

TEST DATA OF TUHS25F05

Regulated DC Power Supply
February 28, 2014

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Nobuyuki Shiraishi Design Manager

Prepared by : Sakae Minamide
Sakae Minamide Design Engineer

COSEL CO.,LTD.

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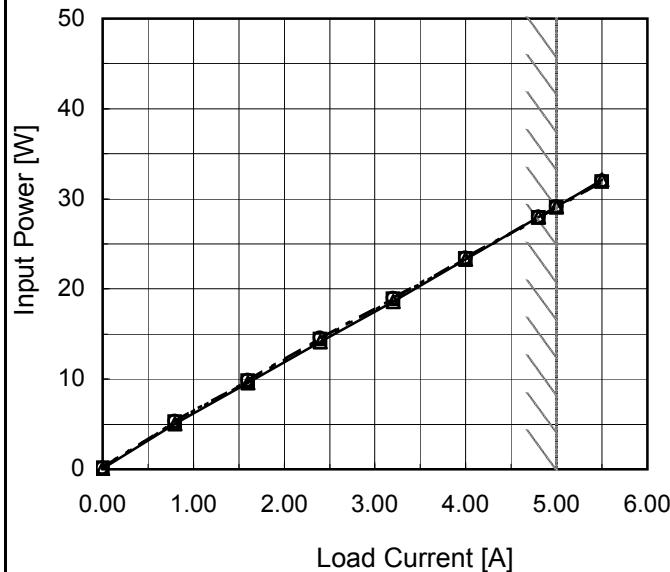
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Model	TUHS25F05	Temperature Testing Circuitry 25°C Figure A																															
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Note: Slanted line shows the range of the rated load current.

Load Current [A]	Input Current [A]		
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0.0	0.002	0.002	0.002
0.8	0.104	0.068	0.062
1.6	0.181	0.116	0.104
2.4	0.257	0.162	0.145
3.2	0.332	0.204	0.184
4.0	0.410	0.247	0.222
4.8	0.478	0.286	0.258
5.0	0.497	0.297	0.268
5.5	0.546	0.324	0.291
--	-	-	-
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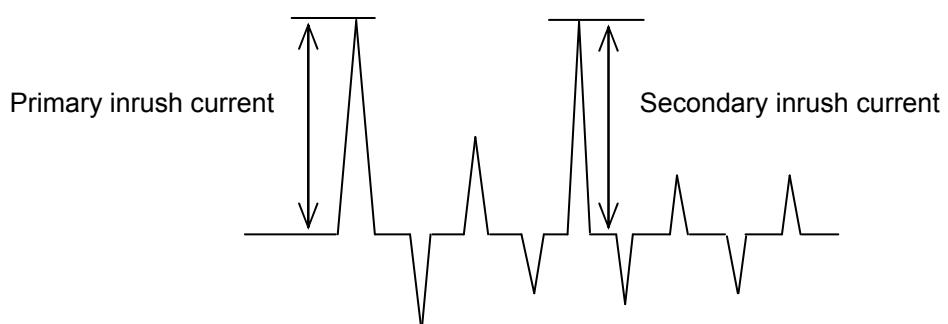
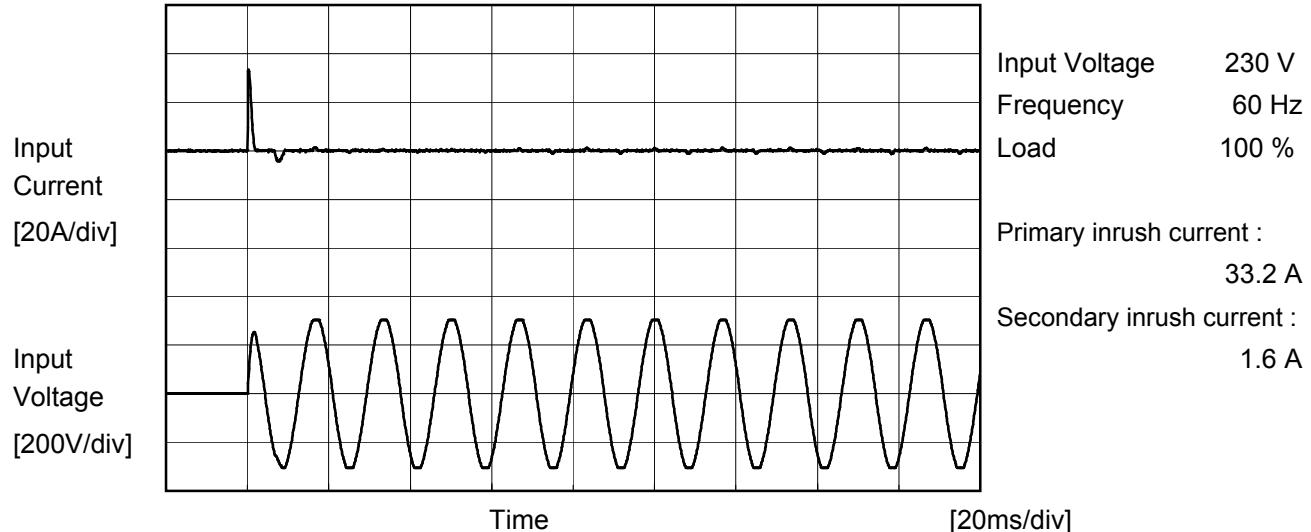
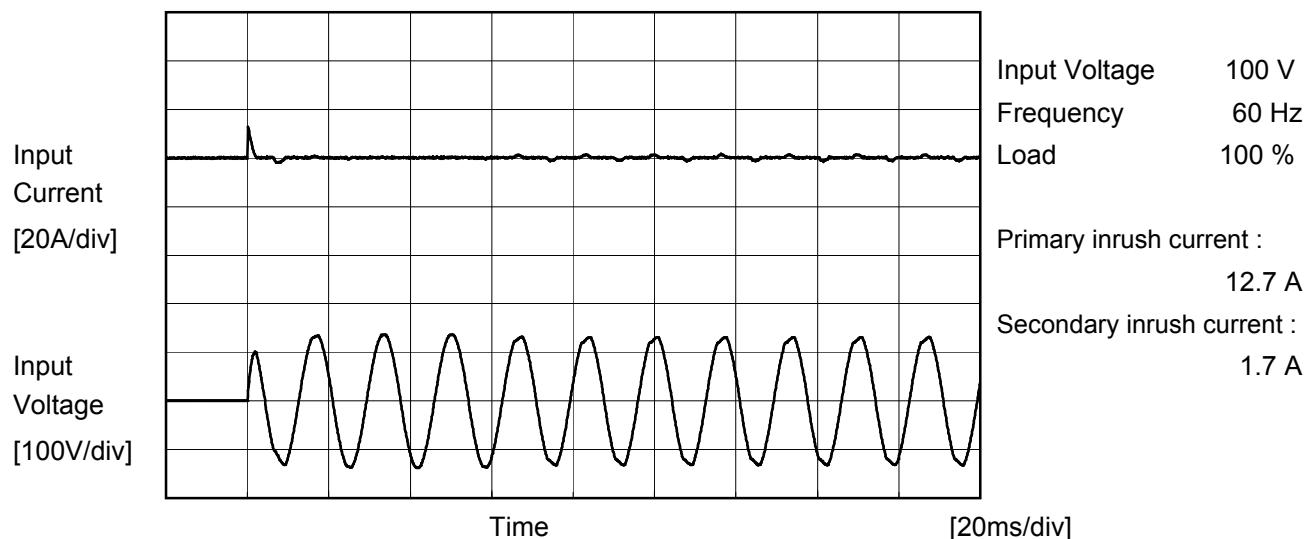
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<p>The graph plots Power Factor against Input Voltage for two load conditions: 50% (dashed line with square markers) and 100% (solid line with triangle markers). The x-axis ranges from 50 to 300 V, and the y-axis ranges from 0.2 to 0.8. Both curves show a slight downward trend as input voltage increases. A vertical slanted line marks the rated input voltage range.</p> <table border="1"> <thead> <tr> <th>Input Voltage [V]</th> <th>Load 50% Power Factor</th> <th>Load 100% Power Factor</th> </tr> </thead> <tbody> <tr><td>75</td><td>0.573</td><td>0.586</td></tr> <tr><td>85</td><td>0.553</td><td>0.569</td></tr> <tr><td>100</td><td>0.537</td><td>0.553</td></tr> <tr><td>120</td><td>0.506</td><td>0.527</td></tr> <tr><td>200</td><td>0.445</td><td>0.472</td></tr> <tr><td>230</td><td>0.426</td><td>0.455</td></tr> <tr><td>264</td><td>0.406</td><td>0.436</td></tr> <tr><td>280</td><td>0.401</td><td>0.430</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table>			Input Voltage [V]	Load 50% Power Factor	Load 100% Power Factor	75	0.573	0.586	85	0.553	0.569	100	0.537	0.553	120	0.506	0.527	200	0.445	0.472	230	0.426	0.455	264	0.406	0.436	280	0.401	0.430	--	-	-		
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5.5	0.554	0.476	0.459																																																				
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Note:	Slanted line shows the range of the rated load current.																																																						

