

# TEST DATA OF WMA150H-24

(230V INPUT)

Regulated DC Power Supply  
December 5, 2019

Approved by :

  
Takashi Kajii  
Design Manager

Prepared by :

  
Ryo Takahashi  
Design Engineer

**COSEL CO.,LTD.**



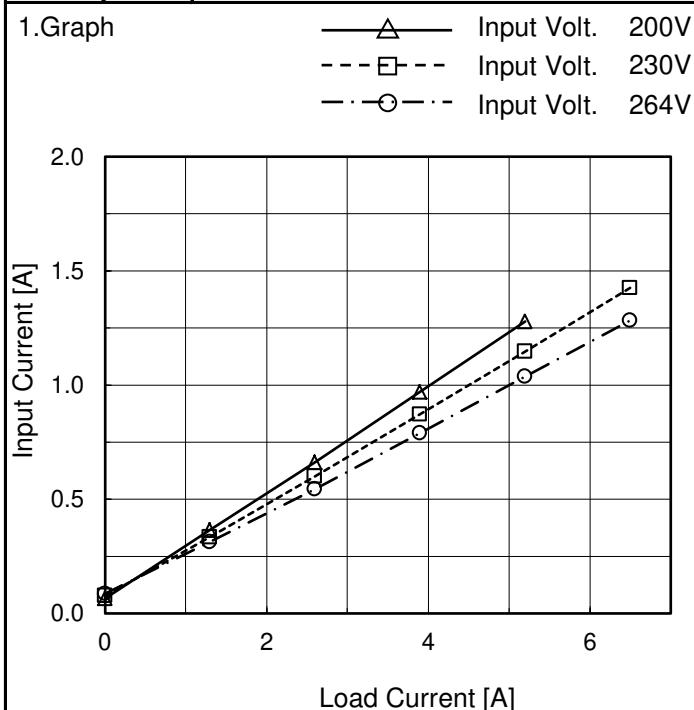
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Model	WMA150H-24
Item	Input Current (by Load Current)
Object	_____


 Temperature 25°C  
 Testing Circuitry Figure A

## 2. Values

Load Current [A]	Input Current [A]		
	Input Volt. 200[V]	Input Volt. 230[V]	Input Volt. 264[V]
0.0	0.066	0.075	0.086
1.3	0.364	0.335	0.313
2.6	0.662	0.600	0.544
3.9	0.969	0.872	0.789
5.2	1.279	1.148	1.038
6.5	-	1.425	1.283
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

**COSEL**

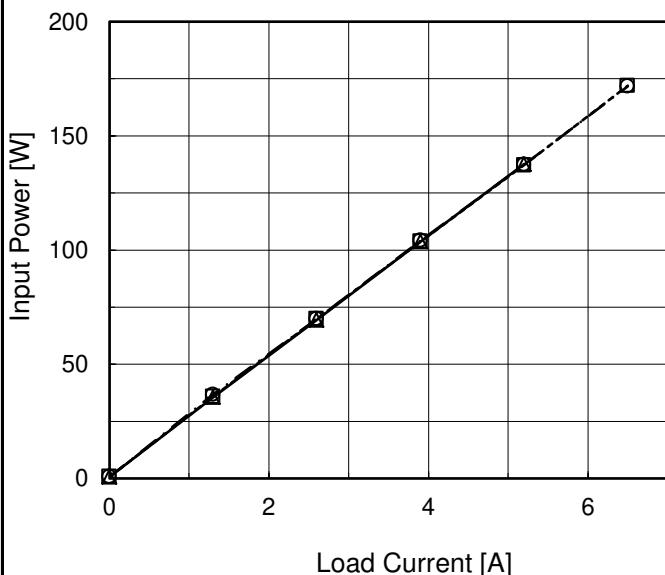
Model WMA150H-24

Item Input Power (by Load Current)

Object \_\_\_\_\_

1.Graph

—△— Input Volt. 200V  
 - - -□- - Input Volt. 230V  
 - ·○- - Input Volt. 264V


 Temperature 25°C  
 Testing Circuitry Figure A

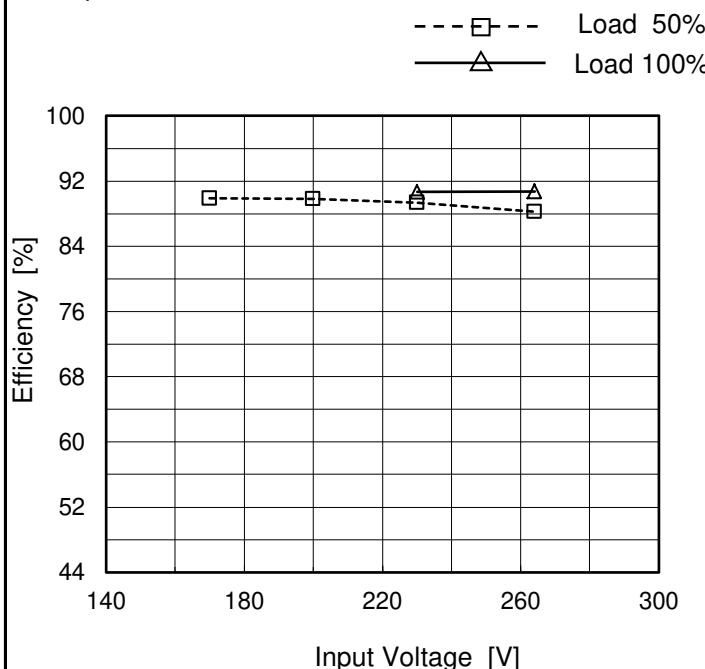
2.Values

Load Current [A]	Input Power [W]		
	Input Volt. 200[V]	Input Volt. 230[V]	Input Volt. 264[V]
0.0	0.5	0.6	0.7
1.3	35.5	35.7	36.6
2.6	69.4	69.8	69.9
3.9	103.8	103.8	104.1
5.2	137.6	137.3	137.5
6.5	-	172.0	171.7
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

**COSEL**

Model	WMA150H-24
Item	Efficiency (by Input Voltage)
Object	+24V6.5A

## 1.Graph


 Temperature 25°C  
 Testing Circuitry Figure A

## 2.Values

Input Voltage [V]	Efficiency [%]	
	Load 50%	Load 100%
170	89.9	-
200	89.8	-
230	89.3	90.6
264	88.2	90.7
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

