

# TEST DATA OF TUHS3F24

Regulated DC Power Supply  
February 28, 2014

Approved by : Nobuyuki Shiraishi  
Nobuyuki Shiraishi Design Manager

Prepared by : Takayuki Yamamoto  
Takayuki Yamamoto Design Engineer

**COSEL CO.,LTD.**

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(Final Page 25)



<p>Model TUHS3F24</p>		<p>Temperature 25°C Testing Circuitry Figure A</p>																																																				
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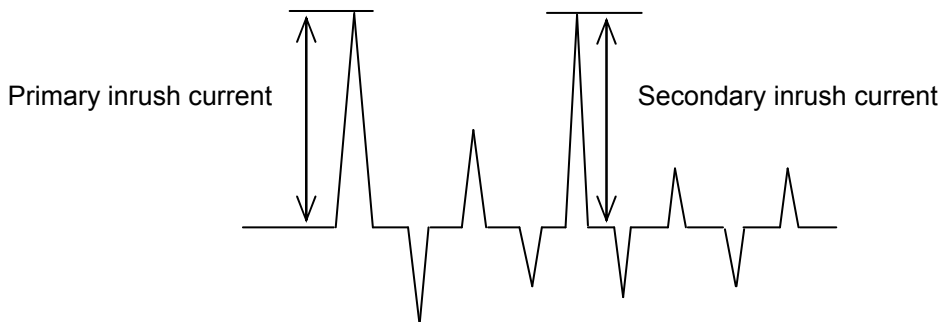
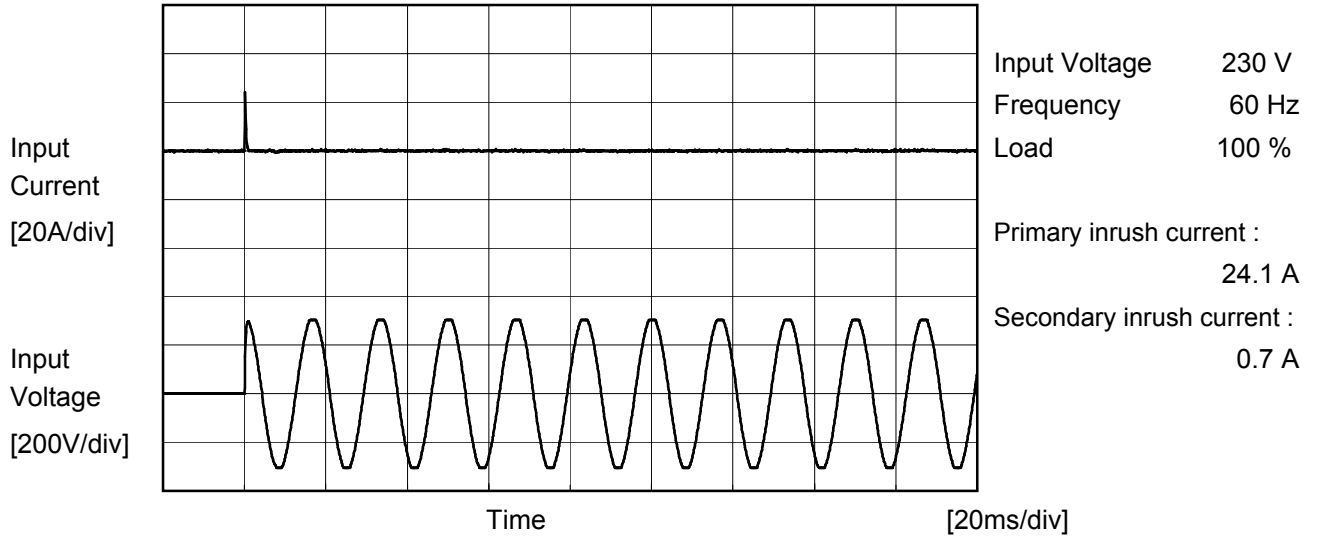
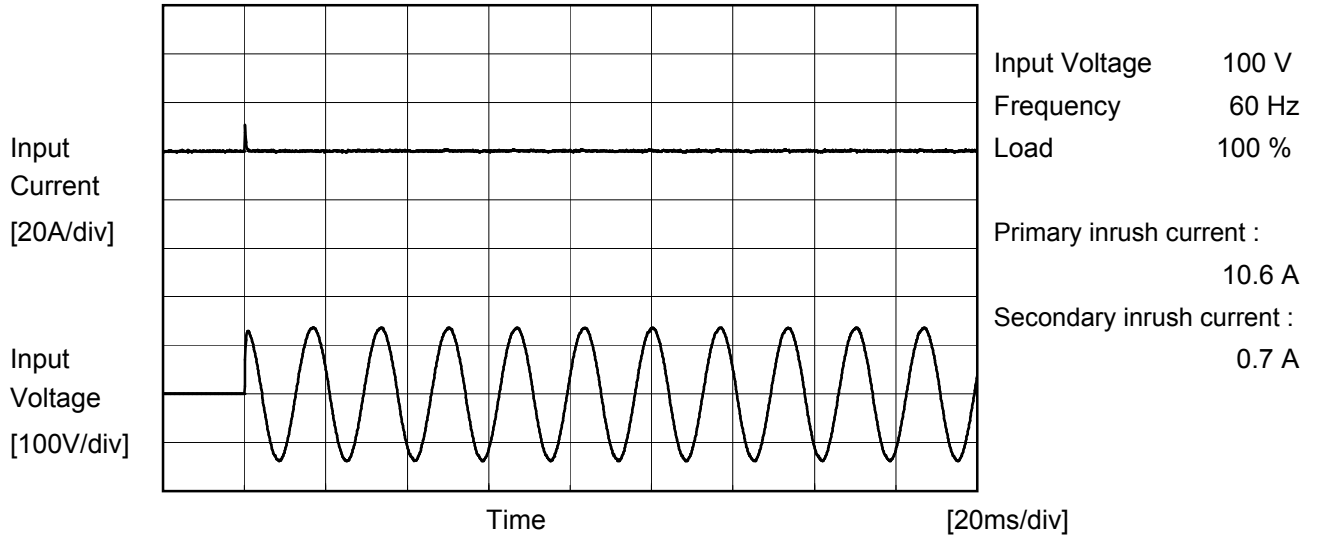


