

# ZWS240RC Series

## Instruction Manual

### BEFORE USING THE PRODUCT

Be sure to read this instruction manual thoroughly before using this product. Pay attention to all cautions and warnings before using this product. Incorrect usage could lead to an electrical shock, damage to the product or a fire hazard.

#### **DANGER**

- Never use this product in locations where flammable gas or ignitable substances are present.

#### **INSTALLATION WARNING**

- When installing, ensure that work is done in accordance with the instruction manual. When installation is improper, there is risk of electric shock and fire.
- Installation shall be done by Service personnel with necessary and appropriate technical training and experience. There is a risk of electric shock and fire.
- Do not cover the product with cloth or paper etc. Do not place anything flammable around. This might cause damage, electric shock or fire.

#### **WARNING on USE**

- Do not touch this product or its internal components while circuit in operation, or shortly after shutdown. You may receive a burn.
- While this product is operating, keep your hands and face away from it as you may be injured by an unexpected situation.
- For products with no cover, do not touch them as there are high-voltage and high temperature parts inside. Touching them might cause injury such as electric shock or burn.
- There are cases where high voltage charge remains inside the product. Therefore, do not touch even if they are not in operation as you might get injured due to high voltage and high temperature. You might also get electric shock or burn.
- Do not make unauthorized changes to this product nor remove the cover as you might get an electric shock or might damage the product. We will not be held responsible after the product has been modified, changed or dis-assembled.
- Do not use this product under unusual condition such as emission of smoke or abnormal smell and sound etc. Please stop using it immediately and shut off the product. It might lead to fire and electric shock. In such cases, please contact us. Do not attempt repair by yourself, as it is dangerous for the user.
- Do not operate and store these products in environments where condensation occurs due to moisture and humidity. It might lead fire and electric shock.
- Do not drop or apply shock to this product. It might cause failure. Do not operate these products mechanical stress is applied.
- When necessary, this products is to be repaired only by us or our authorized agents. It is important that this product cannot be used in hazardous environments (facilities such as nuclear power control system or life support equipment) without our written consent.

#### **CAUTION on MOUNTING**

- Confirm connections to input/output terminals are correct as indicated in the instruction manual before switching on.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be kept within specifications, otherwise the product will be damaged.
- Input line, please use the wires as short and thick as possible.
- Do not use this product in special environment with strong electromagnetic field, corrosive gas or conductive substances and direct sunlight, or places where product is exposed to water or rain.
- Mount this product properly in accordance with the instruction manual, mounting direction and shall be properly be ventilated.
- Please shut down the input when connecting input and output of the product.
- When installing in environment where conductive foreign, dust and liquid may be present, please consider penetration of above foreign material in the power supply by installing filter, to prevent trouble or malfunction.
- Please check the connector is locked securely, and be careful the harness does not come off the connector after connecting.

**⚠ CAUTION on USE**

- Product individual notes are shown in the instruction manual. If there is any difference with common notes individual notes shall have priority.
- Before using this product, be sure to read the catalog and instruction manual. There is risk of electric shock or damage to the product or fire due to improper use.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be kept within specifications, otherwise the product will be damaged, or cause electric shock or fire.
- If the built-in fuse is blown, do not use the product even after replacing the fuse as. There is risk of abnormality inside. Be sure to request repair to our company.
- For products without built-in protection circuit (element, fuse, etc.), insert fuse at the input to prevent smoke, fire during abnormal operation. As for products with built-in protection circuit, depending on usage conditions, built-in protection circuit might not work. It is recommended to provide separate proper protection circuit.
- For externally mounted fuse do not use other fuses aside from our specified and recommended fuse.
- This product was made for general purpose electronic equipment use and is not designed for applications requiring high safety (such as extremely high reliability and safety requirements. Even though high reliability and safety are not required, this product should not be used directly for applications that have serious risk for life and physical safety. Take sufficient consideration in fail-safe design (such as providing protective circuit or protective device inside the system, providing redundant circuit to ensure no instability when single device failure occurs).
- When used in environments with strong electromagnetic field, there is possibility of product damage due to malfunction.
- When used in environment with corrosive gas (hydrogen sulfide, sulfur dioxide, etc.) , there is possibility that they might penetrate the product and lead to failure.
- When used in environments where there is conductive foreign matter or dust, there is possibility of product failure or malfunction.
- Provide countermeasure for prevention of lightning surge voltage, noise and static electricity as there is risk of damage due to abnormal voltage.
- Connect together the frame ground terminal of the product and the ground terminal of the equipment for safety and noise reduction. If these ground is not connected together, there is risk of electric shock.
- Parts with lifetime specifications (electrolytic capacitor) are required to be replaced periodically. Set the overhaul period depending on the environment of usage and perform maintenance. Also, note that there are cases when EOL products cannot be overhauled.
- Take care not to apply external abnormal voltage to the output. Especially, applying reverse voltage or overvoltage more than the rated voltage to the output might cause failure, electric shock or fire.
- This product is designed under condition Material group IIIb, Pollution Degree (PD): PD2, Over Voltage category (OVC): OVCI and Class of equipment: Class I. This product is designed to be accessible only to service technicians as part of indoor use device.
- This product contains a printed circuit board utilizing surface mounted devices. PCB stress such as bending, twisting etc. could cause damage. Therefore, please handle with care.
- When handling this product, hold the board edge and take care not to touch the component side. When installing this product in apparatus or equipment, mount it on spacers.
- The outputs of this product may, under fault conditions, exceed SELV voltage limits. Therefore the outputs must be protected in the end equipment to maintain SELV.
- This product has used Power Thermistor to protect the circuit from Inrush Current. Frequent repetition of input might cause damage to internal components because of generating surge current.
- The output power is considered to be a hazardous energy level (The voltage is 2V or more and the power is 240VA or more). It must not be made accessible to users. Protection must be provided for Service Engineers against indirect contact with the output terminals and/or to prevent tools being dropped across them. While working on this product, the AC input power must be switched off and the input and output voltage should be zero.