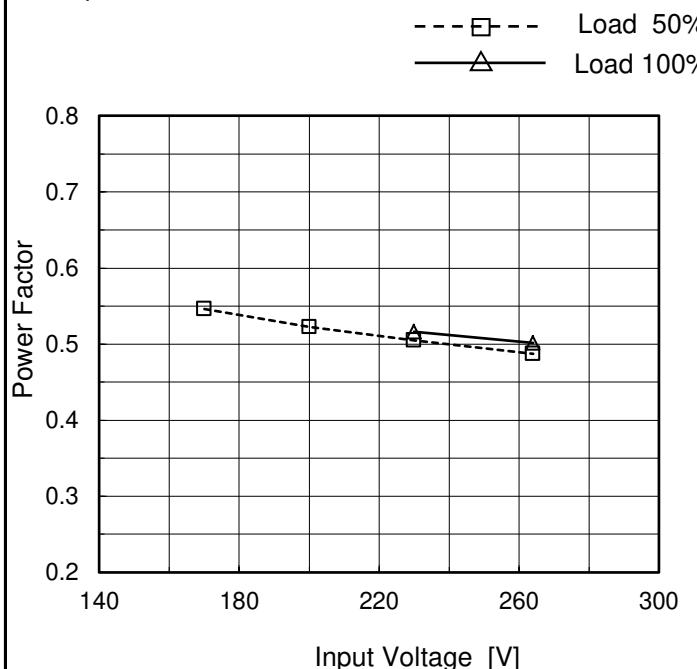
**COSEL**

Model	WMA150H-24	Temperature Testing Circuitry	25°C																																																			
Item	Efficiency (by Load Current)		Figure A																																																			
Object	_____																																																					
1.Graph	<p>—△— Input Volt. 200V        - - □ - - Input Volt. 230V        - · ○ - - Input Volt. 264V</p> <table border="1"> <caption>Data points estimated from Figure A</caption> <thead> <tr> <th>Load Current [A]</th> <th>Efficiency [200V] (%)</th> <th>Efficiency [230V] (%)</th> <th>Efficiency [264V] (%)</th> </tr> </thead> <tbody> <tr><td>1.3</td><td>87.7</td><td>87.1</td><td>85.1</td></tr> <tr><td>2.6</td><td>89.7</td><td>89.2</td><td>89.0</td></tr> <tr><td>3.9</td><td>90.0</td><td>89.9</td><td>89.7</td></tr> <tr><td>5.2</td><td>90.5</td><td>90.7</td><td>90.6</td></tr> <tr><td>6.0</td><td>-</td><td>90.5</td><td>90.7</td></tr> </tbody> </table>			Load Current [A]	Efficiency [200V] (%)	Efficiency [230V] (%)	Efficiency [264V] (%)	1.3	87.7	87.1	85.1	2.6	89.7	89.2	89.0	3.9	90.0	89.9	89.7	5.2	90.5	90.7	90.6	6.0	-	90.5	90.7																											
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**COSEL**

Model	WMA150H-24
Item	Power Factor (by Input Voltage)
Object	+24V6.5A

## 1.Graph

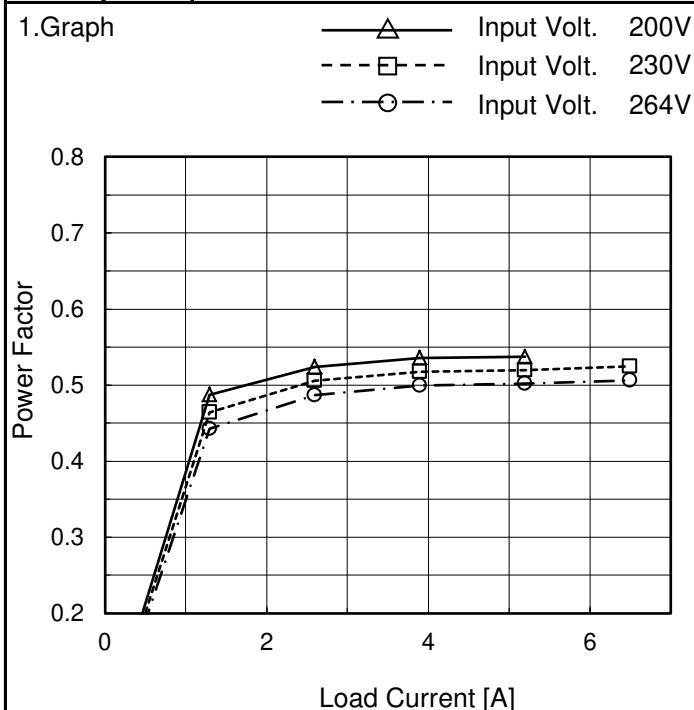

 Temperature 25°C  
 Testing Circuitry Figure A

## 2.Values

Input Voltage [V]	Power Factor	
	Load 50%	Load 100%
170	0.547	-
200	0.523	-
230	0.505	0.516
264	0.488	0.501
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