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<b>COSEL</b>			
Model	TUHS3F24	Temperature	25°C
Item	Inrush Current	Testing Circuitry	Figure A
Object	_____		





<b>COSEL</b>		
Model	TUHS3F24	Temperature 25°C Testing Circuitry Figure B
Item	Leakage Current	
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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<p>1.Graph</p> <p>                     —△— Input Volt. 100V                      - - - □ - - Input Volt. 200V                      - · - ○ - · - Input Volt. 230V                 </p> <p>Output Voltage [V]</p> <p>Load Current [A]</p>		<p>2.Values</p> <table border="1"> <thead> <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> </thead> <tbody> <tr><td>0.00</td><td>24.110</td><td>24.111</td><td>24.107</td></tr> <tr><td>0.02</td><td>24.108</td><td>24.111</td><td>24.109</td></tr> <tr><td>0.04</td><td>24.106</td><td>24.110</td><td>24.108</td></tr> <tr><td>0.06</td><td>24.104</td><td>24.108</td><td>24.107</td></tr> <tr><td>0.08</td><td>24.102</td><td>24.106</td><td>24.105</td></tr> <tr><td>0.10</td><td>24.099</td><td>24.103</td><td>24.103</td></tr> <tr><td>0.12</td><td>24.097</td><td>24.101</td><td>24.101</td></tr> <tr><td>0.13</td><td>24.095</td><td>24.100</td><td>24.099</td></tr> <tr><td>0.14</td><td>24.094</td><td>24.098</td><td>24.098</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]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.00	24.110	24.111	24.107	0.02	24.108	24.111	24.109	0.04	24.106	24.110	24.108	0.06	24.104	24.108	24.107	0.08	24.102	24.106	24.105	0.10	24.099	24.103	24.103	0.12	24.097	24.101	24.101	0.13	24.095	24.100	24.099	0.14	24.094	24.098	24.098	--	-	-	-	--	-	-	-
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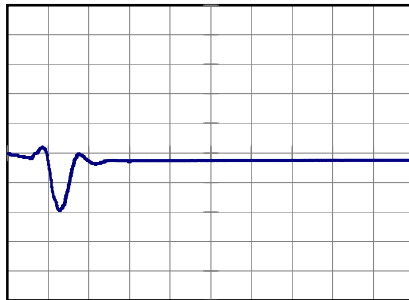
Model		TUHS3F24	
Item		Dynamic Load Response	Temperature 25°C Testing Circuitry Figure A
Object		+24V 0.13A	

