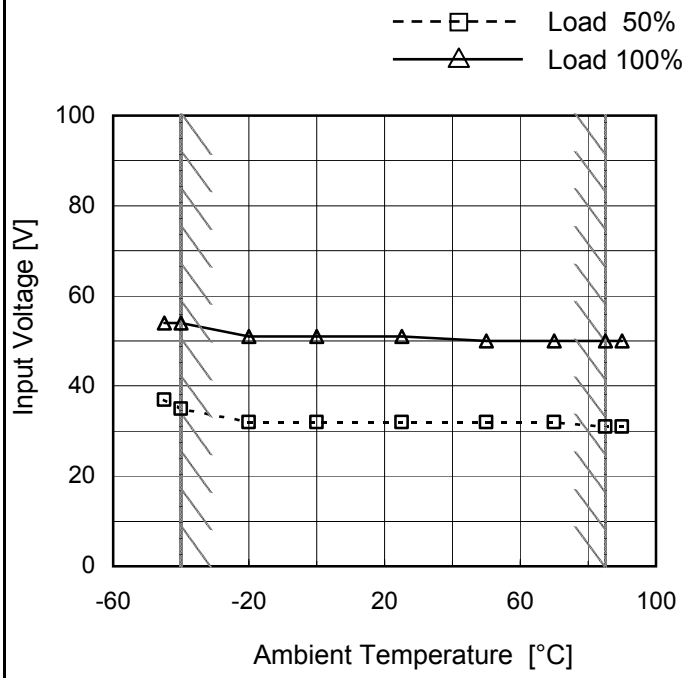
Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	-	-	-
0.04	112	496	651
0.08	98	436	576
0.12	83	376	501
0.16	69	316	427
0.20	55	255	352
0.24	41	195	277
0.25	37	180	258
0.28	26	135	202
--	-	-	-
--	-	-	-

COSEL

Model	TUHS3F12
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+12V0.25A

Testing Circuitry Figure A

1.Graph



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

2.Values

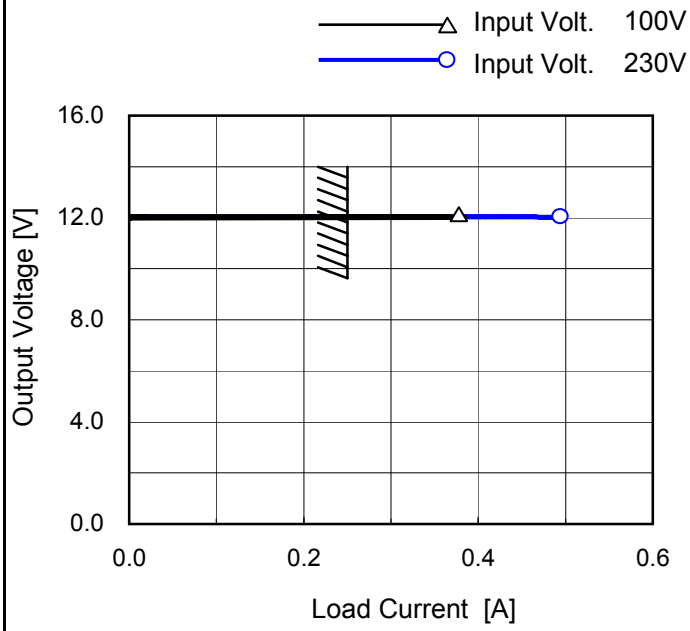
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-45	37	54
-40	35	54
-20	32	51
0	32	51
25	32	51
50	32	50
70	32	50
85	31	50
90	31	50
--	-	-
--	-	-

COSEL

Model	TUHS3F12
Item	Overcurrent Protection
Object	+12V0.25A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



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

2.Values

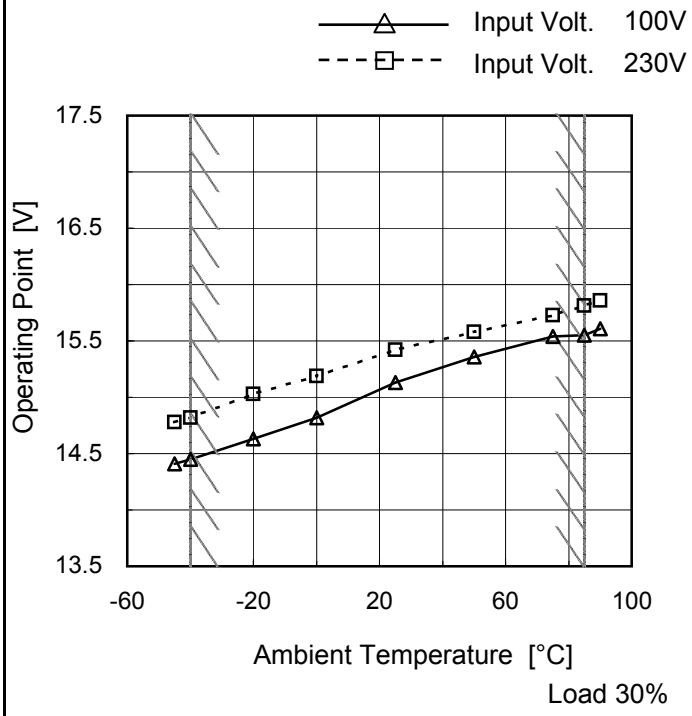
Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 230[V]
12	0.38	0.49
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	TUHS3F12
Item	Overvoltage Protection
Object	+12V0.25A