**COSEL**

Model	WMA150H-24
Item	Power Factor (by Load Current)
Object	_____

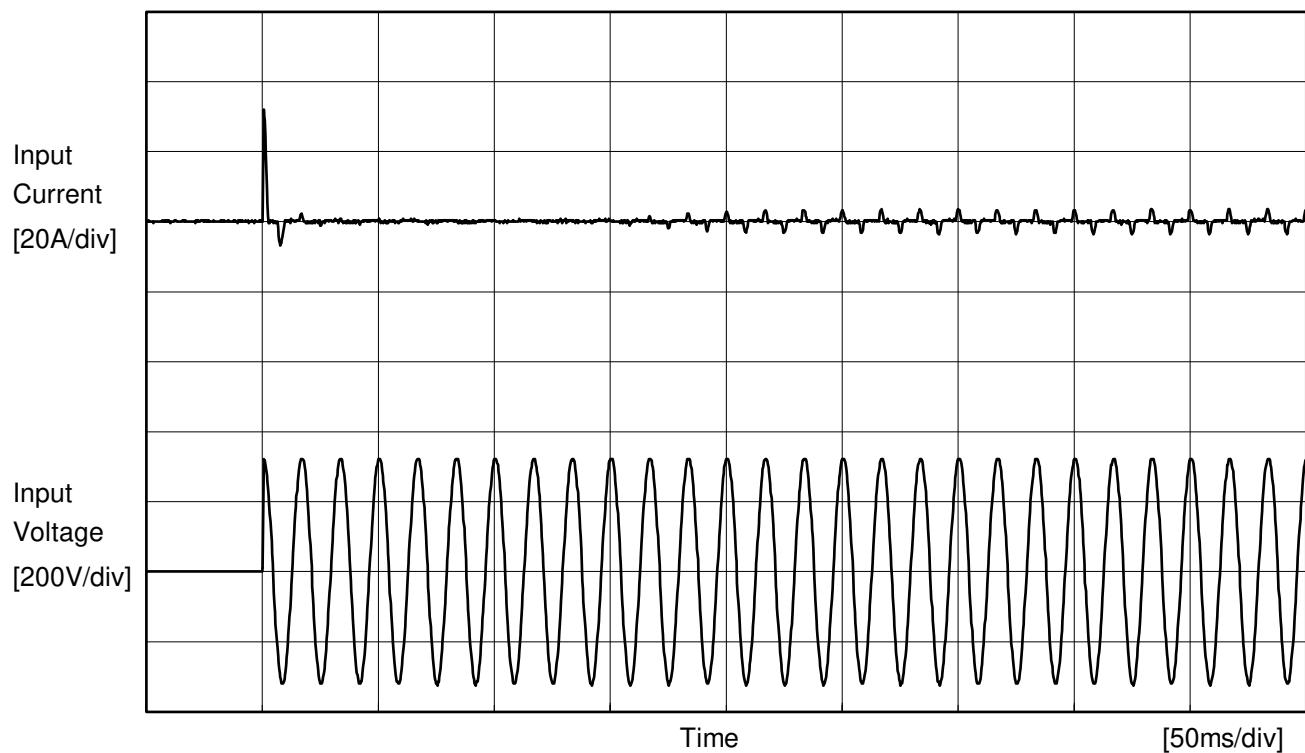

 Temperature 25°C  
 Testing Circuitry Figure A

## 2. Values

Load Current [A]	Power Factor		
	Input Volt. 200[V]	Input Volt. 230[V]	Input Volt. 264[V]
0.0	0.041	0.036	0.031
1.3	0.488	0.464	0.443
2.6	0.524	0.506	0.486
3.9	0.536	0.517	0.500
5.2	0.537	0.520	0.502
6.5	-	0.525	0.507
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

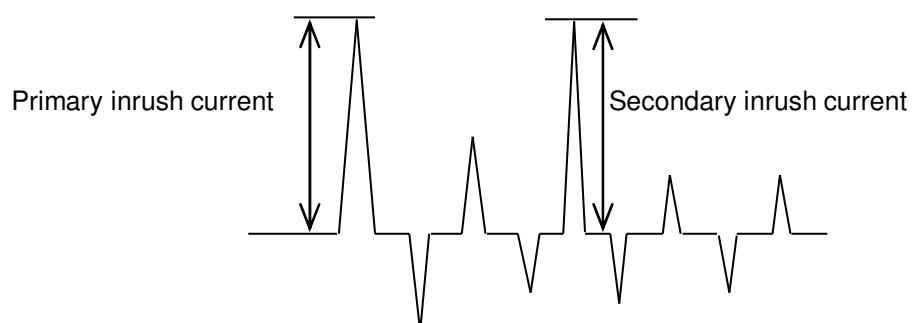
**COSEL**

Model	WMA150H-24	Temperature Testing Circuitry	25°C
Item	Inrush Current		Figure A
Object	_____		



Input Voltage      230 V  
 Frequency          60 Hz  
 Load                100 %

Primary inrush current    32.0 A  
 Secondary inrush current    3.6 A





Model	WMA150H-24	Temperature	25°C
Item	Leakage Current	Testing Circuitry	Figure B
Object	<hr/>		

### 1. Results

Standards		Input Volt.			Note
		200 [V]	240 [V]	264 [V]	
IEC60601-1	Both phases	0.34	0.38	0.41	Operation
	One of phases	0.65	0.73	0.81	Stand by

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

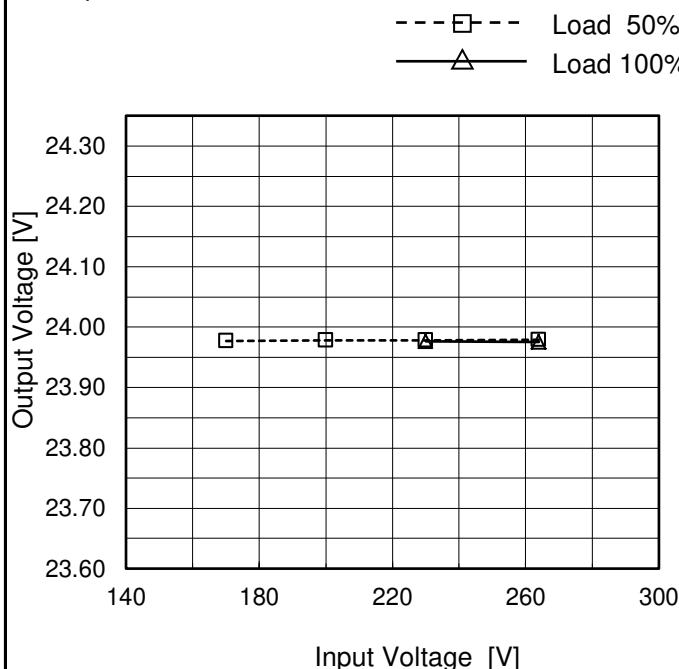
### 2. Condition

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

**COSEL**

Model	WMA150H-24
Item	Line Regulation
Object	+24V6.5A

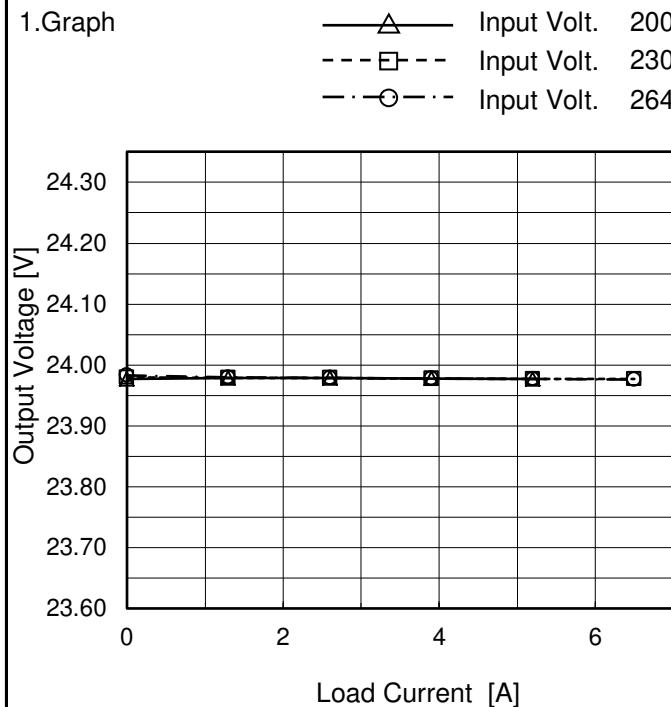
## 1.Graph


 Temperature 25°C  
 Testing Circuitry Figure A

## 2.Values

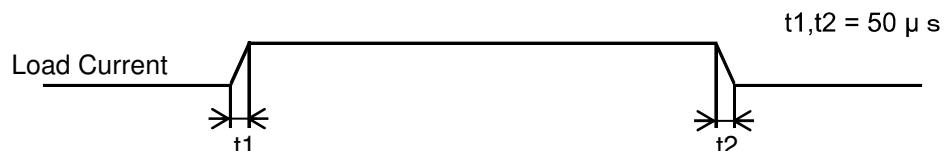
Input Voltage [V]	Output Voltage [V]	
	Load 50%	Load 100%
170	23.977	-
200	23.978	-
230	23.978	23.976
264	23.979	23.976
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