COSEL

Model	TUHS25F05	Temperature Testing Circuitry Figure A	25°C
Item	Inrush Current		
Object	_____		





Model	TUHS25F05	Temperature Testing Circuitry	25°C Figure B
Item	Leakage Current		
Object	_____		

1. Results

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

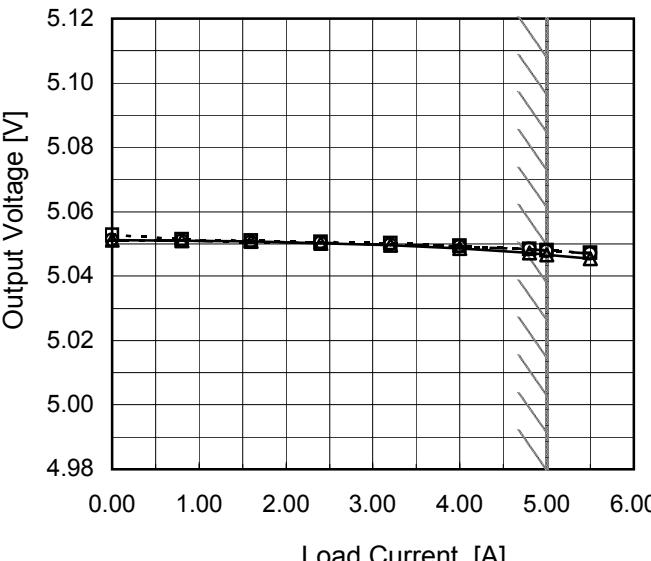
The value for "One of phases" is the reference value only.

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.