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	14.41	14.78
-40	14.45	14.82
-20	14.63	15.03
0	14.82	15.19
25	15.13	15.42
50	15.36	15.58
75	15.54	15.73
85	15.55	15.81
90	15.61	15.86
--	-	-
--	-	-

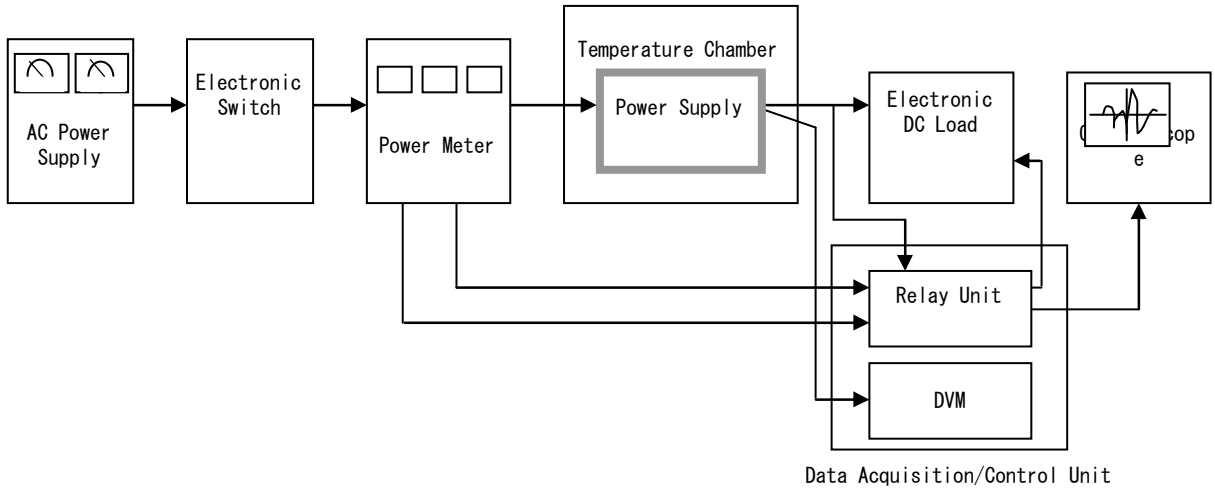


Figure A

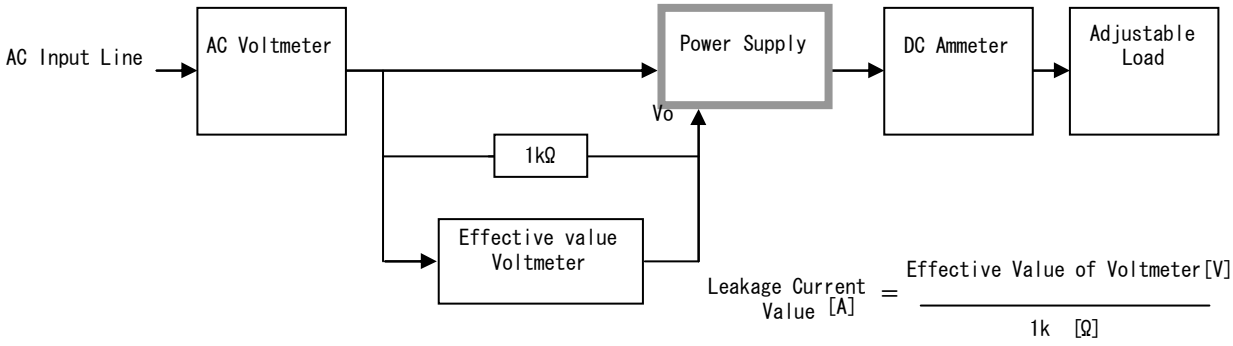


Figure B (DEN-AN)