Input Volt. 230V  
Cycle 500ms

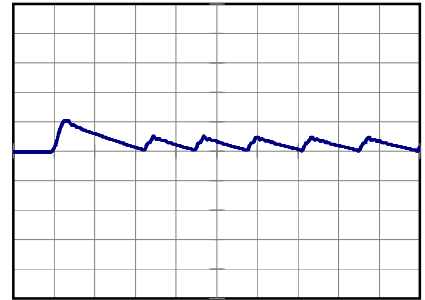
Load Current  0.13A / 100us

Min.Load (0A) ←→  
Load 100% (0.13A)

500 mV/div



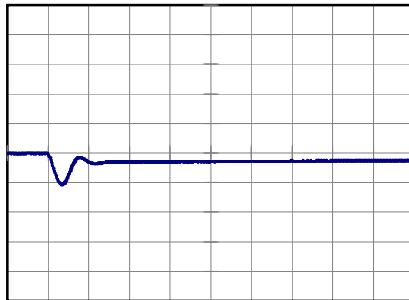
200 us/div



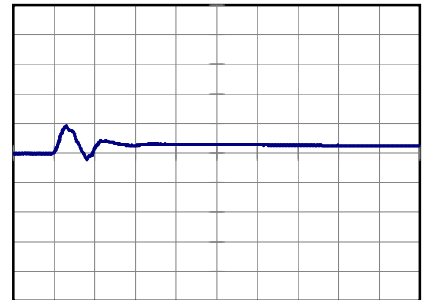
200 us/div

Load 20% (0.026A) ←→  
Load 100% (0.13A)

500 mV/div



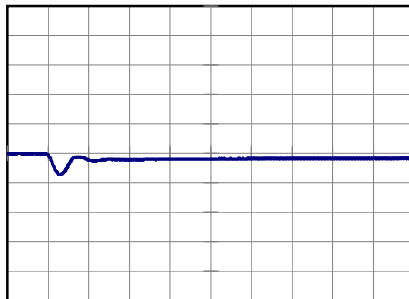
200 us/div



200 us/div

Load 50% (0.065A) ←→  
Load 100% (0.13A)

500 mV/div



200 us/div



200 us/div



<b>COSEL</b>																																								
Model	TUHS3F24	Temperature 25°C Testing Circuitry Figure C																																						
Item	Ripple Voltage (by Load Current)																																							
Object	+24V0.13A																																							
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<b>COSEL</b>																																								
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Model	TUHS3F24																																																				
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Object	+24V0.13A																																																				
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<p>Note: Slanted line shows the range of the rated ambient temperature.</p>																																																					



<b>COSEL</b>		
Model	TUHS3F24	
Item	Output Voltage Accuracy	Testing Circuitry Figure A
Object	+24V0.13A	

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 - 0.13A

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

\* 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	24.195	±148	±0.6
Minimum Voltage	85	85	0.13	23.899		

