

# *SR Series*

# *Instruction Manual*

**BEFORE USING THE POWER SUPPLY UNIT**

Pay attention to all warnings and cautions before using the unit. Incorrect usage could lead to an electrical shock, damage to the unit or a fire hazard.

**WARNING**

- Do not touch the internal components, they may have high voltage or high temperature. You may get electrical shock or burned.
- When the unit is operating, keep your hands and face away from it, you may get injured by an accident.

**CAUTION**

- This power supply is primarily designed and manufactured to be used and enclosed in other equipment. Stick the WARNING label for users on the system equipment and describe the notice in the instruction manual.
- Input Voltage must be switched manually according to the service voltage (AC100/200V). Confirm it before turn-on. It could result in damage to the unit or a fire hazard.

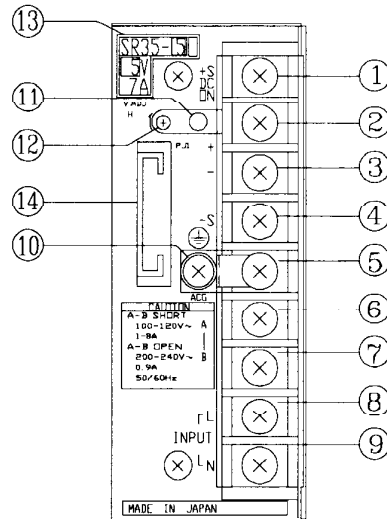
**Note: CE MARKING**

CE Marking, when applied to a product covered by this handbook indicates compliance with the low voltage directive (73/23/EEC) as modified by the CE Marking Directive (93/68/EEC) in that it complies with EN60950.

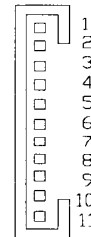
DWG NO. : A078-04-01		
APPD	CHK	DWG
T. SUMIYA 22.JAN.'97	<i>[Signature]</i> 22/JAN/1997	Miyakubo Jan 22, '97

## 1 Front Panel Explanation

SR20,SR35,SR60

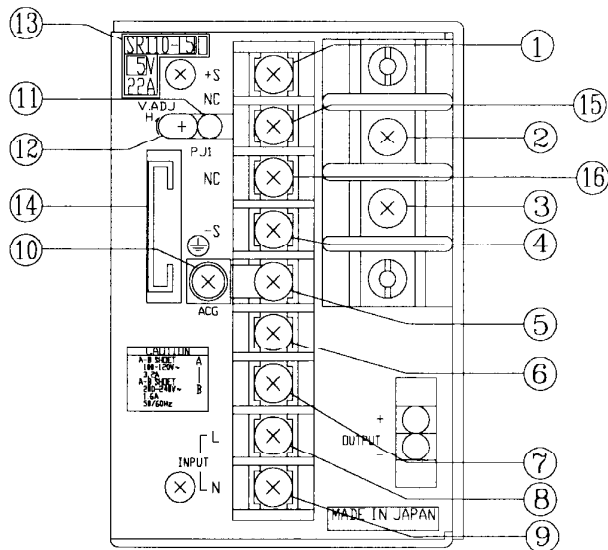


PJ1 Pin Assignment

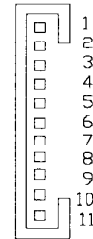


- ①④ Remote Sensing Terminals (+S, -S)**  
 These terminals are for the remote sensing function which compensates for the line drop between the power supply terminals and the load terminals.
- ② + Output Terminal**
- ③ - Output Terminal**
- ⑤ Line Filter Ground Terminal (ACG Terminal)**  
 This terminal is connected to the line filter ground.
- ⑥⑦ 100/200 VAC Input Select Terminals (A,B)**  
 100VAC Input: A and B Terminals Shorted  
 200VAC Input: A and B Terminals Opened
- ⑧ AC Input Terminal (L)**  
 L: Live Line  
 Built in fuse.
- ⑨ AC Input Terminal (N)**  
 N: Neutral Line
- ⑩ Frame Ground Terminal**  
 This terminal is connected with chassis for grounding.
- ⑪ Output (Power On) Indicator**  
 This indicator turns on when the power supply's output is in normal operating condition.
- ⑫ Output Voltage Adjust Trimmer (V.ADJ).**  
 The output voltage rises when a trimmer is turned clockwise.
- ⑬ Model Identification**  
 The model name, rated output voltage and current are displayed.
- ⑭ Connector for Signals (PJ1)**
- |             |   |                                  |
|-------------|---|----------------------------------|
| PJ1-1 :TOG1 | ┐ | ON/OFF Control Terminals         |
| -2 :TOG2    |   | These terminals are used to turn |
| -3 :CNT1    |   | the power supply output on and   |
| -4 :CNT2    | ┘ | off using an external signal.    |
| -5 :PF      |   | PF Signal Output Terminal        |
|             |   | In the case that the output      |
|             |   | voltage drops, this "Power Fail" |
|             |   | terminal will output "High".     |
| -6 :NC      |   | Non Connected Terminal           |
| -7 :PC1     | ┐ | Current Balance Terminals        |
| -8 :PC2     | ┘ |                                  |
|             |   | (PC)                             |
|             |   | These terminals are used for     |
|             |   | current balancing in the case of |
|             |   | parallel operation.              |
| -9 :PV1     | ┐ | Option                           |
| -10 :PV2    | ┘ |                                  |
| -11 :PVGND  |   | Common to -S terminal            |