**COSEL**

Model	WMA150H-24	Temperature 25°C Testing Circuitry Figure A																																																	
Item	Load Regulation																																																		
Object	+24V6.5A																																																		
1.Graph	 <p>Graph showing Output Voltage [V] vs Load Current [A]. The output voltage remains constant at approximately 23.97V across the load range from 0 to 6.5A.</p> <table border="1"> <thead> <tr> <th>Load Current [A]</th> <th>Output Voltage [V]</th> </tr> </thead> <tbody> <tr><td>0.0</td><td>23.977</td></tr> <tr><td>1.3</td><td>23.979</td></tr> <tr><td>2.6</td><td>23.978</td></tr> <tr><td>3.9</td><td>23.978</td></tr> <tr><td>5.2</td><td>23.977</td></tr> <tr><td>6.5</td><td>-</td></tr> </tbody> </table>	Load Current [A]	Output Voltage [V]	0.0	23.977	1.3	23.979	2.6	23.978	3.9	23.978	5.2	23.977	6.5	-	2.Values																																			
Load Current [A]	Output Voltage [V]																																																		
0.0	23.977																																																		
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Load Current [A]	Output Voltage [V]																																																		
	Input Volt. 200[V]	Input Volt. 230[V]	Input Volt. 264[V]																																																
0.0	23.977	23.979	23.983																																																
1.3	23.979	23.979	23.979																																																
2.6	23.978	23.978	23.979																																																
3.9	23.978	23.977	23.978																																																
5.2	23.977	23.977	23.977																																																
6.5	-	23.977	23.976																																																
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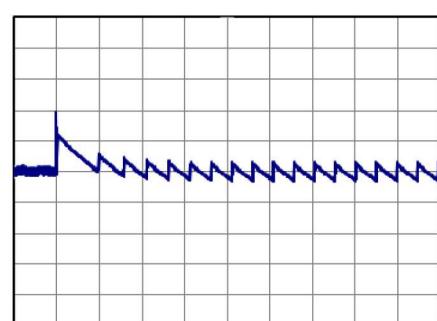
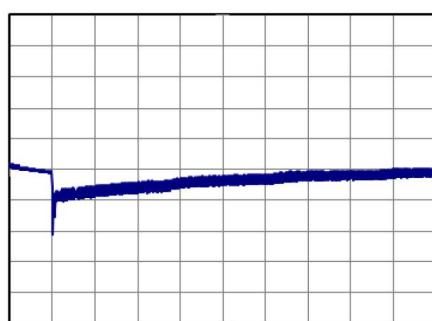
**COSEL**

Model	WMA150H-24
Item	Dynamic Load Response
Object	+24V6.5A

Temperature 25°C  
Testing Circuitry Figure AInput Volt. 230 V  
Cycle 1000 msMin.Load (0A)↔  
Load 100% (6.5A)

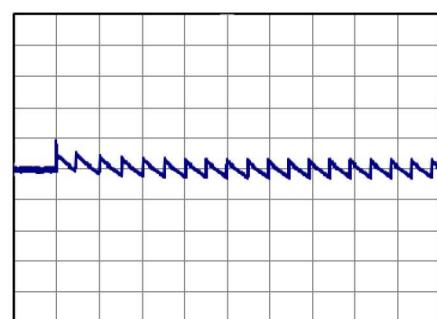
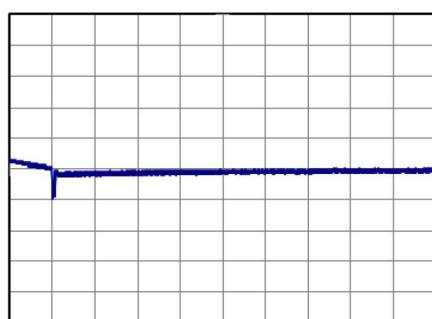
200 mV/div

4 ms/div

Min.Load (0A)↔  
Load 50% (3.25A)

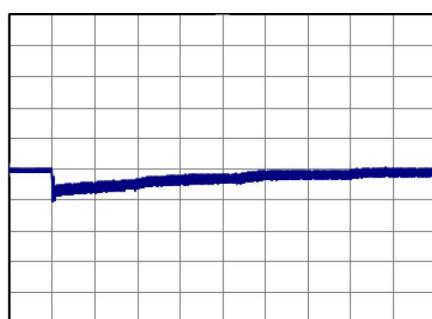
200 mV/div

4 ms/div

Load 50% (3.25A)↔  
Load 100% (6.5A)

200 mV/div

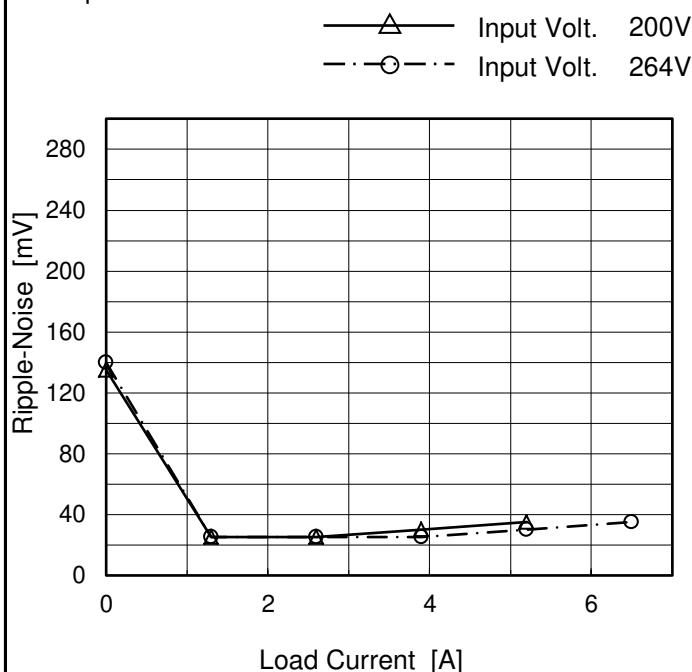
4 ms/div



**COSEL**

Model	WMA150H-24
Item	Ripple Noise(by Load Current)
Object	+24V6.5A

## 1.Graph



Measured by 20 MHz Oscilloscope.

Ripple-Noise is shown as p-p in the figure below.

