

# TEST DATA OF LHA15F-12

Regulated DC Power Supply  
February 2, 2022

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Design Manager

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Design Engineer

**COSEL CO.,LTD.**

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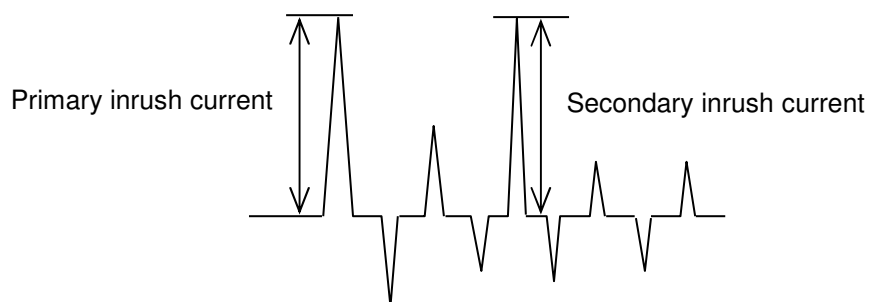
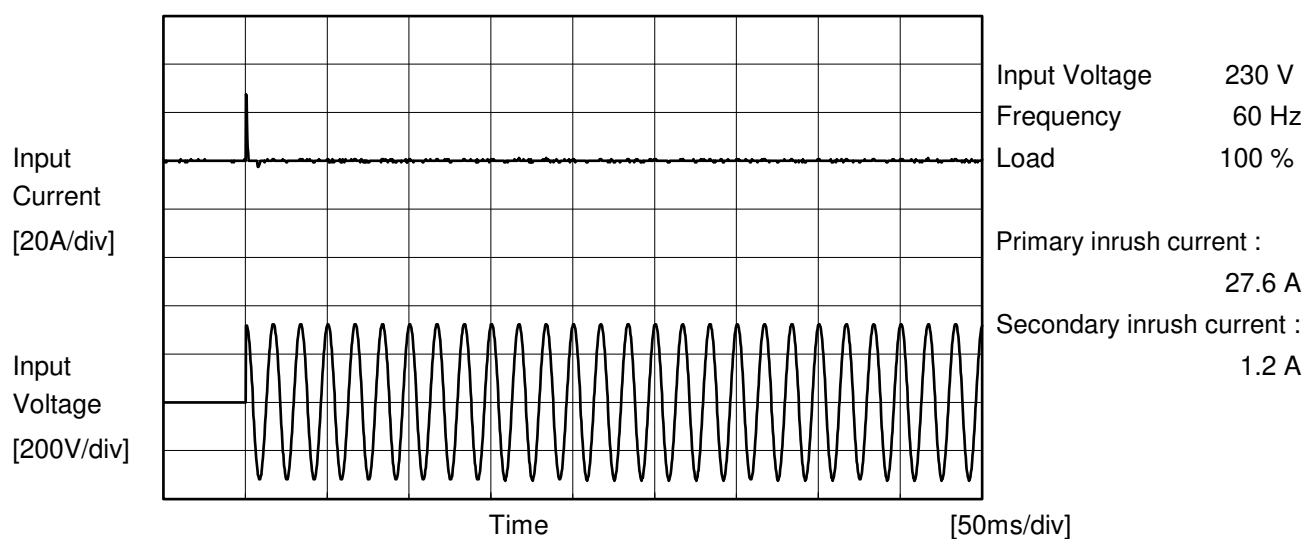
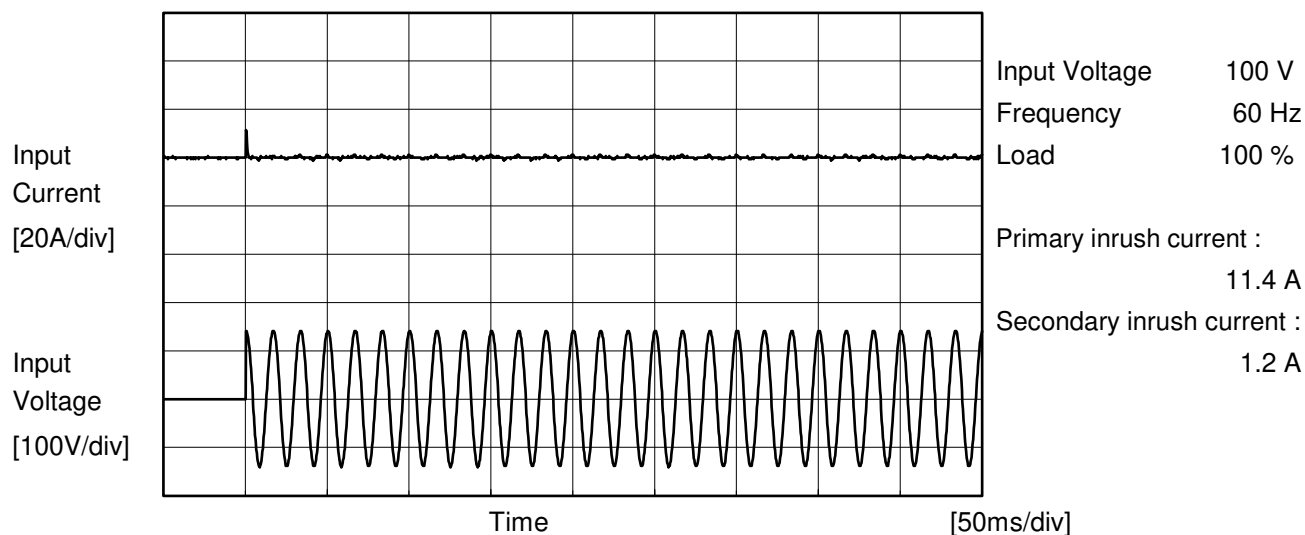
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Model	LHA15F-12	Temperature Testing Circuitry	25° C Figure A
Item	Inrush Current		
Object	_____		