**SR110 Panel**



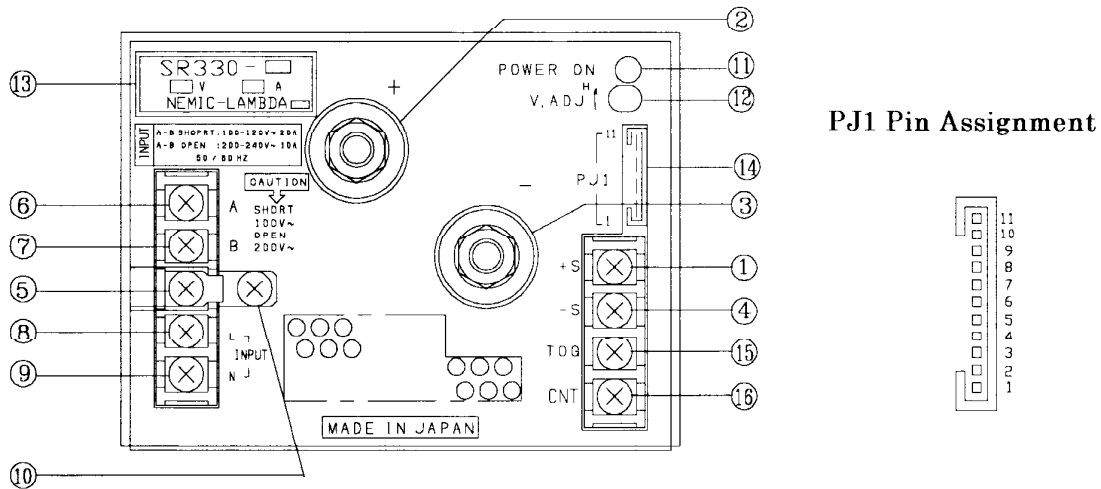
**PJ1 Pin Assignment**



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- ⑫ **Output Voltage Adjust Trimmer (V.ADJ).**  
 The output voltage rises when a trimmer is turned clockwise.
- ⑬ **Model Identification**  
 The model name, rated output voltage and current are displayed.
- ⑭ **Connector for Signals (PJ1)**  
 PJ1-1 :TOG1  $\uparrow$  ON/OFF Control Terminals  
 -2 :TOG2  $\downarrow$  These terminals are used to turn  
 -3 :CNT1  $\downarrow$  the power supply output on and  
 -4 :CNT2  $\downarrow$  off using an external signal.  
 -5 :PF **PF Signal Output Terminal**  
 In the case that the output  
 voltage drops, this "Power Fail"  
 terminal will output "High".  
 -6 :NC **Non Connected Terminal**  
 -7 :PC1  $\uparrow$  **Current Balance Terminals**  
 -8 :PC2  $\downarrow$   
 (PC)  
 These terminals are used for  
 current balancing in the case of  
 parallel operation.  
 -9 :PV1  $\uparrow$  **Option**  
 -10 :PV2  $\downarrow$   
 -11 :PVGND **Common to -S terminal**
- ⑮⑯ **Non Connected Terminals**

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**SR230,SR330,SR660 Panel**

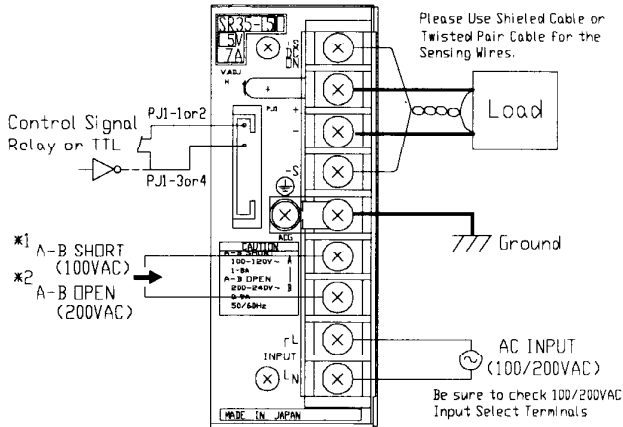


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 This terminal is connected to the line filter ground.
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- ⑬ **Model Identification**  
 The model name, rated output voltage and current are displayed.
- ⑭ **Connector for Signals (PJ1)**  
 PJ1-1 :TOG1  $\uparrow$  ON/OFF Control Terminals  
 -2 :TOG2  $\downarrow$  These terminals are used to turn  
 -3 :CNT1  $\downarrow$  the power supply output on and  
 -4 :CNT2  $\downarrow$  off using an external signal.  
 -5 :PF **PF Signal Output Terminal**  
 In the case that the output voltage drops, this "Power Fail" terminal will output "High".  
 -6 :FAN ALM **Fan Alarm Signal Output Terminal**  
 In the case that the fan rotation drops, will output "Low".  
 -7 :PC1  $\uparrow$  **Current Balance Terminals (PC)**  
 -8 :PC2  $\downarrow$   
 These terminals are used for current balancing in the case of parallel operation.  
 -9 :PV1  $\uparrow$  **Option**  
 -10 :PV2  $\downarrow$   
 -11 :PVGND **Common to -S terminal**
- ⑮⑯ **On/OFF Control Terminals**  
 These terminals are used to turn the power supply output on and off using an external signal.