 Temperature 25°C  
 Testing Circuitry Figure C

## 2.Values

Load Current [A]	Ripple Noise [mV]	
	Input Volt. 200 [V]	Input Volt. 264 [V]
0.0	135	140
1.3	25	25
2.6	25	25
3.9	30	25
5.2	35	30
6.5	-	35
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

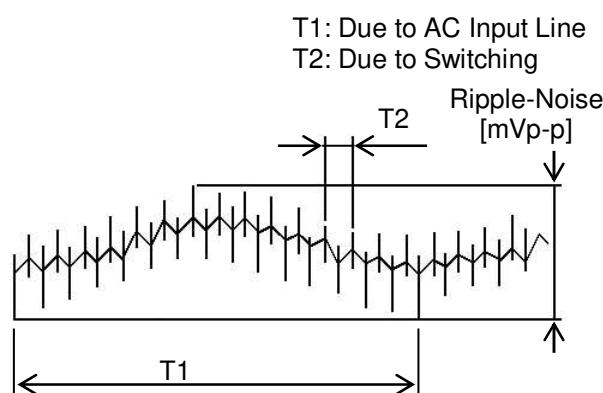
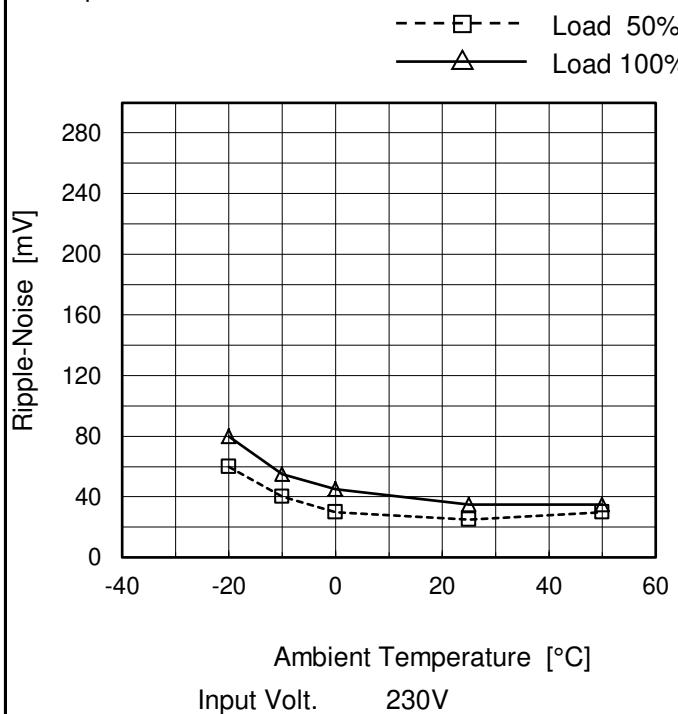


Fig. Complex Ripple Wave Form

**COSEL**

Model	WMA150H-24
Item	Ripple Noise (by Ambient Temp.)
Object	+24V6.5A

## 1. Graph



Measured by 20 MHz Oscilloscope.

Testing Circuitry Figure C

## 2. Values

Ambient Temperature [°C]	Ripple Noise [mV]	
	Load 50%	Load 100%
-20	60	80
-10	40	55
0	30	45
25	25	35
50	30	35
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

**COSEL**

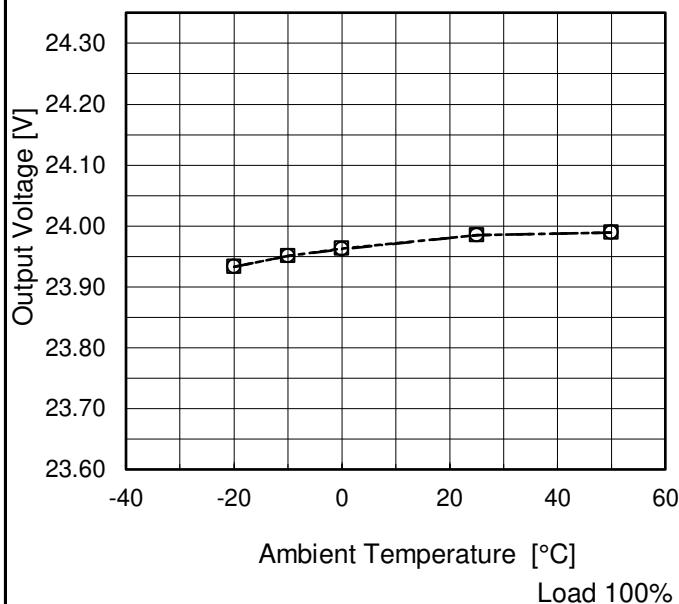
Model WMA150H-24

Item Ambient Temperature Drift

Object +24V6.5A

1.Graph

- △ — Input Volt. 200V
- - - □ - - Input Volt. 230V
- · ○ - - Input Volt. 264V



Testing Circuitry Figure A

2.Values

Ambient Temperature [°C]	Output Voltage [V]		
	Input Volt. 200[V]	Input Volt. 230[V]	Input Volt. 264[V]
-20	-	23.933	23.933
-10	-	23.951	23.951
0	-	23.963	23.962
25	-	23.985	23.985
50	-	23.989	23.989
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-



Model	WMA150H-24	Testing Circuitry Figure A
Item	Output Voltage Accuracy	
Object	+24V6.5A	

### 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 : -10 - 50°C

Input Voltage : 200 - 264V

Load Current : 0 - 6.5A

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

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

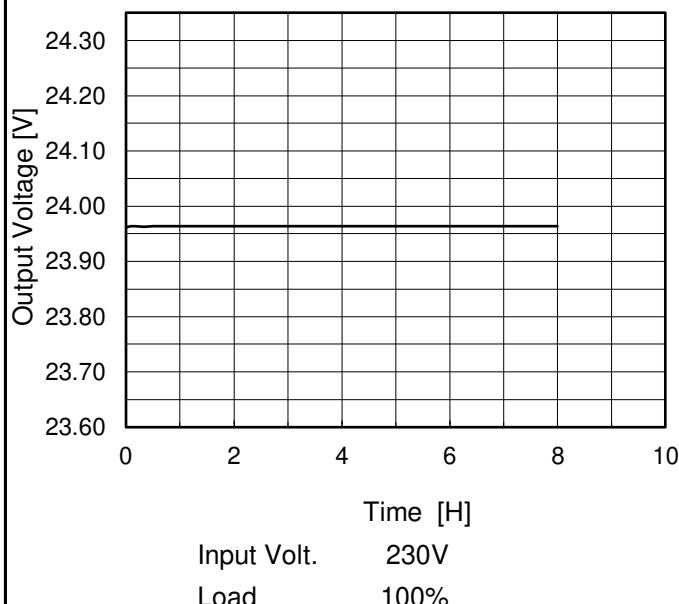
### 2. Values

Item	Temperature [°C]	Input Voltage[V]	Output		Output Voltage Accuracy	
			Current[A]	Voltage[V]	Value [mV]	Ratio [%]
Maximum Voltage	50	230	0	24.001	$\pm 25$	$\pm 0.1$
Minimum Voltage	-10	264	6.5	23.951		