Model		LHA15F-12	Temperature 25°C Testing Circuitry Figure B
Item		Leakage Current	
Object		_____	

## 1.Results

Standards	Testing Circuitry	Measuring Method	Input Volt.			Note
			100 [V]	230 [V]	240 [V]	
DEN-AN	Figure B-1	Both phases	0.02	0.05	0.05	Operation
		One of phases	0.03	0.07	0.07	Stand by
IEC62368-1	Figure B-2	Both phases	0.02	0.05	0.05	Operation
		One of phases	0.03	0.07	0.07	Stand by
	Figure B-3	Both phases	0.02	0.05	0.05	Operation
		One of phases	0.03	0.07	0.07	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.

Model		LHA15F-12	Temperature		25°C
Item		Line Regulation	Testing Circuitry		Figure A
Object		+12V1.3A			
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><div>Load 50%</div><div>Load 100%</div></div> <div><div><div><div>Output Voltage [V]</div><div></div><div>12.40</div><div>12.30</div><div>12.20</div><div>12.10</div><div>12.00</div><div>11.90</div><div>11.80</div><div>11.70</div></div><div><div>50</div><div>100</div><div>150</div><div>200</div><div>250</div><div>300</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><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></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><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></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><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></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><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></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><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></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><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></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><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></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><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></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><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></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><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></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><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></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><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></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><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></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><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></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><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><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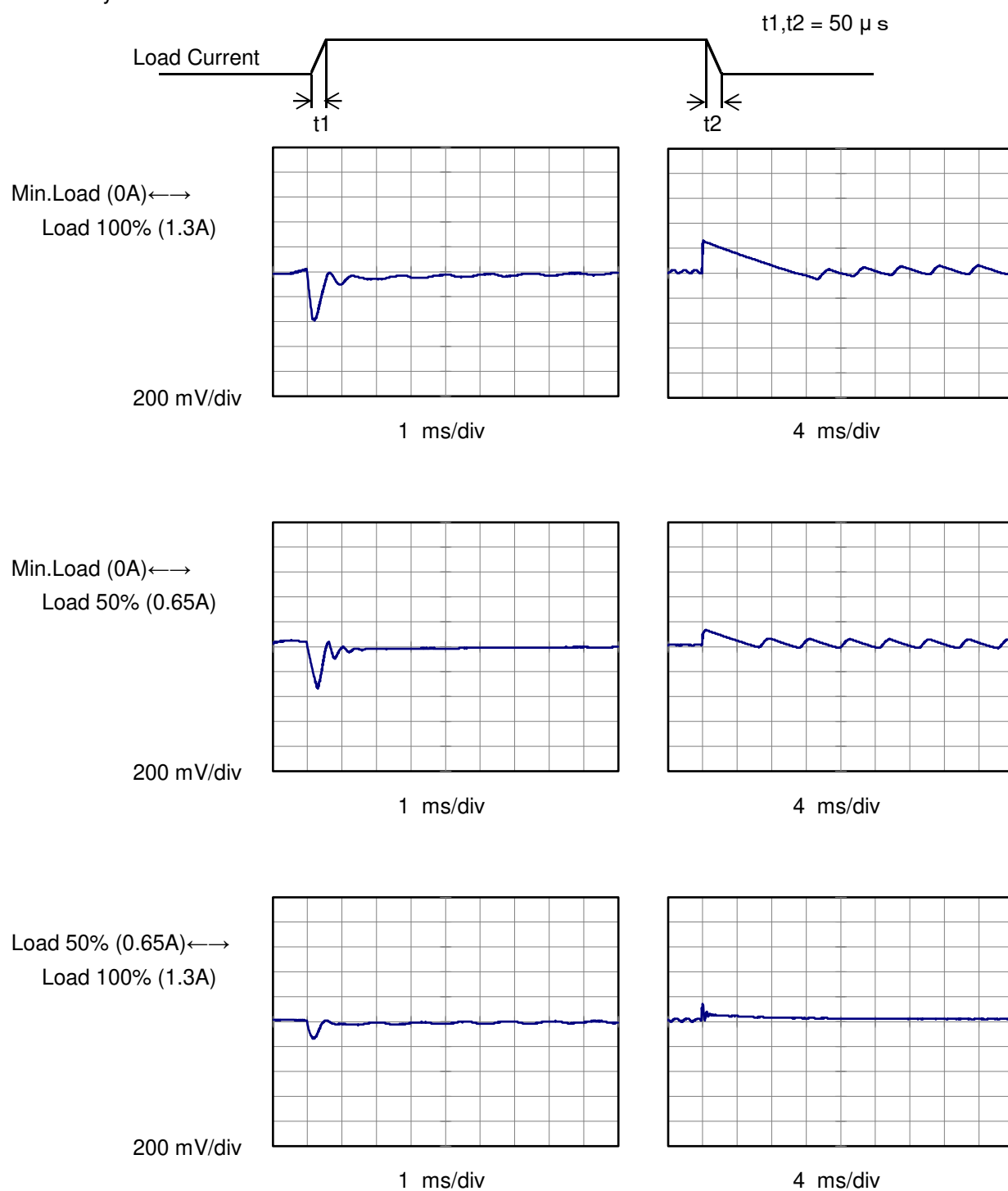