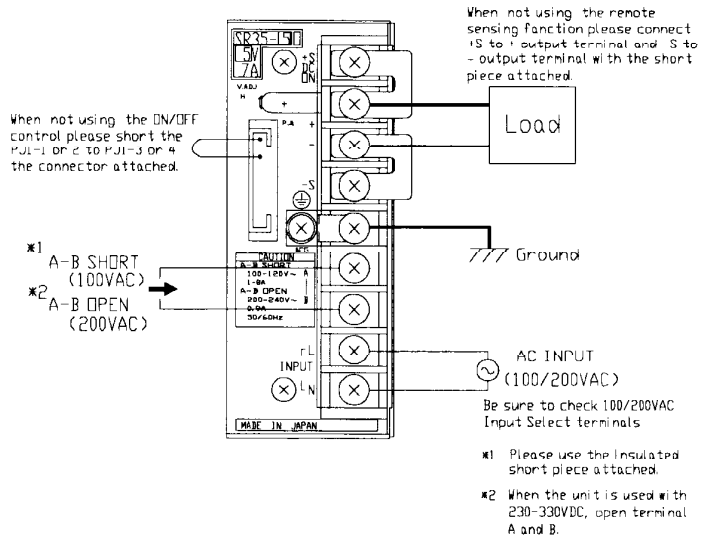
## 2 Connection Method

### SR20,35,60 Panel Side

#### Remote Sensing and ON/OFF Control Required

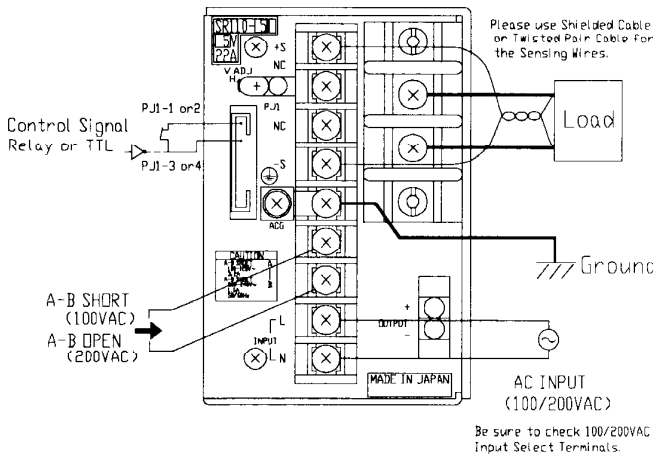


#### Remote Sensing and ON/OFF Control Not Required

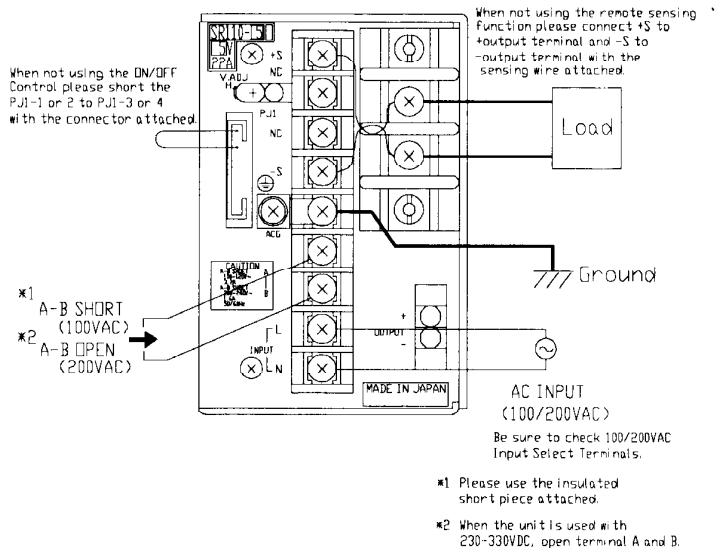


### SR110 Panel Side

#### Remote Sensing and ON/OFF Control Required

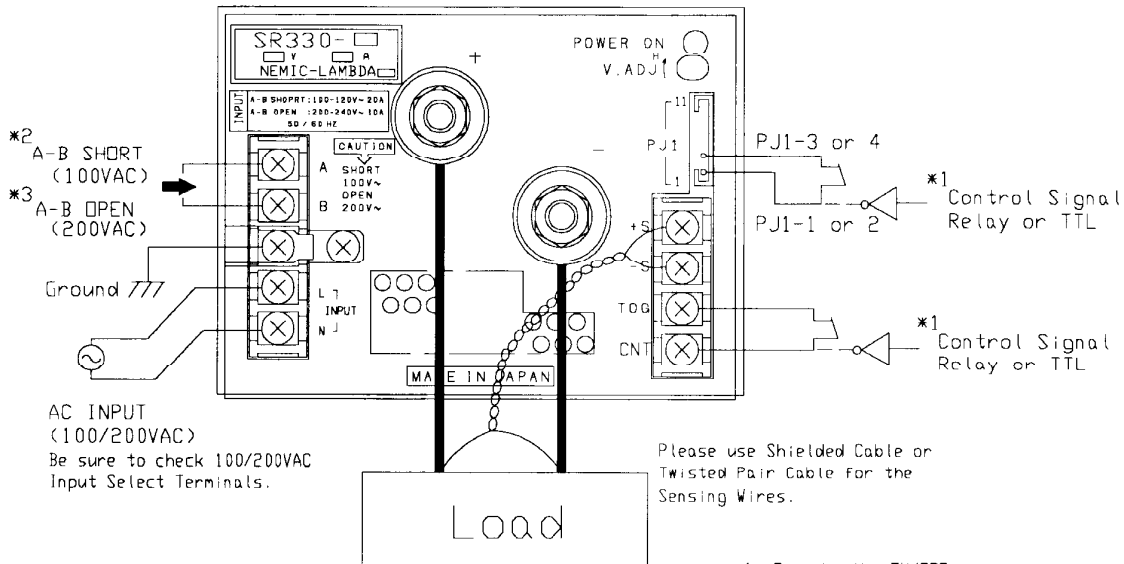


#### Remote Sensing and ON/OFF Control Not Required



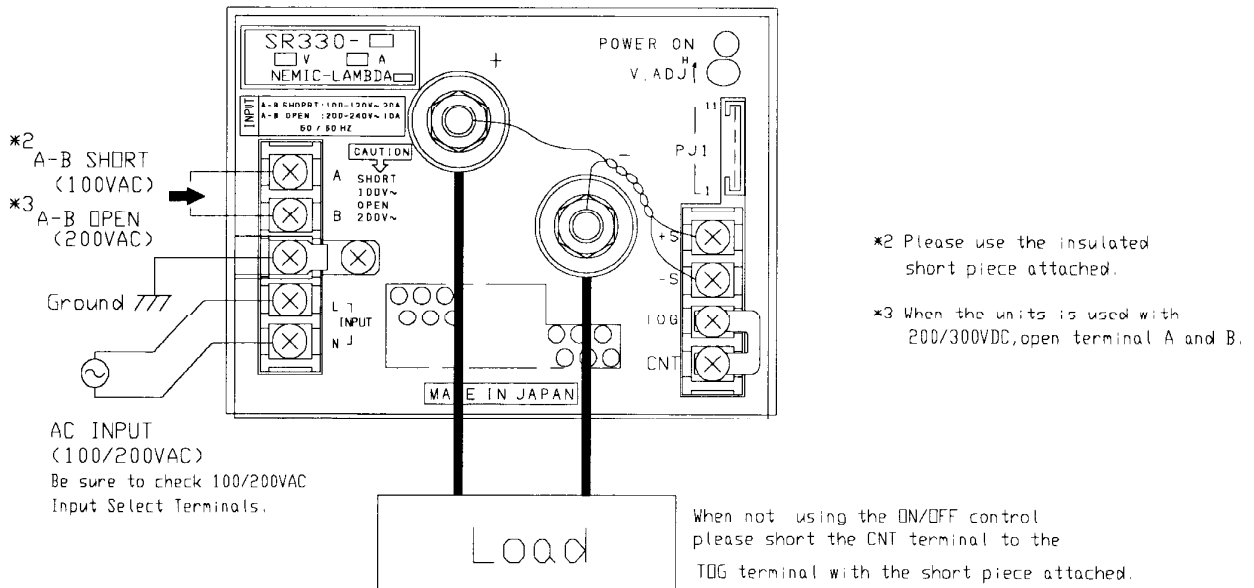
**SR230,330,660 Panel Side**

■ Remote Sensing and ON/OFF Control Required



\*1 To make the ON/OFF control, use TOG and CNT terminals of barrier strip terminal or PJ1 connector. When not using the ON/OFF control, open TOG and CNT terminals of barrier strip terminal or PJ1 connector whichever is not used.