### **Note**

- Take note that traces of sheet metal processing be left in our power supplies.
- When disposing product, follow disposal laws of each municipality.
- Published EMI (CE, RE) or immunity is the result when measured in our standard measurement conditions and might not satisfy specification when mounted and wired inside end-user equipment.  
Use the product after sufficiently evaluating at actual end-user equipment.
- When exporting our products, apply for necessary permissions as required by rules and regulations of Foreign Exchange and Foreign Trade Control Act.
- Catalogue, contents of the instruction manual may be changed without a prior notice. Refer to latest catalogue or instruction manual.
- Reproduction or reprinting the instruction manual or its portion is forbidden without our permission.

### **LONG-TERM STORAGE METHOD AND LONG-TERM STORAGE PERIOD**

- Please keep the product in carton box.
- Please do not apply excessive vibration, shock or mechanical stress applied directly to the product.
- Please keep away from direct sunlight.
- For long-term storage temperature and humidity, the following conditions shall be used as a guideline :
  - Temperature range : 5°C~30°C
  - Humidity range : 40%~60%RHPlease keep away from the places where temperature and humidity can change drastically.  
It can cause condensation on the product or deterioration.
- For long-term storage period, we recommend to use within 2 years after receiving the product.  
There is tendency that the leakage current of an aluminium electrolytic capacitor may increase when stored without using for a long time. This phenomenon can be improved by applying voltage to the aluminum electrolytic capacitor to reduce the increased leakage current through the self-recovery effect of the electrolyte. For reference, before using products that have been stored for a very long time, please warm-up first for 30 minutes or more without taking load.

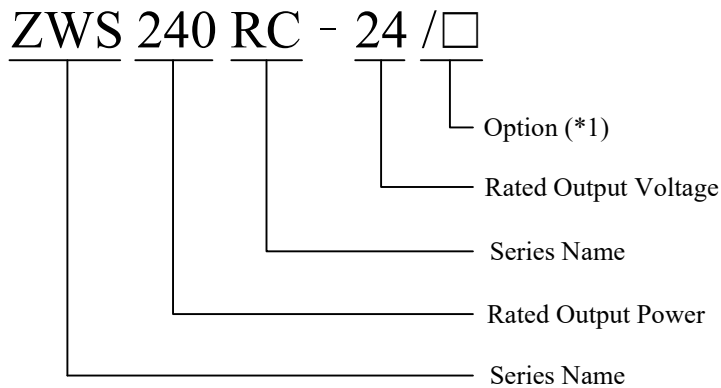
< Criterion of warm up voltage condition >

(1)Implementation period : 1 year or above after the delivery

(2)Electrical continuity condition

Input voltage	: Rating
Load	: 0A
Ambient temperature	: Normal temperature
Time	: 30 minutes or more

## 1. Model name identification method



(\*1)

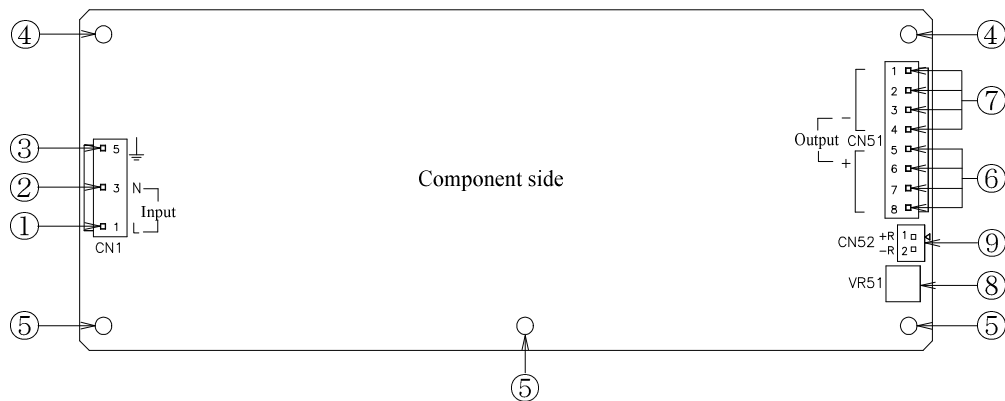
ZWS240RC options

Blank : Standard

/R : With remote ON/OFF control model.

