

TEST DATA OF TUXS200F24

Regulated DC Power Supply
October 21, 2016

Approved by : Junichi Hatagishi
Junichi Hatagishi Design Manager

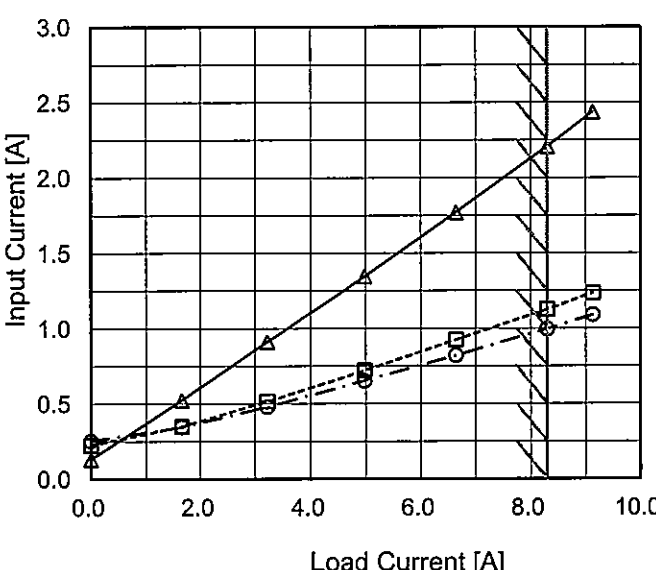
Prepared by : Hiroyuki Shoji
Hiroyuki Shoji Design Engineer

COSEL CO.,LTD.

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Model		TUXS200F24		Temperature 25°C Testing Circuitry Figure A																																																			
Item		Input Current (by Load Current)																																																					
Object		_____																																																					
1.Graph																																																							
		<div><div>—△—</div>Input Volt. 100V</div> <div><div>---□---</div>Input Volt. 200V</div> <div><div>---○---</div>Input Volt. 230V</div>																																																					
																																																							
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<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Input Current [A]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.00</td><td>0.131</td><td>0.225</td><td>0.255</td></tr><tr><td>1.66</td><td>0.524</td><td>0.348</td><td>0.345</td></tr><tr><td>3.22</td><td>0.911</td><td>0.516</td><td>0.480</td></tr><tr><td>4.98</td><td>1.345</td><td>0.721</td><td>0.654</td></tr><tr><td>6.64</td><td>1.770</td><td>0.924</td><td>0.821</td></tr><tr><td>8.30</td><td>2.207</td><td>1.126</td><td>0.997</td></tr><tr><td>9.13</td><td>2.435</td><td>1.235</td><td>1.089</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Input Current [A]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.00	0.131	0.225	0.255	1.66	0.524	0.348	0.345	3.22	0.911	0.516	0.480	4.98	1.345	0.721	0.654	6.64	1.770	0.924	0.821	8.30	2.207	1.126	0.997	9.13	2.435	1.235	1.089	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-			
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Note: Slanted line shows the range of the rated load current.																																																							

Temperature 25°C
Testing Circuitry Figure A



Load Current [A]	Input Power [W]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	6.1	6.5	6.4
1.66	47.7	48.3	49.1
3.22	87.1	87.0	87.3
4.98	131.9	130.9	131.1
6.64	174.7	172.6	172.6
8.30	218.6	215.2	215.0
9.13	241.1	237.0	236.7
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

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

Model		TUXS200F24	
Item		Efficiency (by Input Voltage)	
Object			

1.Graph

Load 50%

Load 100%

Efficiency [%]

100

90

80

70

60

50

50

100

150

200

250

300

Input Voltage [V]

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

2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
80	89.5	90.0
85	89.8	90.4
100	90.1	91.3
120	90.5	91.9
200	90.5	92.7
230	90.4	92.8
264	90.4	93.1
280	90.5	93.0
--	-	-

Model		TUXS200F24																																																				
Item		Efficiency (by Load Current)																																																				
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Model		TUXS200F24	
Item		Power Factor (by Input Voltage)	
Object			
1.Graph		2.Values	

<

Model		TUXS200F24	
Item		Power Factor (by Load Current)	
Object			

1.Graph

—△—

Input Volt.

100V

---□---

Input Volt.

200V

-·-○-·-

Input Volt.

230V

Power Factor

Load Current [A]

