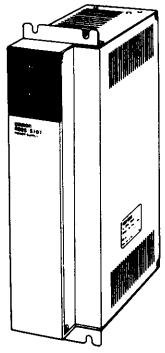
OMRON

Cat. No. I510-E1-1

USER'S MANUAL



MODEL **R88S-S** SERIES

MODEL : R88S-S107/S110

〈VERSION 4〉

POWER UNIT FOR SERVO MOTOR

I N D E X

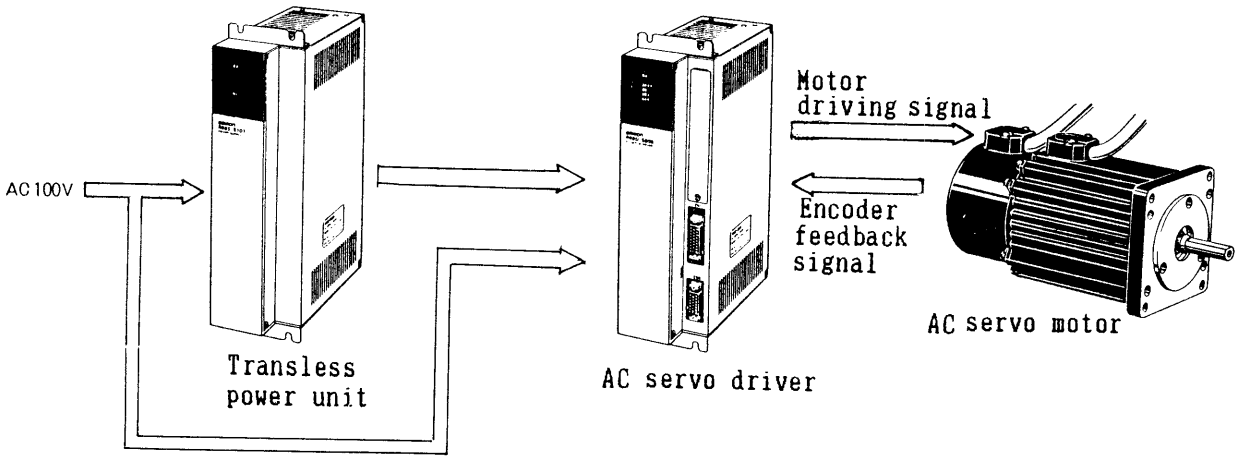
1. GENERAL

1.1 Features and configuration of this unit

This power unit converts AC100V power to DC current ,which it supplies to servo drivers.

In this S series, two models are available. One is R88S-S107, the other is R88S-S110. Select in accordance with output capacity and regenerative absorptive capacity.

This power unit is a "trans-less" system which does not need a power transformer. An absorption circuit for regenerative energy is mounted inside to make the system more easy.

