参考資料

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TEST DATA OF TUHS15F12

Regulated DC Power Supply
February 20, 2015

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COSEL CO.,LTD.

参考資料

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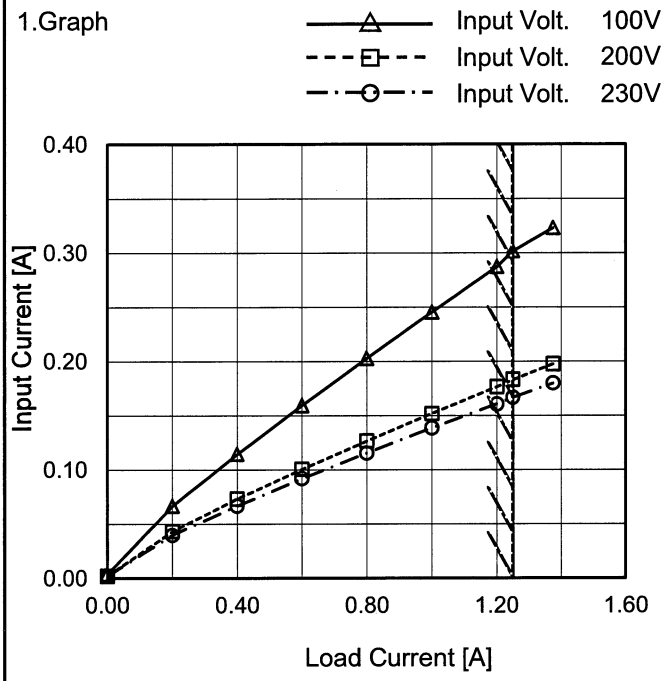
COSEL

Model	TUHS15F12
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]
0.000	0.004	0.002	0.002
0.200	0.067	0.043	0.040
0.400	0.115	0.073	0.067
0.600	0.160	0.101	0.092
0.800	0.203	0.127	0.116
1.000	0.245	0.152	0.139
1.200	0.287	0.177	0.161
1.250	0.302	0.183	0.167
1.375	0.323	0.198	0.180
--	-	-	-
--	-	-	-

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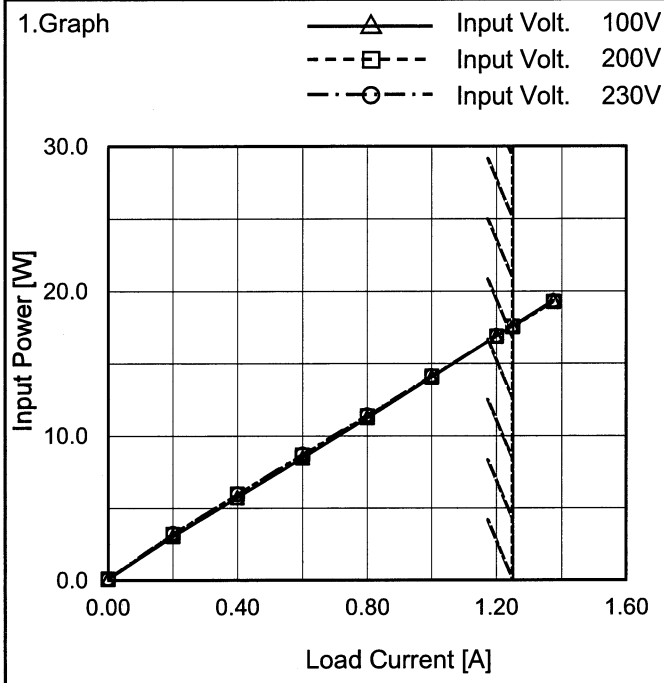
COSEL

Model	TUHS15F12
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]
0.000	0.11	0.10	0.12
0.200	3.05	3.19	3.24
0.400	5.75	5.97	5.97
0.600	8.49	8.67	8.73
0.800	11.26	11.37	11.44
1.000	14.06	14.11	14.15
1.200	16.89	16.87	16.91
1.250	17.60	17.54	17.59
1.375	19.37	19.27	19.31
--	-	-	-
--	-	-	-

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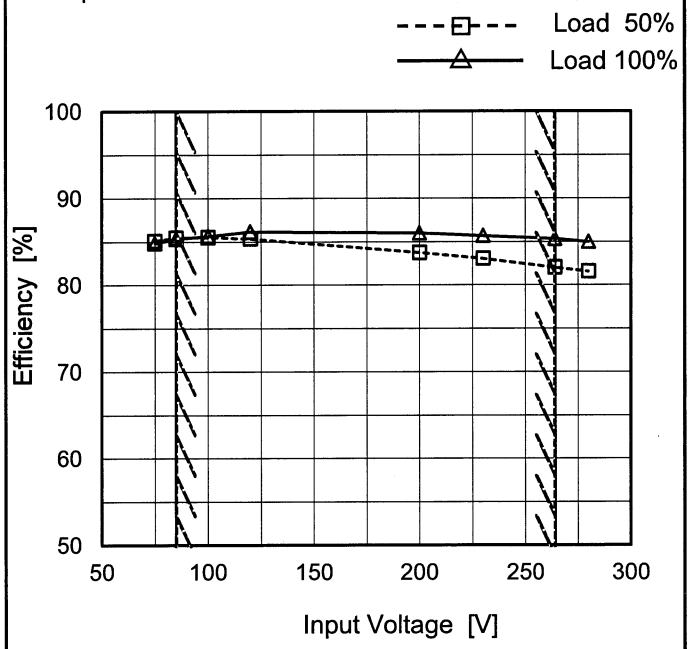
Model	TUHS15F12
Item	Efficiency (by Input Voltage)
Object	――――――――――

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	85.1	84.8
85	85.5	85.4
100	85.5	85.7
120	85.4	86.2
200	83.7	86.0
230	83.1	85.7
264	82.0	85.3
280	81.6	85.0
--	-	-