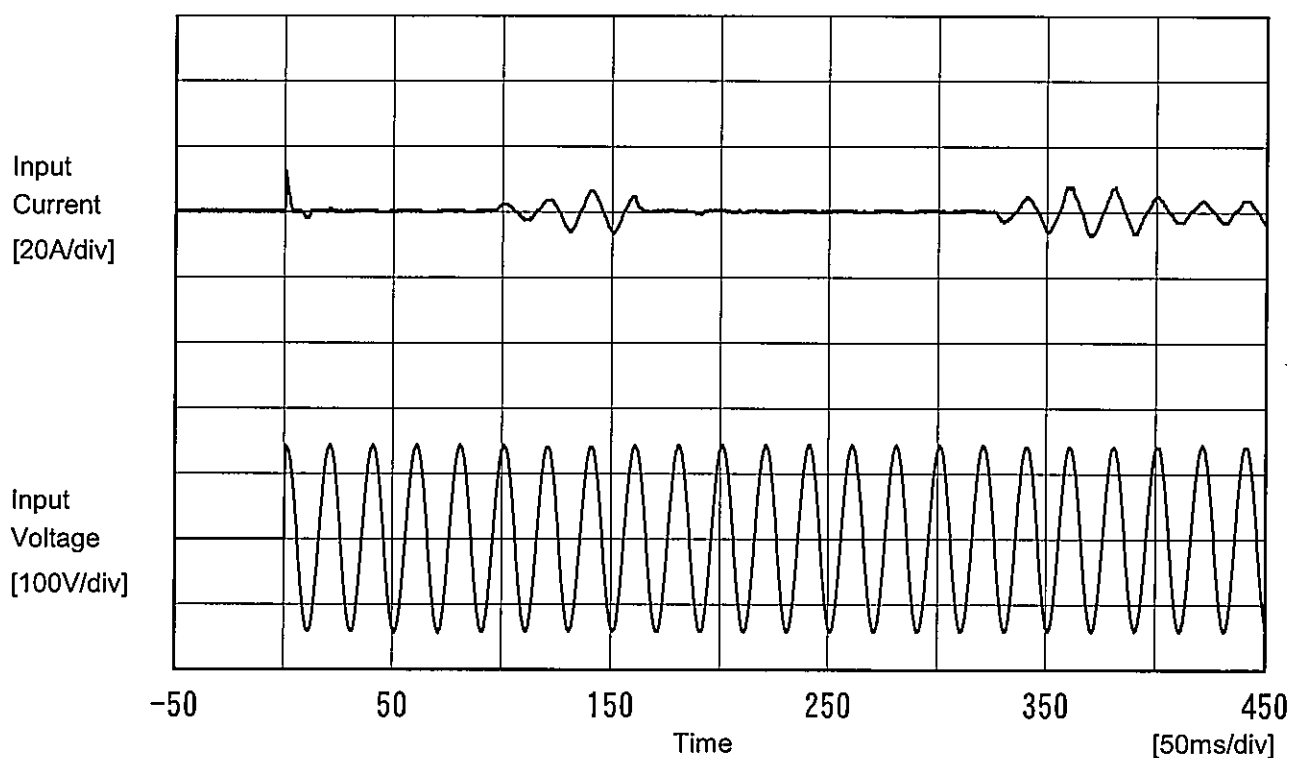
2.Values

Load Current [A]	Power Factor		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
0.00	0.463	0.144	0.109
1.66	0.910	0.693	0.618
3.22	0.957	0.844	0.791
4.98	0.981	0.908	0.872
6.64	0.988	0.933	0.914
8.30	0.991	0.956	0.938
9.13	0.991	0.959	0.945
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--	-	-	-

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

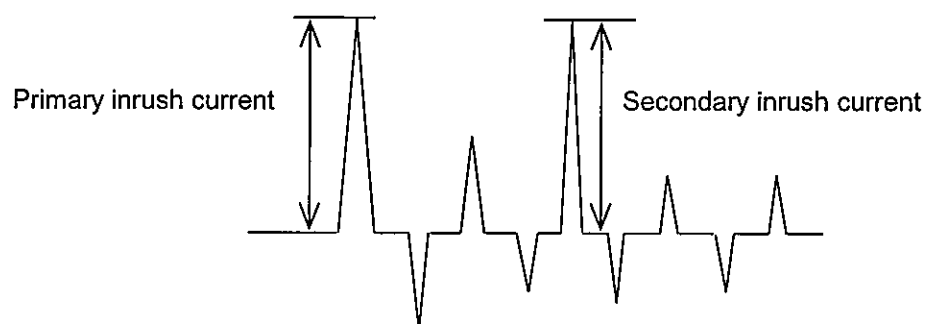
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Model	TUXS200F24	Temperature 25°C Testing Circuitry Figure A
Item	Inrush Current	
Object	_____	



Input Voltage 100 V
Frequency 50 Hz
Load 100 %

Primary inrush current 15.5 A
Secondary inrush current 7.7 A



		Temperature 25°C Testing Circuitry Figure B
Model	TUXS200F24	
Item	Leakage Current	
Object	_____	

1.Results

[mA]

Standards		Input Volt.			Note
		100 [V]	200 [V]	240 [V]	
DEN-AN	Both phases	0.17	0.34	0.41	Operation
	One of phases	0.27	0.54	0.65	Stand by
IEC60950-1	Both phases	0.14	0.29	0.36	Operation
	One of phases	0.28	0.56	0.68	Stand by

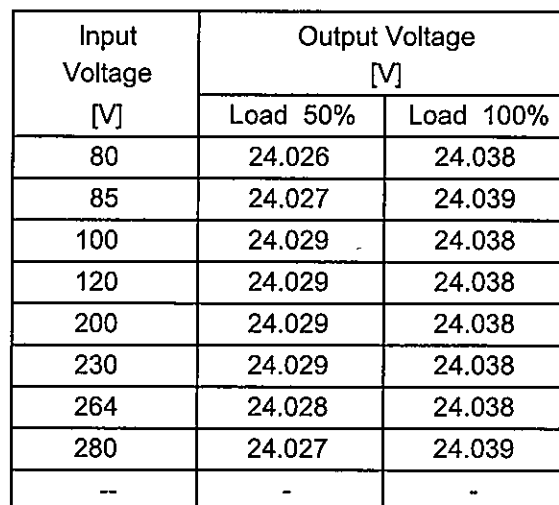
The value for "One of phases" is the reference value only.

2.Condition

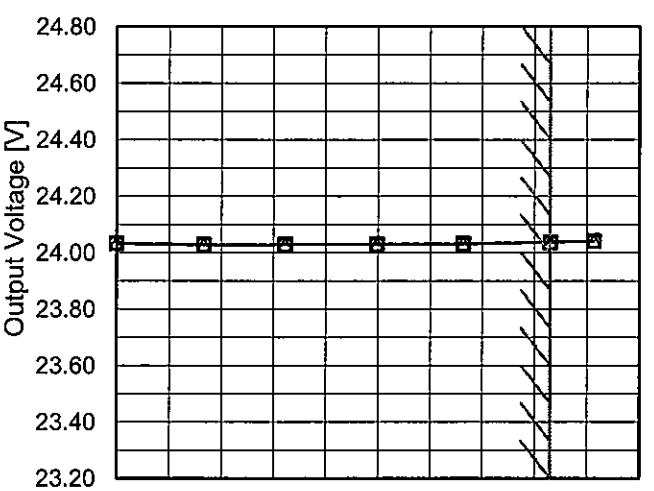
Leakage current value is concluded after measuring both phases of AC input and by choosing the larger one.

