

Basic Characteristics Data

Model	Circuit method	Switching frequency [kHz]	Input current [A]	Inrush current protection	PCB/Pattern			Series/Parallel operation availability	
					Material	Single sided	Double sided	Series operation	Parallel operation
Input module of RBC200F	Active filter	40 - 220	2.4 *1	Relay	FR-4	-	Yes	No	No
Output module of Y, Z	LLC resonant converter	90 - 180	-	-	FR-4	-	Yes	No	No
Output module of G, H, J, K, L	Flyback converter	60 - 120	-	-	FR-4	-	Yes	Yes *2	No
Output module of M, P, Q	Flyback converter	60 - 120	-	-	FR-4	-	Yes	No	No

*1 The value at ACIN 100V and 200W output.

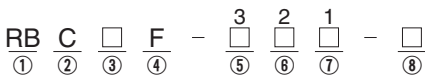
*2 Series operation is possible only if Slot 2 and Slot 3 are the same module. (Refer to Instruction Manual 3.1)

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1 Configuration - Model Name Construction

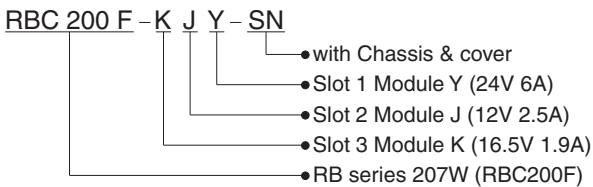
The RB series has Order Name which is used for the ordering aside from Model Name. Please order at Order Name. The Order Name will be assigned after the product is configured. Please contact us for further details.

Model Name Construction



- ① Series name
RB=RB series
- ② Multiple output
- ③ Abbreviation maximum output power
200=207W
- ④ Universal input
- ⑤ Slot 3 module code
- ⑥ Slot 2 module code
- ⑦ Slot 1 module code
- ⑧ Optional code

<Model Name Example>



Order Name Construction

① through ⑦ have the same rules as Model Name, after that add management alphanumeric character (6 digits). Optional codes are not listed on Order Name.

<Order Name Example>

RBC200F - K J Y - 1 2 3 4 5 6
 "1 2 3 4 5 6" is an example of management alphanumeric character.

Output of slot

- Slot 1 output is connected to +V1, G1.
- Slot 2 output is connected to +V2, -V2 and G2.
- Slot 3 output is connected to +V3, G3.

Configuration rules

- (1) The code of the module installed in Slot 1 is selected from Slot 1 output module specifications.
- (2) Slot 1 has to have a module selected.
- (3) The code of the module installed in Slot 2 is selected from Slot 2, Slot 3 output module specifications and Slot 2 dedicated output module.
- (4) The code of the module installed in Slot 3 is selected from Slot 2, Slot 3 output module specifications.
- (5) It is possible to configure Slot 2, Slot 3 as an empty slot. (Refer to Fig.1.1, Fig1.2)
 If you do not install a module, code "O" (blank code) should be selected.
 However, It is not possible to configure both Slot 2 and 3 as "O".
 If you configure Slot 2 as "O", pin no.5 to 7 of CN2 is NC.
 If you configure Slot 3 as "O", CN3 is not installed.
- (6) Series operation is possible only if Slot 2 and Slot 3 are the same module. Please refer to section 3.1

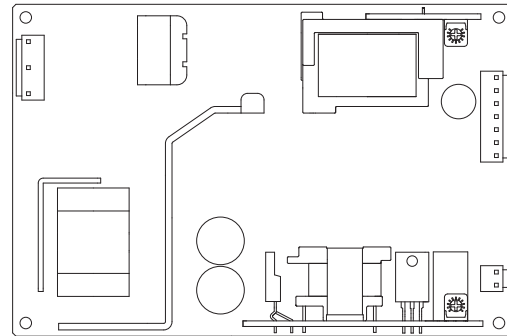


Fig.1.1 Schematic, if you configure Slot 2 as "O"
 (Model Name : RBC200F-O□□)

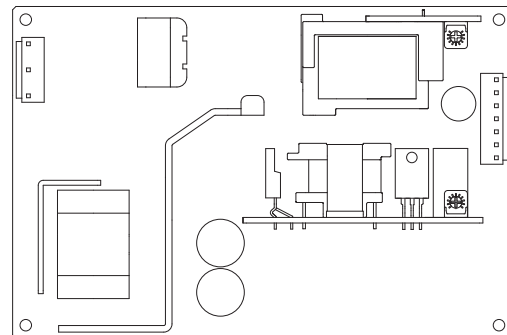


Fig.1.2 Schematic, if you configure Slot 3 as "O"
 (Model Name : RBC200F-O□□)