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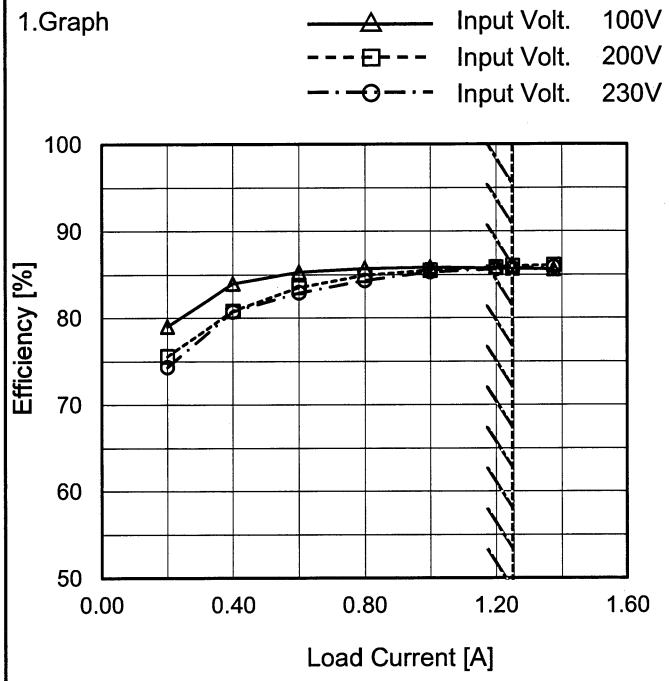
Model	TUHS15F12
Item	Efficiency (by Load Current)
Object	――――――

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]
0.000	-	-	-
0.200	79.0	75.6	74.3
0.400	84.0	80.8	80.8
0.600	85.3	83.5	82.9
0.800	85.7	84.9	84.3
1.000	85.9	85.5	85.3
1.200	85.8	85.9	85.6
1.250	85.7	86.0	85.7
1.375	85.7	86.1	85.9
--	-	-	-
--	-	-	-

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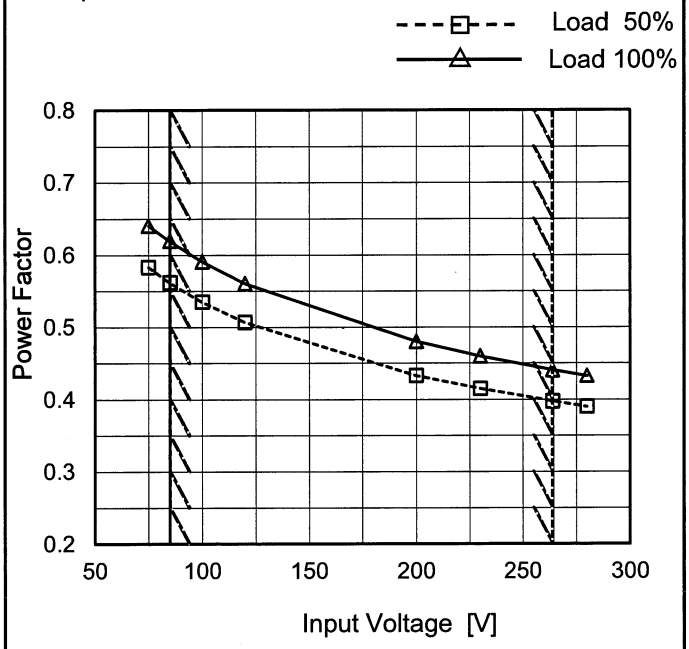
Model	TUHS15F12
Item	Power Factor (by Input Voltage)
Object	――――――――――

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	0.583	0.641
85	0.562	0.619
100	0.535	0.591
120	0.507	0.561
200	0.433	0.480
230	0.415	0.460
264	0.398	0.441
280	0.390	0.433
--	-	-

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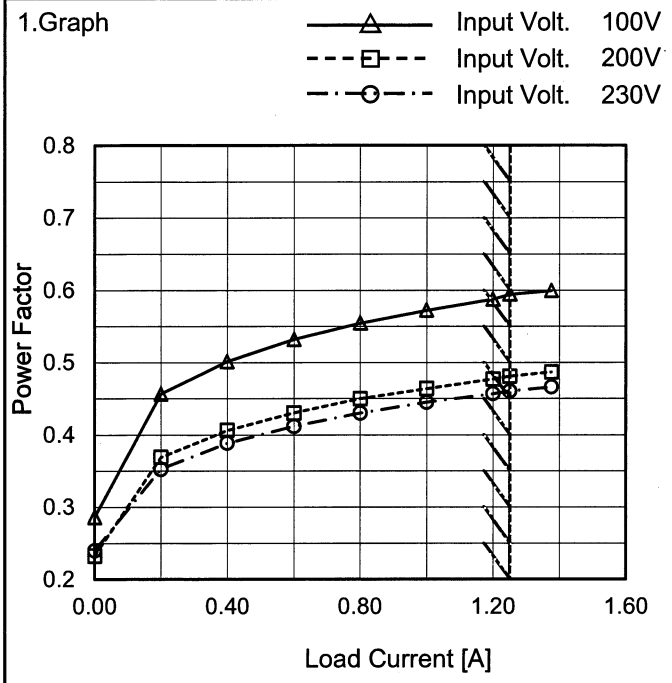
Model	TUHS15F12
Item	Power Factor (by Load Current)
Object	————————

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]
0.000	0.286	0.233	0.240
0.200	0.457	0.369	0.353
0.400	0.502	0.406	0.389
0.600	0.532	0.430	0.412
0.800	0.555	0.450	0.430
1.000	0.573	0.464	0.445
1.200	0.588	0.477	0.457
1.250	0.595	0.481	0.461
1.375	0.600	0.487	0.467
--	-	-	-
--	-	-	-

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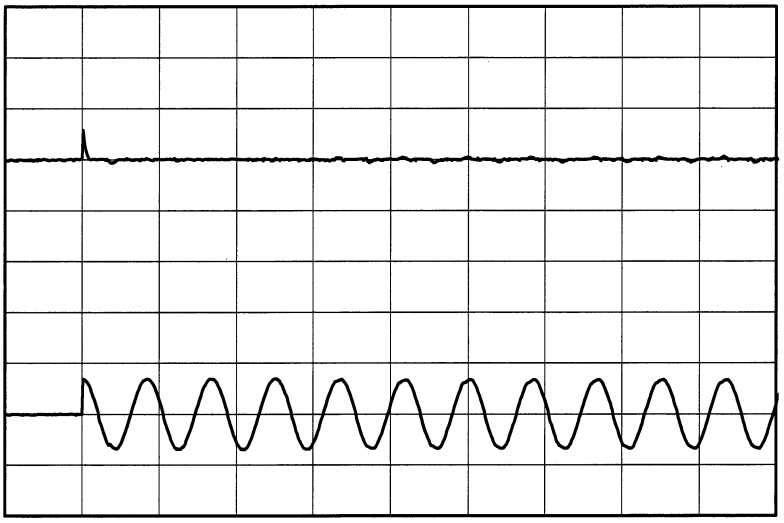
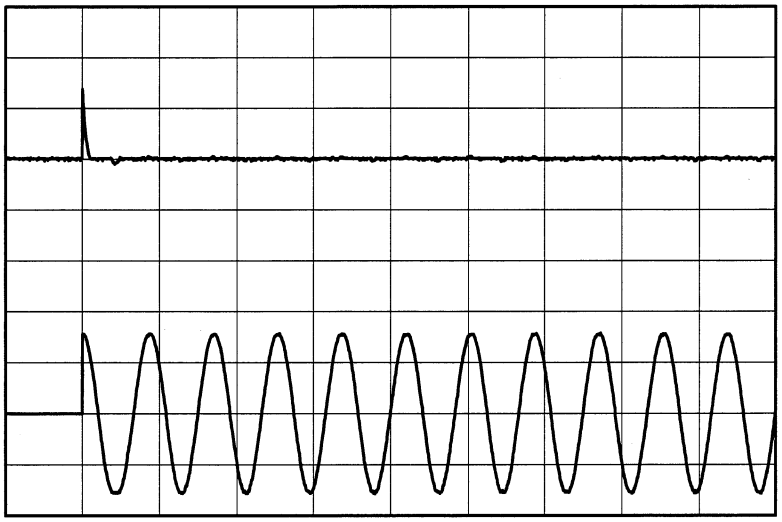
Model	TUHS15F12
Item	Inrush Current
Object	――――――