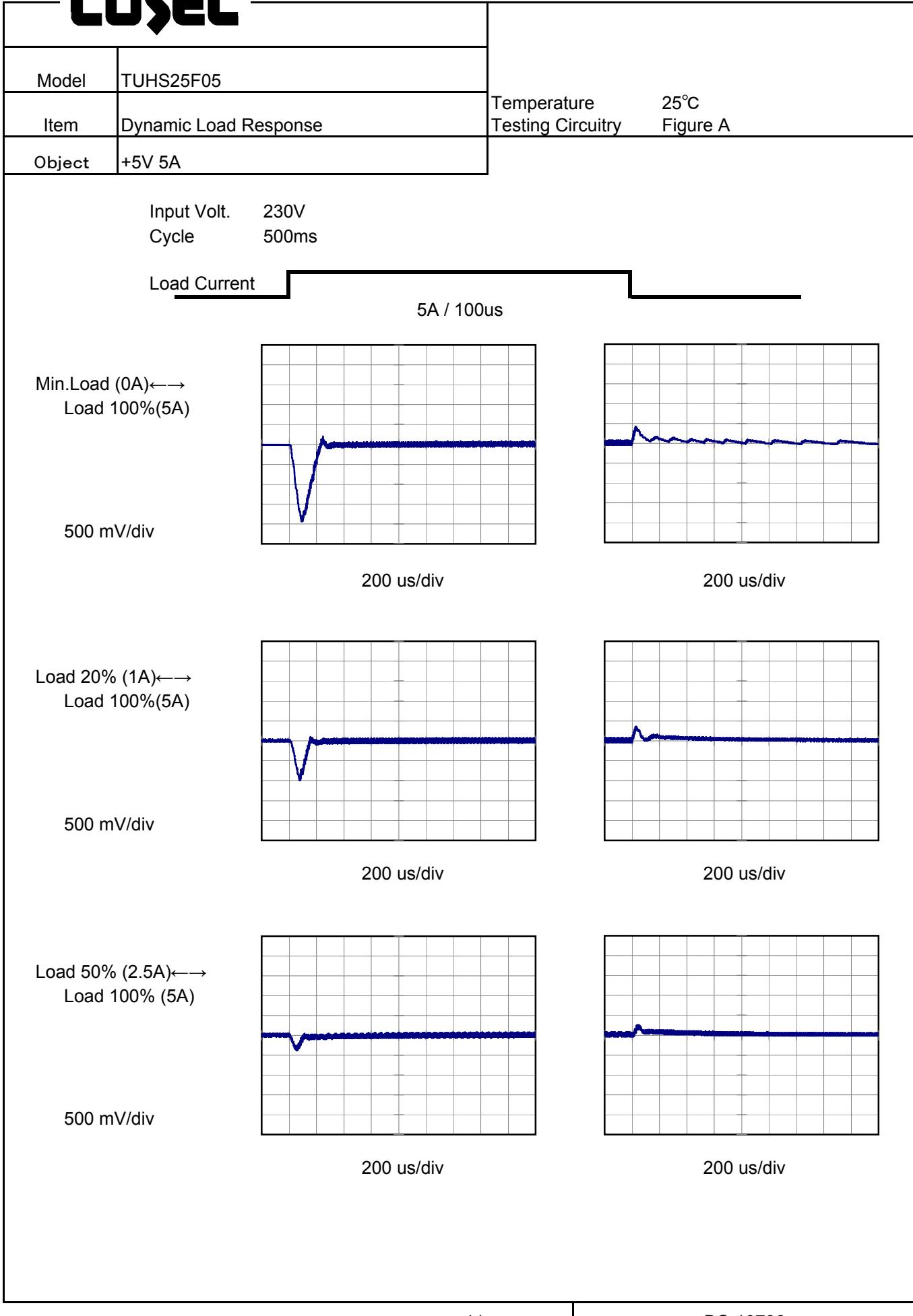
Model	TUHS25F05	Temperature Testing Circuitry 25°C Figure A																																
Item	Line Regulation																																	
Object	+5V5A																																	
1.Graph		2.Values																																
<p>The graph plots Output Voltage [V] on the y-axis (4.98 to 5.12) against Input Voltage [V] on the x-axis (50 to 300). Two sets of data points are shown: Load 50% (dashed line with square markers) and Load 100% (solid line with triangle markers). Both sets show a constant output voltage of approximately 5.05V across the entire input voltage range. A slanted line on the graph indicates the rated input voltage range.</p>		<table border="1"> <thead> <tr> <th rowspan="2">Input Voltage [V]</th> <th colspan="2">Output Voltage [V]</th> </tr> <tr> <th>Load 50%</th> <th>Load 100%</th> </tr> </thead> <tbody> <tr> <td>75</td> <td>5.050</td> <td>5.046</td> </tr> <tr> <td>85</td> <td>5.050</td> <td>5.046</td> </tr> <tr> <td>100</td> <td>5.050</td> <td>5.047</td> </tr> <tr> <td>120</td> <td>5.050</td> <td>5.047</td> </tr> <tr> <td>200</td> <td>5.051</td> <td>5.048</td> </tr> <tr> <td>230</td> <td>5.050</td> <td>5.048</td> </tr> <tr> <td>264</td> <td>5.050</td> <td>5.048</td> </tr> <tr> <td>280</td> <td>5.050</td> <td>5.048</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Input Voltage [V]	Output Voltage [V]		Load 50%	Load 100%	75	5.050	5.046	85	5.050	5.046	100	5.050	5.047	120	5.050	5.047	200	5.051	5.048	230	5.050	5.048	264	5.050	5.048	280	5.050	5.048	--	-	-
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Note: Slanted line shows the range of the rated load current.