Temperature 25°C
Testing Circuitry Figure A

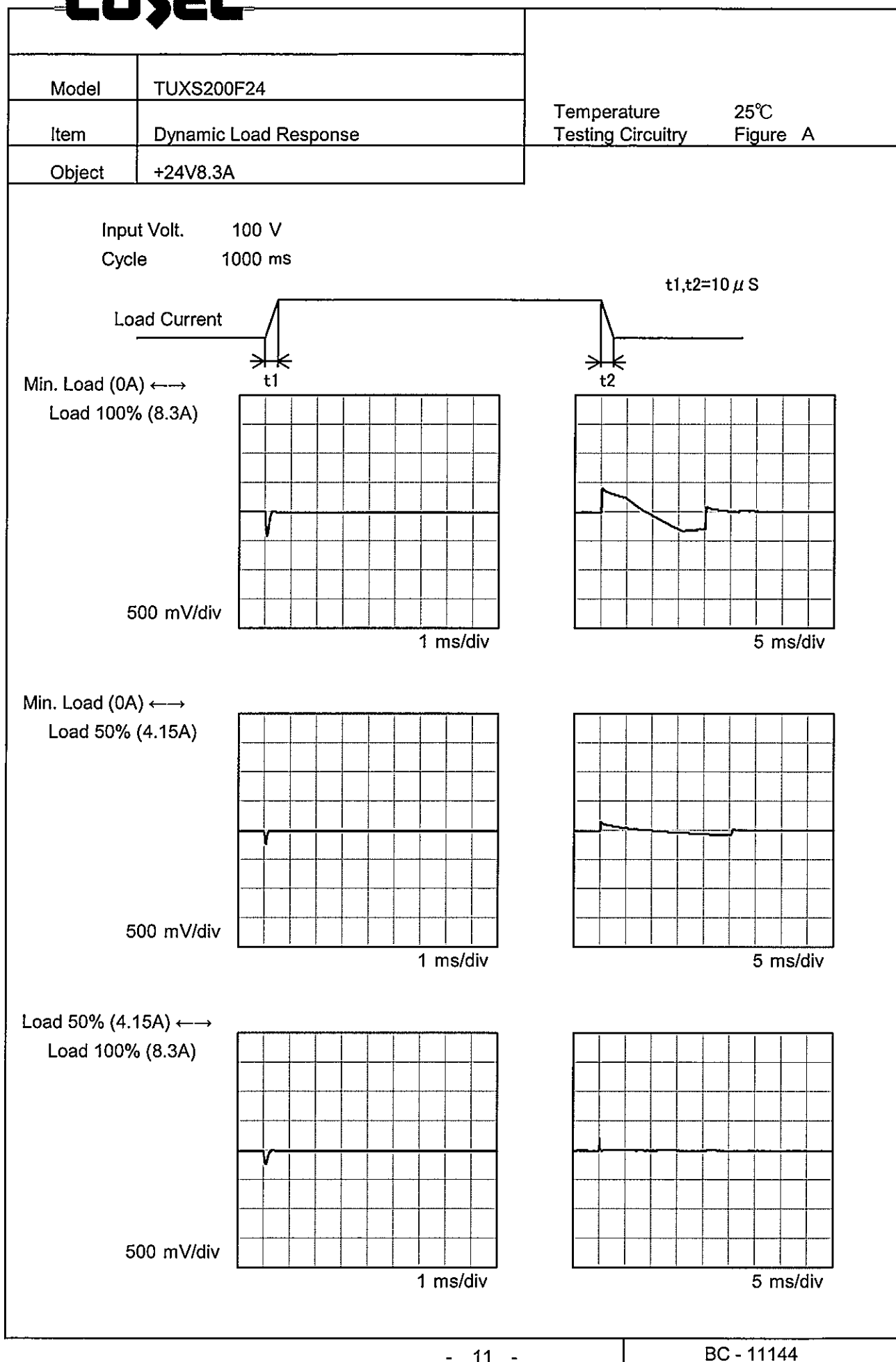
2.Values

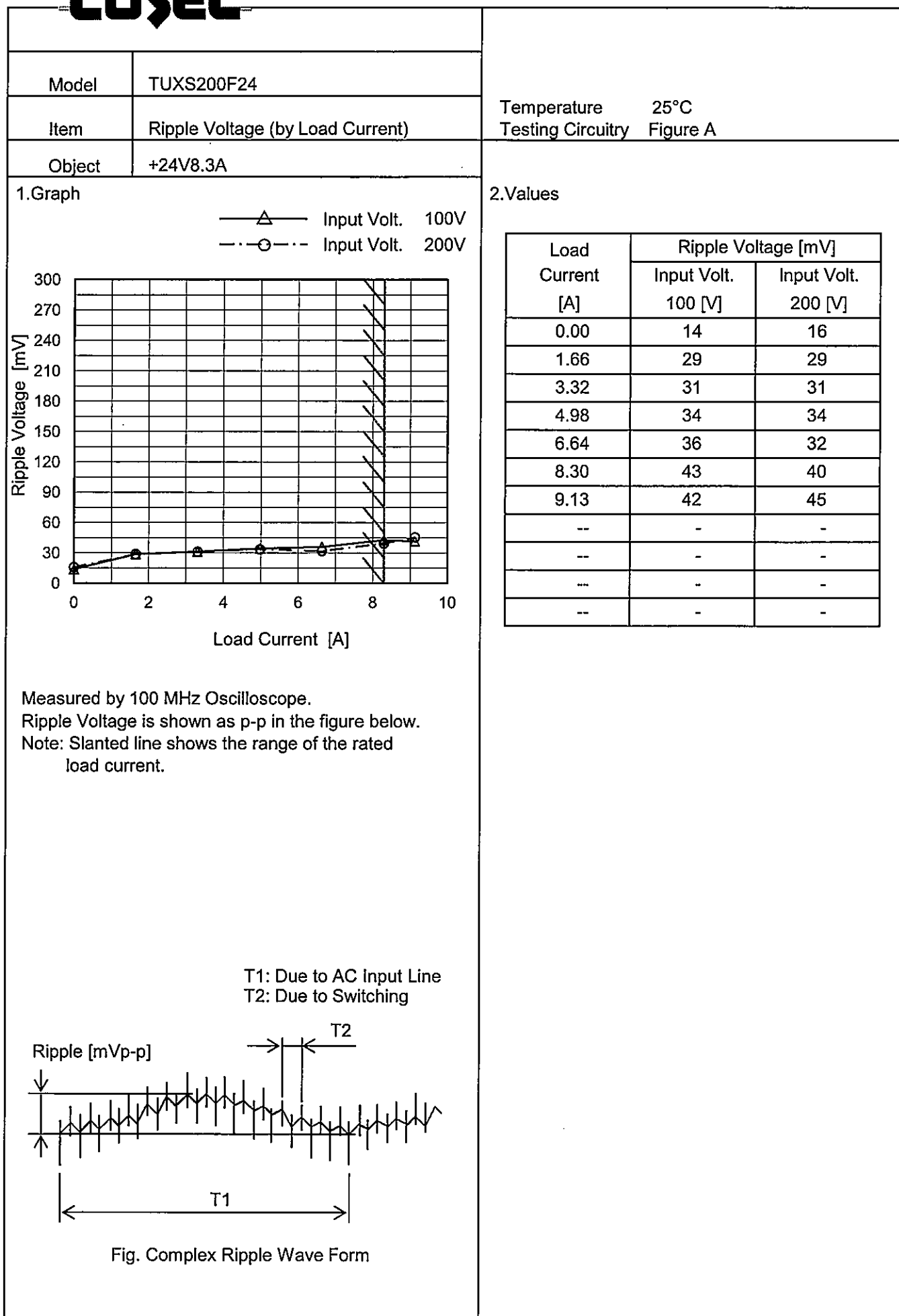