Temperature 25°C
Testing Circuitry Figure A



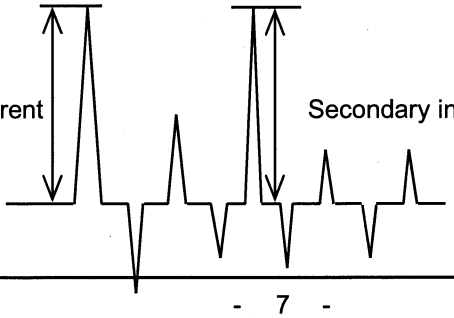
Input Voltage 100 V
Frequency 60 Hz
Load 100 %

Primary inrush current
11.7 A
Secondary inrush current
1.2 A



Input Voltage 230 V
Frequency 60 Hz
Load 100 %

Primary inrush current
27.5 A
Secondary inrush current
1.1 A



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Model	TUHS15F12	Temperature 25°C
Item	Leakage Current	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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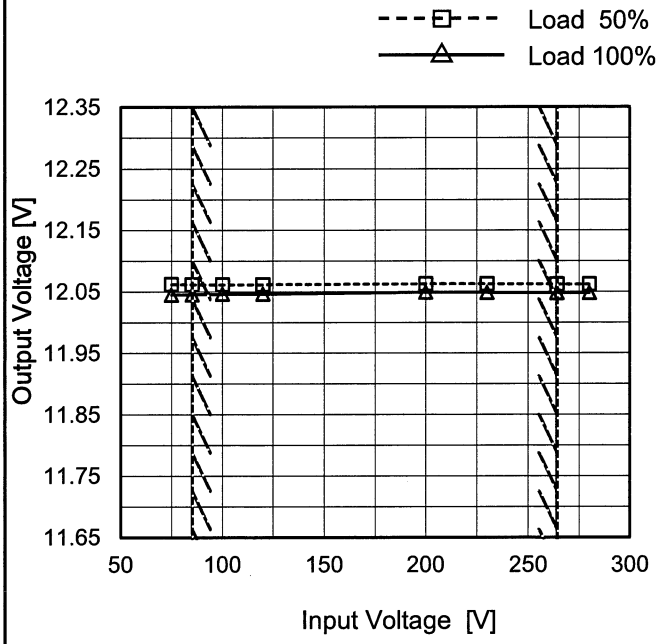
Model	TUHS15F12
Item	Line Regulation
Object	+12V1.25A

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	12.062	12.045
85	12.062	12.046
100	12.062	12.047
120	12.062	12.047
200	12.063	12.049
230	12.063	12.049
264	12.062	12.048
280	12.062	12.048
--	-	-

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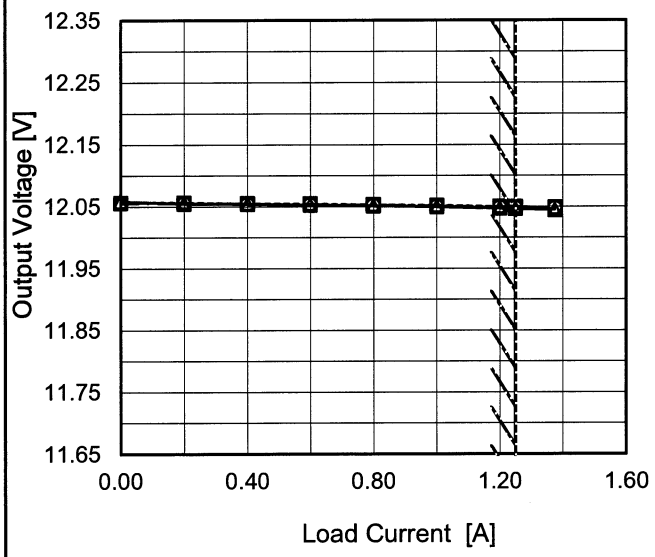
COSEL

Model	TUHS15F12
Item	Load Regulation
Object	+12V1.25A

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]
0.000	12.058	12.056	12.056
0.200	12.055	12.056	12.055
0.400	12.054	12.055	12.054
0.600	12.053	12.055	12.054
0.800	12.051	12.053	12.052
1.000	12.050	12.052	12.051
1.200	12.047	12.050	12.049
1.250	12.047	12.050	12.049
1.375	12.045	12.048	12.048
--	-	-	-
--	-	-	-

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Model	TUHS15F12
Item	Dynamic Load Response
Object	+12V 1.25A

Temperature 25℃
Testing Circuitry Figure A

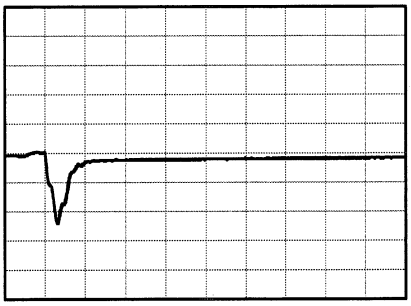
Input Volt. 230V
Cycle 500ms

Load Current

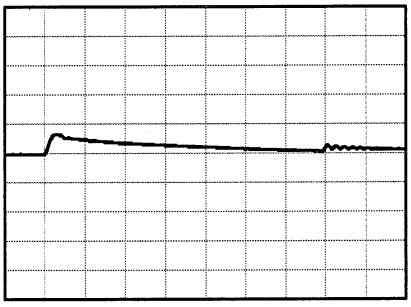
1.25A / 100us

Min.Load (0A)←→
Load 100%(1.25A)