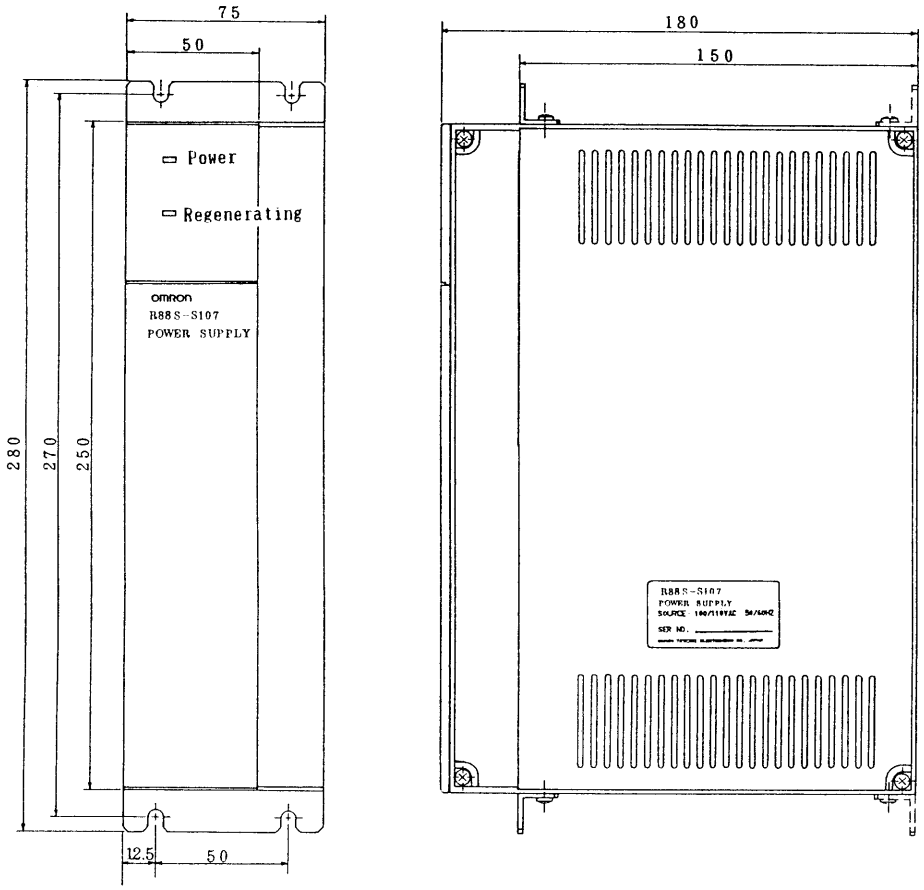


Features of this power unit

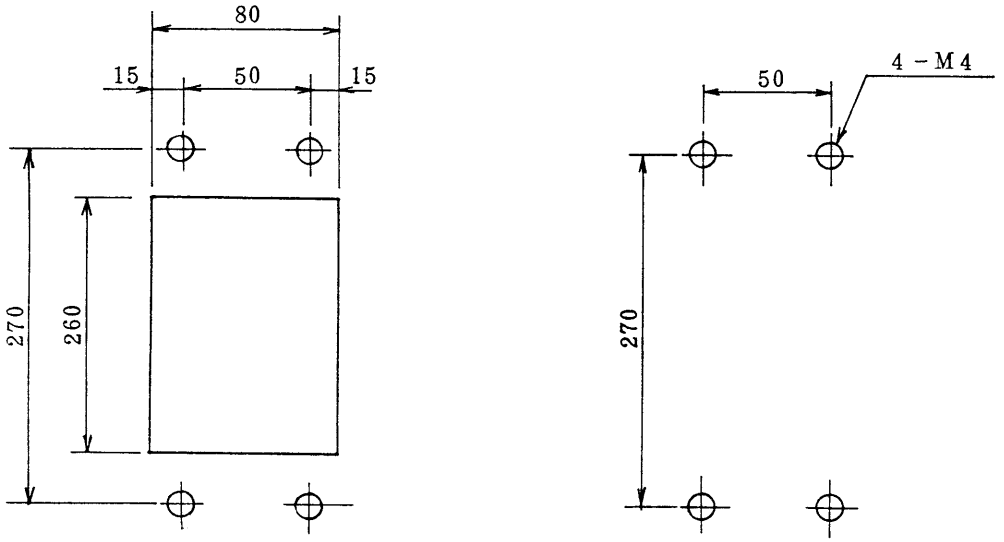
(1) There is little ripple voltage due to built-in large capacity smoothing condenser (gives minimized torque ripple).
(2) There is little heat due to regenerative power being absorbed by a large capacity smoothing condenser.
(3) Stable servo characteristics by constant regenerative power control circuit, referred to the power voltage.
(4) Compact, low cost.
(5) No need of a power transformer thanks to break-in current protection circuit.
(6) As applicable, multi-axes control system minimize total system cost.