COSEL



COSSEL

Model	TUHS25F05																																							
Item	Ripple Voltage (by Load Current)	Temperature 25°C Testing Circuitry Figure C																																						
Object	+5V5A																																							
1. Graph																																								
<p>Graph showing Ripple Voltage [mV] vs Load Current [A]. The Y-axis ranges from 0 to 400 mV, and the X-axis ranges from 0.00 to 6.00 A. Two sets of data points are plotted: Input Volt. 100V (solid triangles) and Input Volt. 230V (open circles). A slanted line indicates the rated load current range.</p> <table border="1"> <thead> <tr> <th>Load Current [A]</th> <th>Ripple Voltage [mV] (Input Volt. 100V)</th> <th>Ripple Voltage [mV] (Input Volt. 230V)</th> </tr> </thead> <tbody> <tr><td>0.00</td><td>35</td><td>60</td></tr> <tr><td>0.8</td><td>5</td><td>20</td></tr> <tr><td>1.6</td><td>10</td><td>20</td></tr> <tr><td>2.4</td><td>15</td><td>20</td></tr> <tr><td>3.2</td><td>20</td><td>10</td></tr> <tr><td>4.0</td><td>35</td><td>20</td></tr> <tr><td>4.8</td><td>45</td><td>25</td></tr> <tr><td>5.0</td><td>60</td><td>25</td></tr> <tr><td>5.5</td><td>90</td><td>30</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table>		Load Current [A]	Ripple Voltage [mV] (Input Volt. 100V)	Ripple Voltage [mV] (Input Volt. 230V)	0.00	35	60	0.8	5	20	1.6	10	20	2.4	15	20	3.2	20	10	4.0	35	20	4.8	45	25	5.0	60	25	5.5	90	30	--	-	-	--	-	-			
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<p>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.</p>																																								
<p>Figure showing a complex Ripple Wave Form. The Y-axis is labeled "Ripple [mVp-p]". Two time intervals are indicated: T1 (Total Ripple Period) and T2 (Switching Period).</p>																																								
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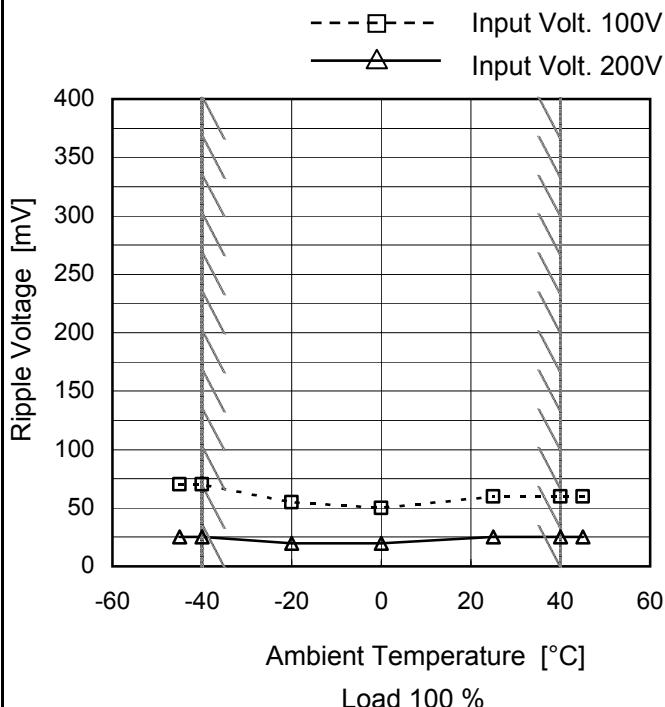
COSEL

Model	TUHS25F05																																							
Item	Ripple-Noise	Temperature 25°C Testing Circuitry Figure C																																						
Object	+5V5A																																							
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<p>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.</p> <p>T1: Due to AC Input Line T2: Due to Switching</p> <p>Fig. Complex Ripple Wave Form</p>																																								

Model	TUHS25F05
Item	Ripple Voltage (by Ambient Temp.)
Object	+5V5A

Testing Circuitry Figure C

1. Graph



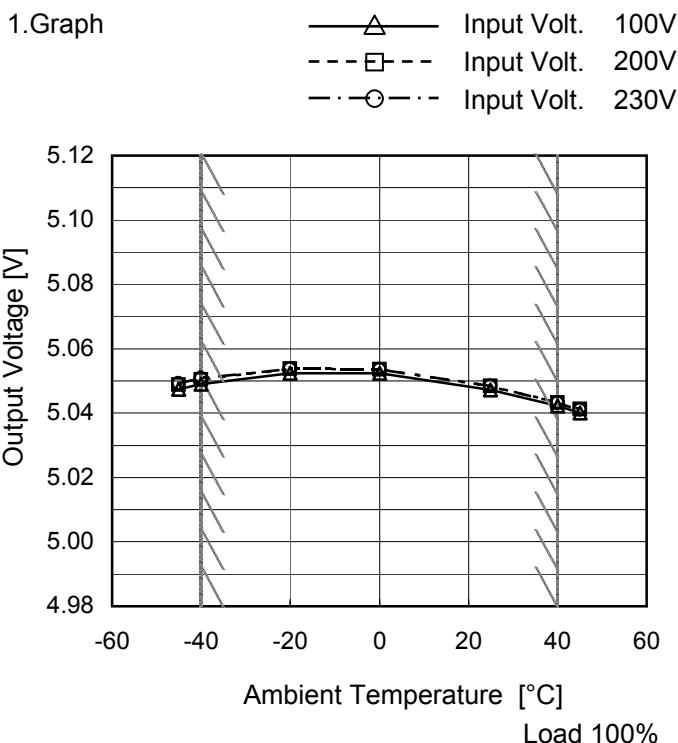
2. Values

Ambient Temperature [°C]	Ripple Voltage [mV]	
	Input Volt. 100V	Input Volt. 230V
-45	70	25
-40	70	25
-20	55	20
0	50	20
25	60	25
40	60	25
45	60	25
--	-	-
--	-	-
--	-	-
--	-	-

Measured by 100 MHz Oscilloscope.