■ Remote Sensing and ON/OFF Control Not Required



When not using the remote sensing function please connect +S to +output terminal and -S to -output terminal with the sensing wire attached.

### 3 Explanation of Functions and Precautions

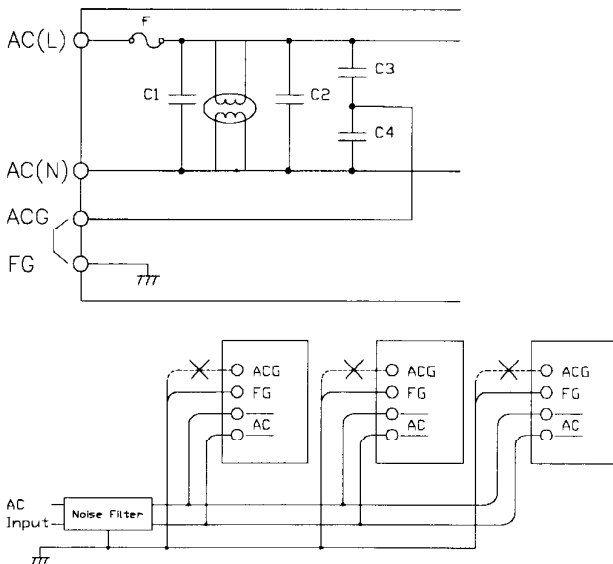
#### 3.1 Input Voltage Switchover

Both input voltage modes, 100VAC and 200VAC, can be used. Switchover between these modes can be carried out by shorting and opening the connection between terminal A and B.

<b>Input Voltage Range</b>
<b>A~B Terminals Shorted : 85~132VAC</b>
<b>A~B Terminals Opened : 170~265VAC, 230~330VDC</b>

#### 3.2 Line Filter Ground (ACG Terminal)

The ACG terminal is internally connected to the line filter ground. When using only one power supply model, please short the ACG terminal and FG terminal together using the attached short piece. When more than one power supply are being used, the leakage current will increase by the number of models being used. If this is a problem, remove the short piece from the ACG and FG terminals. However, please attach a noise filter to the input lines.



#### 3.3 Remote Sensing

This function is used to compensate for the

voltage drop of the wiring from the output terminals to the load terminals. Connect the "+S" terminal to the "+" output terminal, and the "-S" terminal to the "-" output terminal with the sensing wires if remote sensing is not required. The voltage compensation range for a line drop (voltage drop of the wiring) is shown below. Further, be sure to use the power supply below the maximum output power specification. Please use shielded cable or twisted pair for the remote sensing cable.

SR20~110 :

No more than 10% of the rated output voltage

SR230~660 :

No more than 20% of the rated output voltage

#### 3.4 ON/OFF Control

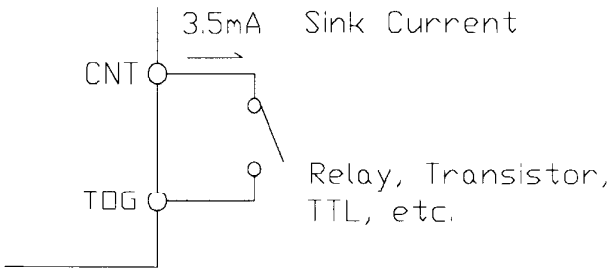
Using this function allows the user to turn the output on and off without having to turn the AC input on and off. Shorting the TOG and CNT terminal turns the output on, and opening these terminals turns the output off. When not using this function, please short the TOG and CNT terminals with the attached short piece. The standards for this function are as follows.

1. TTL compatible. The maximum input voltage to the CNT terminal is 7V and the maximum allowable reverse voltage is -0.7V. The sink current of the CNT terminal is 3.5mA.
2. A switch and relay or a transistor can be used for the ON/OFF switch.
3. This circuit is isolated from the input and output by an opto coupler and can be controlled regardless of the output potential (+ or -). Please connect the TOG terminal to the control signal's ground.

The control mode is shown below.

CNT Level vs. TOG Terminal	Output Condition
H (Higher than 2.0V)	OFF
L (Lower than 0.8V)	ON

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### 3.5 Output Voltage Range

The output voltage can be adjusted within the range below by using the V.ADJ trimmer on the front panel. Turning the trimmer clockwise will increase the output voltage. Please note that if the output voltage is increased excessively, the over voltage protection function may trigger.

- SR20~110 :  $\pm 10\%$
- SR230~660 :  $\pm 20\%$
- (2V Output Model:  $-10\% \sim +20\%$ )

### 3.6 Over Current Protection (Delay Shutdown OCP)

In the case of an output overload or output short continues for the time shown below, the output will be shut down.

- SR20~110 : Approx. 5 seconds
- SR230~660 : Approx. 30 seconds

The output will automatically recover if the overload condition is canceled within this time. In the case that the output is shut down, the input must be momentarily removed, and then re-inputted for the output to recover.

### 3.7 Over Voltage Protection (OVP)

There is a over voltage protection function built into these models. When the OVP triggers the output will be shutdown. The input must be momentarily removed, and then re-inputted for the output to recover.

### 3.8 Over Temperature Protection (OTP)

There is a overtemperature protection function built into these models. When the ambient or internal temperature rises abnormally,

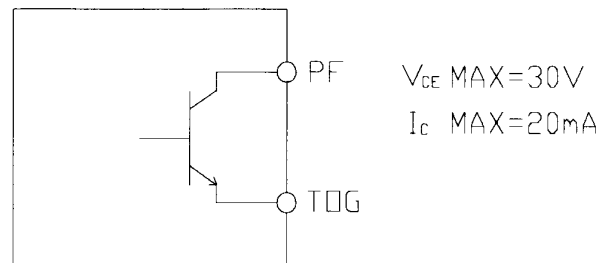
this function will shut down the output. After shut down, please remove the input and allow to cool before re-inputting the input. The detection temperature range for this function is  $85^{\circ}\text{C} \sim 95^{\circ}\text{C}$ .