2.1 Design for installation

(1) Outer dimensions



(2) Installation dimensions



Rack mount type installation dimensions

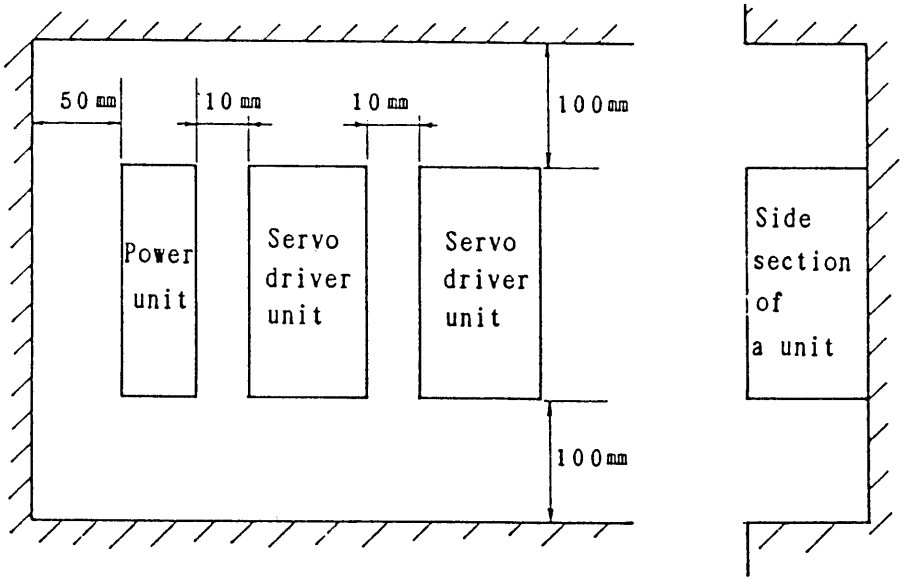
Rear installation dimensions

2.2 Installation conditions

General specifications for installation are as follows:

Operating ambient temperature	0 to 55℃
Operating ambient humidity	35 to 90%RH (without dew condensation)
Storage temperature	-10 to 70℃
Operating ambient environment	Without corrosive gas
Construction	Inside an enclosure type (IP-30)
Vibration proof	JIS-C-0911-IIB item 3

(1) When you install power units and servo drivers, be sure to install in a vertical direction with the following allowance;



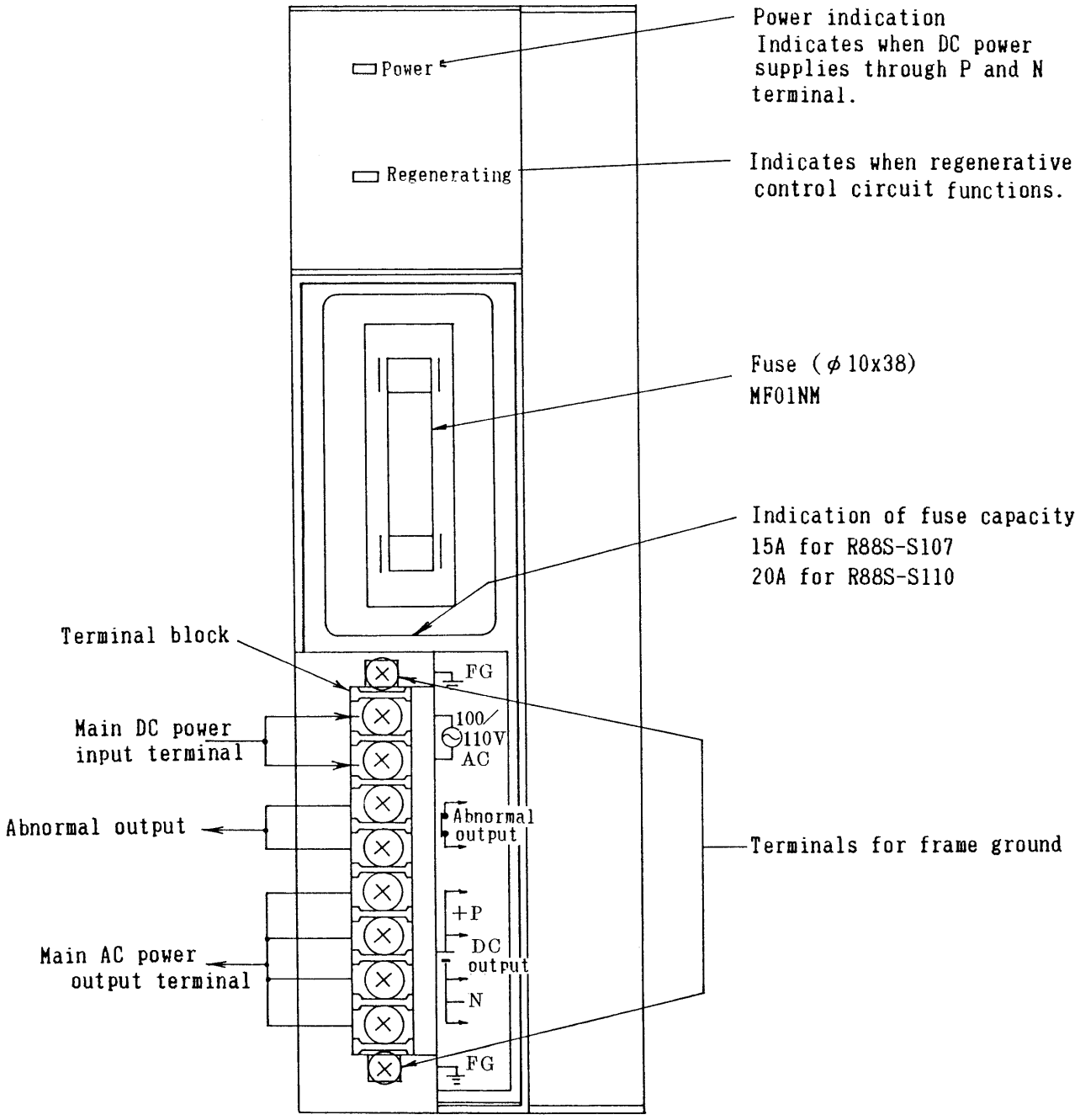
(2) Prepare forced cooling system in order to exceed inside temp. +55℃.