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

Model	TUHS25F05
Item	Ambient Temperature Drift
Object	+5V5A



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

Testing Circuitry Figure A

2. Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]
-45	5.048	5.049	5.049
-40	5.049	5.050	5.051
-20	5.052	5.054	5.054
0	5.052	5.054	5.054
25	5.047	5.048	5.048
40	5.042	5.043	5.043
45	5.040	5.041	5.041
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-



Model	TUHS25F05	Testing Circuitry Figure A
Item	Output Voltage Accuracy	
Object	+5V5A	

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 - 40°C

Input Voltage : 85 - 264V

Load Current : 0 - 5A

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

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

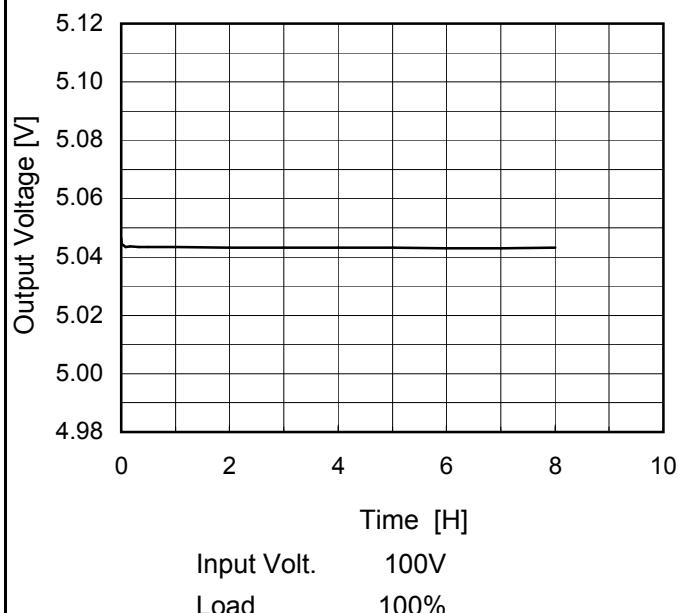
2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ration [%]
Maximum Voltage	0	264	0	5.057	±8	±0.2
Minimum Voltage	40	85	5	5.041		

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Model	TUHS25F05
Item	Time Lapse Drift
Object	+5V5A

1. Graph



2. Values

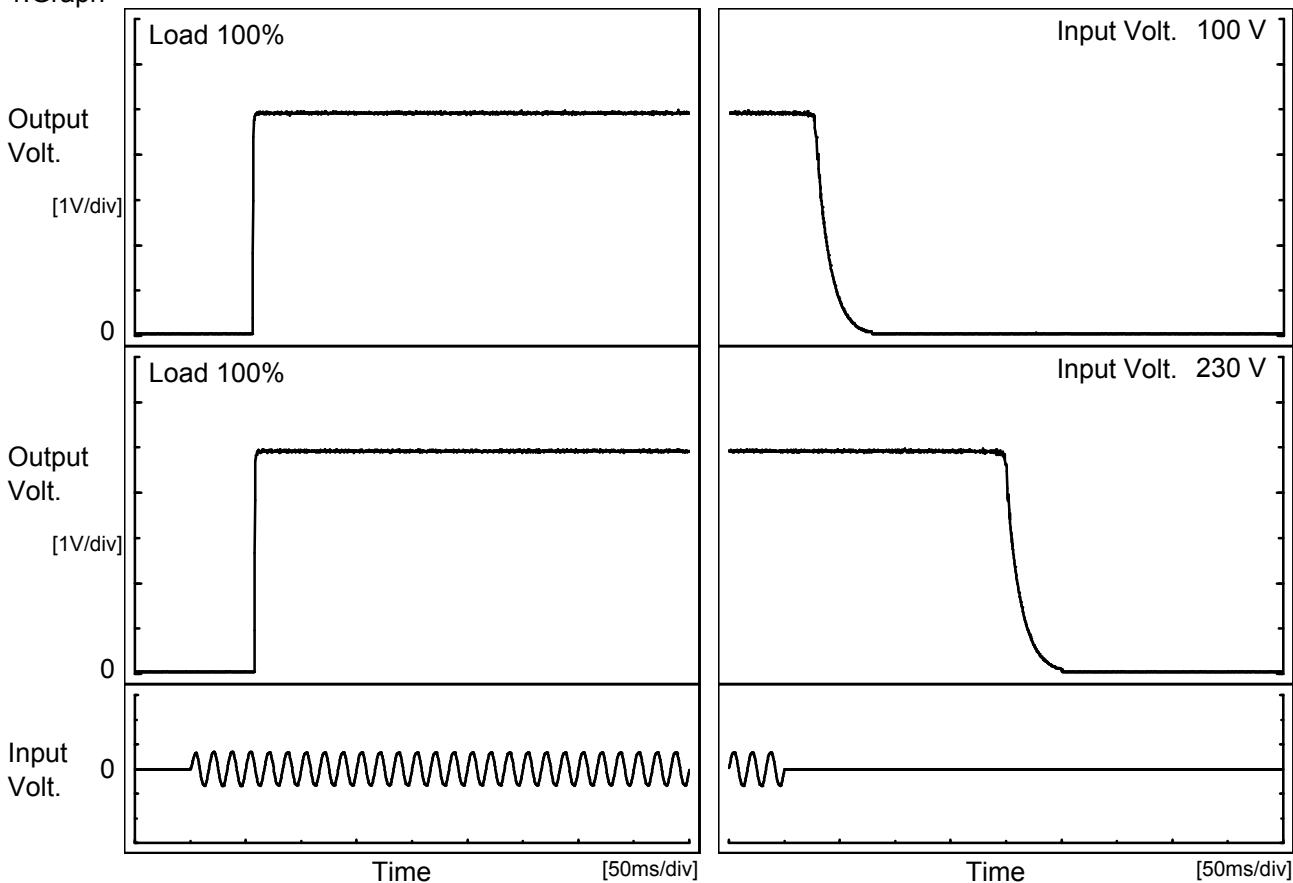
Time since start [H]	Output Voltage [V]
0.0	5.047
0.5	5.044
1.0	5.043
2.0	5.043
3.0	5.043
4.0	5.043
5.0	5.043
6.0	5.043
7.0	5.043
8.0	5.043

* The characteristic of AC230V is equal.