1 V/div



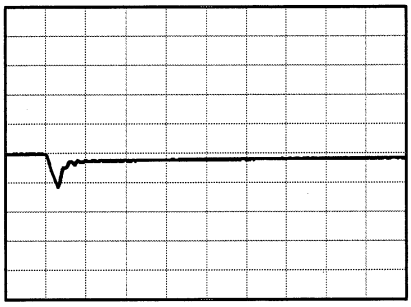
200 us/div



200 us/div

Min.Load (0.25A)←→
Load 100%(1.25A)

1 V/div

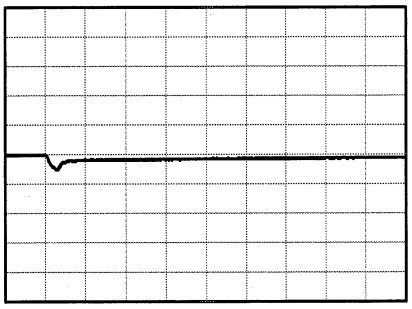


200 us/div

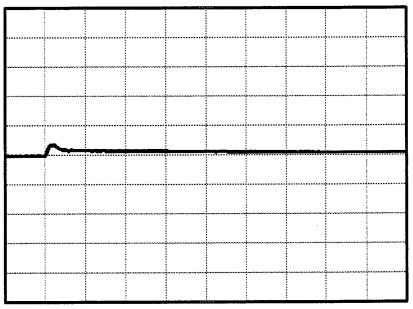
200 us/div

Load 50% (0.625A)←→
Load 100% (1.25A)

1 V/div



200 us/div



200 us/div

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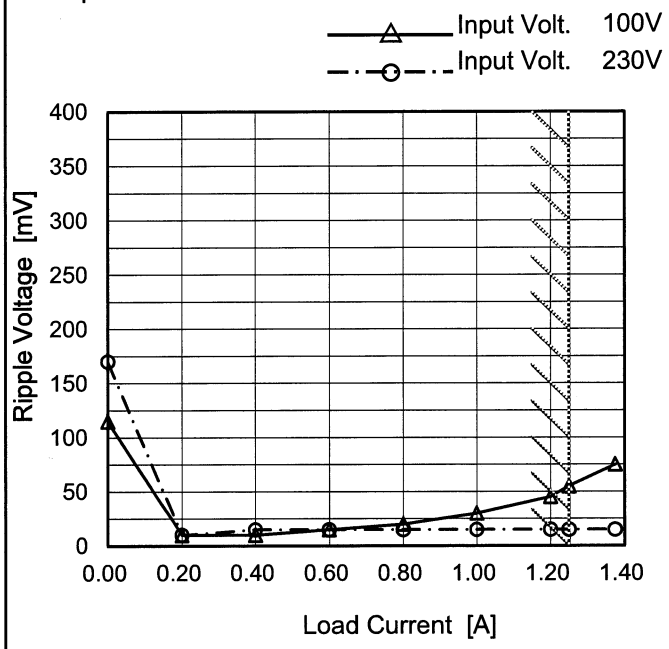
Model	TUHS15F12
Item	Ripple Voltage (by Load Current)
Object	+12V1.25A

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

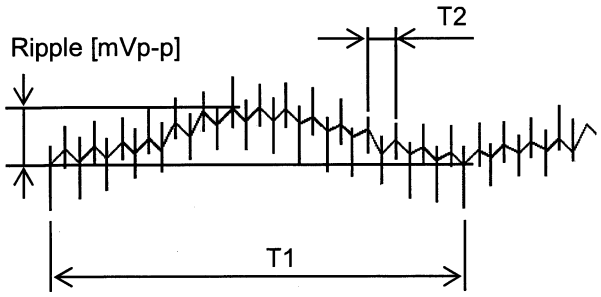


Fig. Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0.000	115	170
0.200	10	10
0.400	10	15
0.600	15	15
0.800	20	15
1.000	30	15
1.200	45	15
1.250	55	15
1.375	75	15
--	-	-
--	-	-

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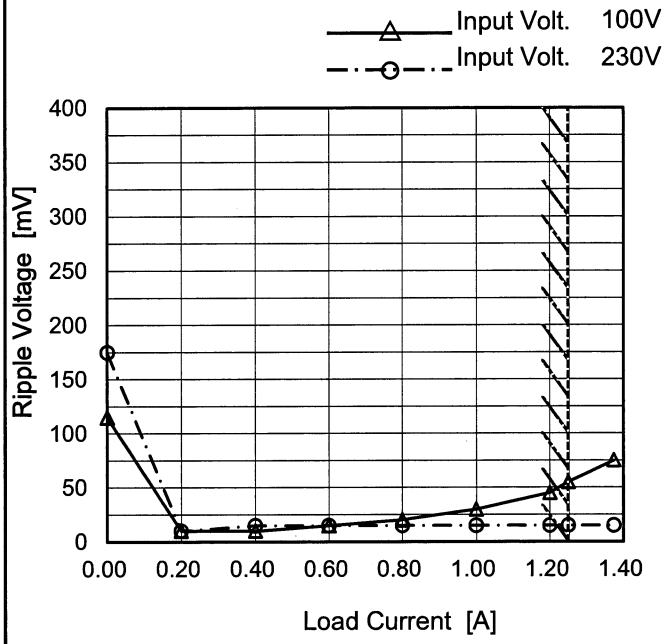
Model	TUHS15F12
Item	Ripple-Noise
Object	+12V1.25A

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
Ripple-Noise [mVp-p]

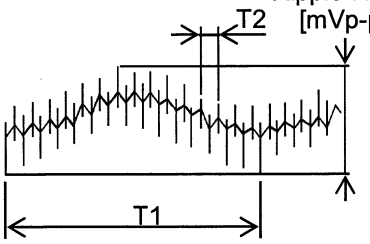


Fig. Complex Ripple Wave Form

2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 100 [V]	Input Volt. 230 [V]
0.000	115	175
0.200	10	10
0.400	10	15
0.600	15	15
0.800	20	15
1.000	30	15
1.200	45	15
1.250	55	15
1.375	75	15
--	-	-
--	-	-