### 3.9 Undervoltage Lockout

There is a undervoltage lockout function built into these models. When the input voltage becomes less than  $65 \sim 75/130 \sim 150\text{VAC}$ , the output will be shut down. The output voltage will automatically recover when the input voltage recovers.

### 3.10 Low Output Detection Circuit

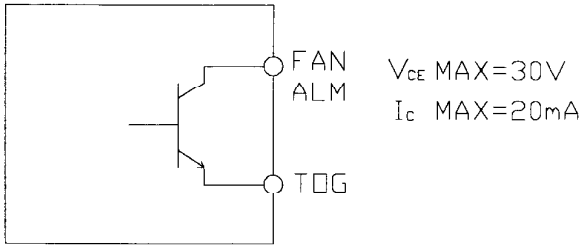
There is a low output detection circuit built into these models. The PF signal will turn "High" level to indicate the abnormal status when the output voltage becomes less than  $75 \sim 80\%$  of rated value caused by the drop or brown out of the input voltage, or by the OCP function operation. The PF signal is insulated by an opto coupler. It uses the open collector method shown below.



### 3.11 Fan Alarm Circuit

The forced air cooling types (SR230, 330, 660) have a built in fan alarm. When the fan rotation speed slows down, the required air cooling for heatsinks, etc. will not be attainable. However, if the fan rotation detection circuit detects a slow down in the fan rotation, the fan alarm will output a "L" level signal notifying the user that the fan needs to be replaced. The fan alarm signal is isolated by a opto coupler. It is a open collector circuit as shown below.

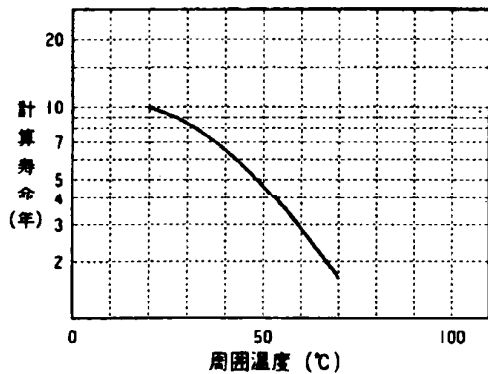
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Rotation Speed	Dectin
SR230	: 3700rpm
SR330,660	: 1700rpm

In the case that the fan alarm signal is outputted, please replace the fan unit within three days. If the fan rotation drops below the standard rotation circuit. If the thermal protection triggers, the output will be shut down. In order for the output to recover, the input must be shut off and the unit be allowed to cool down before reapplying the input.

When replacing the fan without using this function, please use the following curve as a guide for when to change the fan. Please contact NEMIC-LAMBDA for the replacement of the fan.

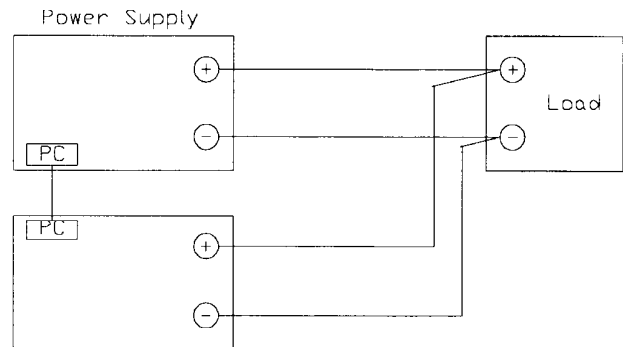


### 3.12 Parallel Operation

There is a current balancing function built in to these models. Either of the operations modes shown below are possible. By the current balance function the paralleled models monitor each other's output current to keep the balance of current equal between the paralleled models. When connecting the power supplies' PC terminals, please do not twist these wires. Further, please make these lines of even length and as short as possible.

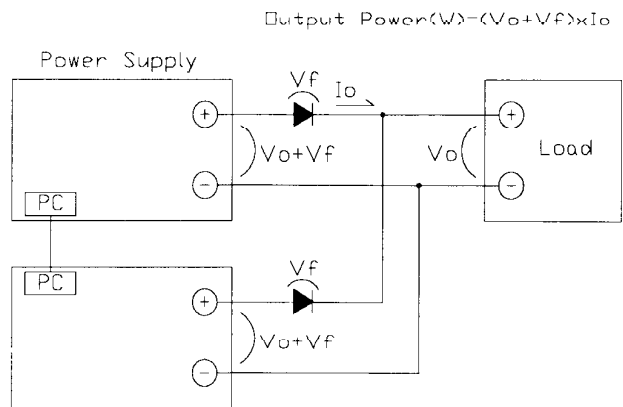
#### (A) To Increase the Output Current

1. Please adjust the output voltage of each power supply to be the same.
2. Please use the same type of wires for all load lines.
3. Please use with an output current of less than 80% of rated output current for all paralleled models.



#### (B) To Use as a Backup Power Supply

1. Set the power supply voltage higher by the amount of forward voltage drop of the diode.
2. Please use within the specifications for output voltage and output current.

