TEST DATA OF TUNS700F28

Regulated DC Power Supply
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COSEL CO.,LTD.

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1.Graph

```
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- - -▣- - - Input Volt.  200V
—·—○—·— Input Volt.  230V
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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. 200[V]	Input Volt. 230[V]
0.0	0.240	0.440	0.504
5.0	1.738	0.962	0.904
10.0	3.268	1.672	1.500
15.0	4.860	2.418	2.136
20.0	6.480	3.185	2.794
25.0	8.140	3.970	3.466
27.5	9.000	4.370	3.810
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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Model	TUNS700F28
Item	Input Power (by Load Current)
Object	————————

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

———△——— Input Volt. 100V
- - -⊟- - - Input Volt. 200V
—·-○—·- Input Volt. 230V

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]
0.0	3.0	2.8	2.9
5.0	168.9	164.0	163.0
10.0	323.1	315.0	313.0
15.0	481.0	468.0	466.0
20.0	643.0	623.0	620.0
25.0	809.0	781.0	776.0
27.5	895.0	861.0	857.0
--	-	-	-
--	-	-	-
---	-	-	-
--	-	-	-

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Model	TUNS700F28
Item	Efficiency (by Input Voltage)
Object	———————
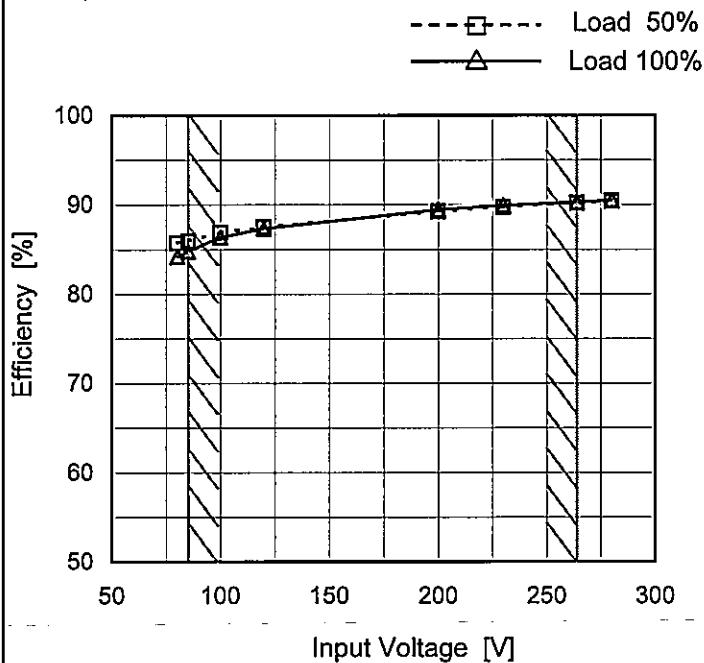
Temperature 25°C
Testing Circuitry Figure A

1.Graph

--- ⊡ --- Load 50%
——△—— Load 100%


Note: Slanted line shows the range of the rated
input voltage.

2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
80	85.8	84.2
85	86.0	84.8
100	86.9	86.4
120	87.5	87.4
200	89.3	89.5
230	89.7	89.9
264	90.2	90.3
280	90.4	90.5
--	-	-

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参考資料

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Model	TUNS700F28
Item	Efficiency (by Load Current)
Object	————————————

Temperature　　25°C
Testing Circuitry　Figure A

1.Graph

————△———— Input Volt.　100V
- - -🔲- - - Input Volt.　200V
—·—◯—·— Input Volt.　230V

Efficiency [%] vs Load Current [A]

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]
0.0	-	-	-
5.0	82.7	85.1	85.7
10.0	86.4	88.6	89.2
15.0	87.1	89.5	89.9
20.0	86.9	89.7	90.2
25.0	86.4	89.5	89.9
27.5	85.9	89.3	89.7