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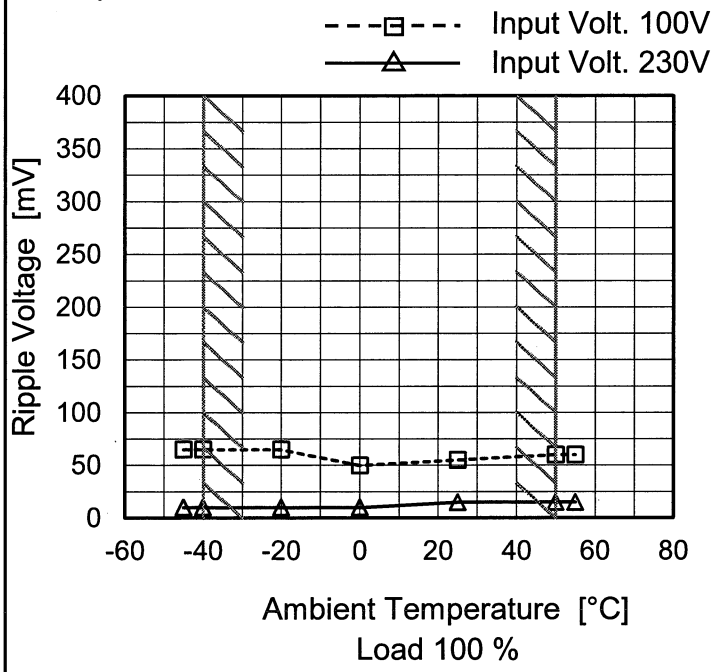
Model	TUHS15F12
Item	Ripple Voltage (by Ambient Temp.)
Object	+12V1.25A

Testing Circuitry Figure C

1.Graph



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	65	10
-40	65	10
-20	65	10
0	50	10
25	55	15
50	60	15
55	60	15
--	-	-
--	-	-
--	-	-
--	-	-

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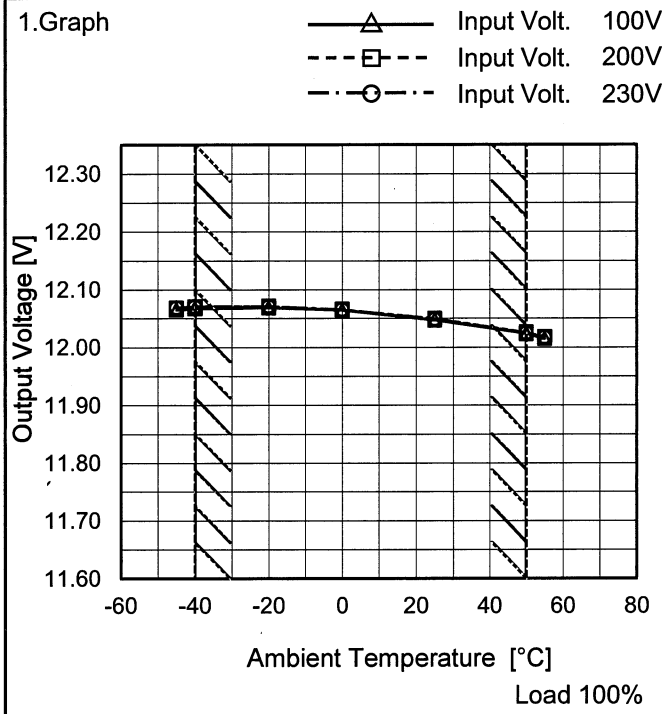
Model	TUHS15F12
Item	Ambient Temperature Drift
Object	+12V1.25A

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	12.066	12.069	12.069
-40	12.068	12.071	12.071
-20	12.069	12.072	12.071
0	12.064	12.066	12.066
25	12.048	12.050	12.049
50	12.024	12.026	12.025
55	12.015	12.018	12.017
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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Model	TUHS15F12
Item	Output Voltage Accuracy
Object	+12V1.25A

Testing Circuitry Figure A

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 - 1.25A

* 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

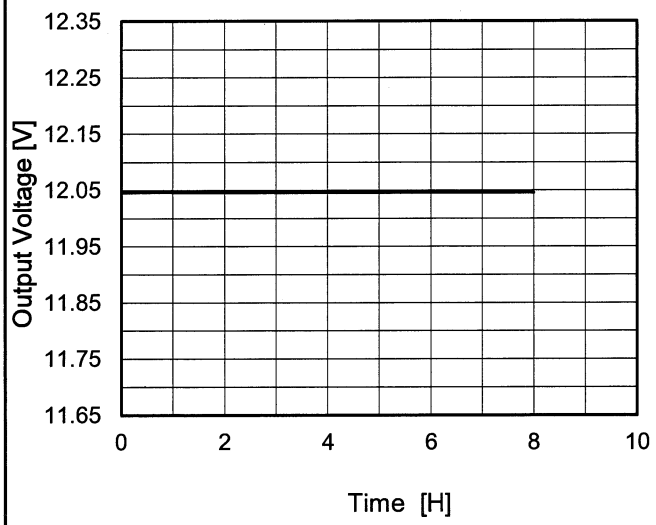
Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	-40	100	0	12.078	±22	±0.2
Minimum Voltage	50	264	1.25	12.035		

COSEL

Model	TUHS15F12
Item	Time Lapse Drift
Object	+12V1.25A

Temperature 25°C
Testing Circuitry Figure A

1.Graph



Input Volt. 100V
Load 100%

* The characteristic of AC230V is equal.