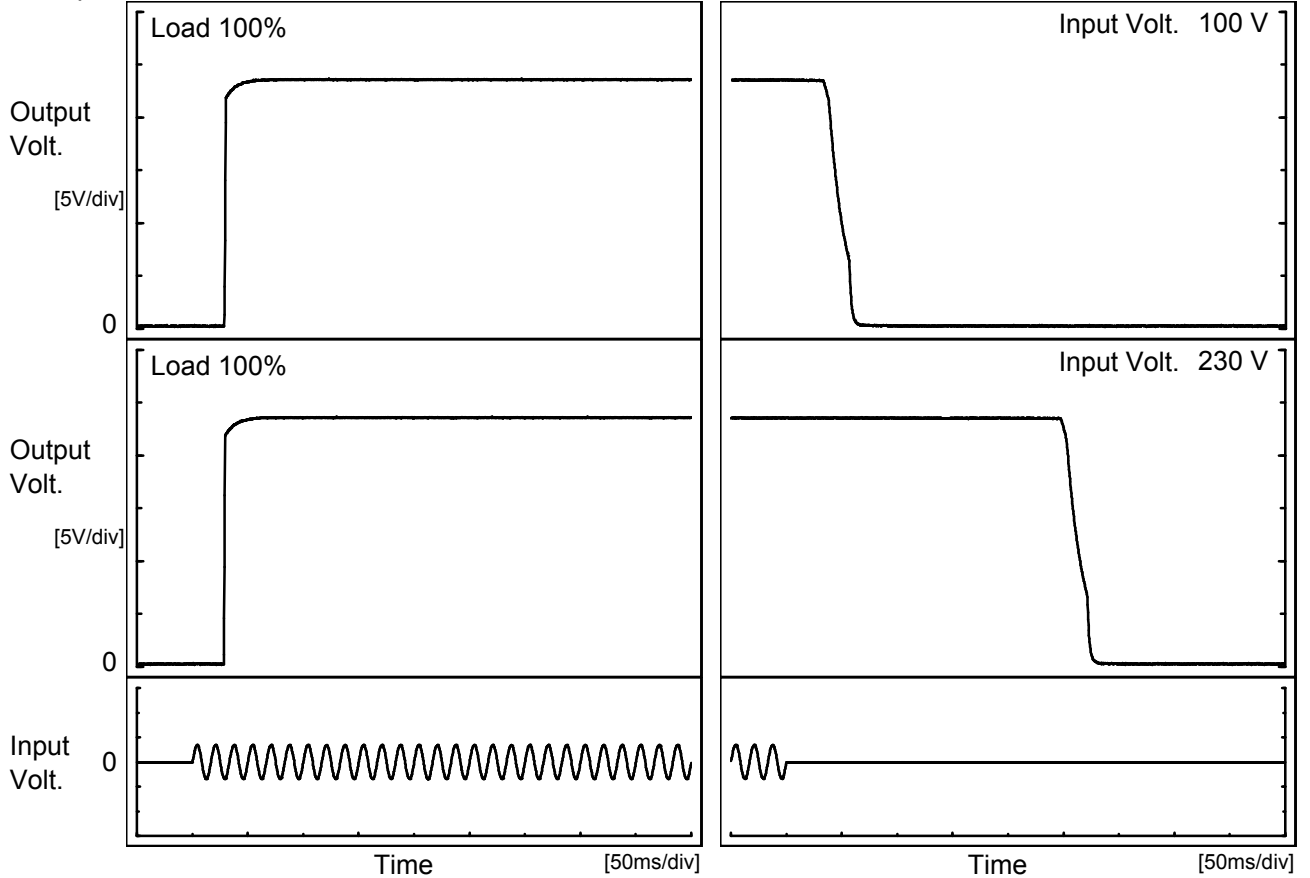


<b>COSEL</b>																								
Model	TUHS3F24																							
Item	Time Lapse Drift	Temperature 25°C Testing Circuitry Figure A																						
Object	+24V0.13A																							
<p>1.Graph</p> <p style="text-align: center;">Time [H]</p> <p>Input Volt. 100V Load 100%</p>		<p>2.Values</p> <table border="1"> <thead> <tr> <th>Time since start [H]</th> <th>Output Voltage [V]</th> </tr> </thead> <tbody> <tr><td>0.0</td><td>24.095</td></tr> <tr><td>0.5</td><td>24.083</td></tr> <tr><td>1.0</td><td>24.082</td></tr> <tr><td>2.0</td><td>24.082</td></tr> <tr><td>3.0</td><td>24.082</td></tr> <tr><td>4.0</td><td>24.082</td></tr> <tr><td>5.0</td><td>24.082</td></tr> <tr><td>6.0</td><td>24.082</td></tr> <tr><td>7.0</td><td>24.082</td></tr> <tr><td>8.0</td><td>24.082</td></tr> </tbody> </table>	Time since start [H]	Output Voltage [V]	0.0	24.095	0.5	24.083	1.0	24.082	2.0	24.082	3.0	24.082	4.0	24.082	5.0	24.082	6.0	24.082	7.0	24.082	8.0	24.082
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<p>* The characteristic of AC230V is equal.</p>																								