**COSEL**

Model	WMA150H-24
Item	Time Lapse Drift
Object	+24V6.5A

## 1.Graph


 Temperature 25°C  
 Testing Circuitry Figure A

## 2.Values

Time since start [H]	Output Voltage [V]
0.0	23.961
0.5	23.964
1.0	23.964
2.0	23.964
3.0	23.964
4.0	23.964
5.0	23.964
6.0	23.964
7.0	23.964
8.0	23.964

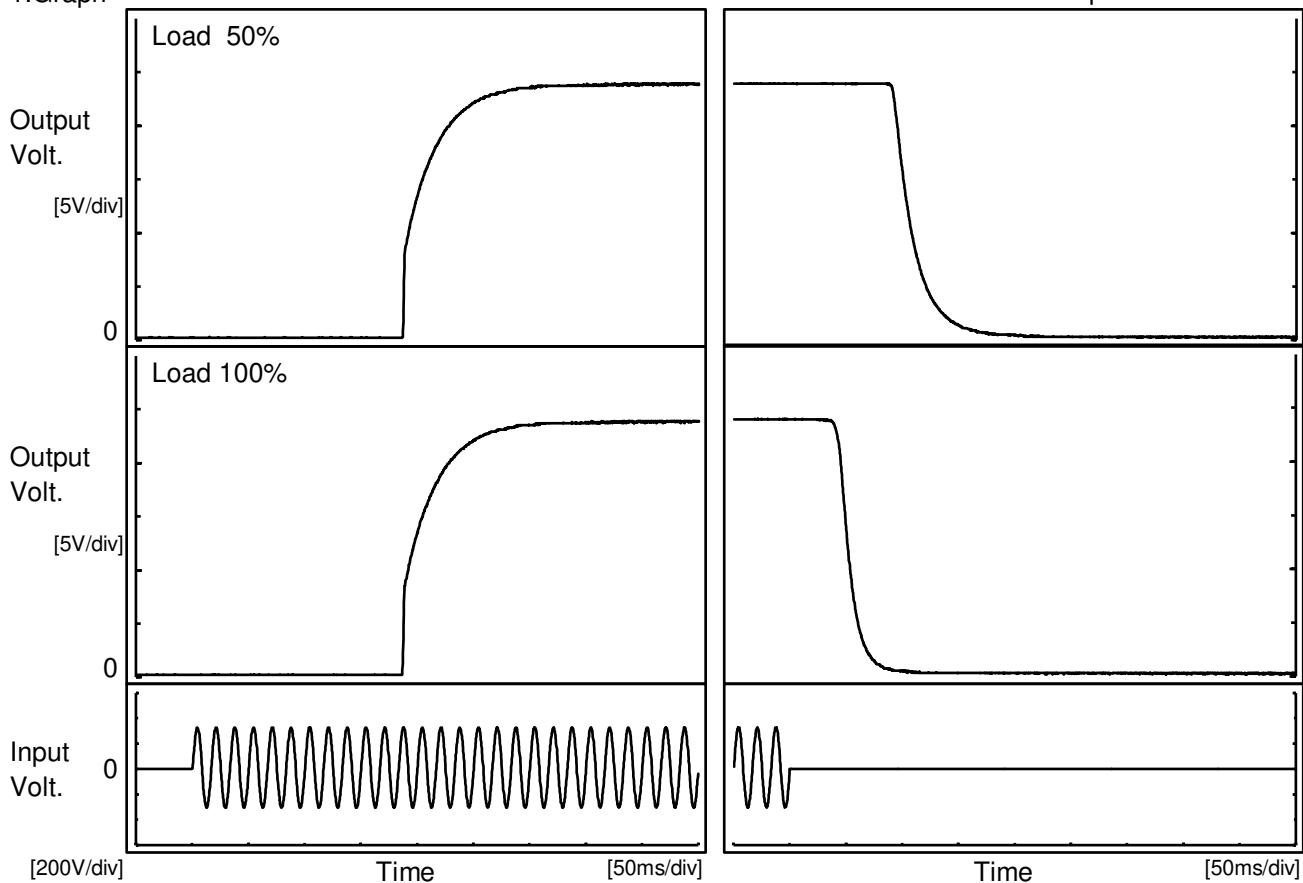
**COSEL**

Model	WMA150H-24
Item	Rise and Fall Time
Object	+24V6.5A

Temperature  
Testing Circuitry  
25°C  
Figure A

## 1. Graph

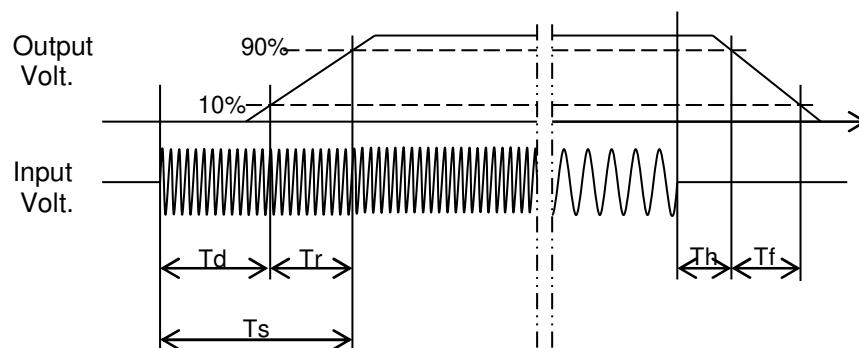
Input Volt. 230 V



## 2. Values

[ms]

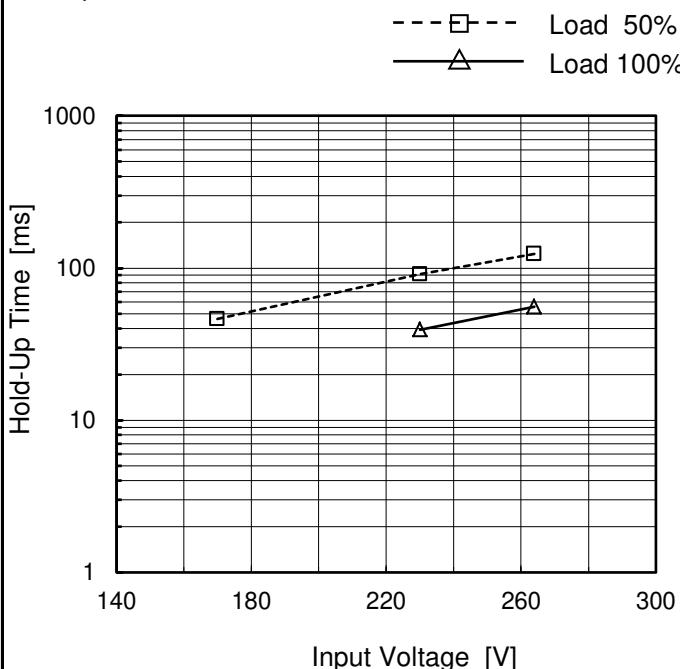
Load	Time	Td	Tr	Ts	Th	Tf
50 %		187.5	58.3	245.8	93.3	40.8
100 %		187.3	58.5	245.8	43.3	24.0



**COSEL**

Model	WMA150H-24
Item	Hold-Up Time
Object	+24V6.5A

## 1. Graph



This duration covers from Shut-off of input voltage to the moment when output voltage descends to the rated range of voltage accuracy.