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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Model	TUNS700F28
Item	Power Factor (by Input Voltage)
Object	

Temperature　25°C
Testing Circuitry　Figure A

1.Graph

- - -□- - -　Load 50%
———△———　Load 100%

Power Factor vs Input Voltage [V]

Note: Slanted line shows the range of the rated input voltage.
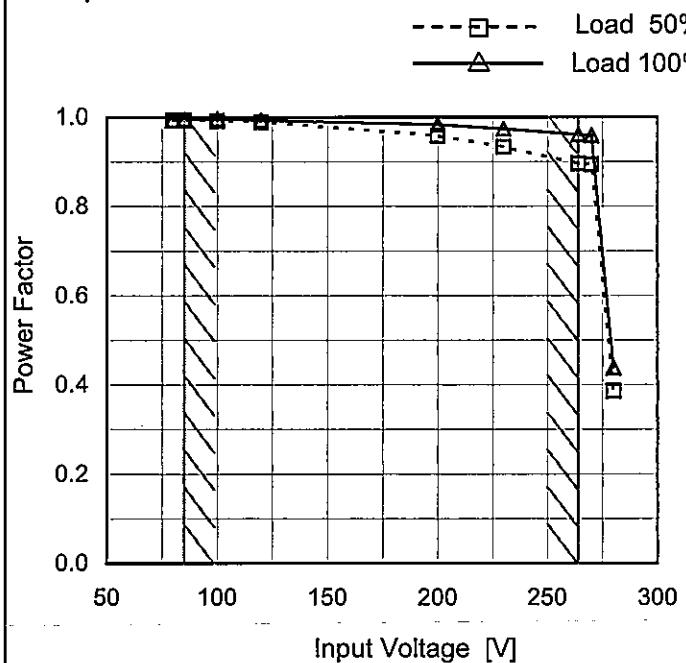
2.Values

Input Voltage [V]	Power Factor	
	Load 50%	Load 100%
80	0.993	0.994
85	0.993	0.995
100	0.991	0.996
120	0.990	0.994
200	0.958	0.984
230	0.933	0.974
264	0.896	0.961
270	0.894	0.959
280	0.386	0.438

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Model	TUNS700F28
Item	Power Factor (by Load Current)
Object	

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

—△— Input Volt. 100V
- - -▭- - - Input Volt. 200V
—·—O—·— Input Volt. 230V

Power Factor vs Load Current [A]

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]
0.0	0.183	0.042	0.032
2.5	0.944	0.704	0.600
5.0	0.974	0.854	0.784
10.0	0.990	0.943	0.907
15.0	0.992	0.969	0.949
20.0	0.994	0.978	0.966
25.0	0.996	0.984	0.974
27.5	0.996	0.985	0.977
--	-	-	-
--	-	-	-
--	-	-	-

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Model	TUNS700F28
Item	Inrush Current
Object	

Temperature　　25°C
Testing Circuitry　Figure A

Input
Current
[20A/div]

Input
Voltage
[100V/div]

Time　　　　　　　　　　[100ms/div]

Input Voltage	100 V
Frequency	60 Hz
Load	100 %

Primary inrush current :
14.0 A
Secondary inrush current :
18.9 A

Input
Current
[20A/div]

Input
Voltage
[200V/div]

Time　　　　　　　　　　[100ms/div]

Input Voltage	230 V
Frequency	60 Hz
Load	100 %

Primary inrush current :
30.0 A
Secondary inrush current :
12.3 A

Primary inrush current　　　　　　　Secondary inrush current

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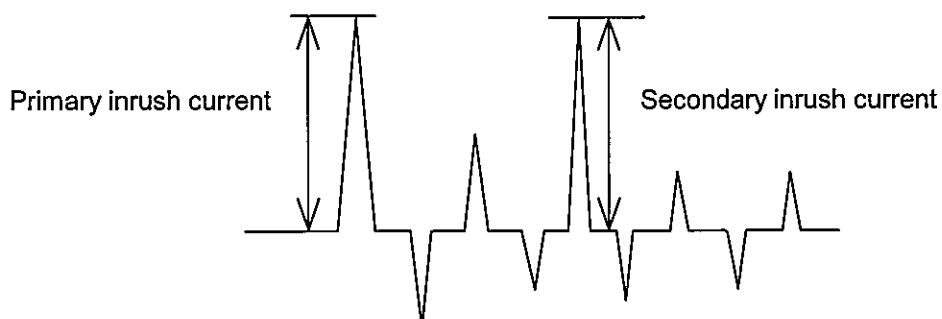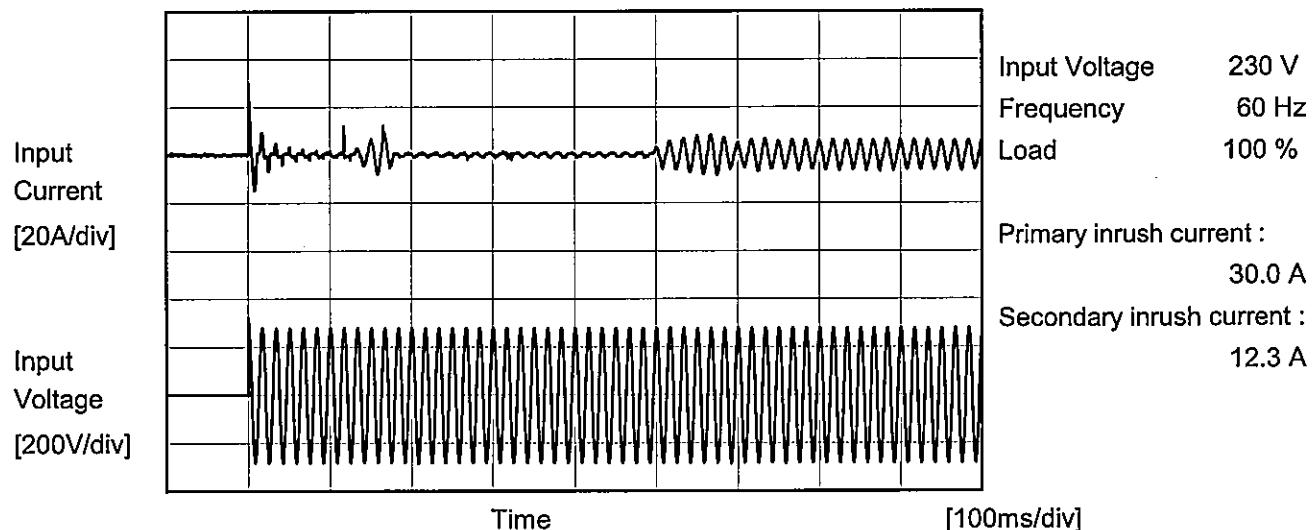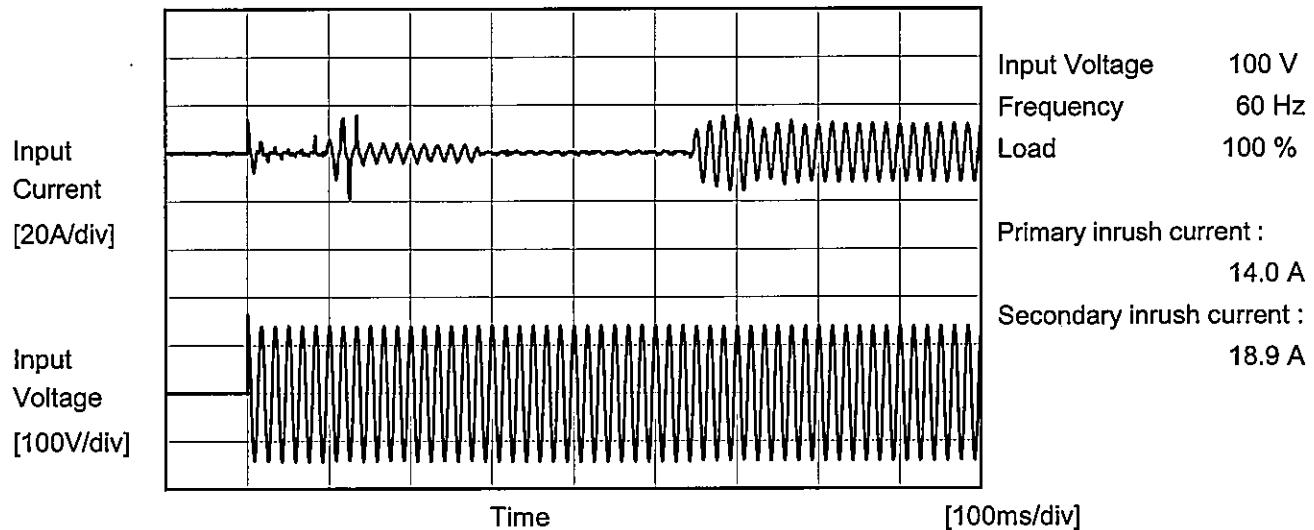
Model	TUNS700F28		Temperature	25°C
Item	Leakage Current		Testing Circuitry	Figure B
Object				

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	200 [V]	240[V]	
IEC60950-1	Both phases	0.16	0.33	0.40	Operation
	One of phase	0.30	0.63	0.77	stand by