2 Function

2.1 Input voltage range

- The range is from AC85V to AC264V. (please see SPECIFICATIONS for details).
- In cases that conform with safety standard, input voltage range is AC100 - AC240V (50/60Hz).
- If input value doesn't fall within above range, the unit may not operate in accordance with specifications and/or start hunting or fail. If you need to apply a square waveform input voltage, which is commonly used in UPS and inverters, please contact us.
- When the input voltage changes suddenly, the output voltage accuracy might exceed the specification. please contact us.

2.2 Inrush current limiting

- An inrush current limiting circuit is built-in.
- If you need to use a switch on the input side, please select one that can withstand an input inrush current.
- Relay technique is used in the inrush current limiting circuit. When you turn the power ON/OFF repeatedly within a short period of time, please have enough intervals so that the inrush current limiting circuit becomes operative.
- Surge current in the filter unit does not include (0.2ms or less).

2.3 Overcurrent protection

- An overcurrent protection circuit is built-in and activated at 105% of the rated current. A unit automatically recovers when a fault condition is removed.
Please do not use a unit in short circuit and/or under an overcurrent condition.
- Intermittent Operation Mode
Intermittent operation for overcurrent protection is included in a part of series. When the overcurrent protection circuit is activated and the output voltage drops to a certain extent, the output becomes intermittent so that the average current will also decrease.
- Output voltage shuts down when the output voltage continuously drops due to overcurrent protection.
- Output voltage recovers from overcurrent protection by shutting down the input voltage and waiting more than 3 minutes then turning on AC input again.

2.4 Overvoltage protection

- An overvoltage protection circuit is built-in. If the overvoltage protection circuit is activated, shut down the input voltage, wait more than 3 minutes and turn on the AC input again to recover the output voltage.

Remarks :

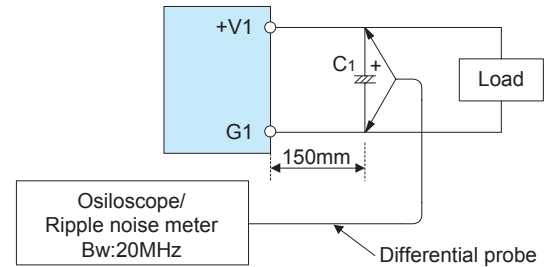
Please avoid applying a voltage exceeding the rated voltage to an output terminal. Doing so may cause a power supply to malfunction or fail. If you cannot avoid doing so, for example, if you need to operate a motor, etc., please install an external diode on the output terminal to protect the unit.

2.5 Output voltage adjustment range

- To increase an output voltage, turn a built-in potentiometer clockwise.
- To decrease the output voltage, turn it counterclockwise.

2.6 Output ripple and ripple noise

- Output ripple noise may be influenced by measurement environment, measuring method Fig.2.1 is recommended.



C1 : Aluminum electrolytic capacitor 22µF

Fig.2.1 Measuring method of Ripple and Ripple Noise
(Example of measurement with V1)

Remarks :

When GND cable of probe with flux of magnetic force from power supply are crossed, ripple and ripple noise might not measure correctly.
Please note the measuring environment.

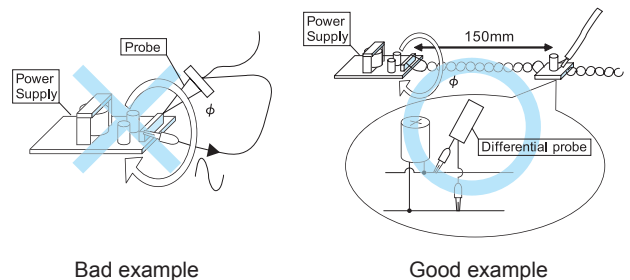


Fig.2.2 Example of measuring output ripple and ripple noise

2.7 Isolation

- For a receiving inspection, such as Hi-Pot test, gradually increase (decrease) the voltage for the start (shut down). Avoid using Hi-Pot tester with the timer because it may generate voltage a few times higher than the applied voltage, at ON/OFF of a timer.
- When you test a unit for isolation between the input and output, or between output and terminal FG, short-circuit between all outputs and function terminal.
- When you test a unit for isolation between output V1, V2, and output V3, short-circuit between output V1 and output V2.