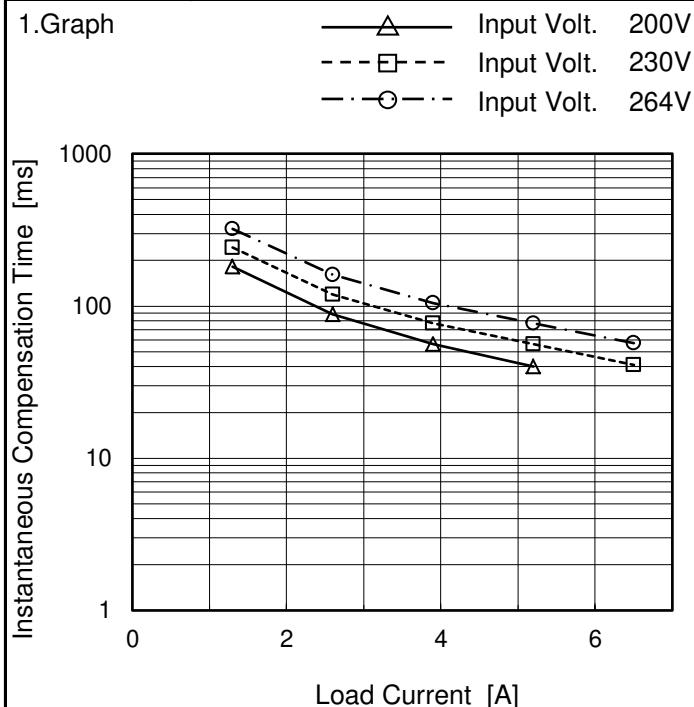
 Temperature 25°C  
 Testing Circuitry Figure A

## 2. Values

Input Voltage [V]	Hold-Up Time [ms]	
	Load 50%	Load 100%
170	46	-
200	67	-
230	91	39
264	124	56
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

**COSEL**

Model	WMA150H-24
Item	Instantaneous Interruption Compensation
Object	+24V6.5A


 Temperature 25°C  
 Testing Circuitry Figure A

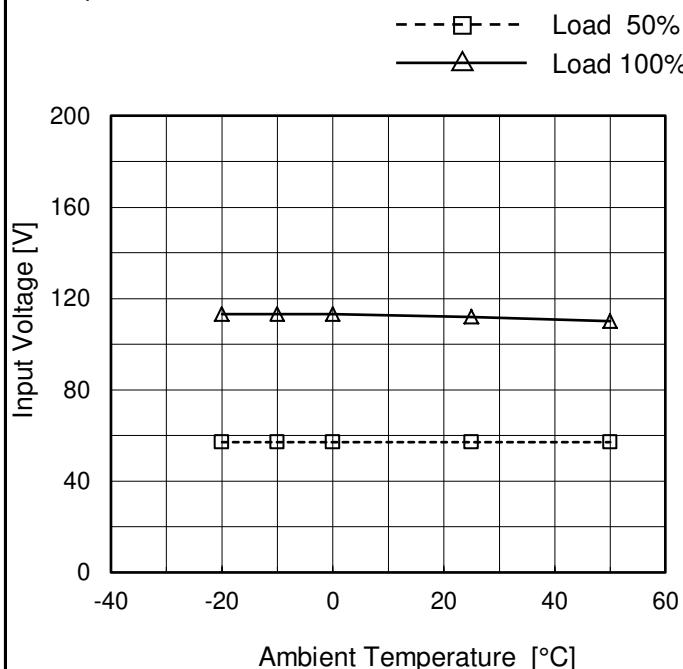
## 2. Values

Load Current [A]	Time [ms]		
	Input Volt. 200[V]	Input Volt. 230[V]	Input Volt. 264[V]
0.0	-	-	-
1.3	181	242	322
2.6	88	119	160
3.9	56	77	105
5.2	40	56	77
6.5	-	41	57
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

**COSEL**

Model	WMA150H-24
Item	Minimum Input Voltage for Regulated Output Voltage
Object	+24V6.5A

## 1. Graph



## Testing Circuitry Figure A

## 2. Values

Ambient Temperature [°C]	Input Voltage [V]	
	Load 50%	Load 100%
-20	57	113
-10	57	113
0	57	113
25	57	112
50	57	110
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