2.Values

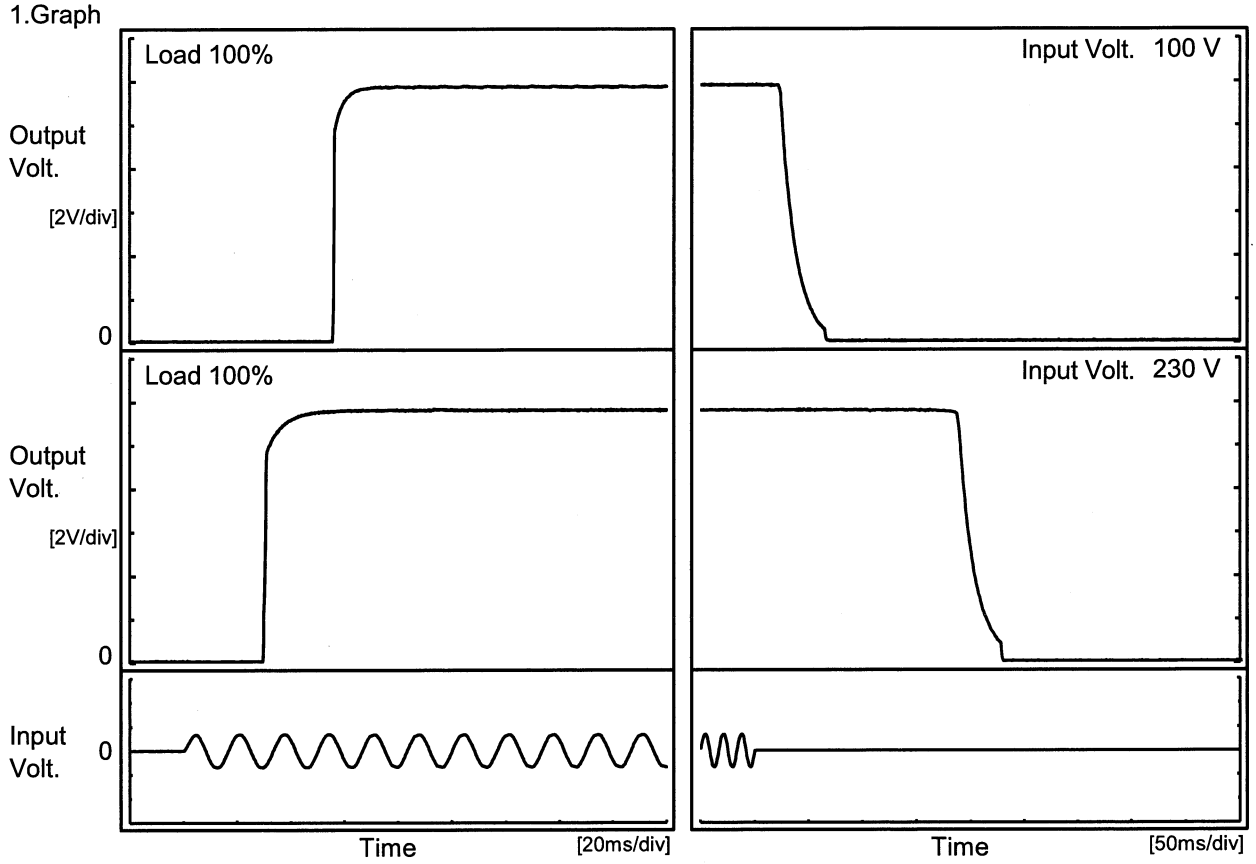
Time since start [H]	Output Voltage [V]
0.0	12.050
0.5	12.047
1.0	12.047
2.0	12.046
3.0	12.046
4.0	12.046
5.0	12.046
6.0	12.046
7.0	12.046
8.0	12.046

BC-10893

COSEL

Model	TUHS15F12	Temperature 25°C
Item	Rise and Fall Time	Testing Circuitry Figure A
Object	+12V0.9A	

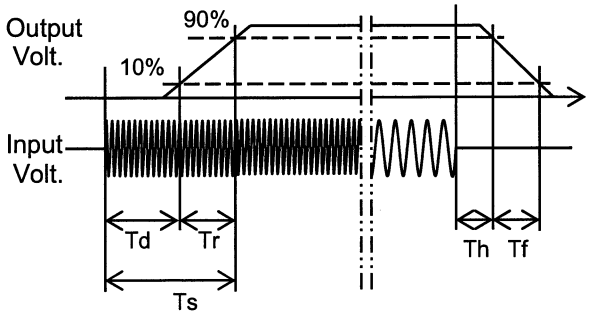
1.Graph



2.Values

[ms]

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	55.7	3.4	59.1	26.3	31.2
230 V	15.0	3.3	18.3	189.0	32.5



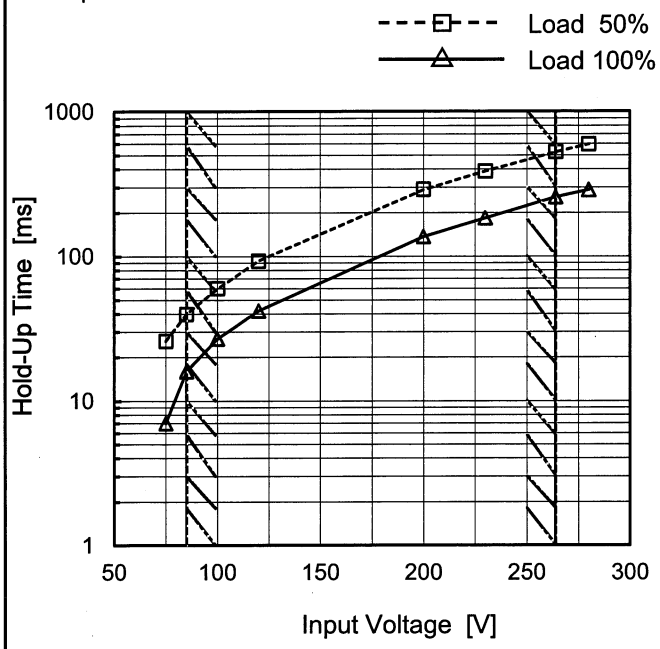
BC-10893

COSEL

Model	TUHS15F12
Item	Hold-Up Time
Object	+12V1.25A

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	26	7
85	40	16
100	60	27
120	93	42
200	290	137
230	388	184
264	525	257
280	595	288
--	-	-

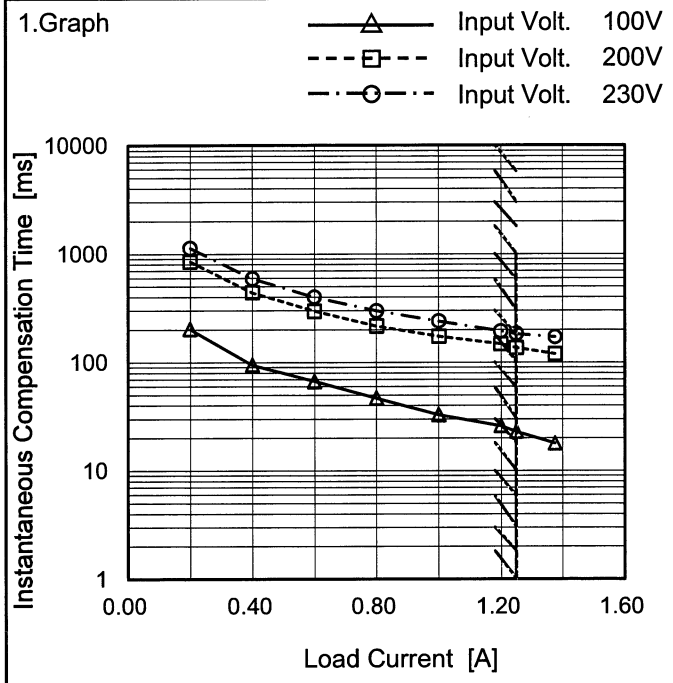
BC-10893

COSEL

Model	TUHS15F12
Item	Instantaneous Interruption Compensation
Object	+12V1.25A

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	-	-	-
0.20	203	856	1138
0.40	95	443	597
0.60	67	298	401
0.80	47	218	300
1.00	33	174	241
1.20	26	148	195
1.25	23	137	184
1.38	18	120	172
--	-	-	-
--	-	-	-