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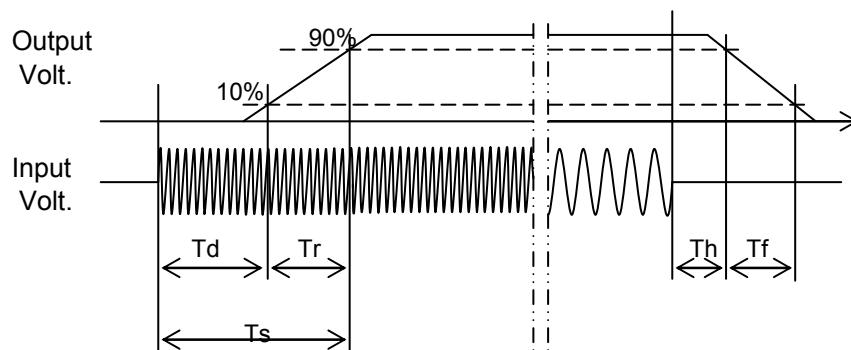
Model	TUHS25F05	Temperature Testing Circuitry 25°C Figure A
Item	Rise and Fall Time	
Object	+5V5A	

1. Graph



2. Values

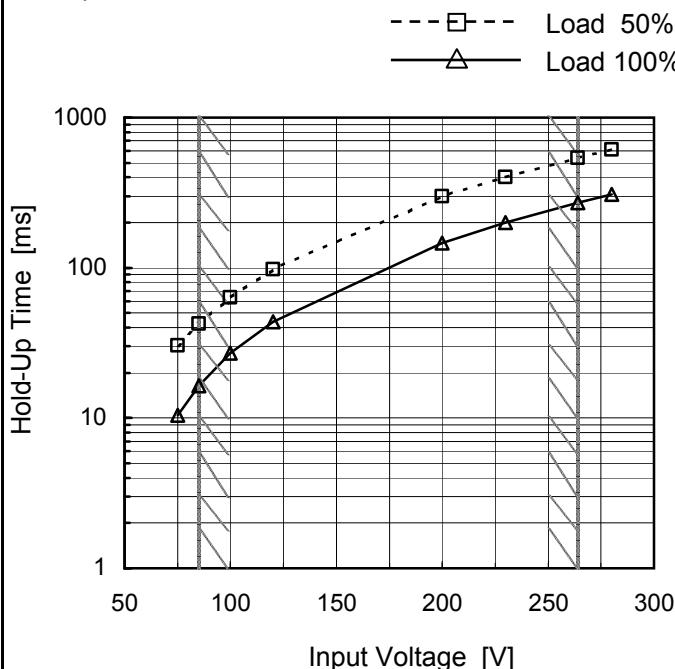
Input Volt.	Time	Td	Tr	Ts	Th	Tf	[ms]
100 V		56.5	0.8	57.3	27.0	26.5	
230 V		58.0	0.8	58.8	200.5	26.8	



Model	TUHS25F05
Item	Hold-Up Time
Object	+5V5A

Temperature 25°C
Testing Circuitry Figure A

1. Graph



2. Values

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
75	30	10
85	42	16
100	64	27
120	97	44
200	300	146
230	403	201
264	541	271
280	612	307
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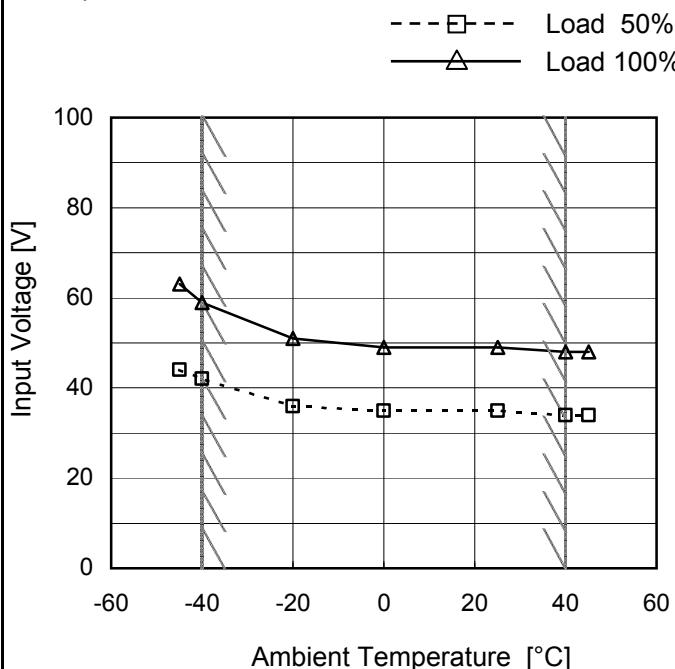
This duration covers from Shut-off of input voltage to the moment when output voltage descends to the rated range of voltage accuracy.
Note: Slanted line shows the range of the rated input voltage.