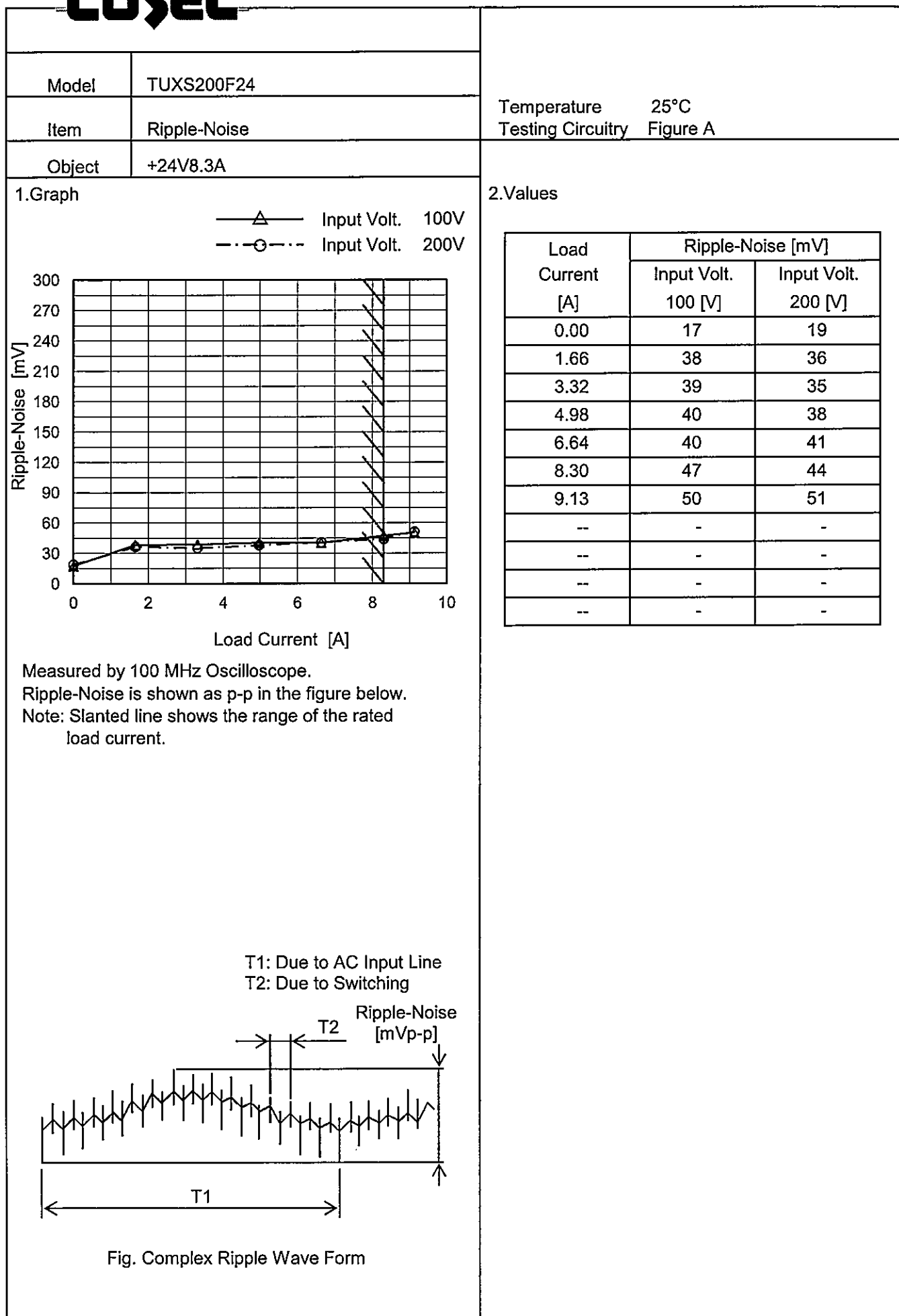
Note: Slanted line shows the range of the rated input voltage.