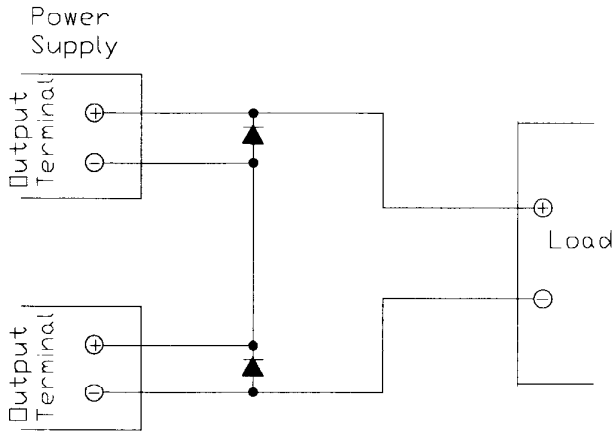


### 3.13 Series Operation

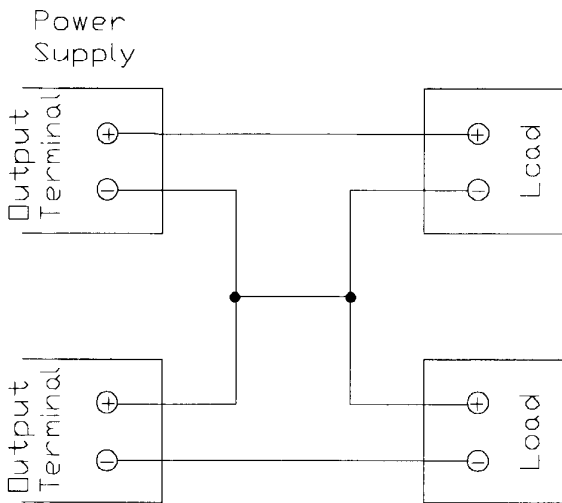
For series operation, either of the modes of operation shown below are possible. In the case of method (A), please connect diodes as shown to prevent the reverse voltage application. Further,

please use bypass diodes that can withstand the output voltage of each power supply and can hold the forward current of the load.

**Method (A)**



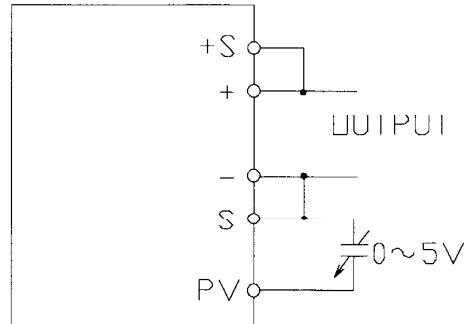
**Method (B)**



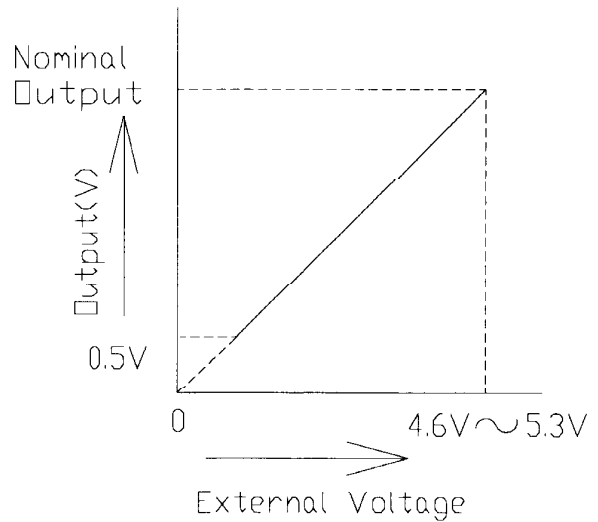
**3.14 Output Voltage External Control (option)**

The 12V and 24V output models for the entire series have this option available. The output voltage can be varied by applying an external voltage (0~5V) to the "PV" and "-S" (or PVGND) terminals.

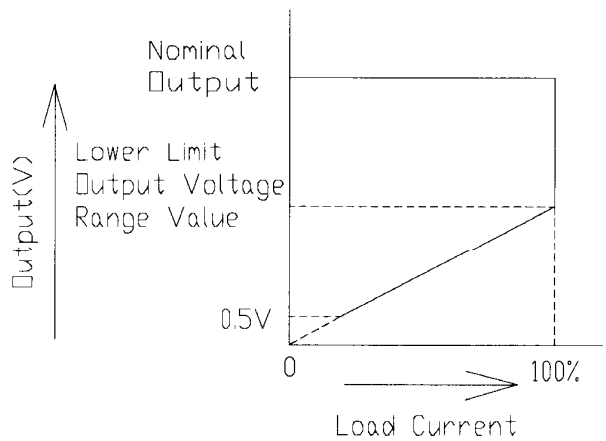
**Connection Method**



**Output Voltage Linearity**



**Output Voltage Derating**

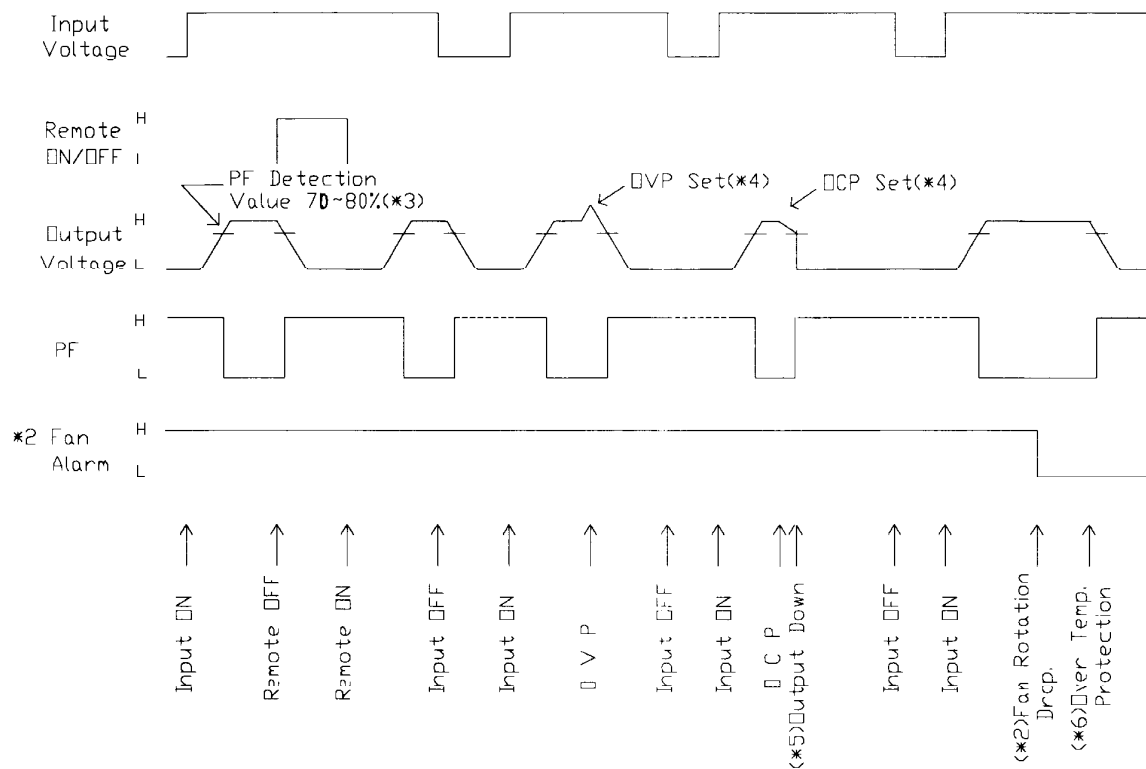


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Please be aware that if an external voltage is not applied, there will be no output. When this function is being used, the PF signal will be kept at "L" level. Please note that if the above connection method is attempted with the standard models

internal components could breakdown. Further, this function cannot be used at full load. When this function is to be used, please contact NEMIC-LAMBDA.