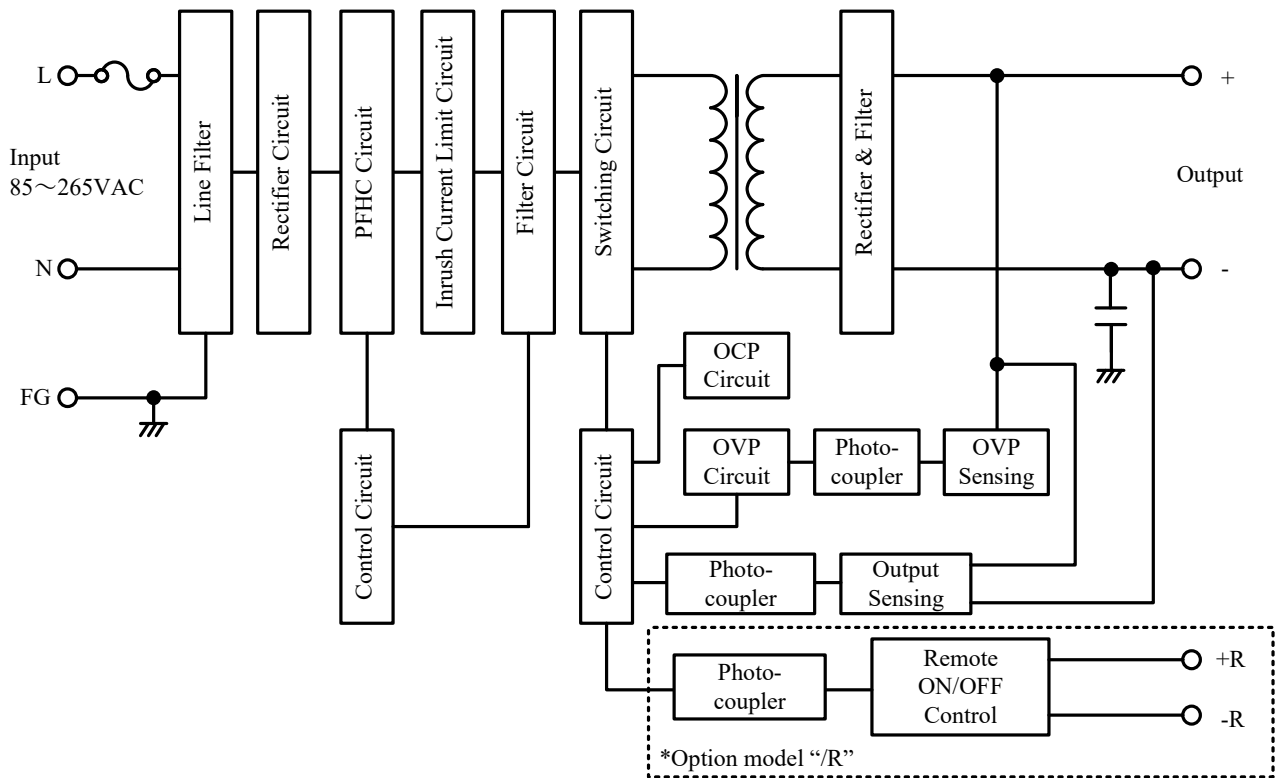
## 2. Terminal Explanation

### ZWS240RC



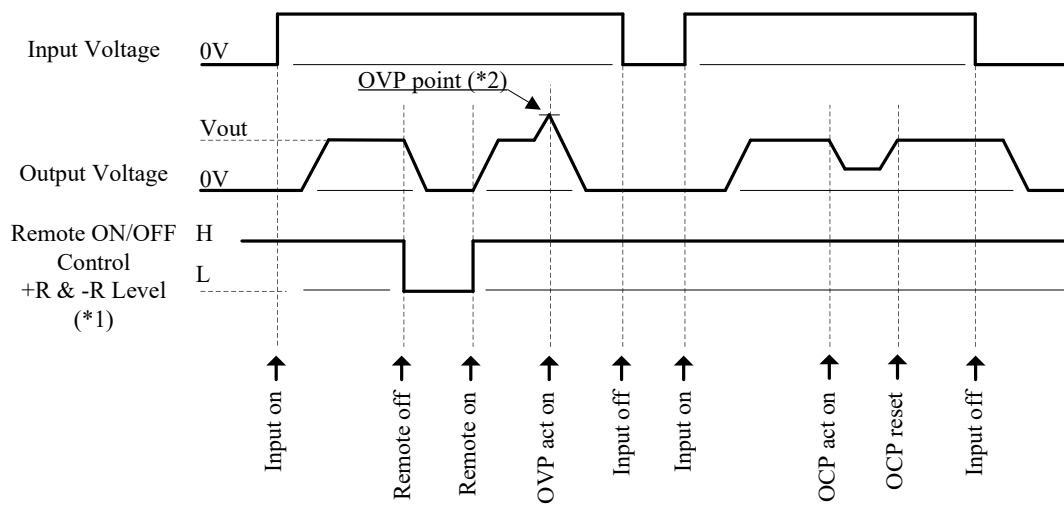
- ① L : AC Input terminal (Live line)  
(Fuse in line)
- ② N : AC Input terminal (Neutral line)
- ③  $\perp$  : Earth terminal
- ④ Mounting hole (hole diameter :  $\phi$  3.5mm)  
These holes are connected to  $\perp$  terminal of CN1.  
Must be connected to electrically conductive spacer. The mounting surface of the spacer should be within Max  $\phi$  8mm.
- ⑤ Mounting hole (hole diameter :  $\phi$  3.5mm)  
These holes are not connected to  $\perp$  terminal of CN1.
- ⑥ + : + Output terminal
- ⑦ - : - Output terminal
- ⑧ V.ADJ : Output voltage adjustment trimmer. The output voltage rises when a trimmer is turned clockwise.
- ⑨ ON/OFF Control Terminal (Option model “/R”)

### 3. Block Diagram



- Circuit topology, switching frequency  
 Switching Circuit  
 Cascade forward topology 130kHz  
 PFHC circuit : active filter  
 50kHz-70kHz (Spread)
- Fuse rating  
 6.3A

#### 4. Sequence time chart



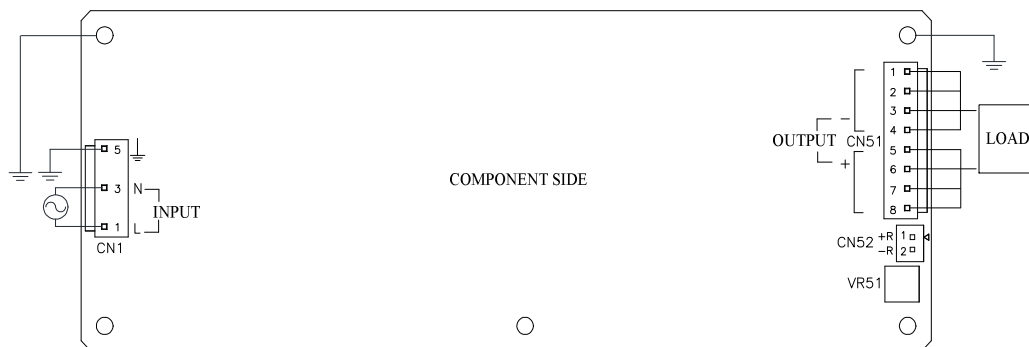
(\*1) Target option : /R  
+R & -R Level  
Higher than 4.5V : Output on  
Lower than 0.8V : Output off  
This sequence is using external voltage.

(\*2) OVP point  
24V : 115%~135%

## 5. Connecting method

Pay attention to the input wiring. If it is connected to wrong terminal, the product will be damaged.