2.8 Start/stop sequence

- The start / stop waveform changes due to external capacity, load current, etc, so please evaluate if start / stop sequence is required.
- Please contact us if start / stop sequence is required.

3 Series Operation and Parallel Operation

3.1 Series Operation

Series operation is possible only if Slot 2 and Slot 3 are the same module. Fig.3.1 shows an example of wiring.

Remarks :

Please be sure to have enough cooling in case one of the slots stops due to activation of the protection circuitry.

In case of malfunction (Failure of protection circuit activation), please stop the operation.

The combined output voltage of series operation is 48 V.

If the combined output voltage exceeds 60V, the safety agency approvals are void.

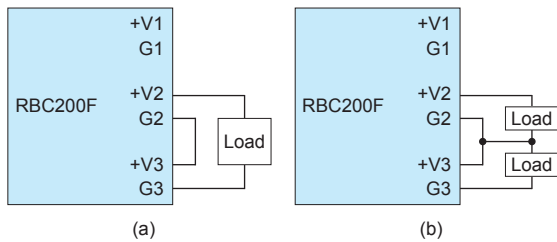


Fig.3.1 Examples of wiring in series operation

3.2 Parallel Operation

Parallel operation and redundancy operation are not possible.

4 Assembling and Installation Method

4.1 Heat dissipation (derating)

For reliable and safe operation, please make sure the maximum component temperature rise given in table 4.1 is not exceeded.

Please refer to Fig.4.2 for derating information based on each mounting methods.

Please allow enough ventilation for the power supply.

Temperature of points ① through ⑤ should be lower than the upper limit temperature.

The expectancy life in the upper bound temperature (Points ① through ⑤) is 3 years or more. Please refer to 4.5 if you want to extend the longevity.

Derating curve depending on input voltage

Derating curve depending on input voltage is shown in Fig.4.3.

The definition of load factor is the following, suffix k means the k-th slot.

$$A_k = \frac{I_k \times V_k}{(\text{Rated output power of k-th module})}$$

Rated output power : Depends on input (refer to Fig.4.3)

Load factor [%] = maximum value of A_1 to A_3

I_k, V_k : output current, voltage

*When the k-th slot is module P, Q, V_k is the voltage between +V and -V.

Test Measuring points

Be aware of the conductive parts during the measurements.

Please contact us for more detail.

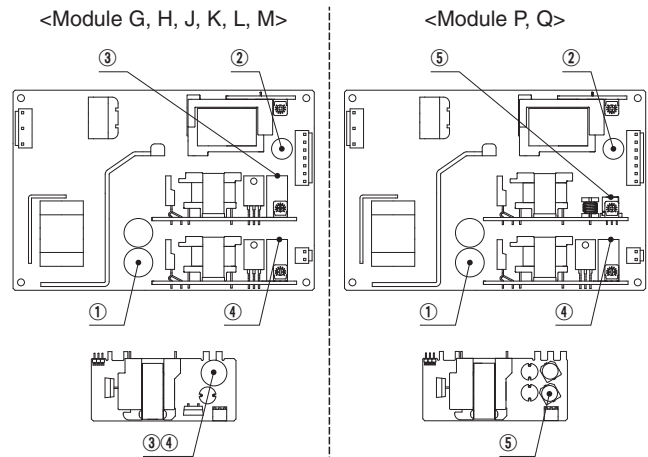
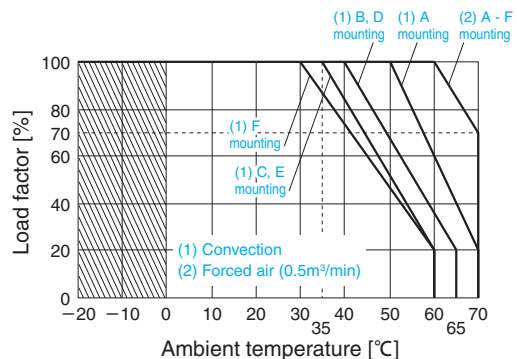