**3.15 Sequence Chart**



(\*1) level :  $2V \leq H \leq 5.25V$   
 $0V \leq L \leq 0.8V$

(\*2) Only SR230,SR330, and SR660

(\*3) PF Monitor Setting : 70~80% of the output voltage

(\*4) OVP,OCP Set Value : Please refer to each specifications.

(\*5) After the OCP condition is cleared,the input must be reapplied in order for the output to recover.

(\*6) The output will be shutdown due to excessive internal temperature rise.

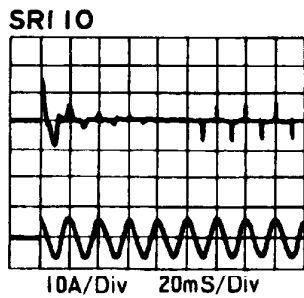
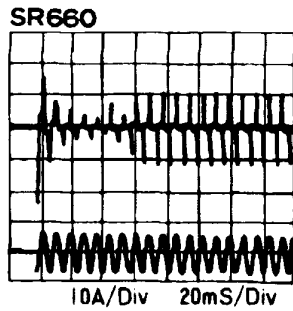
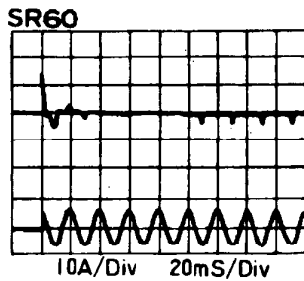
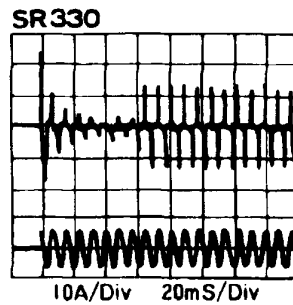
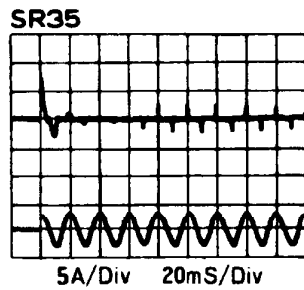
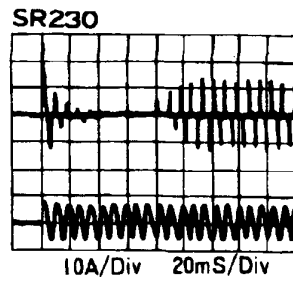
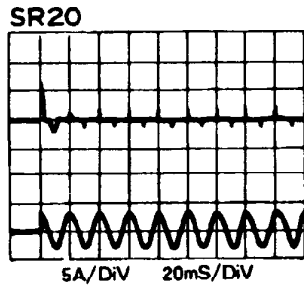
**4 Inrush Current**

This series is provided with a built in inrush

current limiting circuit. However, when using multiple power supplies, please select the input switch, fuse, etc. carefully.

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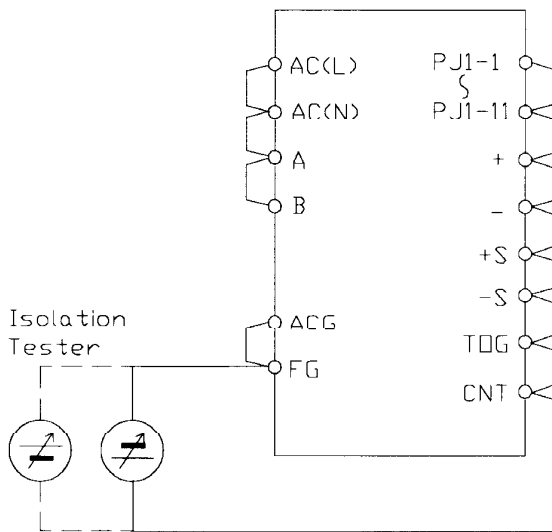
(Input:200VAC, Input Phase Angle:90 degrees,  
Load:100%, Ambient Temp:25 degrees)



## 5 Isolation/Withstand Voltage Test Method

### 5.1 Isolation Test

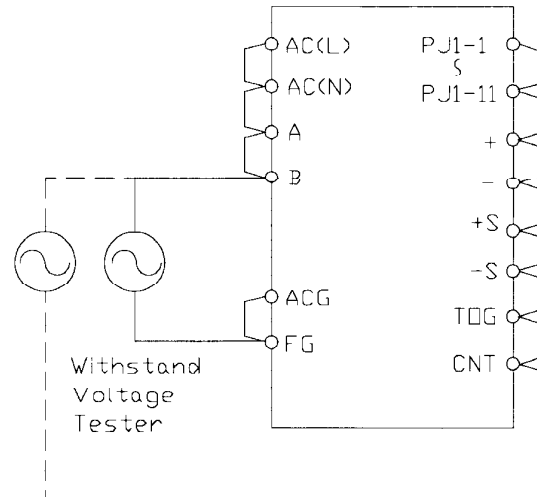
The isolation resistance is more than 100MΩ at 500VDC when tested with a DC isolation tester between the output and the chassis. Note when testing, some isolation testers can produce a high pulse when the applied voltage is varied. Ensure that the tester is fully discharged after the test.