Model	LHA15F-12																																																					
Item	Load Regulation	Temperature	25°C																																																			
Object	+12V1.3A	Testing Circuitry	Figure A																																																			
1.Graph		2.Values																																																				
<div><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></div> <table><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>12.106</td><td>12.106</td><td>12.105</td></tr><tr><td>0.20</td><td>12.105</td><td>12.105</td><td>12.104</td></tr><tr><td>0.40</td><td>12.104</td><td>12.104</td><td>12.104</td></tr><tr><td>0.60</td><td>12.103</td><td>12.104</td><td>12.104</td></tr><tr><td>0.80</td><td>12.103</td><td>12.103</td><td>12.103</td></tr><tr><td>1.00</td><td>12.103</td><td>12.103</td><td>12.103</td></tr><tr><td>1.20</td><td>12.102</td><td>12.102</td><td>12.102</td></tr><tr><td>1.30</td><td>12.102</td><td>12.102</td><td>12.102</td></tr><tr><td>1.43</td><td>12.101</td><td>12.102</td><td>12.101</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></tbody></table> <p>Note: Slanted line shows the range of the rated load current.</p>		Load Current [A]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.00	12.106	12.106	12.105	0.20	12.105	12.105	12.104	0.40	12.104	12.104	12.104	0.60	12.103	12.104	12.104	0.80	12.103	12.103	12.103	1.00	12.103	12.103	12.103	1.20	12.102	12.102	12.102	1.30	12.102	12.102	12.102	1.43	12.101	12.102	12.101	--	-	-	-	--	-	-	-		
Load Current [A]	Output Voltage [V]																																																					
	Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]																																																			
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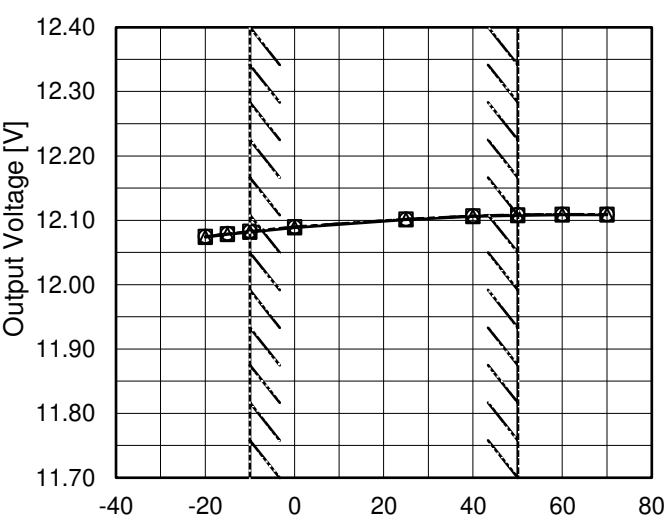
**COSEL**