The value for "One phase" 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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参考資料

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Model	TUNS700F28
Item	Line Regulation
Object	+28V25A

Temperature 25°C
Testing Circuitry Figure A

1.Graph
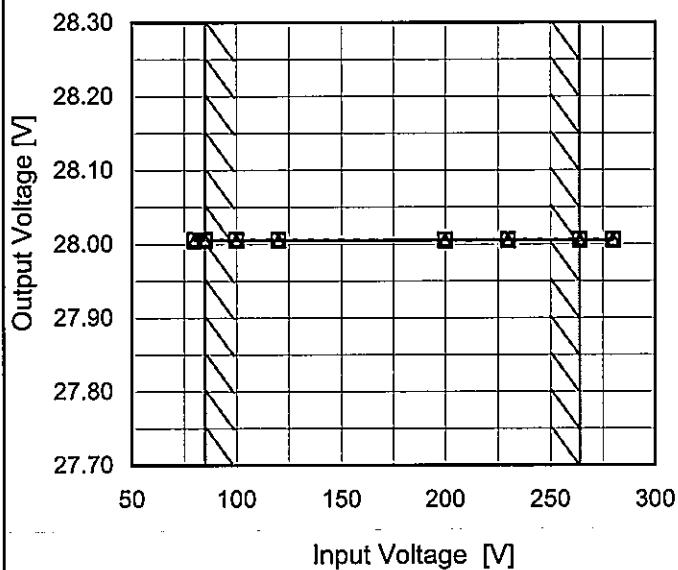
--- ⊟ --- Load 50%
——— △ ——— Load 100%

Note: Slanted line shows the range of the rated input voltage.

2.Values

| Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
80	28.006	28.005
85	28.006	28.005
100	28.006	28.005
120	28.006	28.005
200	28.006	28.005
230	28.006	28.005
264	28.006	28.005
280	28.006	28.006
--	-	-

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Model	TUNS700F28
Item	Load Regulation
Object	+28V25A
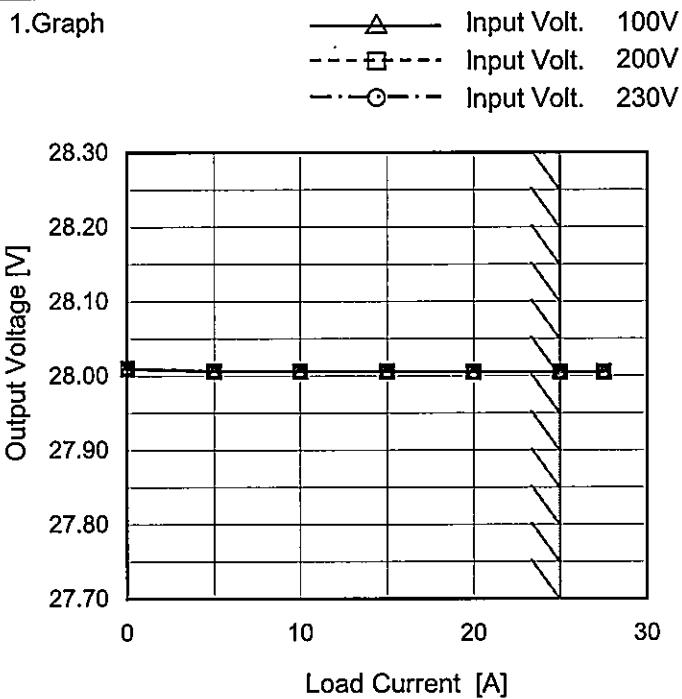
Temperature 25°C
Testing Circuitry Figure A

1.Graph

⎯△⎯ Input Volt. 100V
--⊟-- Input Volt. 200V
—·—⊙—·— Input Volt. 230V

Output Voltage [V] vs Load Current [A]

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]
0.0	28.010	28.010	28.010
5.0	28.006	28.006	28.006
10.0	28.006	28.006	28.006
15.0	28.006	28.006	28.006
20.0	28.005	28.005	28.005
25.0	28.005	28.005	28.005
27.5	28.005	28.005	28.005
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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Model	TUNS700F28
Item	Dynamic Load Response
Object	+28V 25A

Temperature   25℃
Testing Circuitry   Figure A

Input Volt.   100V
Cycle   1000ms

Load Current

25A / 100us

Min.Load (0A)←→
Load 100%(25A)

1 V/div
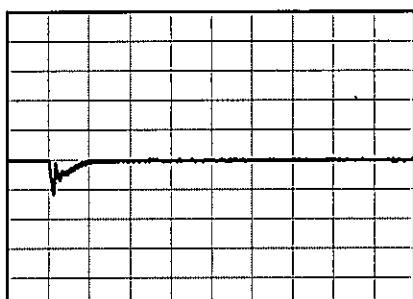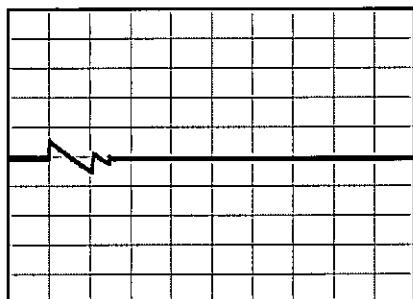
400 us/div   40 ms/div

Min.Load (0A)←→
Load 50%(12.5A)

1 V/div
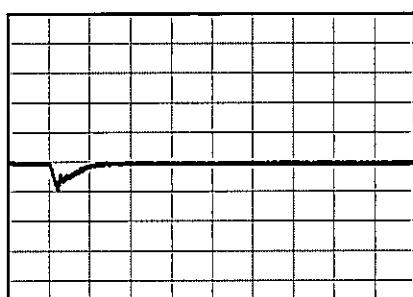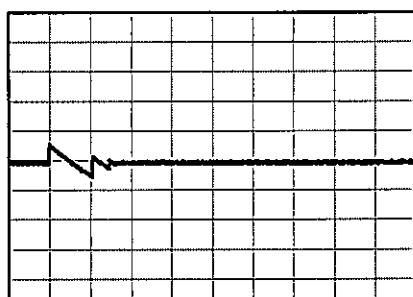
400 us/div   40 ms/div

Load 10% (2.5A)←→
Load 100% (25A)

1 V/div

400 us/div   40 ms/div

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Model	TUNS700F28
Item	Ripple Voltage (by Load Current)
Object	+28V25A

Temperature   25°C
Testing Circuitry   Figure C

1.Graph

——△—— Input Volt.   100V
—·—○—·— Input Volt.   200V

Ripple Voltage [mV] vs Load Current [A]

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.