(3) The surface temp. of the power unit may rise to max.30℃. Units which may damaged by heat should be kept apart from it.

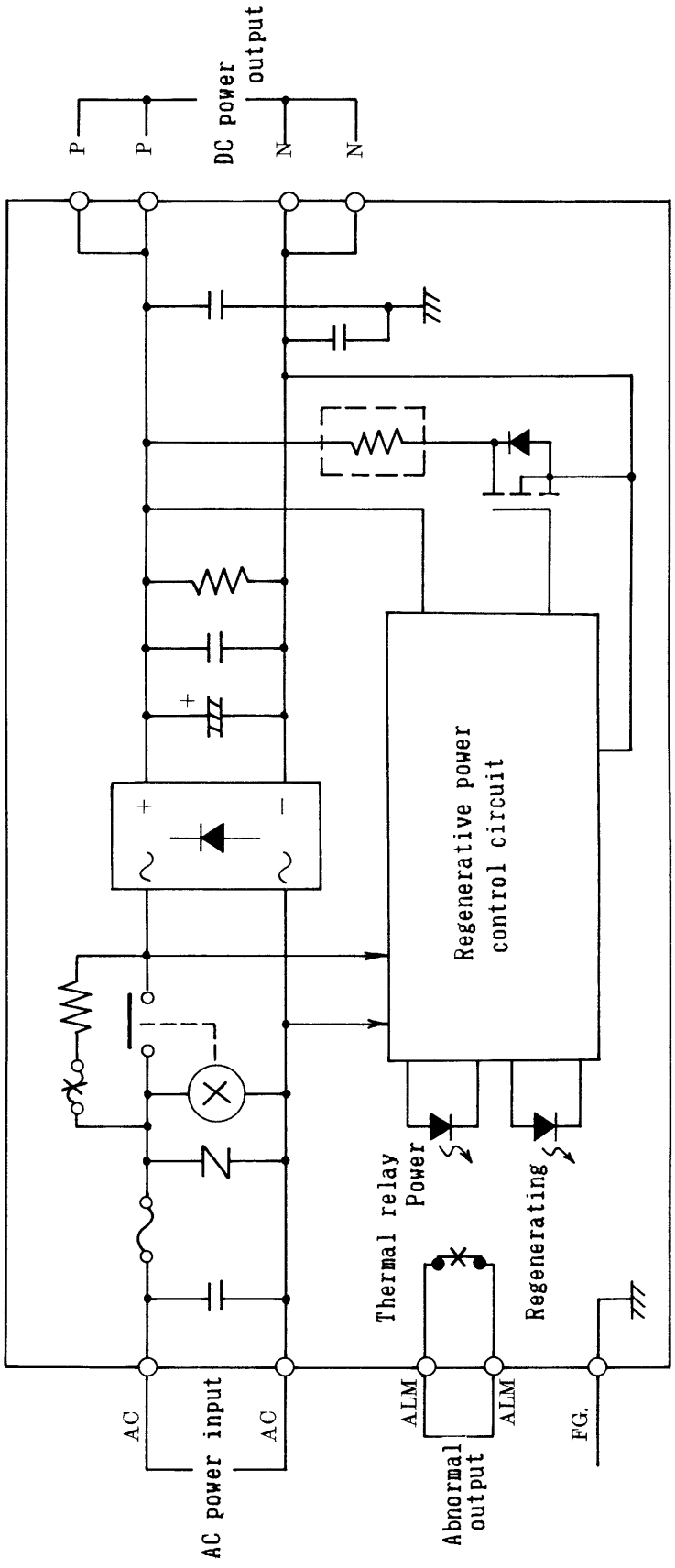
(4) Be careful not to drop screws and wires in the unit while wiring, and not to pour metal powder or oil after installation.