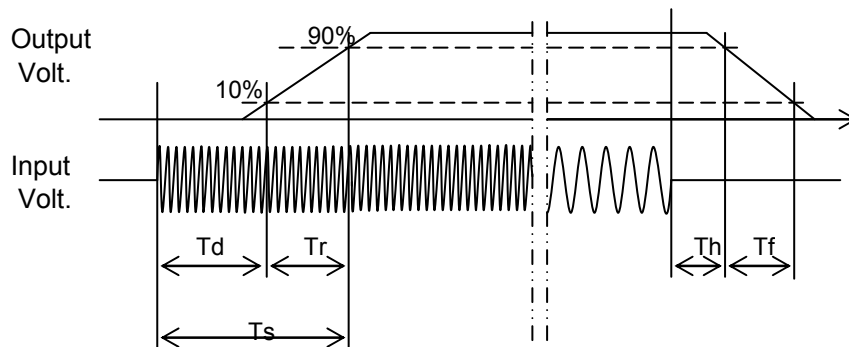
Model		TUHS3F24	Temperature	25°C
Item		Rise and Fall Time	Testing Circuitry	Figure A
Object		+24V0.13A		

1. Graph



2. Values

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	29.3	1.0	30.3	35.3	20.8
230 V	28.8	1.0	29.8	251.0	21.3





<b>COSEL</b>																																			
Model	TUHS3F24	Temperature	25°C																																
Item	Hold-Up Time	Testing Circuitry	Figure A																																
Object	+24V0.13A																																		
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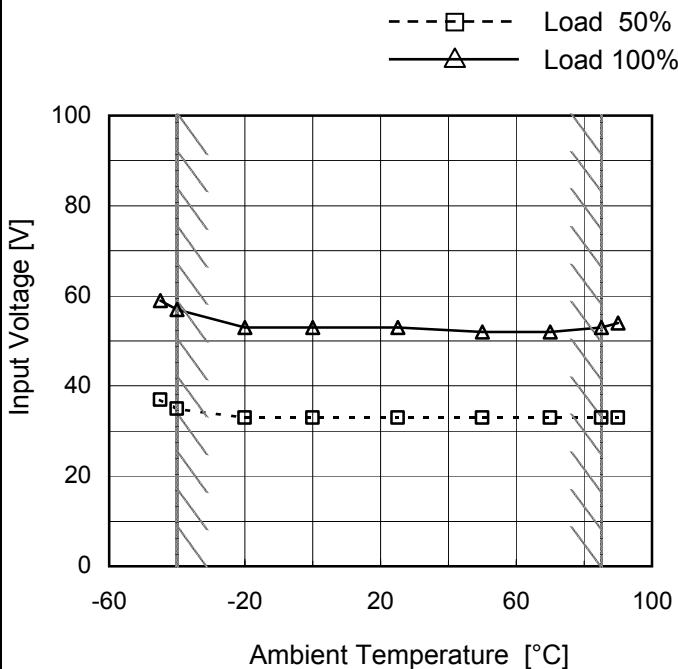
<p>Model TUHS3F24</p>		<p>Temperature 25°C Testing Circuitry Figure A</p>																																																			
<p>Item Instantaneous Interruption Compensation</p>																																																					
<p>Object +24V0.13A</p>																																																					
<p>1.Graph</p> <p>                     —△— Input Volt. 100V                      - - - □ - - - Input Volt. 200V                      - · - ○ - · - - Input Volt. 230V                 </p> <p>Instantaneous Compensation Time [ms]</p> <p>Load Current [A]</p>		<p>2.Values</p> <table border="1"> <thead> <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> </thead> <tbody> <tr><td>0.00</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>0.02</td><td>105</td><td>460</td><td>614</td></tr> <tr><td>0.04</td><td>92</td><td>410</td><td>548</td></tr> <tr><td>0.06</td><td>79</td><td>360</td><td>482</td></tr> <tr><td>0.08</td><td>67</td><td>310</td><td>416</td></tr> <tr><td>0.10</td><td>54</td><td>260</td><td>350</td></tr> <tr><td>0.12</td><td>41</td><td>210</td><td>284</td></tr> <tr><td>0.13</td><td>35</td><td>185</td><td>251</td></tr> <tr><td>0.14</td><td>27</td><td>152</td><td>208</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]	Time [ms]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.00	-	-	-	0.02	105	460	614	0.04	92	410	548	0.06	79	360	482	0.08	67	310	416	0.10	54	260	350	0.12	41	210	284	0.13	35	185	251	0.14	27	152	208	--	-	-	-	--	-	-	-
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Model	TUHS3F24
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+24V0.13A