2.Values

Load Current [A]	Ripple Voltage [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
0.0	35	35
5.0	60	55
10.0	60	60
15.0	60	60
20.0	65	60
25.0	60	60
27.5	65	65
--	-	-
--	-	-
--	-	-
--	-	-

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

Ripple [mVp-p]

Fig. Complex Ripple Wave Form

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Model	TUNS700F28
Item	Ripple-Noise
Object	+28V25A

Temperature 25°C
Testing Circuitry Figure C

1.Graph

──△── Input Volt. 100V
─·─○─·─ Input Volt. 200V

Ripple-Noise [mV] vs Load Current [A]

Load Current [A]

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.
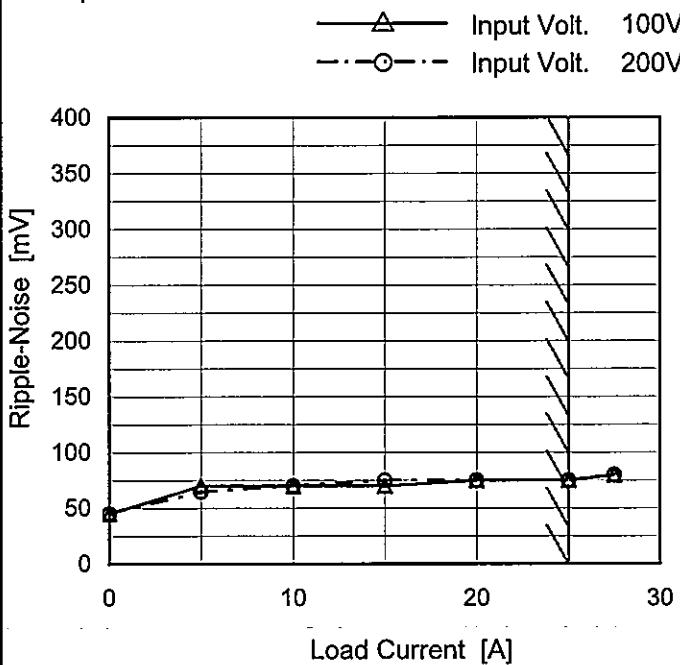
2.Values

Load Current [A]	Ripple-Noise [mV]	
	Input Volt. 100 [V]	Input Volt. 200 [V]
0.0	45	45
5.0	70	65
10.0	70	70
15.0	70	75
20.0	75	75
25.0	75	75
27.5	80	80
--	-	-
--	-	-
--	-	-
--	-	-

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

T2

Ripple-Noise [mVp-p]

T1

Fig. Complex Ripple Wave Form

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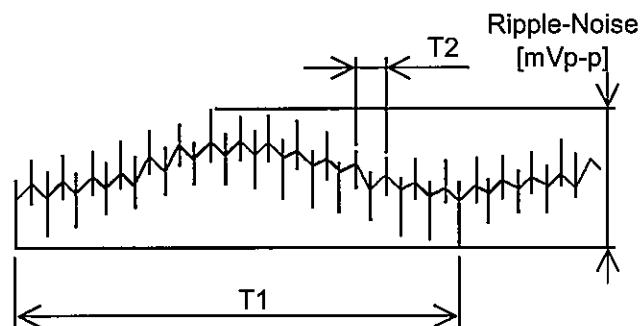
Model	TUNS700F28
Item	Ripple Voltage (by Ambient Temp.)
Object	+28V25A

Testing Circuitry   Figure C

1.Graph

- - -▭- - - Load 50%
———△——— Load 100%

Ambient Temperature [°C]
Input Volt.   200V

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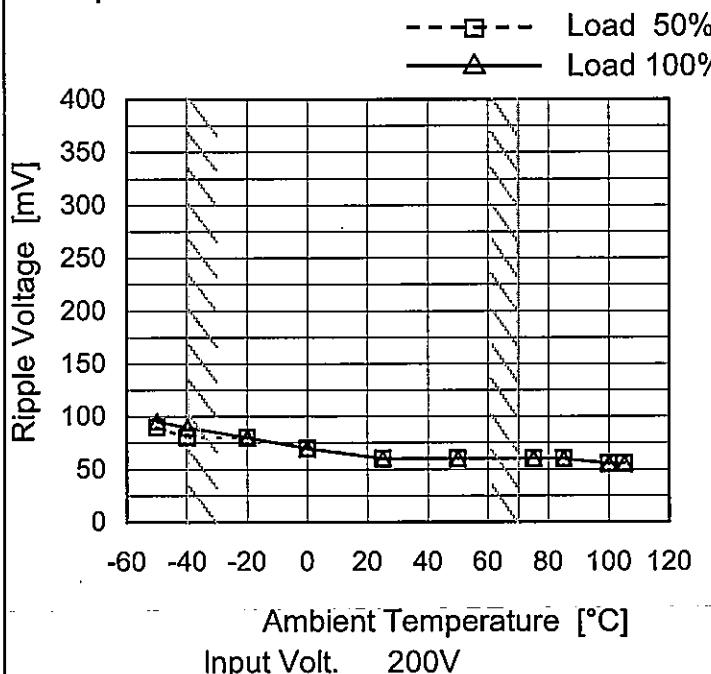
2.Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Load 50%	Load 100%
-50	90	95
-40	80	90
-20	80	80
0	70	70
25	60	60
50	60	60
75	60	60
85	60	60
100	55	55
105	55	55
---	-	-

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Model	TUNS700F28
Item	Output Voltage Accuracy