### 5.2 Withstand Voltage

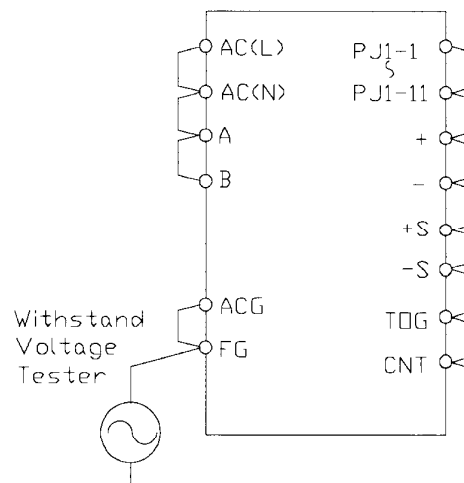
This series is designed to withstand 2.5kVAC between the input and the chassis, and 3.75kVAC between the input and output for 1 minute. In the case that the withstand voltage is tested in the incoming goods test, etc., please set the limit of the withstand voltage test equipment to 20mA. Further, for output to chassis, 500VAC for 1 minute (Current Limit Value: 100mA). The applied voltage must be increased gradually from zero to the testing value, and then decreased gradually at shut down. Especially stay away from use of a timer, where a pulse of several times the applied voltage can be generated. This could cause damage to the model.

Input~Chassis (solid line)  
 Input~Output (dotted line)



※Open ACG and FG terminals, when tested between the input and output.

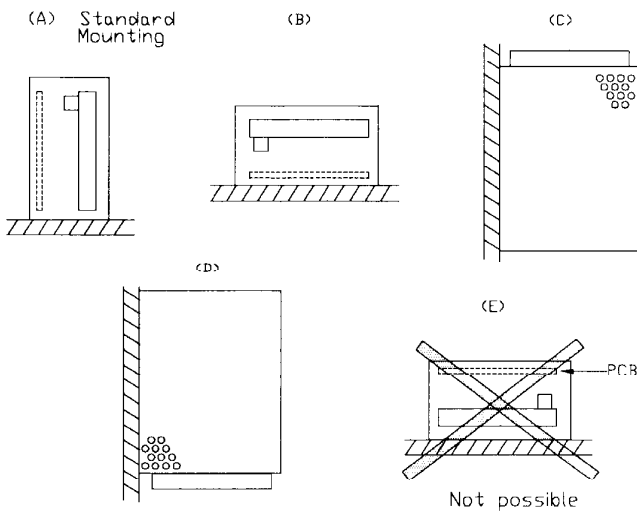
### Output~Chassis



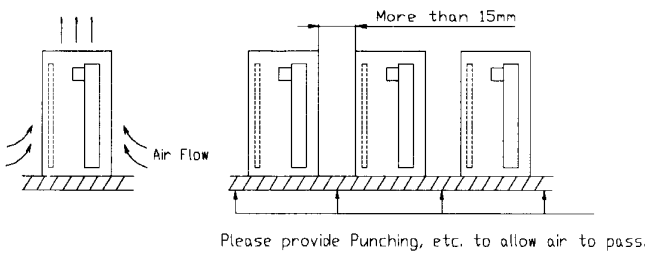
## 6 Mounting Directions

### SR20~SR110

When mounting the power supply inside an apparatus, we recommend method (A) below. However, method (B) and (C) and (D) are also possible. Please do not use installation method (E), where the PC board will be on the top side and heat will be trapped at the top.



※ This is the output derating for convection cooling. Please consider the natural flow of air so that heat does not get trapped around the power supply. When lining up more than one model, please make sure that there is a spacing of 15mm or more between each model.

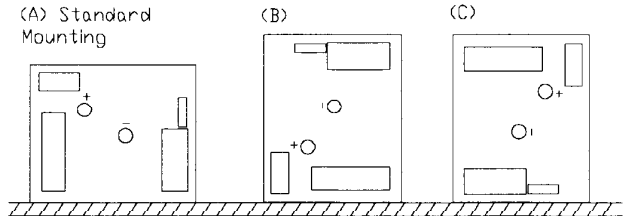


※ Please make the insertion length of the attachment screw into the inside of the power supply less than 6mm.

※ The recommend torque is 5.0Kg · cm.

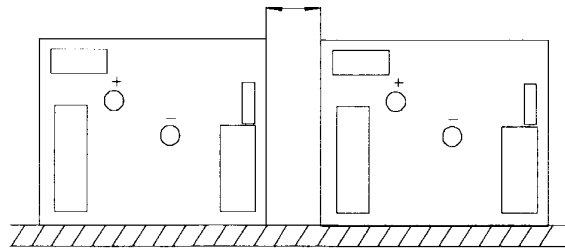
### SR230,SR330,SR660

When mounting the power supply inside an apparatus, we recommend method (A) below. However, method (B) and (C) are also possible.



Standard mounting is with the bottom side down in an upright position.

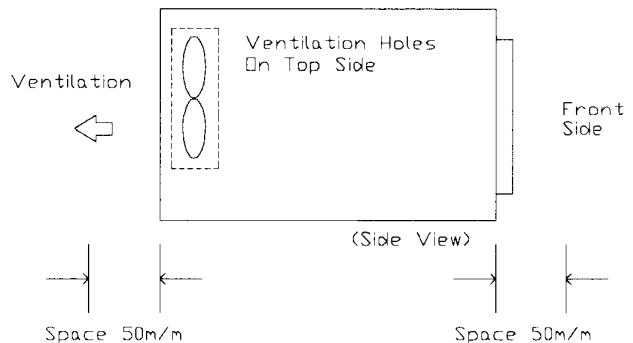
Possible side by side mounting



※ Please make the insertion length of the attachment screw into the inside of the power supply less than 6mm.

The recommend torque is 13.0Kg · cm.

This power supply has ventilating holes on the front, back, and top panels. Please keep these three areas as open as possible.



## 7 Wiring Method

- By keeping the output load lines and ON/OFF control line separate from the input lines, and twisting all line pairs separately the susceptibility to noise can be greatly improved.
- Make all lines as thick and short as possible.
- Noise can be eliminated by attaching a small capacitor to the load terminals.
- For safety and EMI considerations please connect the FG terminal to the mounting set ground terminal.
- The recommended torque for the terminal piece is 13.0kg · cm.  
Further, the recommended torque for the output terminal is 110.0kg · cm.

## 8 External Fuse Rating

In the case that an external fuse is going to be used, please refer to the chart below in selecting the fuse. Please stay away from fast blow fuse.

Model	Fuse (Nominal Current)
SR20	2A
SR35	3A
SR60	4A
SR110	6A
SR230	10A
SR330	10A
SR660	20A