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	59
-40	35	57
-20	33	53
0	33	53
25	33	53
50	33	52
70	33	52
85	33	53
90	33	54
--	-	-
--	-	-



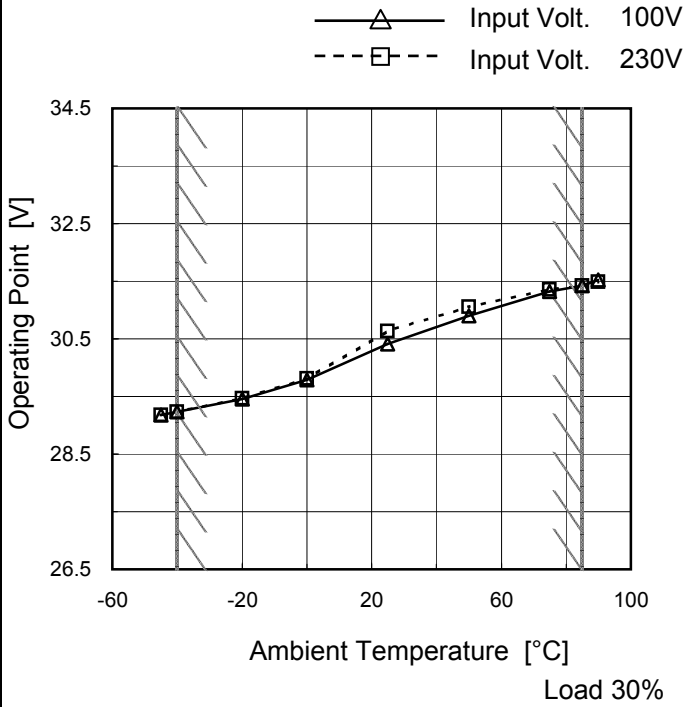
<b>COSEL</b>																																																														
Model	TUHS3F24	Temperature	25°C																																																											
Item	Overcurrent Protection	Testing Circuitry	Figure A																																																											
Object	+24V0.13A																																																													
<p>1.Graph</p> <p> <span style="color: black;">—△</span> Input Volt. 100V  <span style="color: blue;">—○</span> Input Volt. 230V         </p> <p>Note: Slanted line shows the range of the rated load current.</p>		<p>2.Values</p> <table border="1"> <thead> <tr> <th rowspan="2">Output Voltage [V]</th> <th colspan="2">Load Current [A]</th> </tr> <tr> <th>Input Volt. 100[V]</th> <th>Input Volt. 230[V]</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>0.20</td> <td>0.26</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> <tr> <td>--</td> <td>-</td> <td>-</td> </tr> </tbody> </table>		Output Voltage [V]	Load Current [A]		Input Volt. 100[V]	Input Volt. 230[V]	24	0.20	0.26	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-	--	-	-
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Model	TUHS3F24	Testing Circuitry Figure A
Item	Overvoltage Protection	
Object	+24V0.13A	