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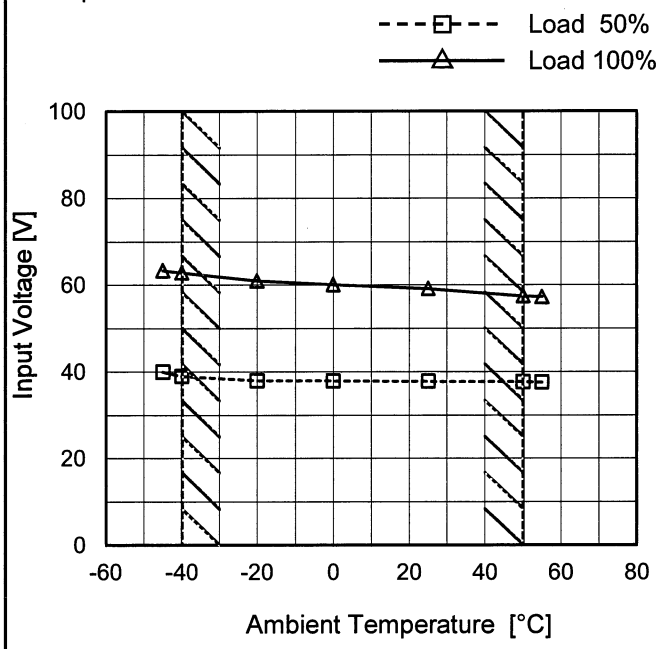
COSEL

Model	TUHS15F12
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+12V1.25A

Testing Circuitry Figure A

1.Graph



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

2.Values

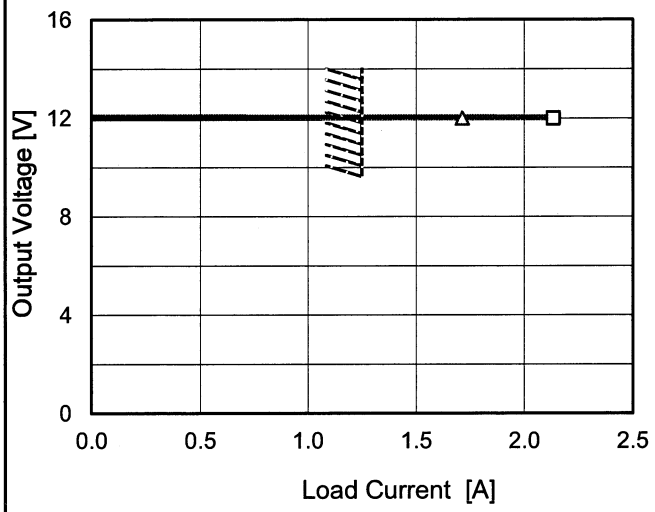
Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-45	40	64
-40	39	63
-20	38	61
0	38	61
25	38	60
50	38	58
55	38	58
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

Model	TUHS15F12
Item	Overcurrent Protection
Object	+12V1.25A

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]	Load Current [A] Input Volt. 230[V]
12.0	1.71	2.13
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

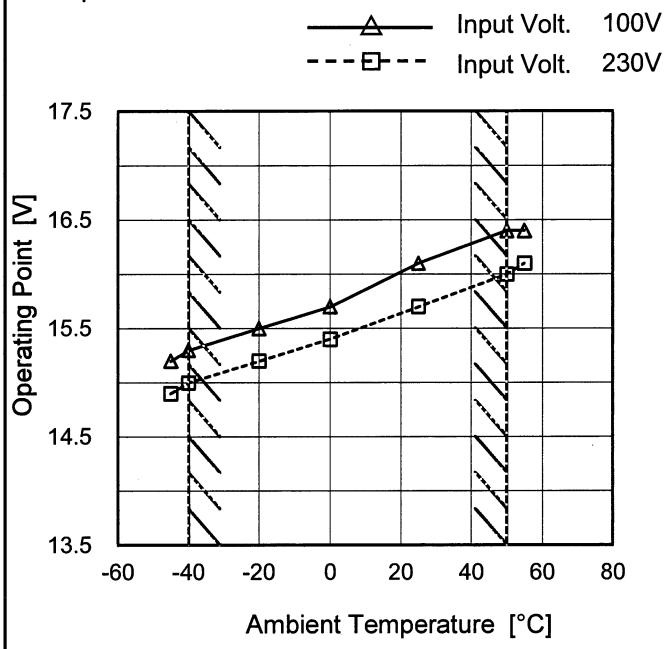
BC-10893

COSEL

Model	TUHS15F12
Item	Overvoltage Protection
Object	+12V0.9A

Testing Circuitry Figure A

1.Graph



Load 30%

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	15.20	14.90
-40	15.30	15.00
-20	15.50	15.20
0	15.70	15.40
25	16.10	15.70
50	16.40	16.00
55	16.40	16.10
--	-	-
--	-	-
--	-	-
--	-	-