Model	TUHS25F05	Temperature Testing Circuitry 25°C Figure A																																															
Item	Instantaneous Interruption Compensation																																																
Object	+5V5A																																																
1.Graph		2.Values																																															
<p>—△— Input Volt. 100V - - -□- - Input Volt. 200V - - ○ - - Input Volt. 230V</p> <table border="1"> <thead> <tr> <th>Load Current [A]</th> <th>Input Volt. 100[V]</th> <th>Input Volt. 200[V]</th> <th>Input Volt. 230[V]</th> </tr> </thead> <tbody> <tr><td>0.0</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>0.8</td><td>88</td><td>404</td><td>554</td></tr> <tr><td>1.6</td><td>77</td><td>355</td><td>483</td></tr> <tr><td>2.4</td><td>65</td><td>306</td><td>412</td></tr> <tr><td>3.2</td><td>53</td><td>257</td><td>340</td></tr> <tr><td>4.0</td><td>42</td><td>208</td><td>269</td></tr> <tr><td>4.8</td><td>30</td><td>158</td><td>198</td></tr> <tr><td>5.0</td><td>27</td><td>146</td><td>180</td></tr> <tr><td>5.5</td><td>20</td><td>115</td><td>136</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>--</td><td>-</td><td>-</td><td>-</td></tr> </tbody> </table>		Load Current [A]	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.0	-	-	-	0.8	88	404	554	1.6	77	355	483	2.4	65	306	412	3.2	53	257	340	4.0	42	208	269	4.8	30	158	198	5.0	27	146	180	5.5	20	115	136	--	-	-	-	--	-	-	-
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<p>Note: Slanted line shows the range of the rated load current.</p>																																																	

Model	TUHS25F05
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+5V5A

Testing Circuitry Figure A

1.Graph



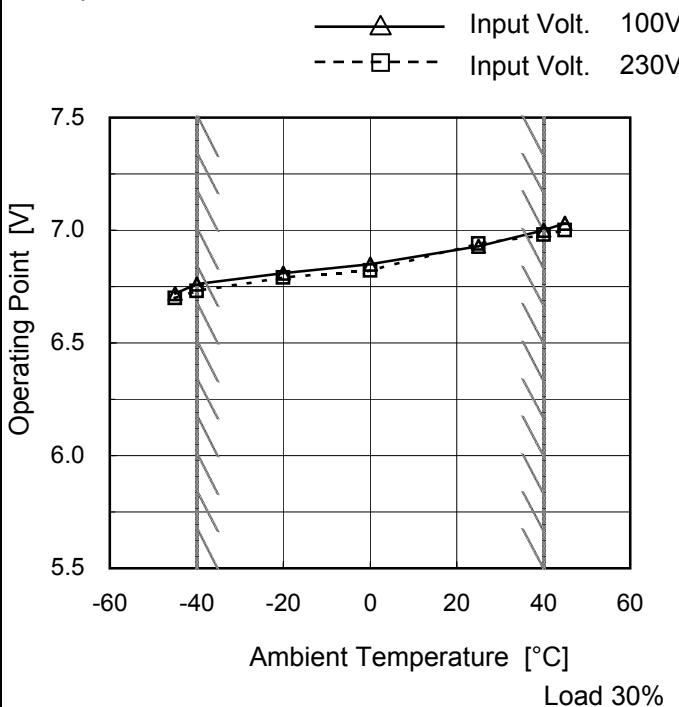
2.Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-45	44	63
-40	42	59
-20	36	51
0	35	49
25	35	49
40	34	48
45	34	48
--	-	-
--	-	-
--	-	-
--	-	-

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

Model	TUHS25F05
Item	Overvoltage Protection
Object	+5V5A

1. Graph



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

Testing Circuitry Figure A

2. Values

Ambient Temperature [°C]	Operating Point [V]	
	Input Volt. 100[V]	Input Volt. 230[V]
-45	6.72	6.70
-40	6.76	6.73
-20	6.81	6.79
0	6.85	6.82
25	6.93	6.94
40	7.00	6.98
45	7.03	7.00
--	-	-
--	-	-
--	-	-
--	-	-