(5) For installation on a board made of material other than metal, leave a space 10mm or more between the rear of unit and the board.

3.1 Front panel

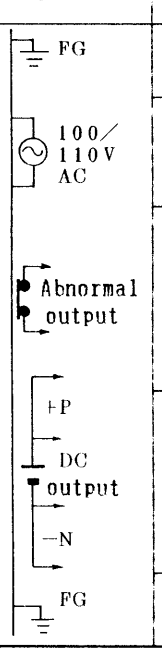


3.2 Inner block diagram



	R88S-S107	R88S-S110
Smoothing condenser	328 μF	492.0 μF
Regenerative resistance	40Ω-80W	30Ω-120W

3.3 Explanation of terminal block

Sign	Name	Contents
	Frame ground	Connect low impedance earth.
	AC power input terminal	Input for main circuit. Supply AC 85～110V
	Abnormal output	Inner contact opens when a radiation fin in the unit exceeds 85℃±3. Make a circuit to shut-off input power when this functions.
	DC power output terminal	This is an output terminal of DC main circuit to supply DC power to servo drivers. P is positive, N is negative polarity.
	Frame ground	As for frame ground above

4. SELECTION OF POWER UNITS

Models of power unit should be selected in accordance with the total amount of motor wattage. The total amount of each power unit is as shown in the following chart:

Power unit	Total amount of applicable motor wattage
R88S-S107	600W
R88S-S110	800W

Select a power unit according to above total amount in excess of the one using motors.
In this calculation, a 50W motor should be calculated as 100W.

Eg.: Using motors 2 sets of 50W
1 sets of 100W
2 sets of 200W

Total amount of using motors:
100 (W) x 3 + 200 (W) x 2 + 700 = (W)

Therefore, we select R88S-S110 which has a total wattage of 800W.

Required main circuit DC current of R88M-S series are as follows:

Note: In case of AC100V supply

Motor	Main circuit DC current
R88M-S05030 (50W)	0.6A
R88M-S10030 (100W)	1.1A
R88M-S20030 (200W)	2.3A
R88M-S30030 (300W)	3.2A

Each rated current and instantaneous max. current are shown below:

Model	Rated current	Instantaneous max. current	I^2t
R88S-S107	7A	20A (sec.)	$400A^2$sec.
R88S-S110	10A	24.5A (sec.)	$600A^2$sec.