- Input must be off when making connections.
- Connect  $\perp$  terminal to earth (frame ground of the equipment etc.) by thick wire for safety and improvement of noise sensitivity.
- The output load line and input line shall be separated to improve noise sensitivity.
- Do not apply stress to PCB, when connecting or removing connector.
- Use input/output connector (housing) specified by the table below.
- Use the terminal pin SVH-21T-P1.1 or BVH-21T-P1.1, when output current per connector pin is 5A or less.
- Use the terminal pin SVH-41T-P1.1 or BVH-41T-P1.1, when output current per connector pin is 7A or less.
- Use recommended crimping tool. Connector is not included with this product.



### Input/Output Connector

	Connector	Housing	Terminal Pin	Maker
Input (CN1)	B3P(6-2.4.5)-VH(LF)(SN)	VHR-6N	(In the case of 5A MAX per PIN) BVH-21T-P1.1 or SVH-21T-P1.1	J.S.T.
Output (CN51)	B8P-VH(LF)(SN)	VHR-8N	(In the case of 7A MAX per PIN) BVH-41T-P1.1 or SVH-41T-P1.1	

### Remote ON/OFF Control (Option model "/R")

Ref.No.	Connector	Housing	Terminal Pin	Maker
CN52	B2B-XH-AM	XHP-2	BXH-001T-P0.6 or SXH-001T-P0.6	JST

### Hand Crimping Tool

Hand Crimping Tool	Terminal Pin
YC-160R(J.S.T)	BVH-21T-P1.1 or SVH-21T-P1.1
YC-930R(J.S.T)	BVH-41T-P1.1 or SVH-41T-P1.1
YC-110R(J.S.T) or YRS-110(J.S.T)	BXH-001T-P0.6 or SXH-001T-P0.6

## 6. Explanation of Functions and Precautions

### 6-1. Input Voltage Range

Input voltage range is single phase 85-265VAC (47-63Hz).

Input voltage, which is out of specification, might lead the product damage. For cases where conformance to various safeties required, described as 100-240VAC (50-60Hz).

Output derating is required for AC input voltage less than 90VAC.

### 6-2. Output Voltage Range

Output voltage is set at the rated value. Output voltage within the range specified can be adjusted by V.ADJ trimmer. Please set output voltage within specified adjustable range.

Turning the trimmer clockwise, the output voltage will be increased. Take note when the output voltage is increased. excessively, over voltage protection (OVP) function may trigger and voltage will be shut down. Furthermore, when increasing the output voltage, reduce the output current as not to exceed the maximum output power.

When the trimmer turns quickly at no load condition, the output voltage might become unstable. To maintain the output voltage stable, flow the output current, or remove the input of the product until the output be shut down, and then re-input. Please turn the trimmer slowly during the output voltage adjustment.

### 6-3. Inrush Current

Inrush current is suppressed by power thermistor for the product. Higher current will flow at higher ambient temperature or re-input on condition. Please select input switch or external fuse carefully. The inrush current value specified in the specification is under cold start condition (at 25°C).

### 6-4. Over Voltage Protection (OVP)

The OVP function is inverter shut down method and manual reset type. OVP function operates within 115-135% of nominal output voltage.

When OVP triggers, the output will be shut down. To reset OVP, remove the input of the product for a few minutes, and then re-input. In addition, the setting value of OVP is fixed and not adjustable. Never apply higher voltage externally to the output terminal to avoid the product Failure. In case of inductive load, put protective diode in series to the output power line.

### 6-5. Over Current Protection (OCP)

Constant current limit with automatic recovery.

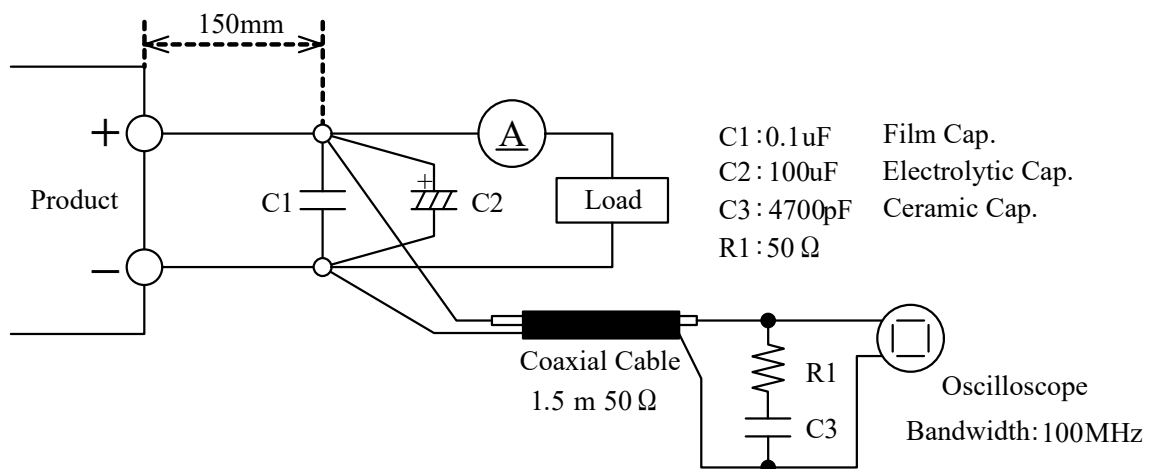
OCP function operates when the output current exceeds 105% of maximum DC output current of specification.

The outputs will be automatically recovered when the overload condition is removed. Never operate the unit under over current or shorted conditions, which may lead unit damage. OCP setting is fixed and cannot be adjusted externally.

### 6-6. Output Ripple & Noise

The specified maximum ripple & noise value is measured according to measurement circuit specified by JEITA-RC9131C. When load lines are longer, ripple will becomes larger. In this case, electrolytic capacitor, film capacitor, etc. might be necessary to be used across the load terminal.

The output ripple cannot be measured accurately if the probe ground lead of oscilloscope is too long.