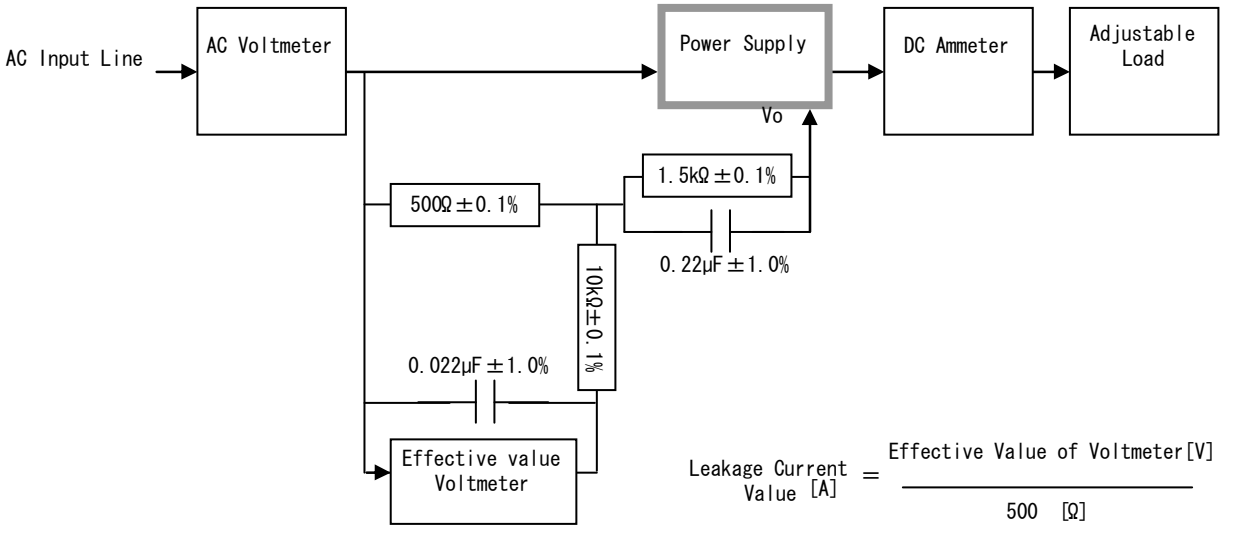
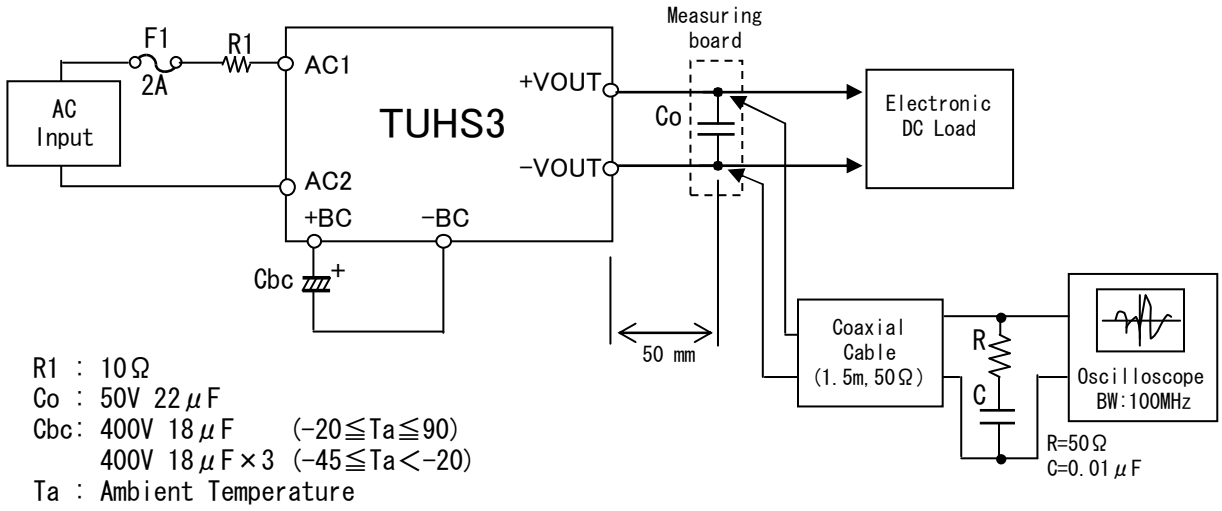


Figure B (IEC60950-1)



R1 : 10Ω
Co : 50V 22μF
Cbc: 400V 18μF (-20≦Ta≦90)
400V 18μF×3 (-45≦Ta<-20)
Ta : Ambient Temperature

Figure C