5. INSTALLATION

5.1 Unpacking

Check the following when opening the package:

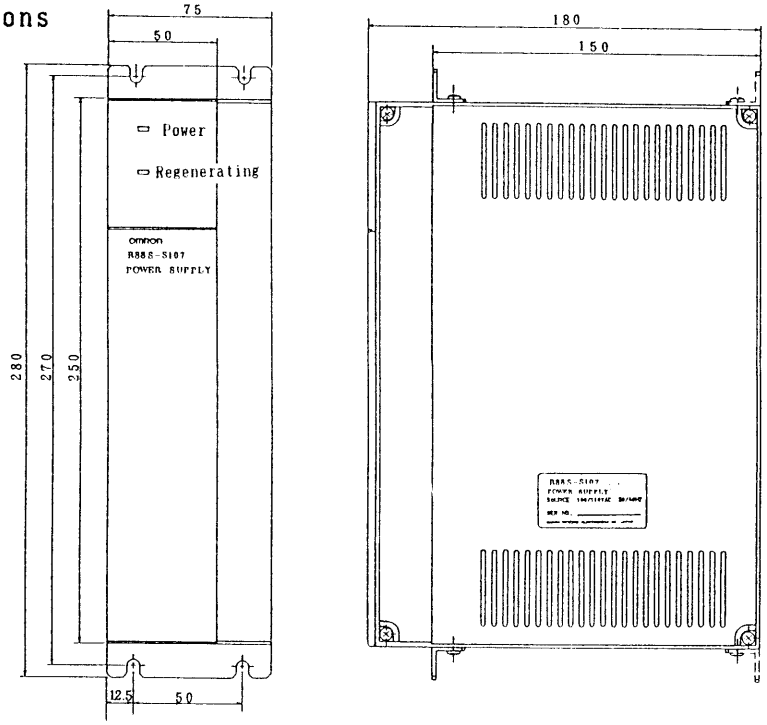
- o Differences between ordered items and delivered items.
- o Transportation damage.
- o Misdelivery of accessory.

Accessories consist of the following:

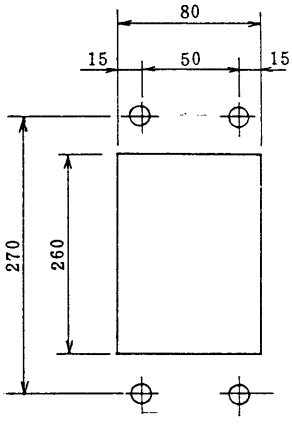
- · 2 pcs. Installation metal
- · 4 pcs. Fixing screw
- · 1 pc. Spare fuse

5.2 Installation

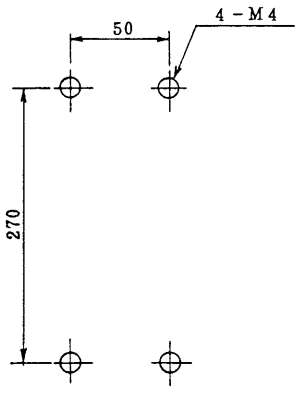
(1) Outer dimensions



(2) Installation dimensions



Installation dimension for mounting on a panel

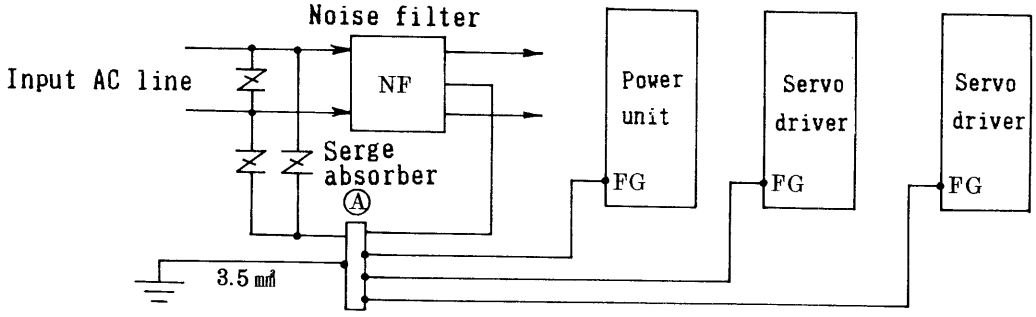


Installation dimension for rear fixing

5.3 Wiring

(1) Earth line

Noise-proof characteristics of this system depend on wiring of earth line. We recommend the following wiring for earthing.



One point earth terminal, sectional area = 2mm² or more.

<Caution> 1. Do not bundle or put in together with other signal wires.