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	29.18	29.18
-40	29.23	29.23
-20	29.46	29.47
0	29.79	29.81
25	30.41	30.63
50	30.90	31.05
75	31.32	31.35
85	31.42	31.42
90	31.52	31.49
--	-	-
--	-	-

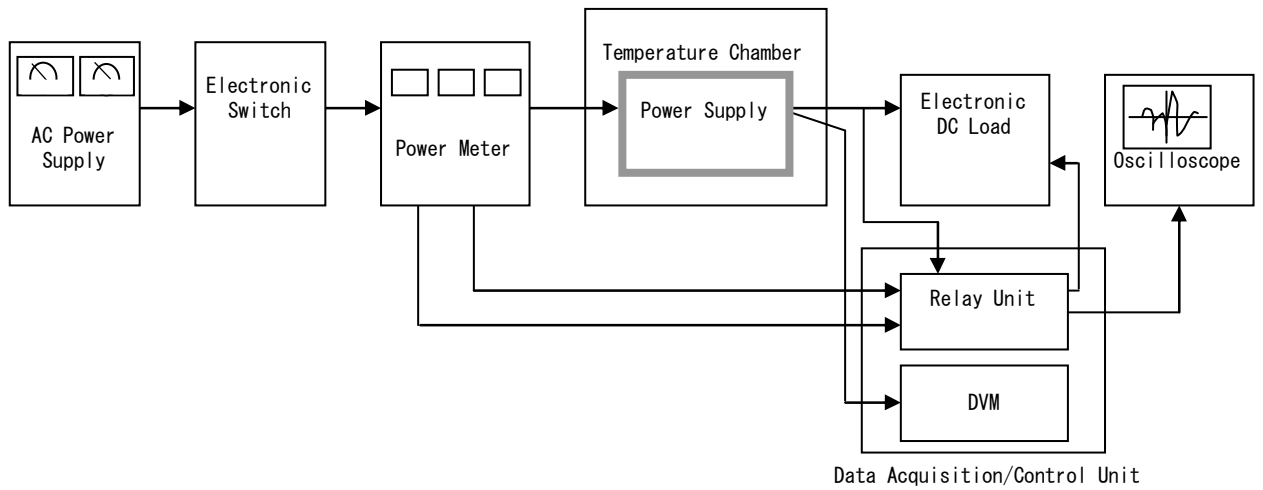


Figure A

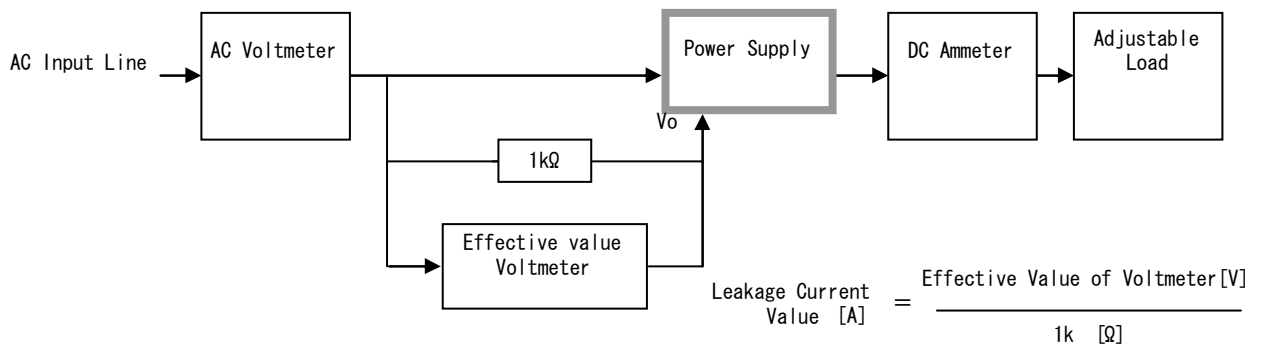


Figure B ( DEN-AN )