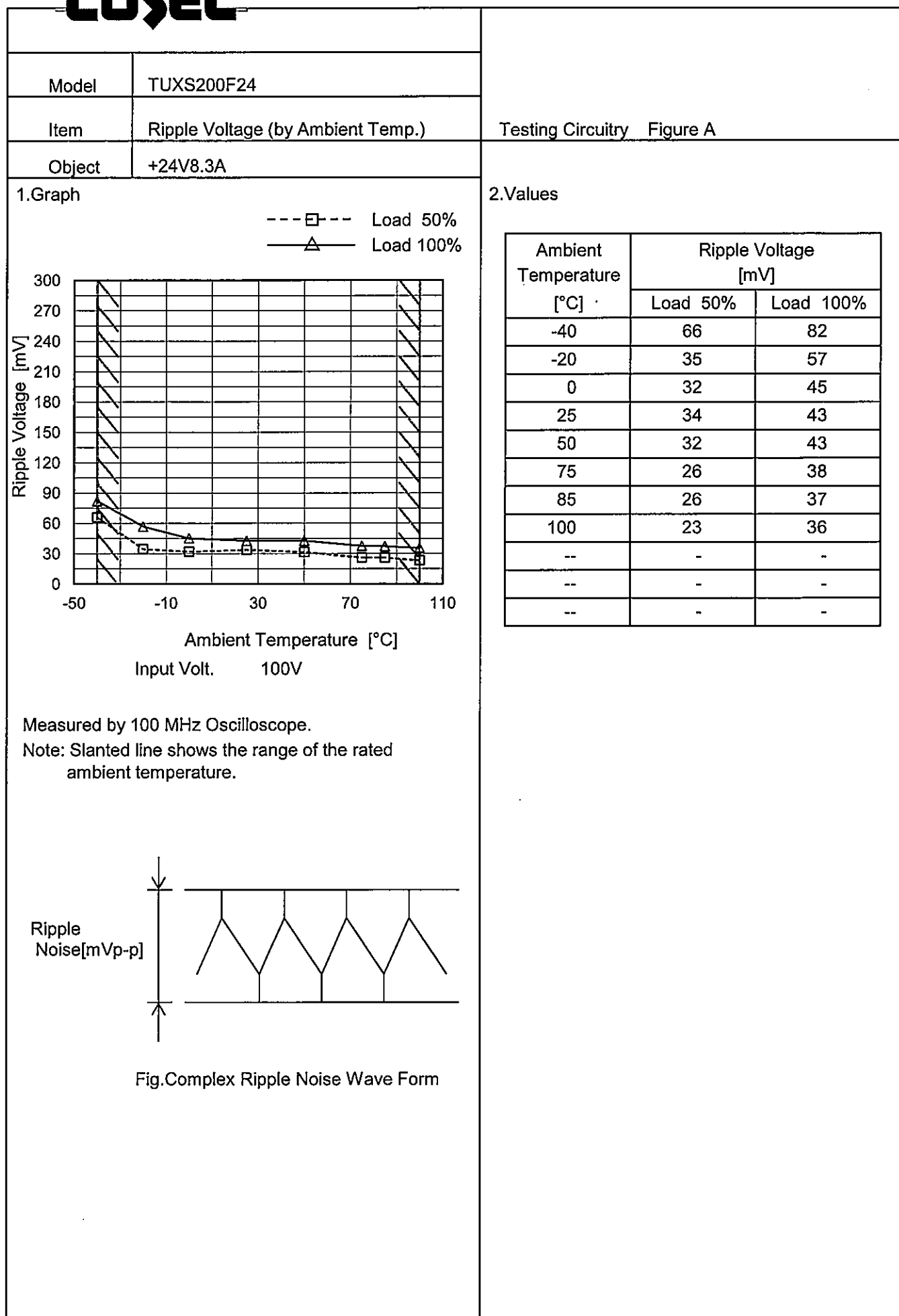
Model	TUXS200F24																																																					
Item	Load Regulation	Temperature	25°C																																																			
Object	+24V8.3A	Testing Circuitry	Figure A																																																			
1.Graph		2.Values																																																				
<div><div>—△—</div><div>Input Volt.</div><div>100V</div></div> <div><div>---□---</div><div>Input Volt.</div><div>200V</div></div> <div><div>---○---</div><div>Input Volt.</div><div>230V</div></div>  <p>Note: Slanted line shows the range of the rated load current.</p>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Output Voltage [V]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.00</td><td>24.033</td><td>24.034</td><td>24.035</td></tr><tr><td>1.66</td><td>24.028</td><td>24.029</td><td>24.029</td></tr><tr><td>3.22</td><td>24.029</td><td>24.030</td><td>24.029</td></tr><tr><td>4.98</td><td>24.030</td><td>24.031</td><td>24.031</td></tr><tr><td>6.64</td><td>24.031</td><td>24.033</td><td>24.032</td></tr><tr><td>8.30</td><td>24.038</td><td>24.038</td><td>24.038</td></tr><tr><td>9.13</td><td>24.042</td><td>24.041</td><td>24.041</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.00	24.033	24.034	24.035	1.66	24.028	24.029	24.029	3.22	24.029	24.030	24.029	4.98	24.030	24.031	24.031	6.64	24.031	24.033	24.032	8.30	24.038	24.038	24.038	9.13	24.042	24.041	24.041	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
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3.22	24.029	24.030	24.029																																																			
4.98	24.030	24.031	24.031																																																			
6.64	24.031	24.033	24.032																																																			
8.30	24.038	24.038	24.038																																																			
9.13	24.042	24.041	24.041																																																			
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Model		TUXS200F24	
Item		Ambient Temperature Drift	
Object		+24V8.3A	
1.Graph		2.Values	

—△—

Input Volt. 100V

---□---

Input Volt. 200V

---○---

Input Volt. 230V

Output Voltage [V]

Ambient Temperature [°C]

Load 100%

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

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-50	23.931	23.936	23.938
-40	23.961	23.966	23.968
-20	23.996	23.999	24.001
0	24.022	24.024	24.025
25	24.038	24.038	24.038
50	24.048	24.047	24.047
75	24.040	24.038	24.036
85	24.031	24.028	24.026
100	24.010	24.008	24.006
105	24.003	24.001	23.998
--	-	-	-

		Testing Circuitry Figure A
Model	TUXS200F24	
Item	Output Voltage Accuracy	
Object	+24V8.3A	

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 : 100 - 230V

Load Current : 0 - 8.3A

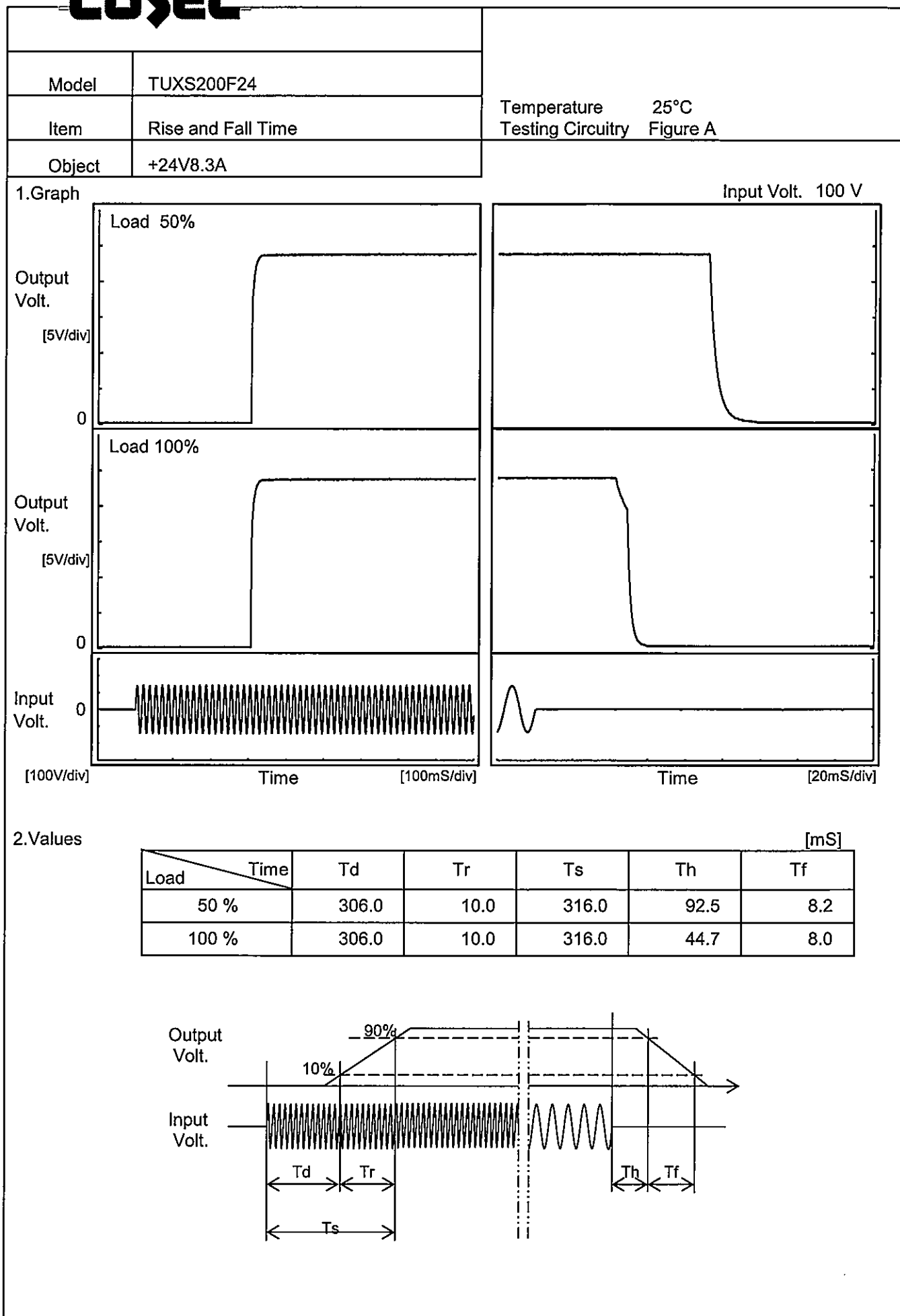
* Output Voltage Accuracy = $\pm(\text{Maximum of Output Voltage} - \text{Minimum of Output Voltage}) / 2$