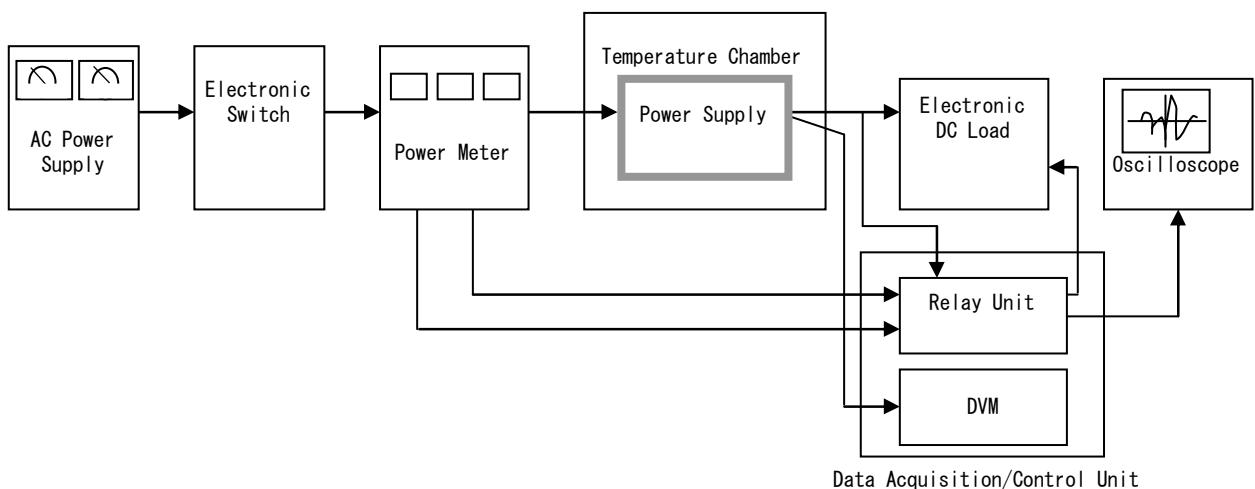


Figure A

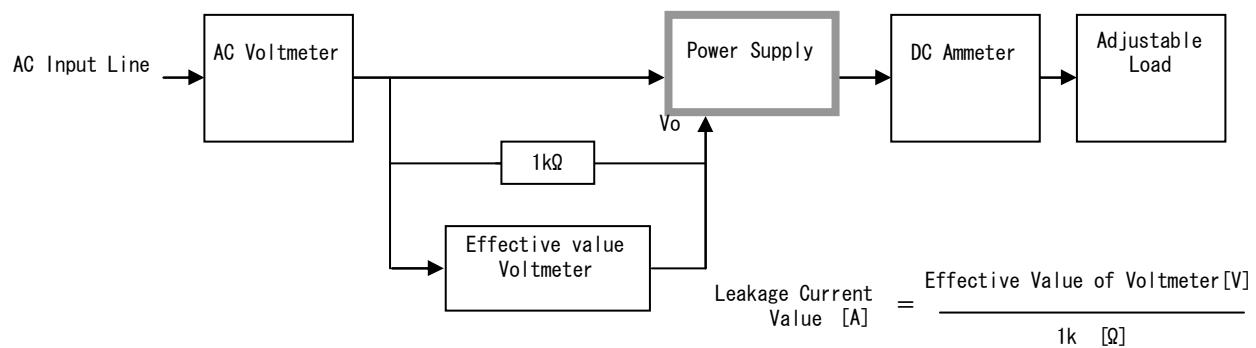


Figure B (DEN-AN)

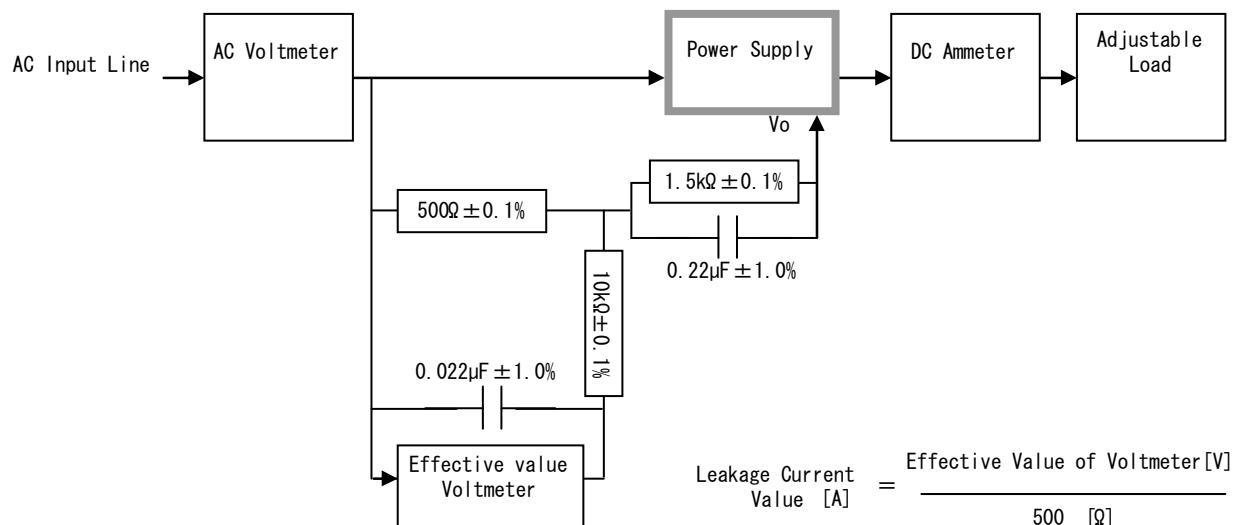


Figure B (IEC60950-1)

COSEL

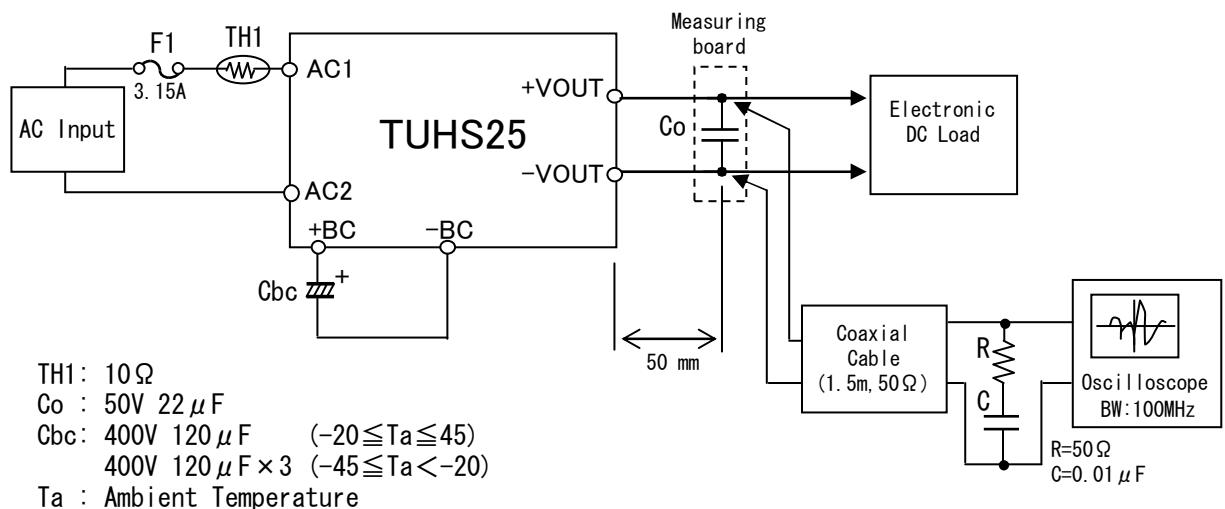


Figure C