Fig.4.1 Measurement points locations

Table 4.1 Maximum temperature of measurement points

Installation condition	Cooling Method	Load factor	Maximum temperature [°C]				
			① : Capacitor	② : V1 Capacitor	③ : V2 Capacitor	④ : V3 Capacitor	⑤ : V2 Capacitor
A	Convection	75% < $P_o \leq 100\%$	81	79	80	79	90
		$P_o \leq 75\%$	86	84	84	84	93
B		75% < $P_o \leq 100\%$	66	72	75	70	85
		$P_o \leq 75\%$	78	81	84	80	92
C		75% < $P_o \leq 100\%$	70	61	73	79	83
		$P_o \leq 75\%$	78	73	81	83	89
D		75% < $P_o \leq 100\%$	73	66	68	67	78
		$P_o \leq 75\%$	81	77	79	78	87
E		75% < $P_o \leq 100\%$	68	72	81	79	91
		$P_o \leq 75\%$	75	80	84	83	93
F	75% < $P_o \leq 100\%$	65	67	74	72	84	
	$P_o \leq 75\%$	79	79	84	82	92	
A,B,C, D,E,F	Forced air	75% < $P_o \leq 100\%$	79	82	83	80	83
		$P_o \leq 75\%$	82	82	83	80	83



*Specifications for ripple and ripple noise changes in the shaded area.

Fig.4.2 Derating curve depends on ambient temperature (Reference value)

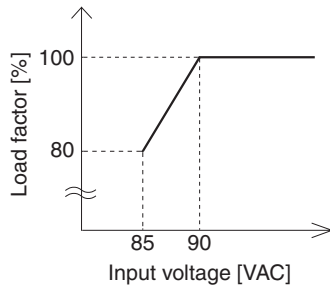


Fig.4.3 Derating curve depends on input voltage

4.2 Installation method

■ Mounting method

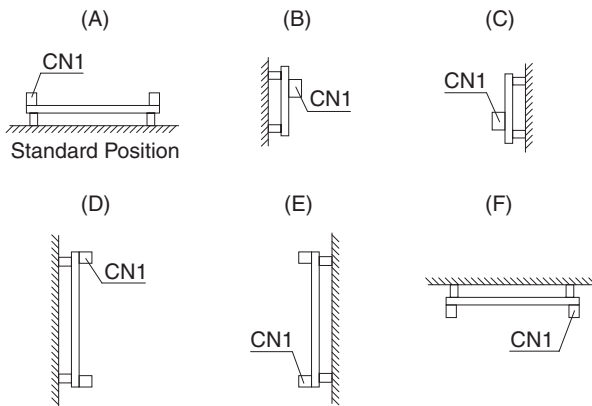


Fig.4.4 Mounting method

- This power supply is manufactured by SMD technology. Do not touch any SMD components on the unit. Be especially careful when handling.
- If using a metal chassis, keep proper insulation between the component and metal chassis, use the spacer of 10mm or more between bottom of power supply and metal chassis. If d_1 and/or d_2 are less than the value mentioned in Fig.4.5, insert an insulating sheet with reinforced insulation between the power supply unit and metal chassis. The following distance is not satisfactory for cooling condition. Please refer to section 4.1 for cooling method.

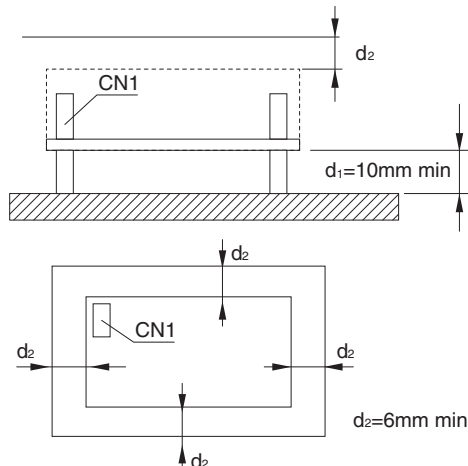


Fig.4.5 Installation method

- There is a possibility that it is not possible to cool enough when the power supply is used by the sealing up space as showing in Figure 4.6. Please use it after confirming the temperature of points ① through ⑤ of section 4.1.

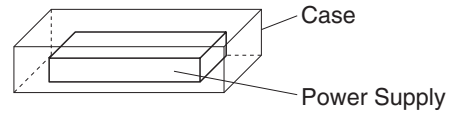


Fig.4.6 Installation example

4.3 Mounting screw

- The mounting screw should be M3. The hatched area shows the allowance of metal parts for mounting.