Object	+28V25A

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 - 70°C

Input Voltage : 85 - 264V

Load Current : 0 - 25A

* Output Voltage Accuracy = ±(Maximum of Output Voltage - Minimum of Output Voltage) / 2

* Output Voltage Accuracy (Ration) = $\dfrac{\text{Output Voltage Accuracy}}{\text{Rated Output Voltage}} \times 100$

2.Values

Item	Temperature [°C]	Input Voltage[V]	Output Current[A]	Output Voltage[V]	Output Voltage Accuracy Value [mV]	Output Voltage Accuracy Ration [%]
Maximum Voltage	70	85	0	28.038	±86	±0.3
Minimum Voltage	-40	85	25	27.867		

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参考資料

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Model	TUNS700F28
Item	Time Lapse Drift
Object	+28V25A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

Time [H]

Input Volt. 100V
Load 100%
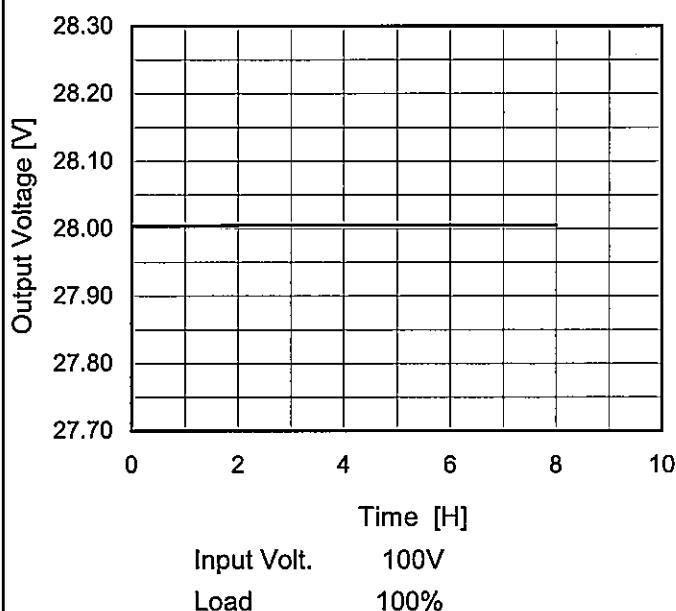
* The characteristic of AC200V is equal.

2.Values

Time since start [H]	Output Voltage [V]
0.0	28.002
0.5	28.004
1.0	28.004
2.0	28.005
3.0	28.005
4.0	28.005
5.0	28.005
6.0	28.005
7.0	28.005
8.0	28.005

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参考資料

COSEL

Model	TUNS700F28
Item	Rise and Fall Time
Object	+28V25A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

Load 100%   Output Volt. [5V/div]   0

Input Volt.   100 V

Load 100%   Output Volt. [5V/div]   0

Input Volt.   230 V

Input Volt.   0

Time   [200ms/div]

Time   [20ms/div]
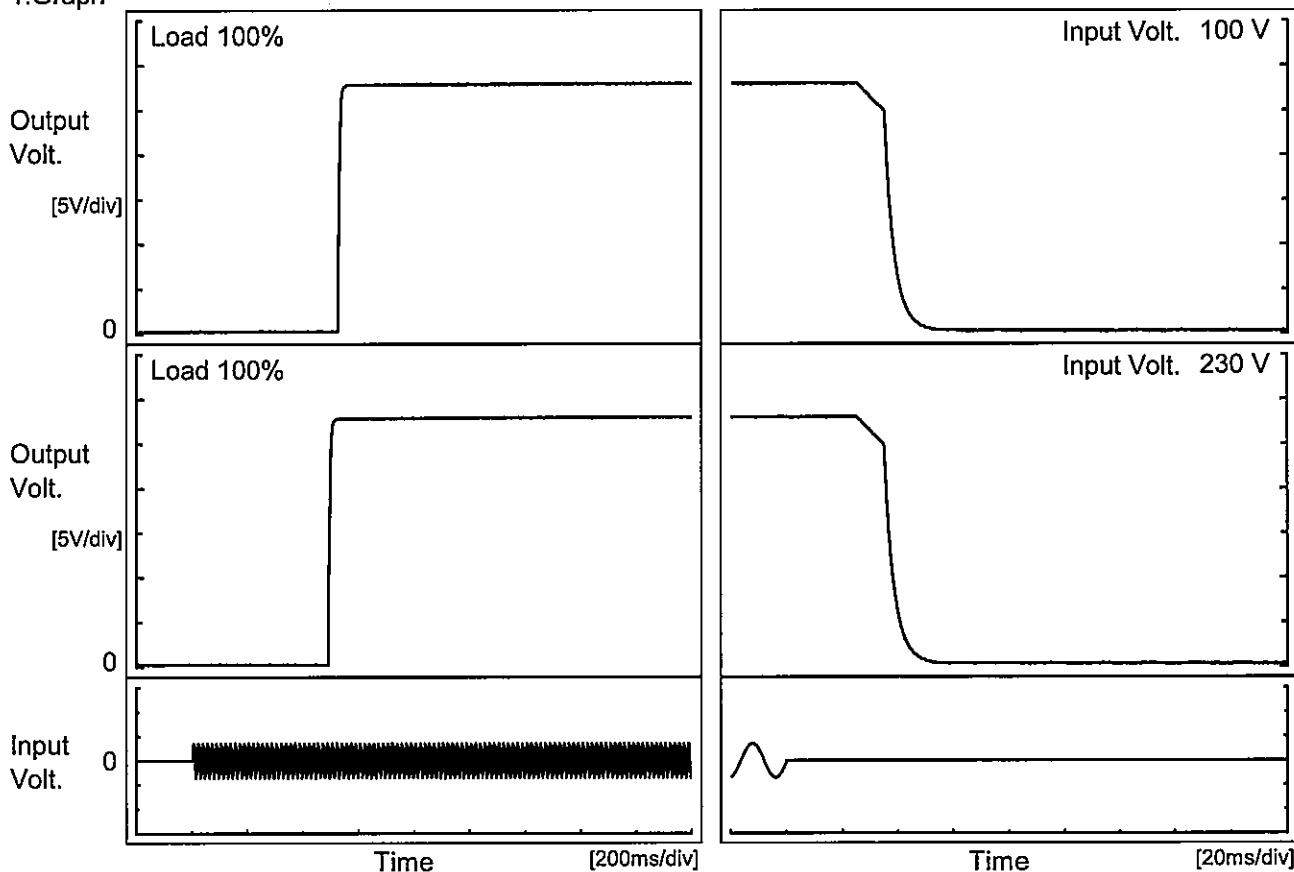
2.Values   [ms]

Input Volt. ＼ Time	Td	Tr	Ts	Th	Tf
100 V	527.0	11.0	538.0	33.5	9.2
230 V	493.0	11.0	504.0	33.8	9.1

Output Volt.   90%   10%

Input Volt.