* Output Voltage Accuracy (Ratio) =
$$\frac{\text{Output Voltage Accuracy}}{\text{Rated Output Voltage}} \times 100$$

2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	50	100	8.3	24.048	±44	±0.2
Minimum Voltage	-40	100	8.3	23.961		

Model		TUXS200F24																							
Item		Time Lapse Drift																							
Object		+24V8.3A																							
1.Graph		2.Values																							
<div><div><div>24.80</div><div>24.60</div><div>24.40</div><div>24.20</div><div>24.00</div><div>23.80</div><div>23.60</div><div>23.40</div><div>23.20</div></div><div><div>0</div><div>2</div><div>4</div><div>6</div><div>8</div><div>10</div></div><div><div>Output Voltage [V]</div><div>Time [H]</div></div><div><div>Input Volt.100V</div><div>Load100%</div></div></div>		<table><tr><th>Time since start [H]</th><th>Output Voltage [V]</th></tr><tr><td>0.0</td><td>24.025</td></tr><tr><td>0.5</td><td>24.038</td></tr><tr><td>1.0</td><td>24.038</td></tr><tr><td>2.0</td><td>24.038</td></tr><tr><td>3.0</td><td>24.038</td></tr><tr><td>4.0</td><td>24.038</td></tr><tr><td>5.0</td><td>24.038</td></tr><tr><td>6.0</td><td>24.038</td></tr><tr><td>7.0</td><td>24.038</td></tr><tr><td>8.0</td><td>24.038</td></tr></table>		Time since start [H]	Output Voltage [V]	0.0	24.025	0.5	24.038	1.0	24.038	2.0	24.038	3.0	24.038	4.0	24.038	5.0	24.038	6.0	24.038	7.0	24.038	8.0	24.038
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Model		TUXS200F24	Temperature 25°C Testing Circuitry Figure A																													
Item		Hold-Up Time																														
Object		+24V8.3A																														
1.Graph			2.Values																													
<div><div><div><div><div></div><div></div><div></div></div><div><div></div><div></div><div></div></div></div><div><div>---</div><div>□</div><div>---</div></div><div>Load 50%</div></div><div><div>---</div><div>△</div><div>---</div></div><div>Load 100%</div></div> <p>The graph shows Hold-Up Time [ms] on a logarithmic y-axis (1 to 1000) versus Input Voltage [V] on a linear x-axis (50 to 300). Two data series are plotted: Load 50% (dashed line with square markers) and Load 100% (solid line with triangle markers). Both series show a sharp drop in hold-up time as input voltage decreases below 100V. The Load 50% series maintains a higher hold-up time than the Load 100% series across the tested voltage range.</p> <table border="1"><thead><tr><th>Input Voltage [V]</th><th>Load 50% [ms]</th><th>Load 100% [ms]</th></tr></thead><tbody><tr><td>80</td><td>91</td><td>41</td></tr><tr><td>85</td><td>91</td><td>43</td></tr><tr><td>100</td><td>91</td><td>42</td></tr><tr><td>120</td><td>91</td><td>42</td></tr><tr><td>200</td><td>91</td><td>43</td></tr><tr><td>230</td><td>91</td><td>42</td></tr><tr><td>264</td><td>91</td><td>43</td></tr><tr><td>280</td><td>91</td><td>43</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></tbody></table>				Input Voltage [V]	Load 50% [ms]	Load 100% [ms]	80	91	41	85	91	43	100	91	42	120	91	42	200	91	43	230	91	42	264	91	43	280	91	43	--	-
Input Voltage [V]	Load 50% [ms]	Load 100% [ms]																														
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200	91	43																														
230	91	42																														
264	91	43																														
280	91	43																														
--	-	-																														
<p>This duration covers from Shut-off of input voltage to the moment when output voltage descends to the rated range of voltage accuracy.</p> <p>Note: Slanted line shows the range of the rated input voltage.</p>																																

Model	TUXS200F24																																																						
Item	Instantaneous Interruption Compensation	Temperature	25°C																																																				
Object	+24V8.3A	Testing Circuitry	Figure A																																																				
1.Graph		2.Values																																																					
<div><div><div>—△—</div><div>Input Volt. 100V</div></div><div><div>---□---</div><div>Input Volt. 200V</div></div><div><div>---○---</div><div>Input Volt. 230V</div></div></div> <p>Instantaneous Compensation Time [ms]</p> <p>Load Current [A]</p> <p>Note: Slanted line shows the range of the rated load current.</p>		<table><tr><th rowspan="2">Load Current [A]</th><th colspan="3">Time [ms]</th></tr><tr><th>Input Volt. 100[V]</th><th>Input Volt. 200[V]</th><th>Input Volt. 230[V]</th></tr><tr><td>0.00</td><td>-</td><td>-</td><td>-</td></tr><tr><td>1.66</td><td>204</td><td>204</td><td>204</td></tr><tr><td>3.22</td><td>111</td><td>111</td><td>111</td></tr><tr><td>4.98</td><td>73</td><td>73</td><td>73</td></tr><tr><td>6.64</td><td>55</td><td>55</td><td>56</td></tr><tr><td>8.30</td><td>42</td><td>43</td><td>42</td></tr><tr><td>9.13</td><td>22</td><td>22</td><td>22</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>			Load Current [A]	Time [ms]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.00	-	-	-	1.66	204	204	204	3.22	111	111	111	4.98	73	73	73	6.64	55	55	56	8.30	42	43	42	9.13	22	22	22	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-
Load Current [A]	Time [ms]																																																						
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]																																																				
0.00	-	-	-																																																				
1.66	204	204	204																																																				
3.22	111	111	111																																																				
4.98	73	73	73																																																				
6.64	55	55	56																																																				
8.30	42	43	42																																																				
9.13	22	22	22																																																				
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Model