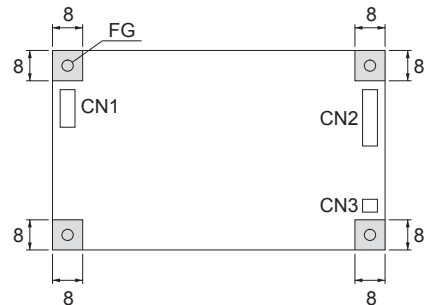


Fig.4.7 Allowance of metal for mounting

- If the power supply unit is fixed with metal parts from the top side, make sure not to make contact with any components on the unit.
- This power supply is manufactured by SMD technology. The stress to PCB like twisting or bending causes defects to the unit, so handle the unit with care.

4.4 Ground

- When installing the power supply with your unit, ensure that the input FG terminal or mounting hole FG is connected to safety ground of the unit. However when applying the safety agency, connect the input FG terminal to safety ground of the unit.
- * It is recommended to electrically connect FG to metal chassis for reducing noise.

4.5 Expectancy life and warranty

■ Expectancy life

Table 4.2 Expectancy life

Installation condition	Cooling Method	Average ambient temperature (yearly)	Expectancy Life [years]	
			Po≤75%	75%<Po≤100%
A	Convection	Ta=40°C or less	6	6
		Ta=50°C	6	4
B, D		Ta=30°C or less	6	6
		Ta=40°C	6	4
C, E		Ta=25°C or less	6	6
		Ta=35°C	6	4
F	Ta=20°C or less	6	6	
	Ta=30°C	6	4	
A,B,C,D,E,F	Forced air	Ta=50°C or less	6	6
		Ta=60°C	6	4

Remarks :

Estimated life expectancy can be calculated by point temperature ① through ⑤ shown in section 4.1. Please contact us for details.

■Warranty

Table 4.3 Warranty

Installation condition	Cooling Method	Average ambient temperature (yearly)	Warranty [years]	
			Po≤75%	75%<Po≤100%
A	Convection	Ta=40°C or less	5	5
		Ta=50°C	5	3
B, D		Ta=30°C or less	5	5
		Ta=40°C	5	3
C, E		Ta=25°C or less	5	5
		Ta=35°C	5	3
F	Ta=20°C or less	5	5	
	Ta=30°C	5	3	
A,B,C,D,E,F	Forced air	Ta=50°C or less	5	5
		Ta=60°C	5	3

5 Option and Others

5.1 Outline of options

- *Please contact us for details of specifications and delivery timing.
- *You can combine multiple options. Some options, however, cannot be combined with other options. Please contact us for details.

●-C

- Option -C units have coated internal PCB for better moisture resistance. The Input connector is hibox type (Mfr. J.S.T.).

Table 5.1 Coated internal PCB type

I/O Connector	Part No.	Connector type
Input connector	CN1	VH (hibox type)
Output connector	CN2	
	CN3	
Function connector (optional)	CN4	PH (hibox type)

●-G

- Option -G units are low leakage current type.
- Differences from standard versions are summarized in Table 5.2.

Table 5.2 Low leakage current type

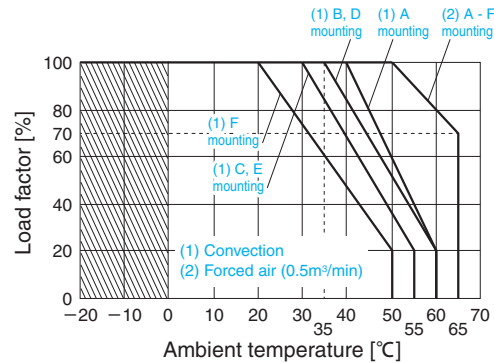
Leakage Current (AC240V 60Hz)	0.15mA max
Conducted Noise	N/A
Output Ripple Noise	Please contact us for details about Ripple Noise

●-S, -SN

- S indicates a type with chassis, and -SN indicates a type with chassis and cover (Refer to external view).
- The vibration resistance specification changes depending on the mounting method. Please contact us for detail.
- "Maximum temperature of measurement points", "Derating curve depends on ambient temperature", "Expectancy life" and "Warranty" is different from standard version. Please refer to Table 5.3., Fig.5.1., Table 5.4 and Table 5.5.