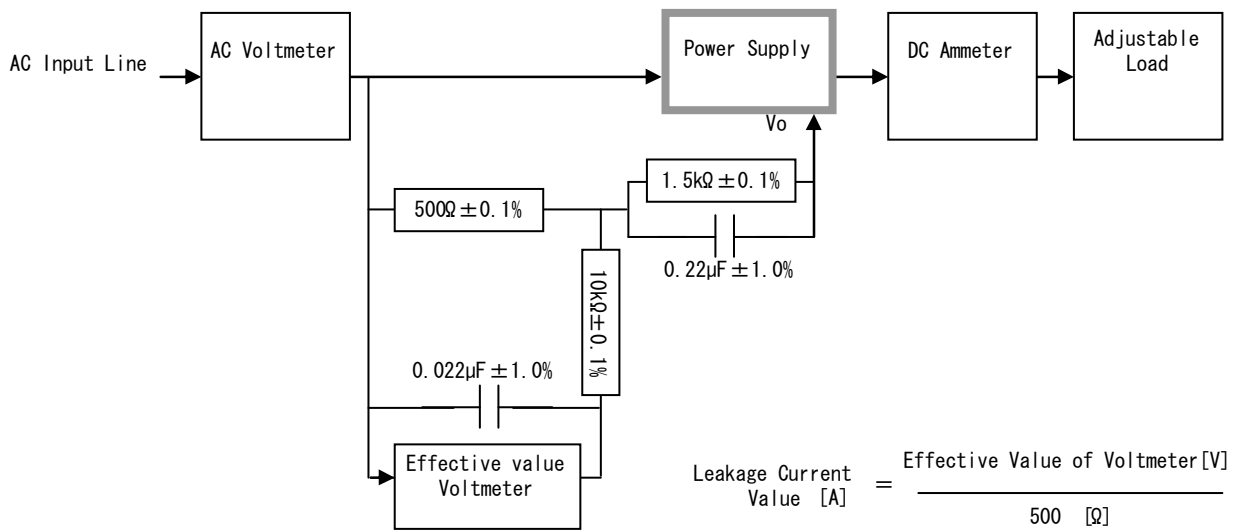


Figure B ( IEC60950-1 )

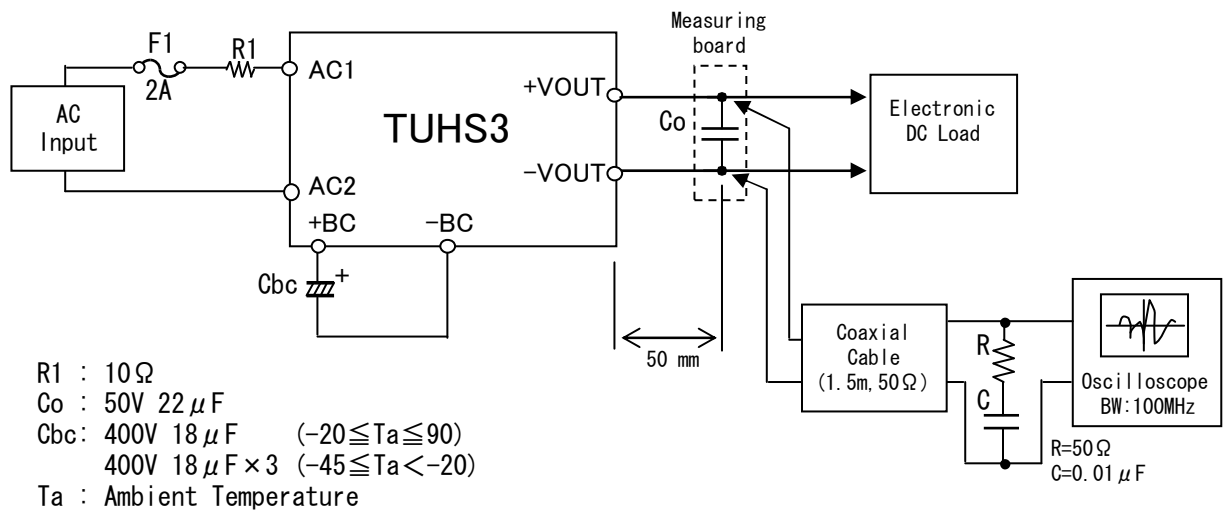


Figure C