Model	LHA15F-12	Temperature 25°C Testing Circuitry Figure A
Item	Dynamic Load Response	
Object	+12V1.3A	

Input Volt. 230 V  
Cycle 1000 ms

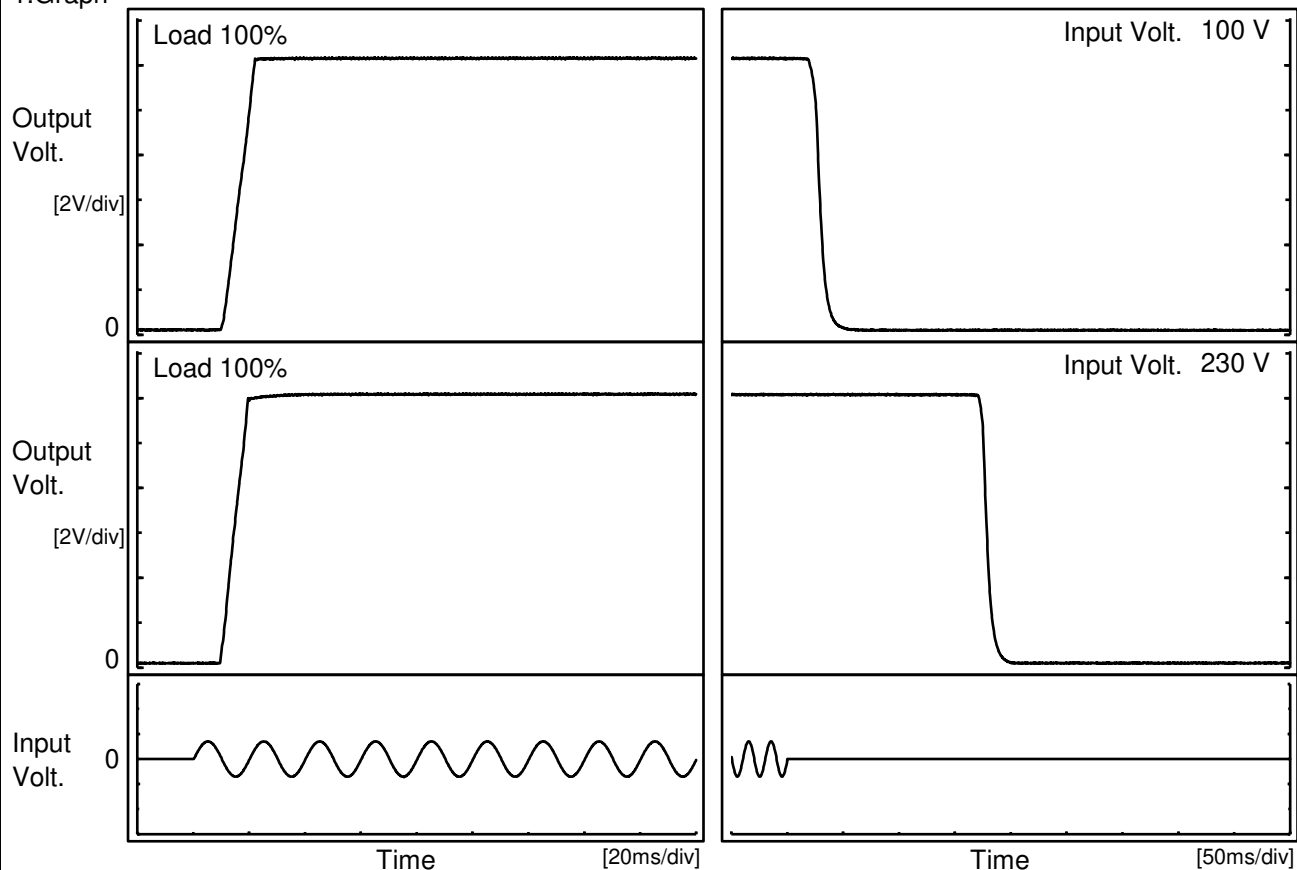


Model		LHA15F-12	Temperature 25°C																																							
Item		Ripple-Noise(by Load Current)	Testing Circuitry Figure C																																							
Object		+12V1.3A																																								
1.Graph			2.Values																																							
<div><div><div>—△—</div><div>Input Volt. 100V</div></div><div><div>-·-○-·-</div><div>Input Volt. 230V</div></div></div> <p>Measured by 20 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>			<table><tr><th rowspan="2">Load Current [A]</th><th colspan="2">Ripple-Noise [mV]</th></tr><tr><th>Input Volt. 100 [V]</th><th>Input Volt. 230 [V]</th></tr><tr><td>0.00</td><td>75</td><td>75</td></tr><tr><td>0.20</td><td>25</td><td>25</td></tr><tr><td>0.40</td><td>15</td><td>15</td></tr><tr><td>0.60</td><td>40</td><td>15</td></tr><tr><td>0.80</td><td>50</td><td>25</td></tr><tr><td>1.00</td><td>50</td><td>40</td></tr><tr><td>1.20</td><td>55</td><td>45</td></tr><tr><td>1.30</td><td>60</td><td>45</td></tr><tr><td>1.43</td><td>60</td><td>45</td></tr><tr><td>--</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td></tr></table>		Load Current [A]	Ripple-Noise [mV]		Input Volt. 100 [V]	Input Volt. 230 [V]	0.00	75	75	0.20	25	25	0.40	15	15	0.60	40	15	0.80	50	25	1.00	50	40	1.20	55	45	1.30	60	45	1.43	60	45	--	-	-	--	-	-
Load Current [A]	Ripple-Noise [mV]																																									
	Input Volt. 100 [V]	Input Volt. 230 [V]																																								
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1.30	60	45																																								
1.43	60	45																																								
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<p>Fig. Complex Ripple Wave Form</p>																																										