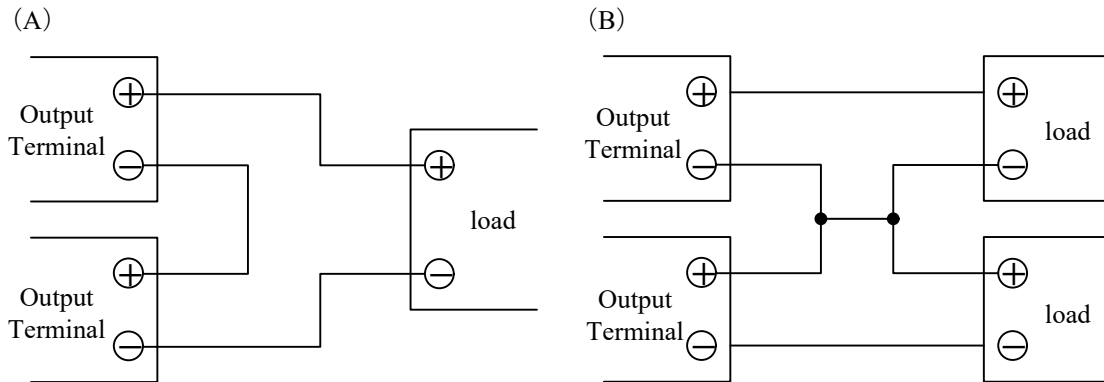
### 6-7. Series Operation

For series operation, either method (A) or (B) is possible.

In series operation, the actual voltage between output and  $\perp$  must be less than withstand voltage (500VAC).

In addition, take note that using the product with total output voltage 60V or more does not comply with SELV in safety standard. In series operation, the rising waveform may have steps.

When connecting with a battery, connect an ORing-diode to the output side of the product.



Note :In case of (A), Never use when one of the unit not operate, which leads damage.

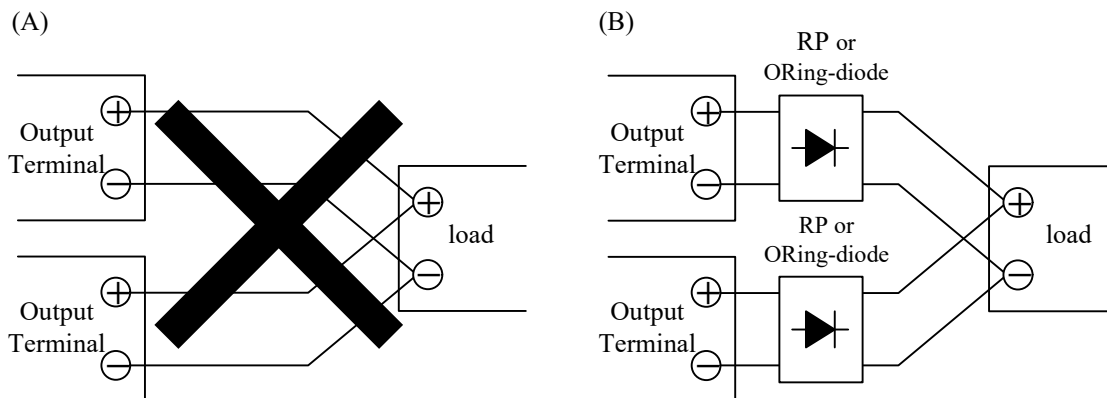
### 6-8. Parallel Operation

(A) Operation to increase the output current is not possible.

(B) Operation as a Backup System

Connect our reverse prevention module "RP-60-20" or ORing-diode to the output side of the product.

- (1) Adjust each product output to same voltage. (The difference of each product output voltage should be within  $\pm 5\%$ .)
- (2) Adjust the output voltage higher by the value of the voltage drop (90mV typ.) of RP-60-20 or the forward voltage drop ( $V_f$ ) of ORing-diode.
- (3) Output voltage and output power should be used within specifications.
- (4) When using RP-60-20, output load current should be used within specifications. When using ORing-diode, current rating must be more than output load current.

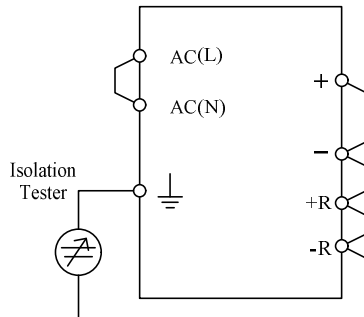


For more information about RP-60-20, please refer to "RP-60-20 Instruction Manual". RP-60-20 can be replaced by ORing-diode. In such case, please take care of ORing-diode temperature.

### 6-9. Isolation Test

Isolation resistance between Output -  $\perp$  terminal is more than 100M $\Omega$  at 500VDC. For safety operation, voltage setting of DC isolation tester must be done before the test. Ensure that the product is fully discharged after the test.

- Output -  $\perp$  terminal : 500VDC More than 100M $\Omega$

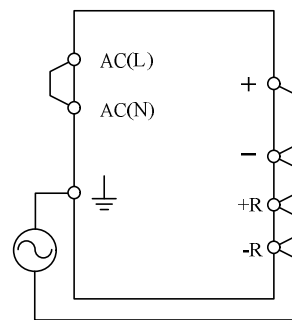
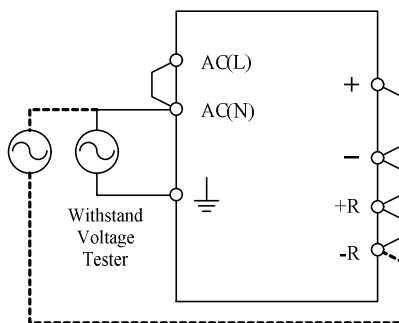


### 6-10. Withstand Voltage

The product is designed to withstand 3.0kVAC between input and output, 2.0kVAC between input and  $\perp$  terminal and 500VAC between output and  $\perp$  terminal each for 1 minute. When testing withstand voltage, set current limit of withstand voltage test equipment at 10mA (Output -  $\perp$  terminal : 20mA).

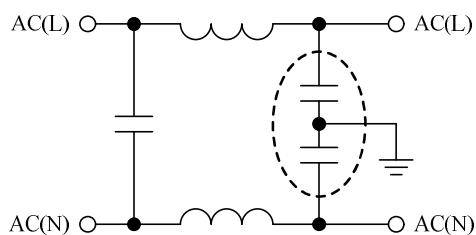
The applied voltage must be gradually increased from zero to testing value and then gradually decreased for shut down. When timer is used, the product may be damaged by high impulse voltage at switch on and off timing. Connect input and output as follows.