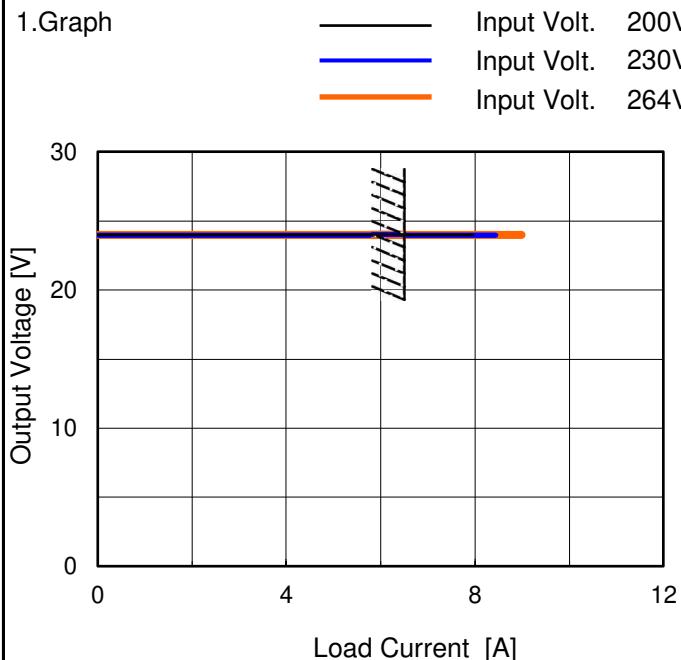
**COSEL**

Model WMA150H-24

Item Overcurrent Protection

Object +24V6.5A

1.Graph



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

 Temperature 25°C  
 Testing Circuitry Figure A

2.Values

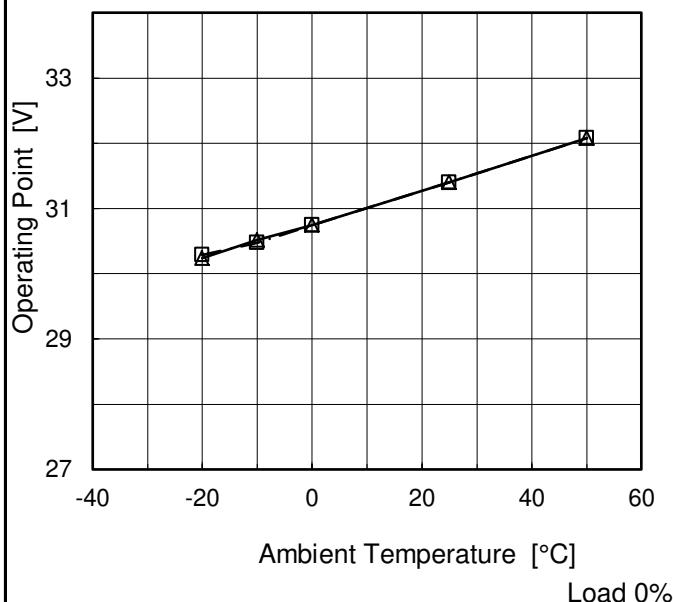
Output Voltage [V]	Load Current [A]		
	Input Volt. 200[V]	Input Volt. 230[V]	Input Volt. 264[V]
24	7.95	8.43	8.98
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-
--	-	-	-

**COSEL**

Model	WMA150H-24
Item	Oversupply Protection
Object	+24V6.5A

## 1.Graph

—△— Input Volt. 170V  
 - - □ - - Input Volt. 264V



## Testing Circuitry Figure A

## 2.Values

Ambient Temperature [°C]	Operating Point [V]	
	Input Volt. 170[V]	Input Volt. 264[V]
-20	30.24	30.29
-10	30.52	30.48
0	30.75	30.75
25	31.40	31.40
50	32.08	32.08
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-
--	-	-

**COSEL**

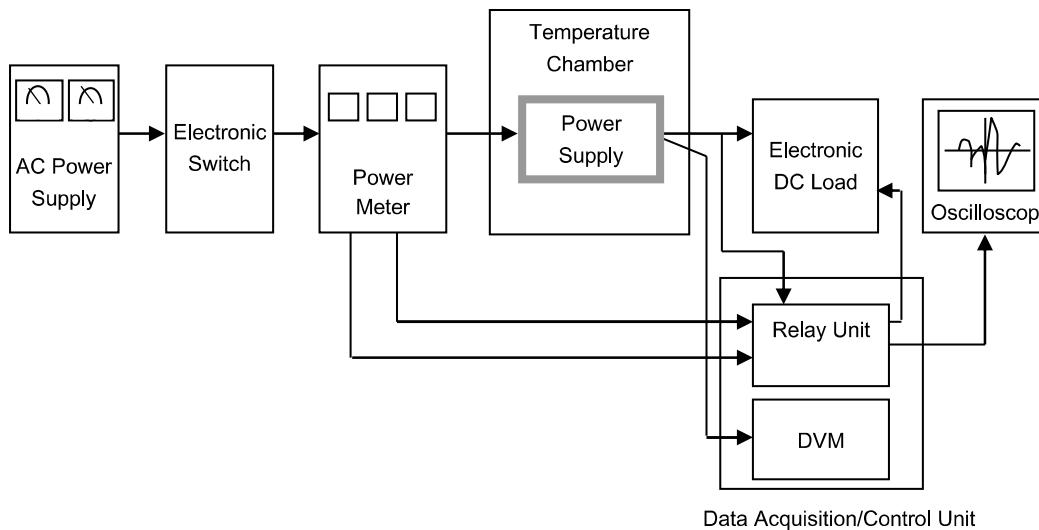


Figure A

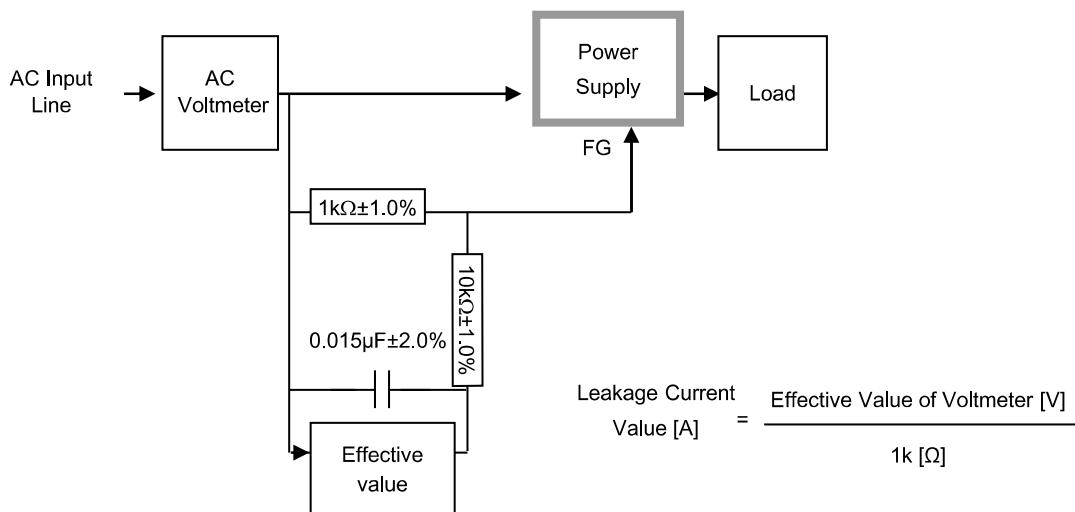


Figure B ( IEC60601-1 )

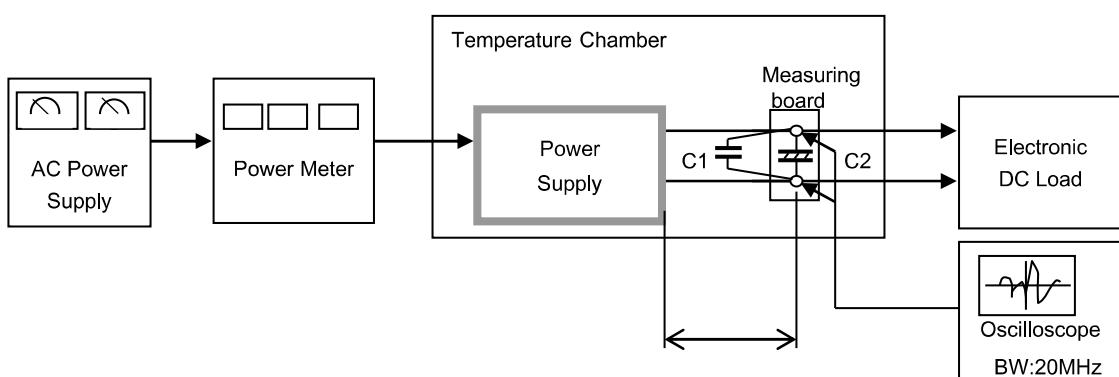


Figure C