Model		LHA15F-12																																																					
Item		Ambient Temperature Drift	Testing Circuitry    Figure A																																																				
Object		+12V1.3A																																																					
1.Graph		<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>Output Voltage [V]</p> <p>Ambient Temperature [°C]</p> <p>Load 100%</p> <p>Note: Slanted line shows the range of the rated ambient temperature.</p>	2.Values																																																				
		<table><tr><th rowspan="2">Ambient Temperature [°C]</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>-20</td><td>12.074</td><td>12.075</td><td>12.075</td></tr><tr><td>-15</td><td>12.078</td><td>12.079</td><td>12.079</td></tr><tr><td>-10</td><td>12.082</td><td>12.083</td><td>12.083</td></tr><tr><td>0</td><td>12.089</td><td>12.090</td><td>12.090</td></tr><tr><td>25</td><td>12.101</td><td>12.102</td><td>12.102</td></tr><tr><td>40</td><td>12.106</td><td>12.107</td><td>12.107</td></tr><tr><td>50</td><td>12.107</td><td>12.109</td><td>12.109</td></tr><tr><td>60</td><td>12.108</td><td>12.109</td><td>12.109</td></tr><tr><td>70</td><td>12.108</td><td>12.109</td><td>12.109</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr><tr><td>--</td><td>-</td><td>-</td><td>-</td></tr></table>			Ambient Temperature [°C]	Output Voltage [V]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	-20	12.074	12.075	12.075	-15	12.078	12.079	12.079	-10	12.082	12.083	12.083	0	12.089	12.090	12.090	25	12.101	12.102	12.102	40	12.106	12.107	12.107	50	12.107	12.109	12.109	60	12.108	12.109	12.109	70	12.108	12.109	12.109	--	-	-	-	--	-	-	-
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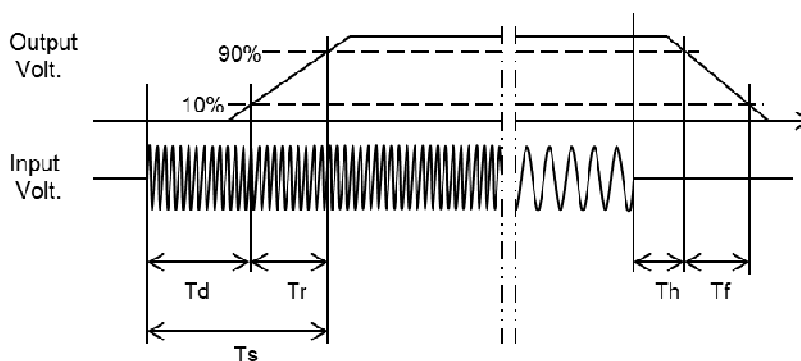
Model	LHA15F-12	Temperature	25°C
Item	Rise and Fall Time	Testing Circuitry	Figure A
Object	+12V1.3A		

1.Graph



2.Values

Input Volt. \ Time	Td	Tr	Ts	Th	Tf
100 V	11.8	9.2	21.0	24.0	12.8
230 V	10.9	8.1	19.0	174.5	11.0