Td   Tr   Th   Tf

Ts

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Model	TUNS700F28
Item	Hold-Up Time
Object	+28V25A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

- - - ⊟ - - -   Load 50%
———△———   Load 100%

Hold-Up Time [ms] vs Input Voltage [V]

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	56	24
85	55	26
100	56	26
120	56	26
200	56	26
230	56	26
264	56	26
280	60	26
--	-	-

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Model	TUNS700F28
Item	Instantaneous Interruption Compensation
Object	+28V25A

Temperature 25°C
Testing Circuitry Figure A

1.Graph

——△—— Input Volt. 100V
---□--- Input Volt. 200V
—·—○—·— Input Volt. 230V

Instantaneous Compensation Time [ms] vs Load Current [A]

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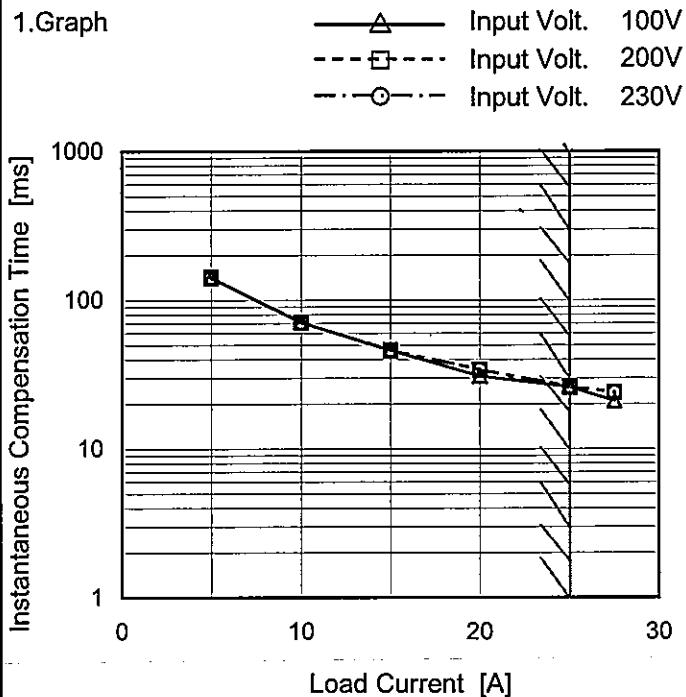
2.Values

Load Current [A]	Time [ms]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.0	-	-	-
5.0	142	142	142
10.0	71	71	71
15.0	46	46	46
20.0	31	34	34
25.0	26	26	26
27.5	21	24	24
--	-	-	-
---	-	-	-
--	-	-	-
--	-	-	-

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Model	TUNS700F28
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+28V25A
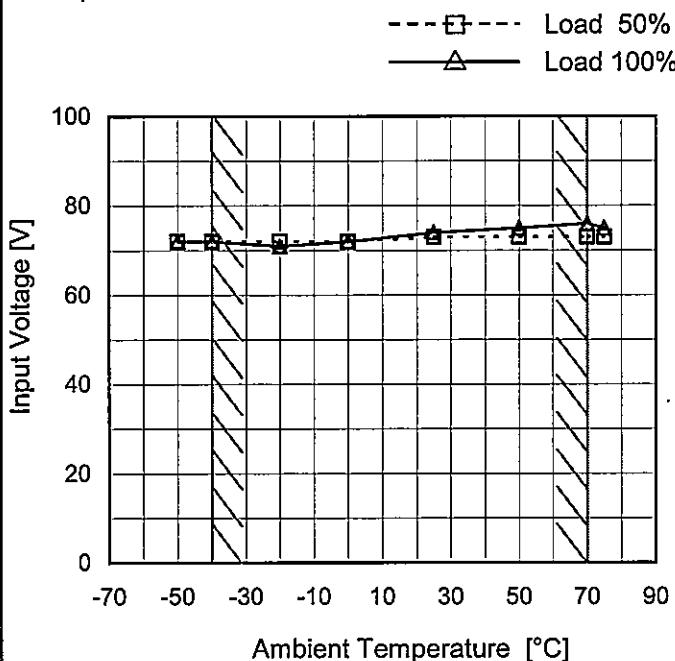
Testing Circuitry   Figure A

1.Graph

- - -□- - - Load 50%
——△—— Load 100%

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

2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-50	72	72
-40	72	72
-20	72	71
0	72	72
25	73	74
50	73	75
70	73	76
75	73	75
--	-	-
--	-	-
--	-	-

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Model	TUNS700F28
Item	Overcurrent Protection
Object	+28V25A

Temperature   25°C
Testing Circuitry   Figure A

1.Graph

——————— Input Volt.   100V
——————— Input Volt.   230V
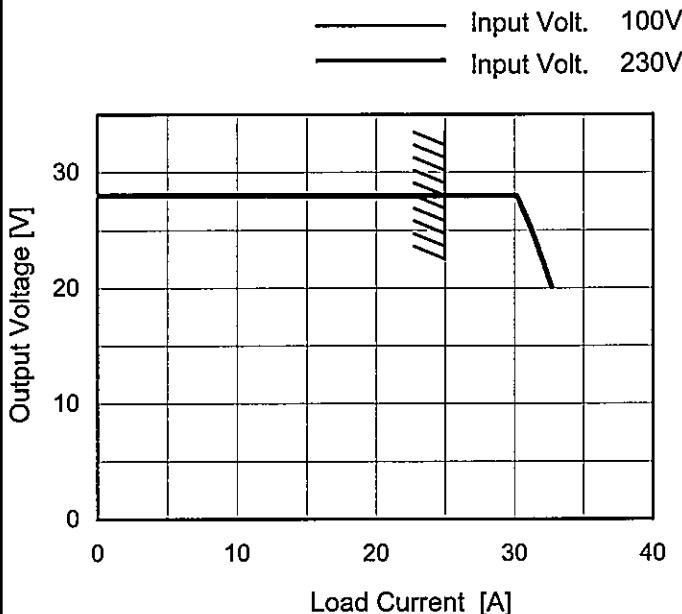
Note: Slanted line shows the range of the rated load current.