Table 5.3 Maximum temperature of measurement points (RBC200F-□-SN)

Installation condition	Cooling Method	Load factor	Maximum temperature [°C]				
			① : Capacitor	② : V1 Capacitor	③ : V2 Capacitor	④ : V3 Capacitor	⑤ : V2 Capacitor
A	Convection	75%<Po≤100%	83	76	77	75	86
		Po≤75%	83	76	77	77	86
B		75%<Po≤100%	73	72	75	70	84
		Po≤75%	79	78	80	78	88
C		75%<Po≤100%	77	61	73	81	82
		Po≤75%	81	70	78	80	85
D		75%<Po≤100%	79	66	67	67	77
		Po≤75%	84	73	76	75	84
E		75%<Po≤100%	75	72	83	81	92
		Po≤75%	77	76	81	80	90
F	75%<Po≤100%	67	62	69	67	79	
	Po≤75%	76	71	76	74	83	
A,B,C,D,E,F	Forced air	75%<Po≤100%	74	77	79	75	79
		Po≤75%	72	75	76	73	76



*Specifications for ripple and ripple noise changes in the shaded area.

Fig.5.1 Derating curve depends on ambient temperature (RBC200F-□-SN) (Reference value)

Table 5.4 Expectancy life (RBC200F-□-SN)

Installation condition	Cooling Method	Average ambient temperature (yearly)	Expectancy Life [years]		
			Po≤75%	75%<Po≤100%	
A	Convection	Ta=30°C or less	6	6	
		Ta=40°C	6	4	
B, D		Ta=25°C or less	6	6	
		Ta=35°C	6	4	
C, E		Ta=20°C or less	6	6	
		Ta=30°C	6	4	
F		Ta=10°C or less	6	6	
		Ta=20°C	6	4	
A,B,C,D,E,F		Forced air	Ta=40°C or less	6	6
			Ta=50°C	6	4

Table 5.5 Warranty (RBC200F-□-SN)

Installation condition	Cooling Method	Average ambient temperature (yearly)	Warranty [years]		
			Po≤75%	75%<Po≤100%	
A	Convection	Ta=30°C or less	5	5	
		Ta=40°C	5	3	
B, D		Ta=25°C or less	5	5	
		Ta=35°C	5	3	
C, E		Ta=20°C or less	5	5	
		Ta=30°C	5	3	
F		Ta=10°C or less	5	5	
		Ta=20°C	5	3	
A,B,C,D,E,F		Forced air	Ta=40°C or less	5	5
			Ta=50°C	5	3

●-R

- You can control output ON/OFF remotely in Option -R units. To do so, connect an external DC power supply and apply a voltage to a CN4, which is available as option.
- Remote ON/OFF circuits (RC+ and SGND) are isolated from input, outputs and FG.
- All outputs (V1,V2,V3) are targets of remote ON/OFF.
- Targets of remote ON/OFF is selectable. Please contact us for detail.

Built-in Resistor Ri[Ω]	Voltage between RC and SGND[V]		Input Current [mA]
	Output ON	Output OFF	
2200	4.5~12.5	0~0.5	6max

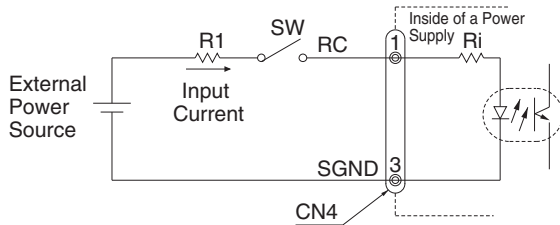


Fig.5.2 Example of using a remote ON/OFF circuit

- * If the output of an external power supply is within the range of 4.5 - 12.5V, you do not need a current limiting resistor R1. If the output exceeds 12.5V, however, please connect the current limiting resistor R1.

R1 Recommended resistor [Ω]	Ri : 2200Ω
$\frac{V_{cc} - (1.1 + R_i \times 0.003)}{0.003}$	

- * Please wire carefully. If you wire incorrectly, the internal components of a unit may be damaged.

●-T

- Option -T units have vertically positioned screws on a terminal block.
- The size specification is different from standard version. (Refer to external view).
- If you configure Slot 2 as "O", +V2, G2 and -V2 of TB2 is NC.
- If you configure Slot 3 as "O", TB3 is not installed.

5.2 Others

- High voltage exists in the power supply for a few minutes after input voltage is stopped. Please pay attention to this during maintenance.
- This power supply is manufactured by SMD technology. The stress to PCB like twisting or bending causes the defects of the unit, so handle the unit with care.
 - Notes for mounting
 - ① All Mounting holes should be tight and secured.
 - ② Power supply should be mounted parallel to the mounting surface.
 - ③ Avoid applying mechanical stress or shock to the power supply.
 - ④ Do not touch any SMD components on the unit.
- When power supply is energized or immediately after power supply stops working, power supply is still very hot, so please handle it with care.