Model	LHA15F-12																																	
Item	Hold-Up Time	Temperature      25°C Testing Circuitry   Figure A																																
Object	+12V1.3A																																	
<p>1.Graph</p> <div style="text-align: right; margin-right: 10%;">             ---□--- Load 50%              —△— Load 100%         </div>		<p>2.Values</p> <table border="1"> <thead> <tr> <th rowspan="2">Input Voltage [V]</th> <th colspan="2">Hold-Up Time [ms]</th> </tr> <tr> <th>Load 50%</th> <th>Load 100%</th> </tr> </thead> <tbody> <tr><td>85</td><td>37</td><td>11</td></tr> <tr><td>90</td><td>42</td><td>14</td></tr> <tr><td>100</td><td>54</td><td>20</td></tr> <tr><td>120</td><td>83</td><td>34</td></tr> <tr><td>200</td><td>262</td><td>126</td></tr> <tr><td>230</td><td>352</td><td>171</td></tr> <tr><td>264</td><td>469</td><td>232</td></tr> <tr><td>280</td><td>531</td><td>262</td></tr> <tr><td>--</td><td>-</td><td>-</td></tr> </tbody> </table>	Input Voltage [V]	Hold-Up Time [ms]		Load 50%	Load 100%	85	37	11	90	42	14	100	54	20	120	83	34	200	262	126	230	352	171	264	469	232	280	531	262	--	-	-
Input Voltage [V]	Hold-Up Time [ms]																																	
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--	-	-																																
<p>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.</p>																																		

Model		LHA15F-12	Temperature		25°C																																																			
Item		Instantaneous Interruption Compensation	Testing Circuitry		Figure A																																																			
Object		+12V1.3A																																																						
1.Graph			2.Values																																																					
<div><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></div> <div>Instantaneous Compensation Time [ms]</div> <div>Load Current [A]</div> <div>Note: Slanted line shows the range of the rated load current.</div>			<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>0.20</td><td>183</td><td>775</td><td>1049</td></tr><tr><td>0.40</td><td>93</td><td>400</td><td>546</td></tr><tr><td>0.60</td><td>59</td><td>266</td><td>366</td></tr><tr><td>0.80</td><td>44</td><td>200</td><td>276</td></tr><tr><td>1.00</td><td>34</td><td>157</td><td>219</td></tr><tr><td>1.20</td><td>25</td><td>135</td><td>186</td></tr><tr><td>1.30</td><td>20</td><td>126</td><td>171</td></tr><tr><td>1.43</td><td>16</td><td>96</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></table>			Load Current [A]	Time [ms]			Input Volt. 100[V]	Input Volt. 200[V]	Input Volt. 230[V]	0.00	-	-	-	0.20	183	775	1049	0.40	93	400	546	0.60	59	266	366	0.80	44	200	276	1.00	34	157	219	1.20	25	135	186	1.30	20	126	171	1.43	16	96	136	--	-	-	-	--	-	-	-
Load Current [A]	Time [ms]																																																							
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Model	LHA15F-12																																						
Item	Minimum Input Voltage for Regulated Output Voltage	Testing Circuitry    Figure A																																					
Object	+12V1.3A																																						
1.Graph		2.Values																																					
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Ambient Temperature [°C]	Load 50% [V]	Load 100% [V]																																					
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Note: Slanted line shows the range of the rated ambient temperature.																																							



Model	LHA15F-12																																														
Item	Overcurrent Protection	Temperature	25°C																																												
Object	+12V1.3A	Testing Circuitry	Figure A																																												
1.Graph		2.Values																																													
<div><div><div></div>Input Volt. 100V</div><div><div></div>Input Volt. 230V</div></div> <p>Note: Slanted line shows the range of the rated load current.</p> <p>Overcurrent protection is Hiccup mode.</p>		<table><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><tr><td>12.0</td><td>1.77</td><td>1.71</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></table>		Output Voltage [V]	Load Current [A]		Input Volt. 100[V]	Input Volt. 230[V]	12.0	1.77	1.71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Output Voltage [V]	Load Current [A]																																														
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Model		LHA15F-12
Item		Overvoltage Protection
Object		+12V1.3A

1.Graph

△

Input Volt. 100V

□

Input Volt. 230V

Operating Point [V]

19.0

17.0

15.0

13.0

-40

-20

0

20

40

60

80

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]
-20	17.44	17.31
-15	17.40	17.25
-10	17.36	17.24
0	17.34	17.22
25	17.31	17.21
40	17.31	17.19
50	17.29	17.19
60	17.28	17.18
70	17.27	17.17
--	-	-
--	-	-