COSEL

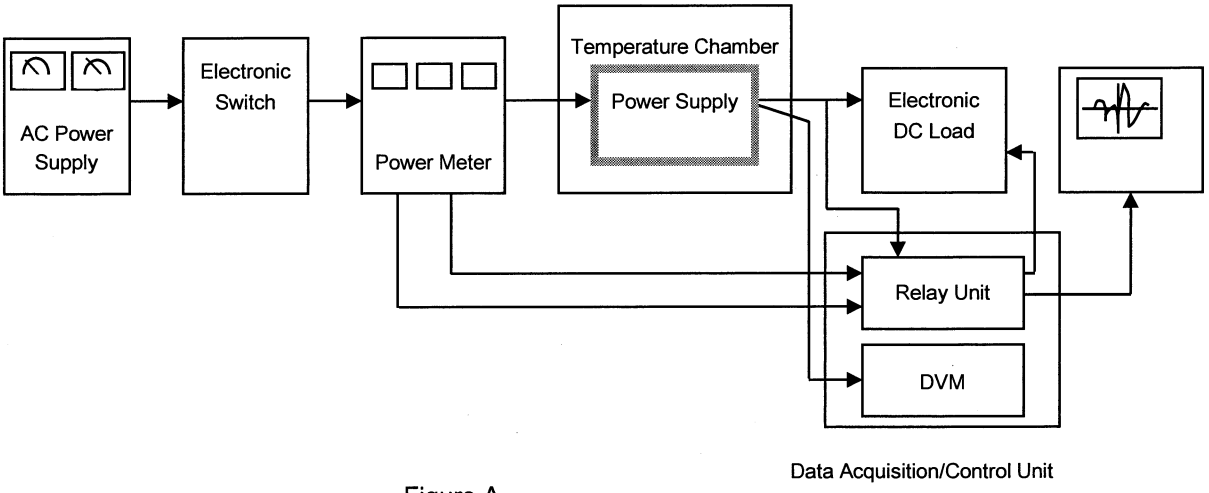


Figure A

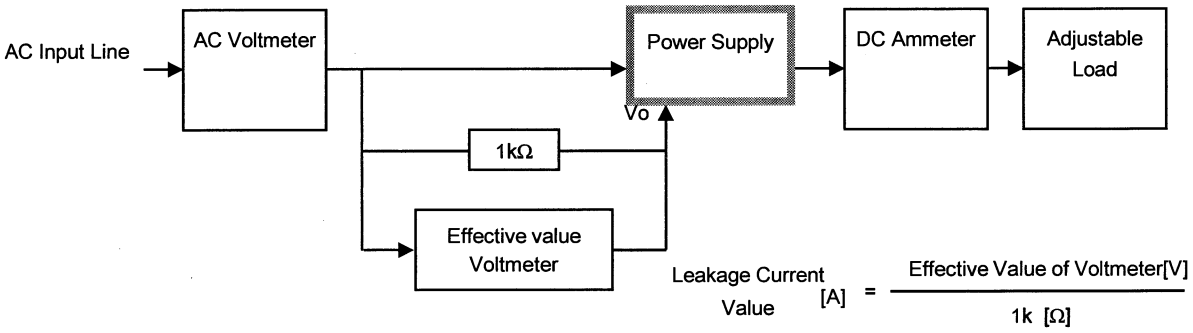


Figure B (DEN-AN)

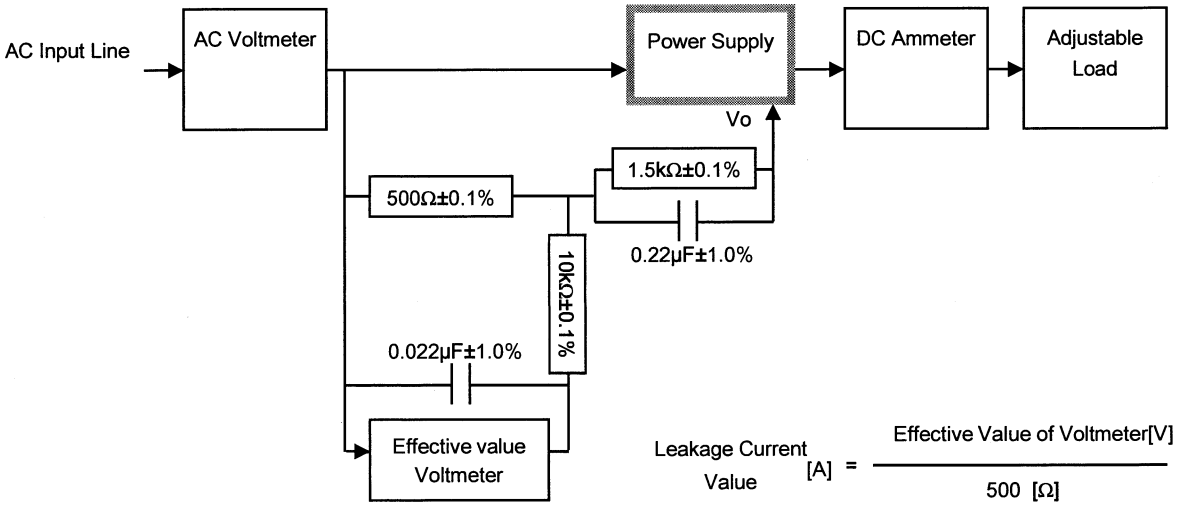
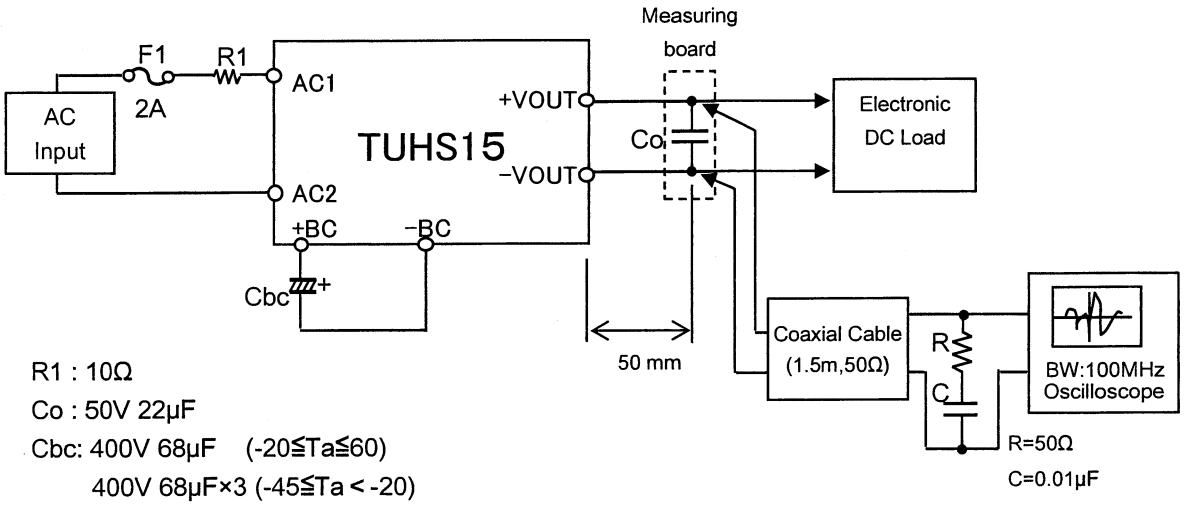


Figure B (IEC60950-1)

COSEL



R1 : 10Ω

Co : 50V 22μF

Cbc: 400V 68μF (-20≦Ta≦60)

400V 68μF×3 (-45≦Ta < -20)

Ta : Ambient Temperature

Figure C