TUXS200F24

Item

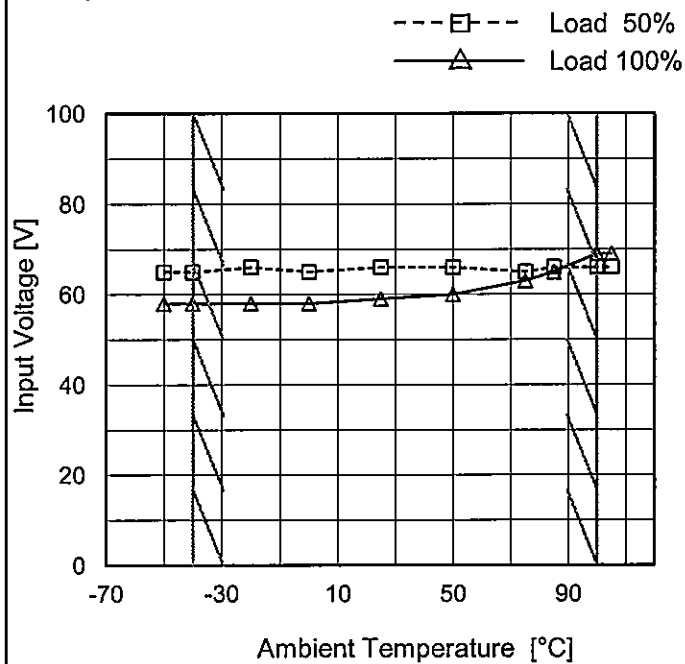
Minimum Input Voltage
for Regulated Output Voltage

Object

+24V8.3A

Testing Circuitry Figure A

1. Graph

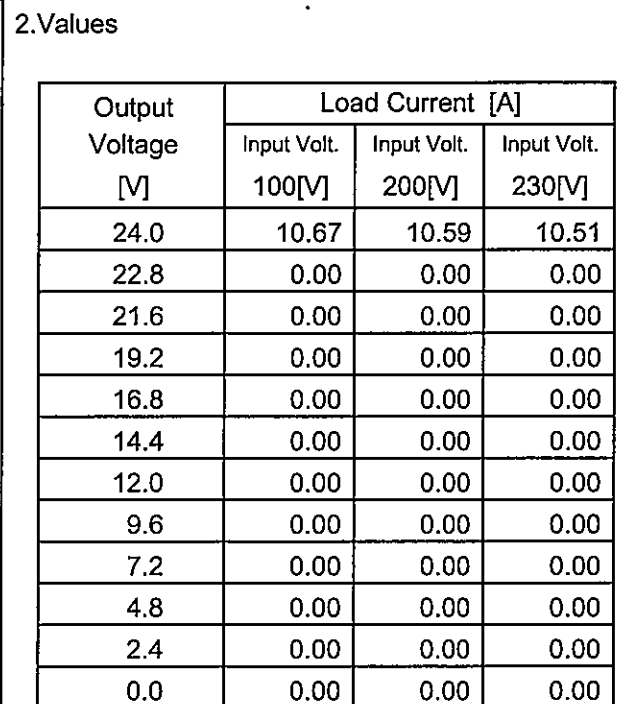


Note: Slanted line shows the range of the rated ambient temperature.

2. Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-50	65	58
-40	65	58
-20	66	58
0	65	58
25	66	59
50	66	60
75	65	63
85	66	65
100	66	69
105	66	69
--	-	-

Temperature	25°C
Testing Circuitry	Figure A



- 22 -

Model		TUXS200F24
Item		Overvoltage Protection
Object		+24V8.3A

1.Graph

△

Input Volt. 100V

□

Input Volt. 230V

Operating Point [V]

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	27.72	27.72
-40	27.78	27.78
-20	27.92	27.92
0	28.00	28.00
25	28.10	28.08
50	28.08	28.08
75	28.12	28.12
85	28.14	28.14
100	28.14	28.14
105	28.14	28.14
--	-	-