- Input - Output (dotted line) : 3.0kVAC, 1min (10mA)
- Output -  $\perp$  terminal : 500VAC, 1min (20mA)
- Input -  $\perp$  terminal (solid line) : 2.0kVAC, 1min (10mA)

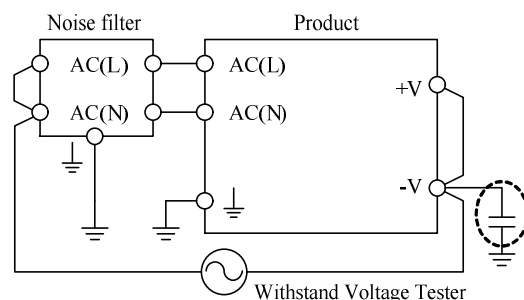


Note1 : In case of using external noise filter, capacitance between "Input and  $\perp$  terminal" might be increased. When testing withstand voltage between "Input and Output", there is a possibility exceeding withstand voltage between "Output and  $\perp$  terminal" (500VAC). Please check the voltage between "Output and  $\perp$  terminal". If the voltage exceeding withstand voltage, please add external capacitor to "Output and  $\perp$  terminal". It can decrease the voltage.

On the other hand, no need to check the voltage in case of "Output and  $\perp$  terminal" is shorted.



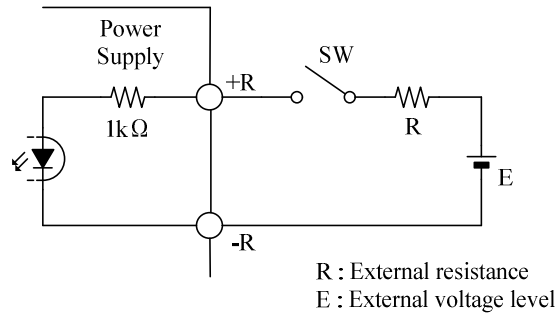
The example of noise filter circuit that may increase capacitance value between "Input and  $\perp$ ".  
 (Capacitance value in dashed line is added.)



External capacitor adding point or short point.  
 Even in the case of "+V and  $\perp$ ", there is a similar effect.

**6-11. Remote ON/OFF Control (Option “/R”)**

Remote ON/OFF control function is provided on option model “/R”. Using this function allows the user to turn the output on and off without having to turn the AC input off and on. It is controlled by the external voltage applied to +R and -R of remote ON/OFF terminal. This circuit is in the secondary side of the product. Never connect to primary side. And this circuit is isolated from the Secondary (output).



+R & -R terminal condition	Output Condition
SW ON (Higher than 4.5V)	ON
SW OFF (Lower than 0.8V)	OFF

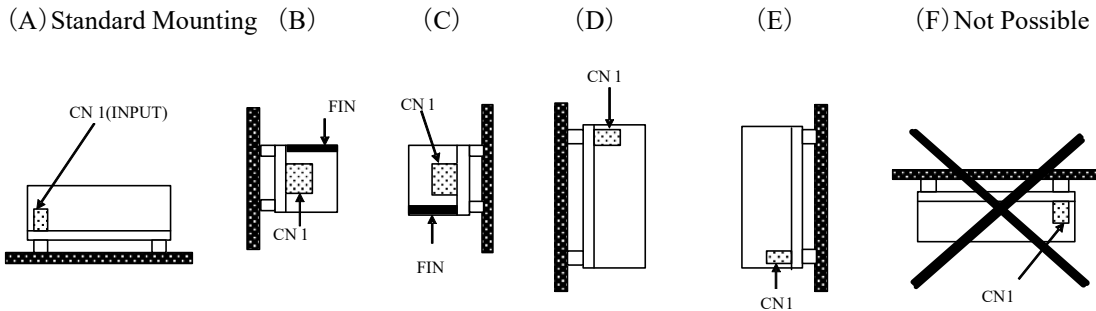
External voltage level: E	External resistance : R
4.5 - 12.5VDC	No required
12.5 - 24.5VDC	1.5k Ω

## 7. Mounting Method

### 7-1. Mounting Direction

The standard mounting is direction (A).

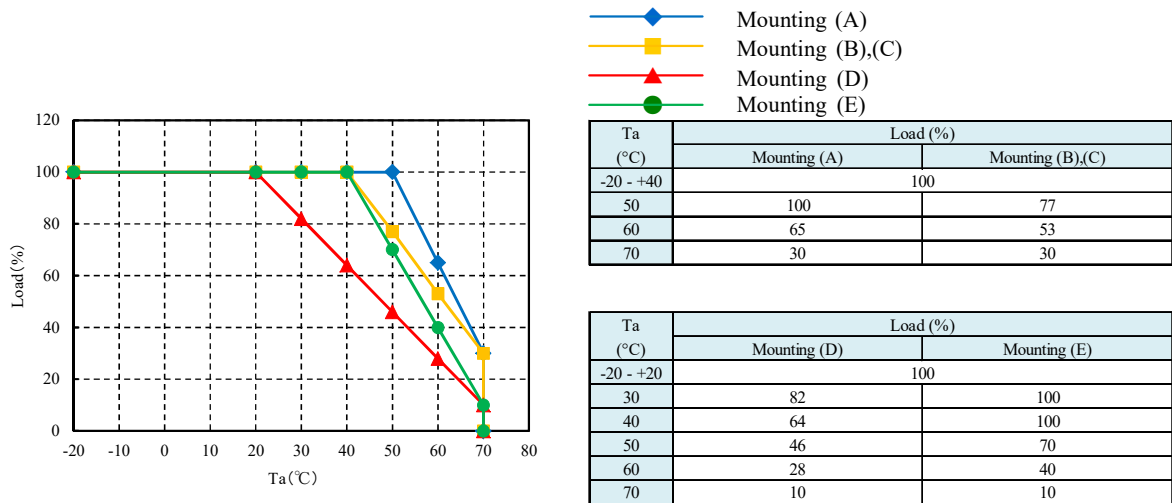
Possible mounting directions are (A), (B),(C), (D) and (E). Do not mount the product in any other directions. Do not exceed the derating of maximum load, which is limited by mounting direction and ambient temperature. Refer to “5-2.Output Derating” for more information.