Intermittent operation occurs when the output voltage is from 20V to 0V.

2.Values

Output Voltage [V]	Load Current [A]	
	Input Volt. 100[V]	Input Volt. 230[V]
28.0	24.85	24.87
26.6	30.66	30.67
25.2	31.16	31.16
22.4	32.01	32.00
20.0	32.72	32.67
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

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CO$EL

Model	TUNS700F28
Item	Overvoltage Protection
Object	+28V25A
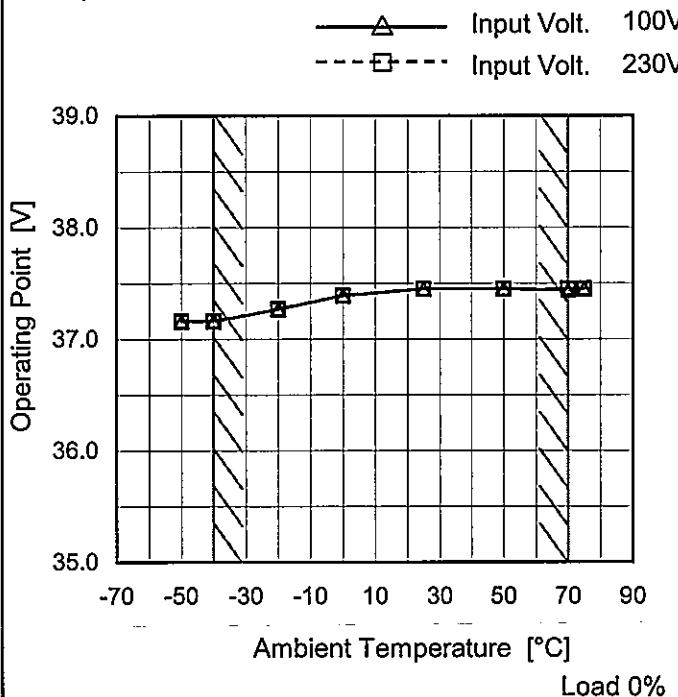
Testing Circuitry　Figure A

1.Graph

— △ — Input Volt.　100V
- - - ☐ - - - Input Volt.　230V

Ambient Temperature　[°C]

Load 0%

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]
-50	37.16	37.16
-40	37.16	37.16
-20	37.27	37.27
0	37.39	37.39
25	37.45	37.45
50	37.45	37.45
70	37.44	37.45
75	37.45	37.45
--	-	-
--	-	-
--	-	-

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Figure A

Leakage Current Value [A] $= \dfrac{\text{Effective Value of Voltmeter [V]}}{1k \ [\Omega]}$

Figure B (DEN-AN)