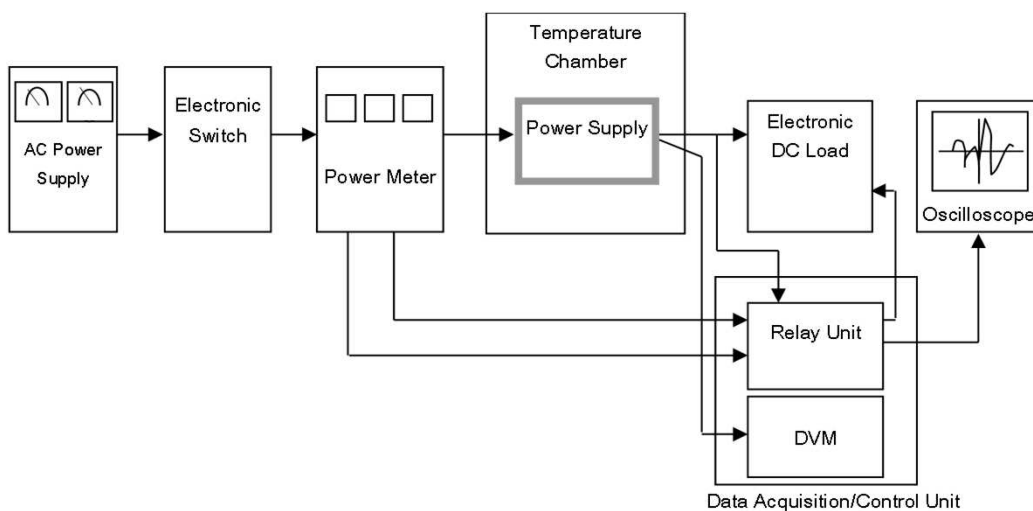


Figure A

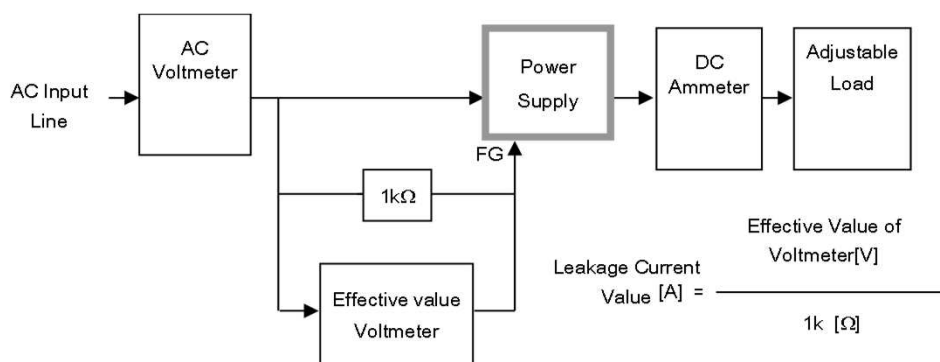


Figure B-1 ( DEN-AN )

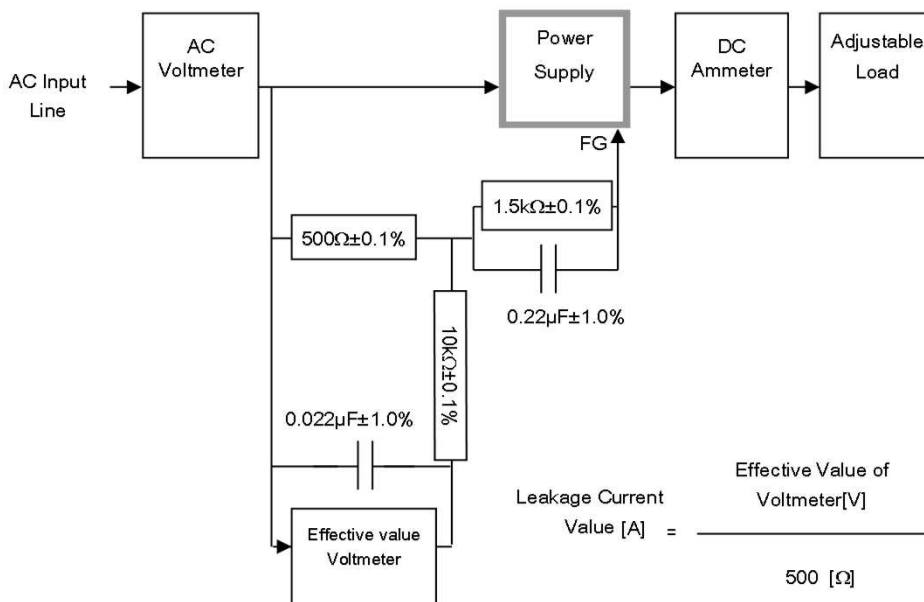


Figure B-2 ( IEC62368-1 refer to IEC60990 Fig.4 )