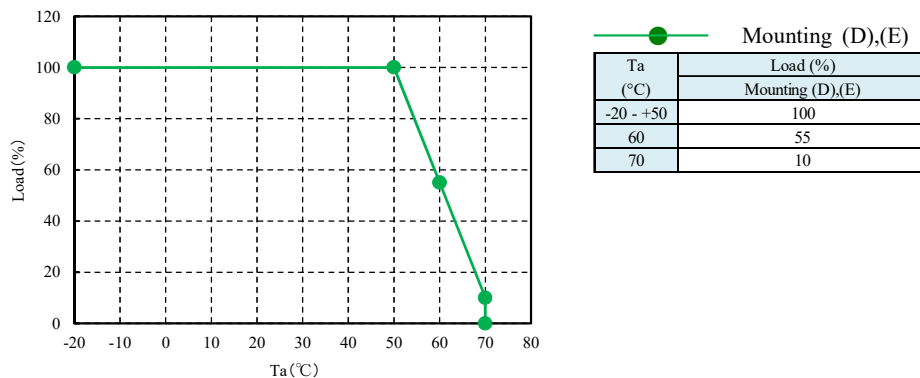
### 7-2. Output Derating

Refer to the output derating below, load (%) is percent of maximum output current value in a rated output voltage.

#### Convection Cooling

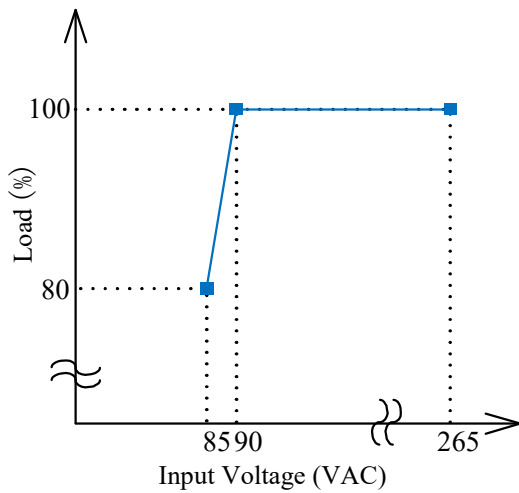


The output derating below also can be used, when input voltage is 170VAC-265VAC for the Mounting (D) or (E).



### 7-3. Output Derating according to the Input Voltage

Load (%) is percent of maximum output current value in a rated output voltage.



—■— Mounting (A) - (E)

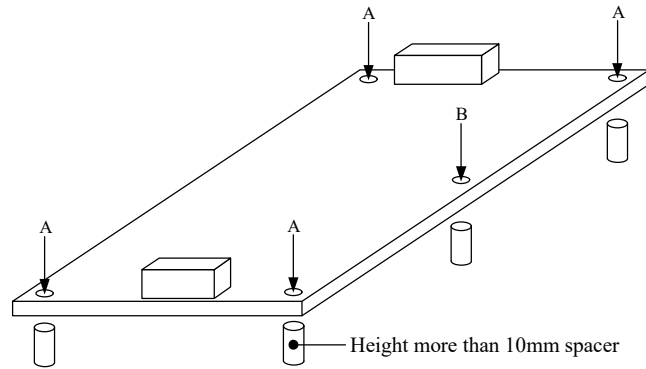
Input Voltage (VAC)	Load (%)
	Mounting (A) - (E)
85	80
90-265	100

### 7-4. Mounting Method

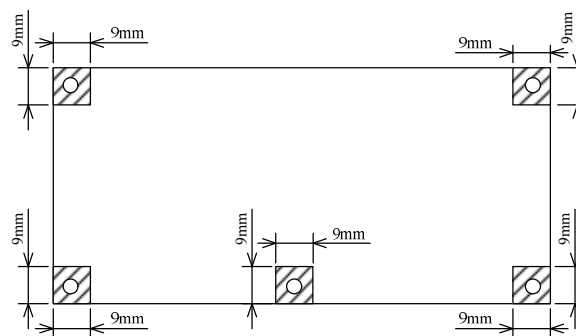
Insert the spacer (Max  $\phi$  8) of height more than 10mm to lift the product. And use all mounting holes A for the product installation. The vibration spec is specified under this mounting condition. Please use mounting hole B as needed, vibratility resistant improves.