Leakage Current Value [A] $= \dfrac{\text{Effective Value of Voltmeter [V]}}{500 \ [\Omega]}$
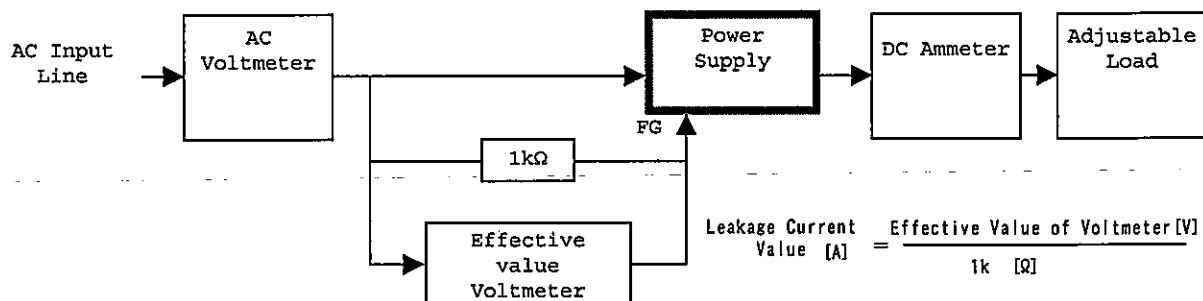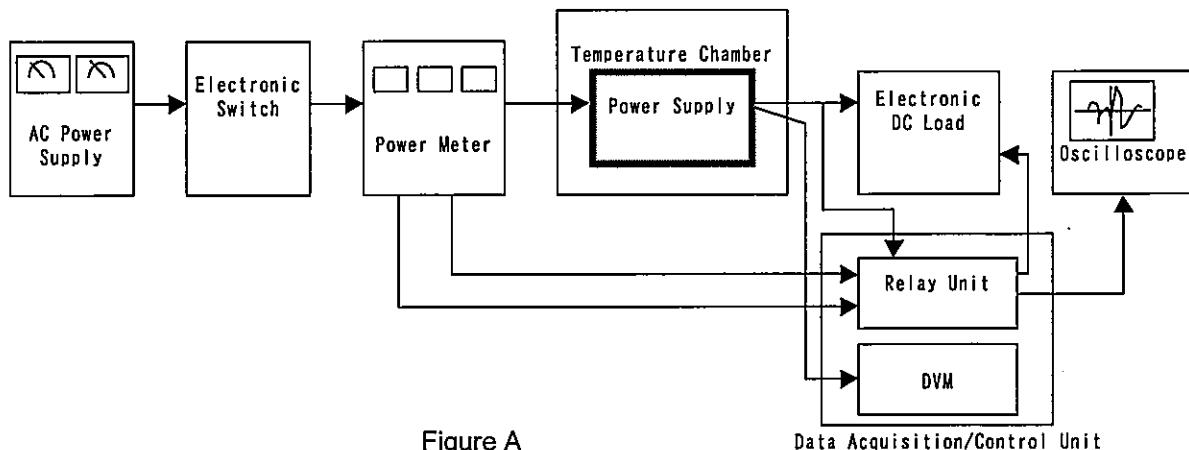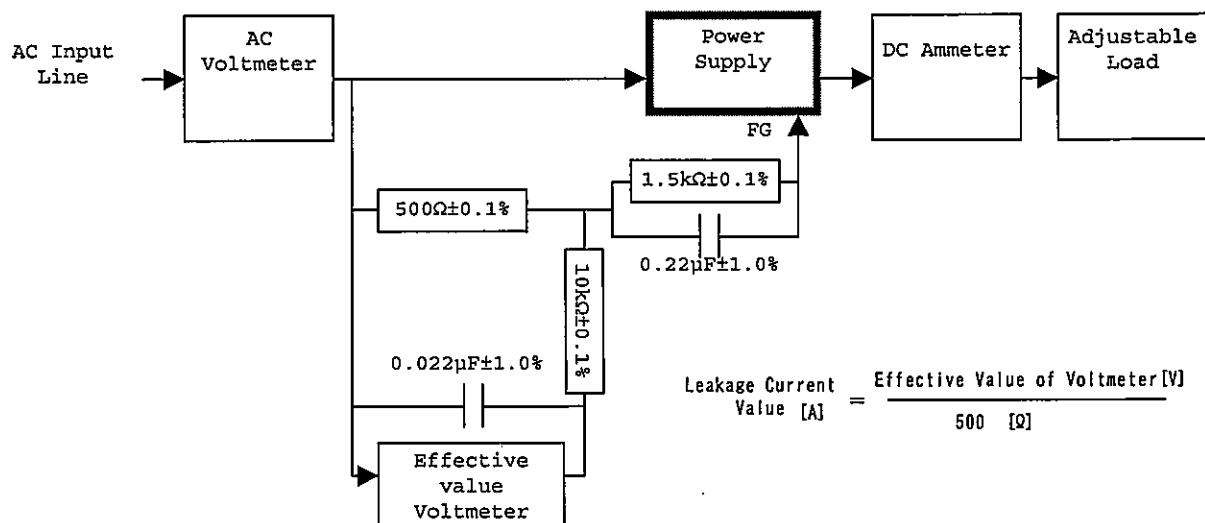
Figure B (IEC60950-1)

BC-10907
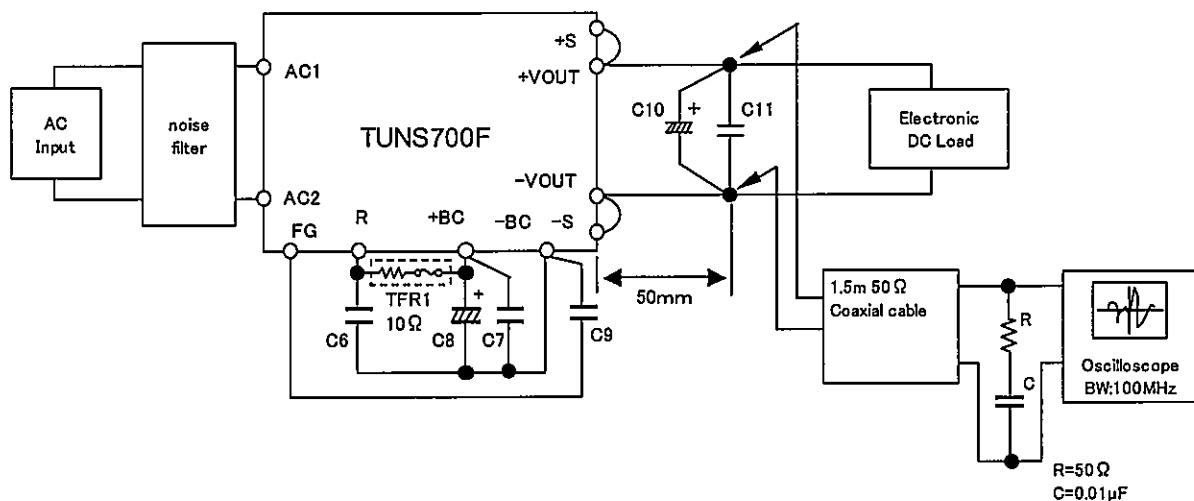
C10 : TUNS700F12 2200μF (0≦Tc≦100)
2200μF×3 (−40≦Tc＜0)
TUNS700F28 1000μF (0≦Tc≦100)
1000μF×3 (−40≦Tc＜0)
TUNS700F48 470μF (0≦Tc≦100)
470μF×3 (−40≦Tc＜0)
Tc:Base Plate Temp.

C11 : TUNS700F12 10μF
TUNS700F28 4.7μF
TUNS700F48 2.2μF

Figure C
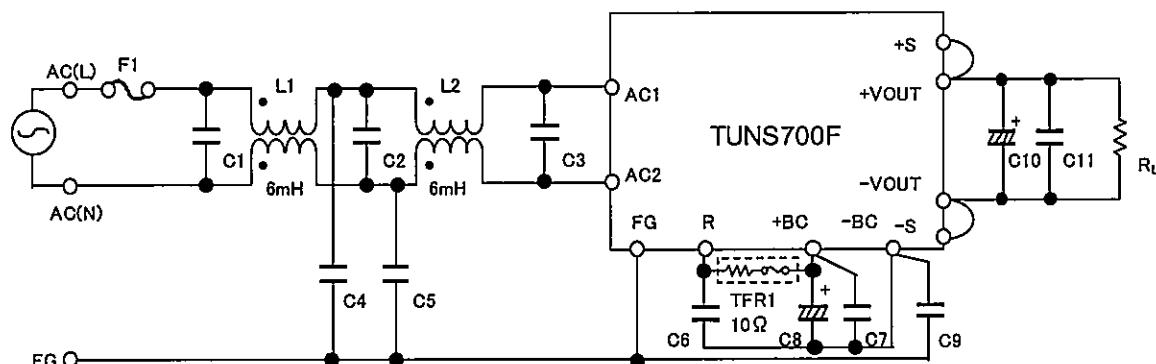
L1,L2 : ADM−25−12−060T(Ueno)
C1,C2 : 1.5μF 275V Film Capacitor
C3 : 1.5μF 275V Film Capacitor × 2
C4,C5,C9 : 2200pF Ceramic Capacitor
C6,C7 : 0.68μF 450V Film Capacitor × 2
C8 : 390μF 450V Electrolytic Capacitor × 2
C10 : TUNS700F12 2200μF 25V Electrolytic Capacitor
TUNS700F28 1000μF 50V Electrolytic Capacitor
TUNS700F48 470μF 63V Electrolytic Capacitor

C11 : TUNS700F12 10μF Ceramic Capacitor
TUNS700F28 4.7μF Ceramic Capacitor
TUNS700F48 2.2μF Ceramic Capacitor

Figure D

BC-10907