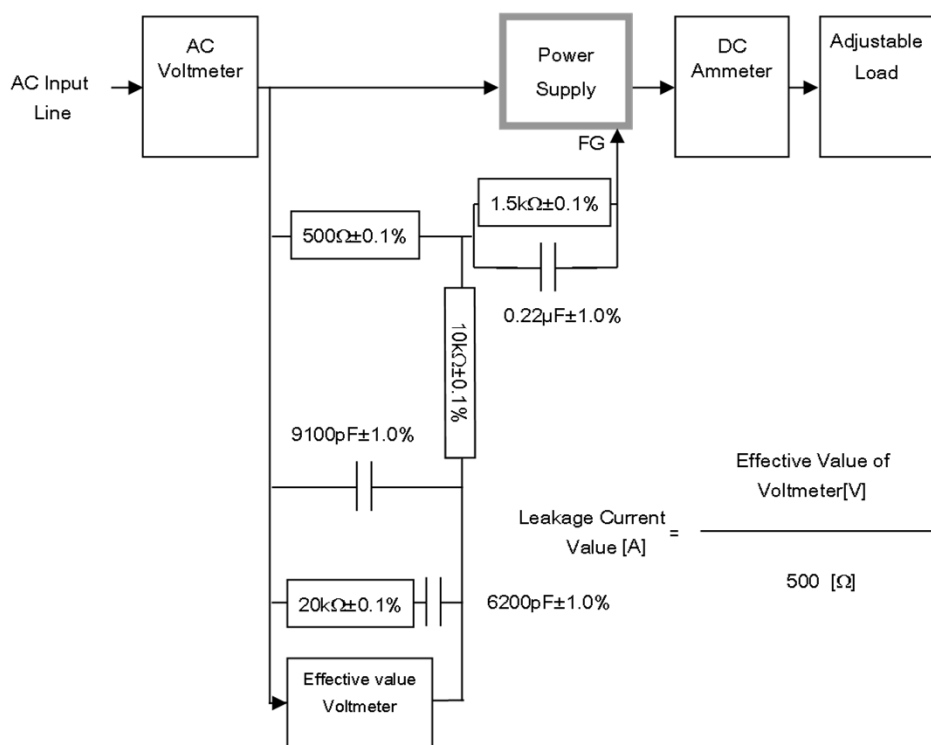


Figure B-3 ( IEC62368-1 refer to IEC60990 Fig.5 )

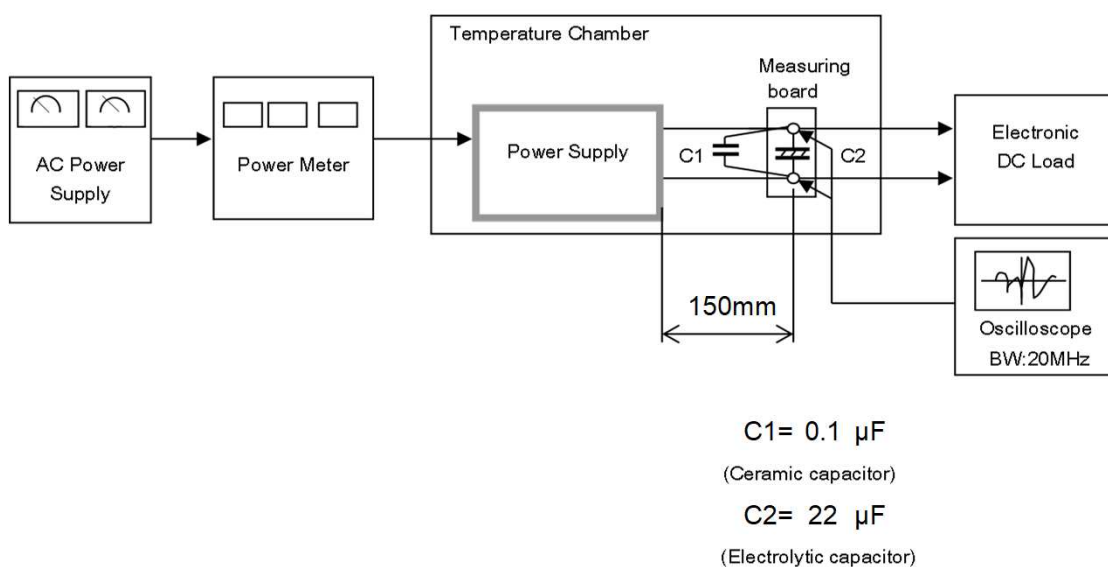


Figure C