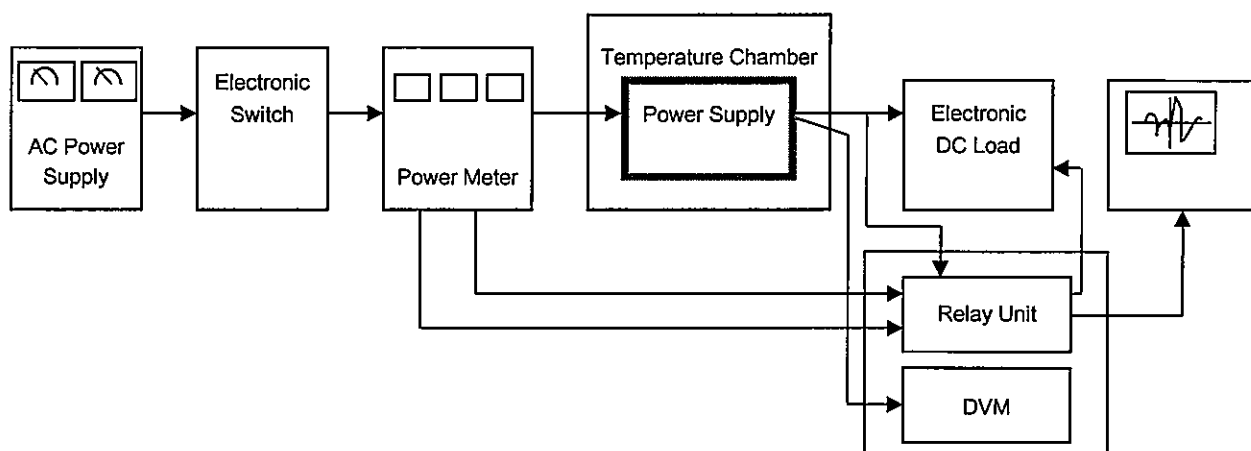


Figure A

Data Acquisition/Control Unit

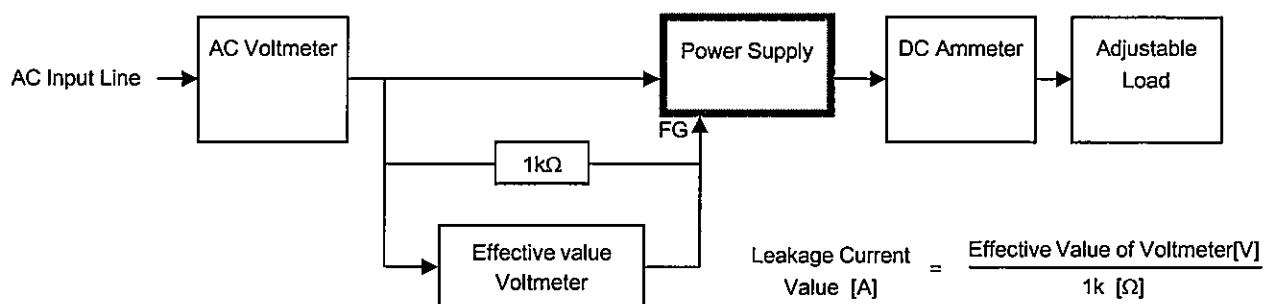


Figure B (DEN-AN)

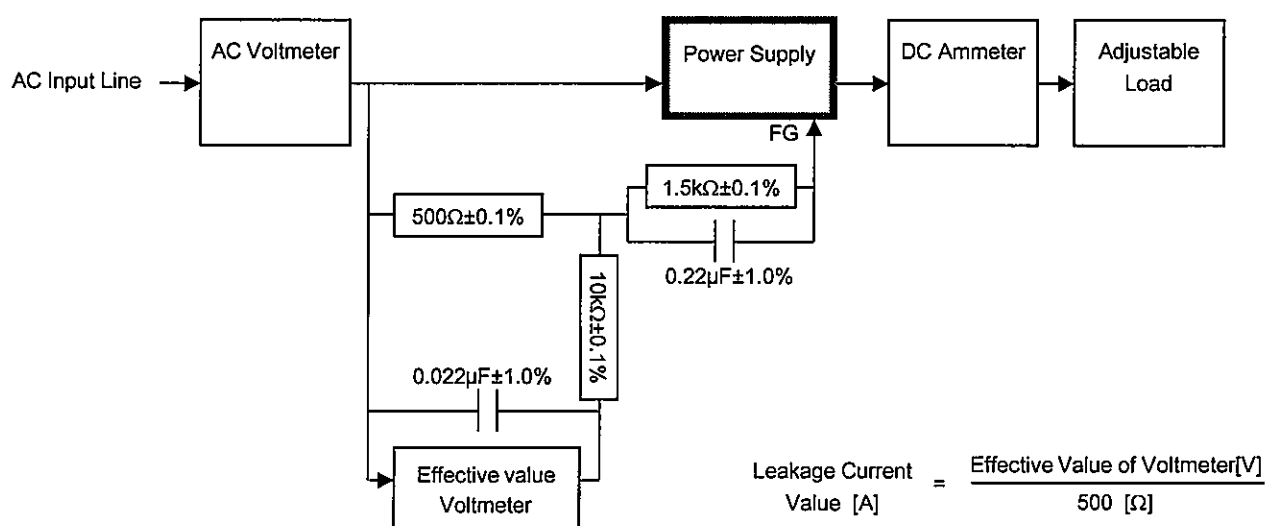
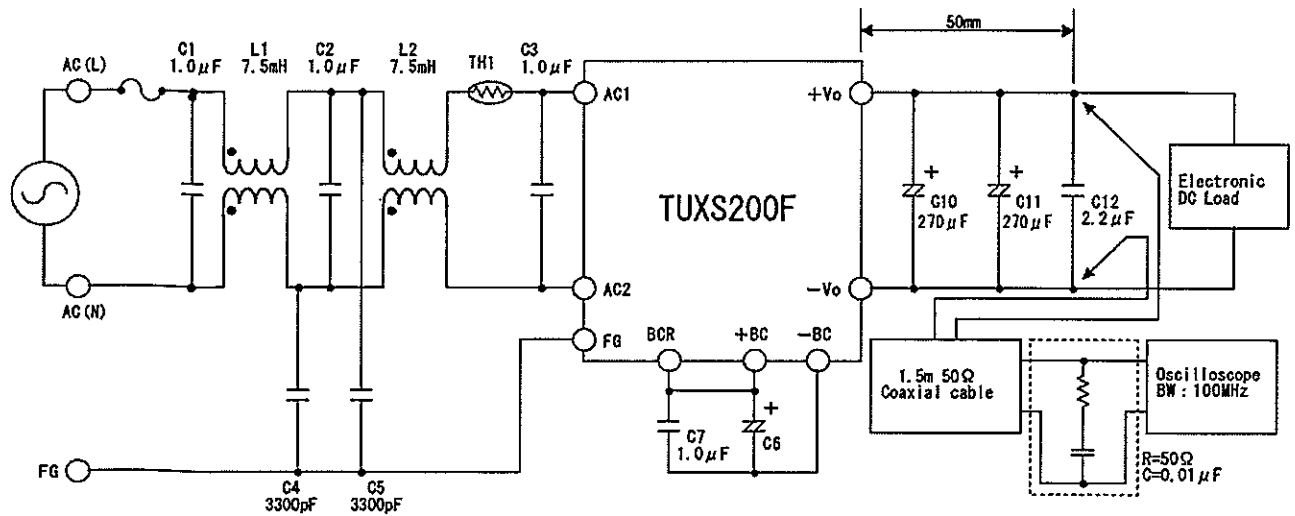


Figure B (IEC60950-1)



- L1,L2 : SCR22-060-1R0A075J(NEC TOKIN)
 TH1 : 12D2-15LCS(SEMITEC)
 C1,C2,C3 : LE105-MX(OKAYA)
 C4,C5 : DE1E3KX332M(MURATA)
 C6 : EKXJ421ELL151MM50S(Nippon Chemi-Con)
 C7 : AFS450V105K(OKAYA)
 C10,C11 : PCR1V271MCL1GS(NICHICON)
 C12 : GRM31CR72A225K(MURATA)

Figure C