(1) Mounting Holes size

5 holes  $\phi$  3.5mm

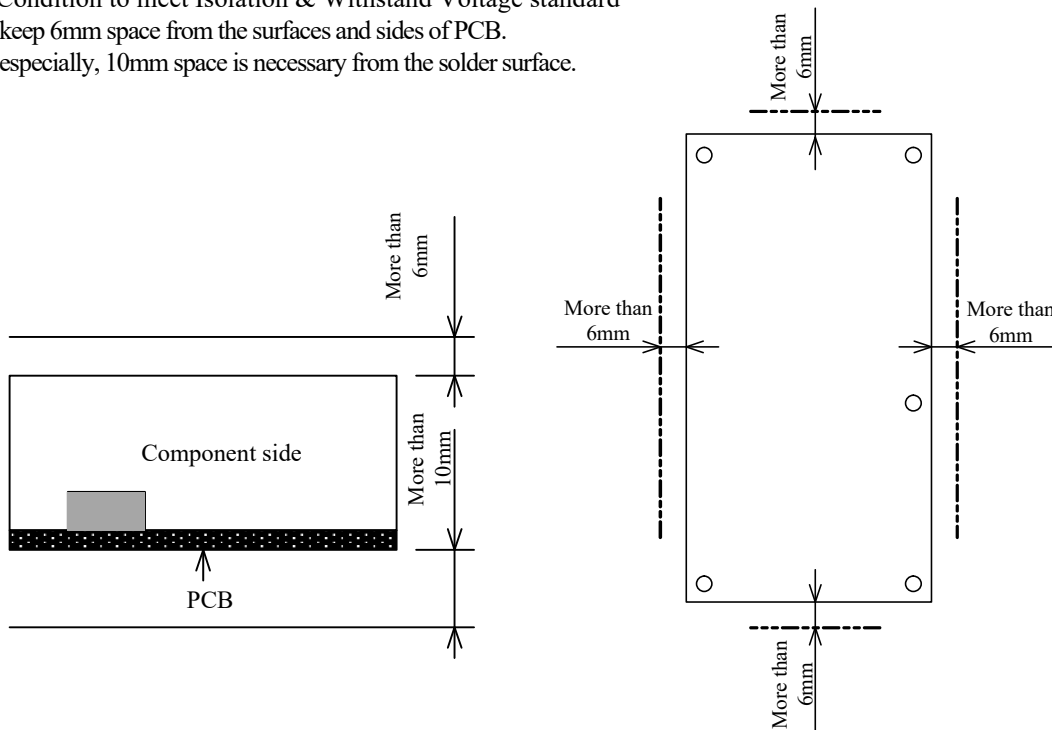


Allowable area by metal pieces is 9mm from each PCB corners. Refer to figure below.

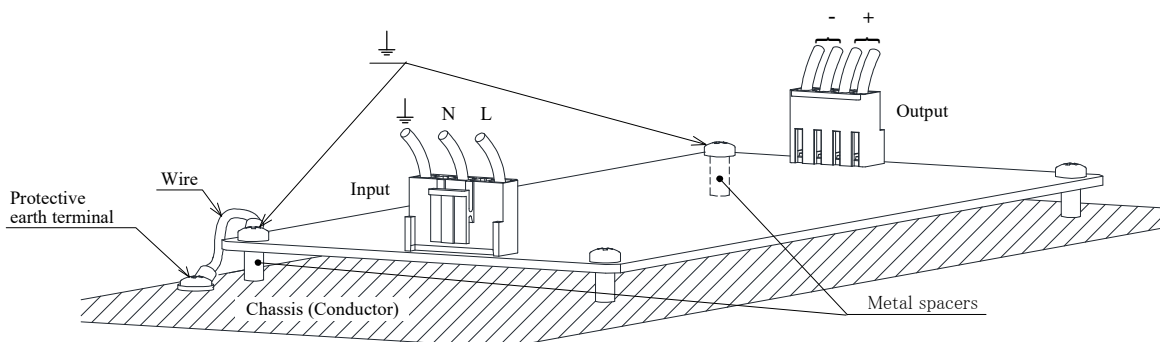


If the space is not enough, the specification of isolation and withstand will not be satisfied. Take the space in the product surroundings and the upper area of components to keep enough for convection cooling.

- (2) Condition to meet Isolation & Withstand Voltage standard  
 keep 6mm space from the surfaces and sides of PCB.  
 especially, 10mm space is necessary from the solder surface.



- (3)  $\perp$   
 $\perp$  must be connected to the Protective earth terminal of the equipment. Also 2 mounting holes are must be connected to the Chassis (Conductor) by Metal spacer. When screw clamping the mounting holes, please use the screw with spring washer. If not connect to the Chassis (Conductor), the conducted noise, radiation noise and output noise will increase. (The location of 2 mounting holes for Chassis connection is shown with  $\perp$  mark in below figure.)



## 8. Wiring Method

- (1) The output load line and input line shall be separated, and use all lines as thick and short as possible to make lower impedance. The output load line and input line shall be twisted or use shielded wire to improve noise sensitivity.
- (2) Input/Output lines shall be twisted and separated from the output lines.
- (3) Noise can be eliminated by attaching a capacitor to the load terminals.
- (4) For safety and EMI considerations, connect between  $\perp$  terminal of input connector and protective earth terminal firmly.
- (5) The recommended wire type, torque and crimp-type terminal :

Input : AWG#22 ~ AWG#18  
Output : AWG#22 ~ AWG#16

## 9. The life expectancy

The life of the power supply depends on the life of the built-in aluminum electrolytic capacitor.  
The life is described in reliability data.  
The life of the aluminum electrolytic capacitor varies depending on the method of mounting the power supply, the load current, and the ambient temperature.  
Please refer to "Electrolytic Capacitor Lifetime".  
Please do not use the product which passed over the life expectancy.  
There is a risk of unexpected output shutdown and specifications may not be satisfied.  
Please contact us for maintenance or exchange the product which passed over the life expectancy.

## 10. External Fuse Rating

Refer to the following fuse rating when selecting the external input fuse.  
Surge current flows when input turn on. Use slow-blow fuse or time-lug fuse. Fast-blow fuse can not be used.  
Fuse rating is specified by inrush current value at input turn on.  
Do not select the fuse according to actual input current (rms.) values.

ZWS240RC : 6.3A

## 11. Before concluding that the product is at fault...

Before concluding that the product is at fault, make the following checks.

- (1) Check if the rated input voltage is connected.
- (2) Check if the wiring of input and output is correct.
- (3) Check if the wire size is not too thin.
- (4) Check if the output voltage control (V.ADJ) is properly adjusted.
- (5) Check if the output current and output power does not over specifications.
- (6) Audible noise can be heard when input voltage waveform is not sinusoidal wave.
- (7) Audible noise can be heard during Dynamic-Load operation.

## 12. Warranty Period

This product is warranted for a period of 5 years from the date of shipment.  
For damages occurring at normal operation within this warranty period, repair is free of charge.

### **13. CEMARKINNG / UKCAMARKING**

#### **CE MARKING**

CE Marking, when applied to a product or packing material for a product covered by this handbook, indicates compliance with the Low Voltage Directive, EMC Directive and RoHS Directive.

#### **UKCA MARKING**

UKCA Marking, when applied to a product or packing material for a product covered by this handbook, indicates compliance with the Electrical Equipment (Safety) Regulations, Electromagnetic Compatibility Regulations and Restriction of the Use of Certain Hazardous Substances in Electrical & Electronic Equipment Regulations.