2. In case of wiring inside of metal pipes, metal ducts and /or metal conduit, connect metal surface to A as earth.

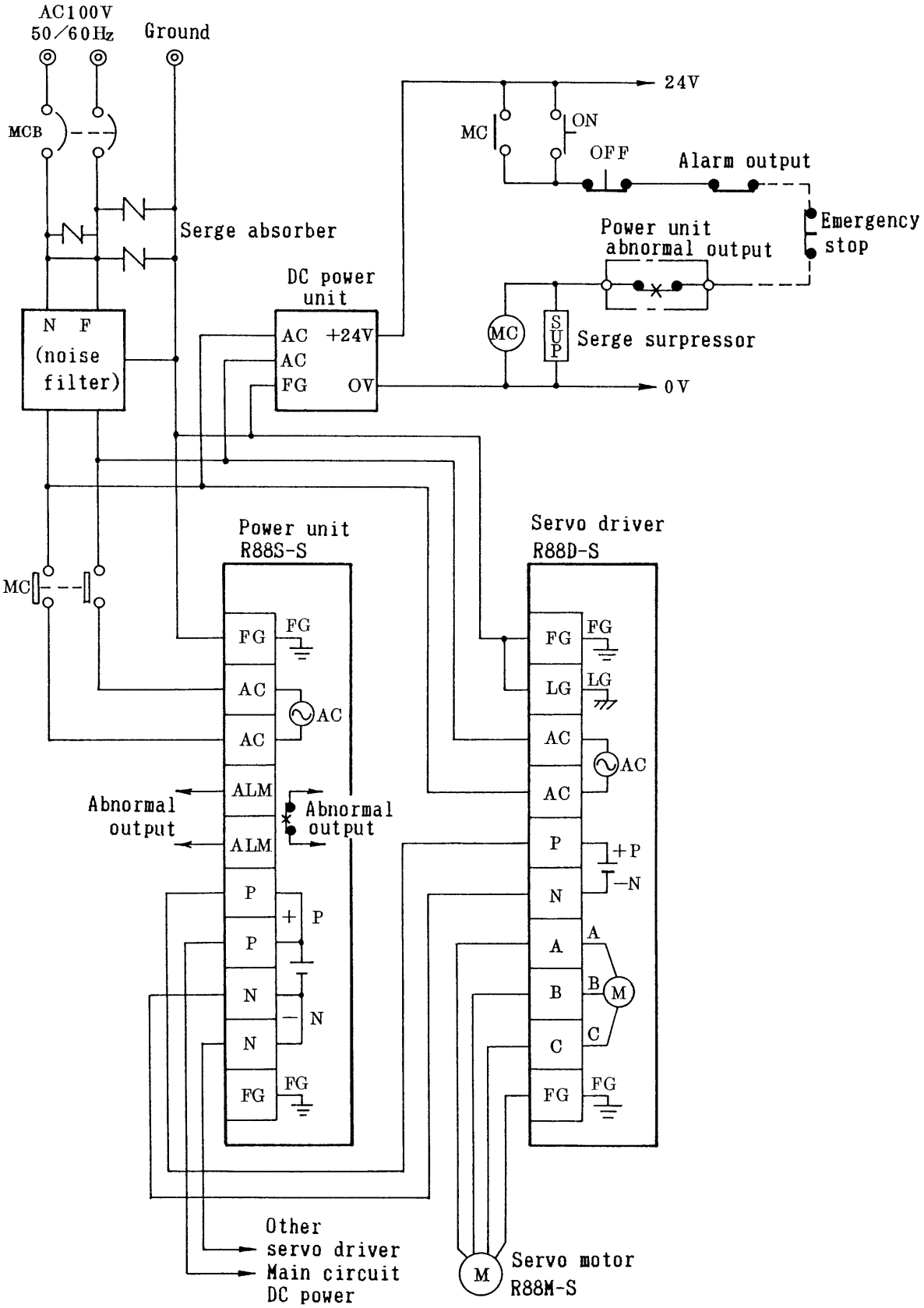
(2) Wire size and color

Terminal	Name	Wire size	Wire color
AC	Main power input	2.0 mm²	Yellow
P.N	DC main power output	2.0 mm²	red as P, blue or black as N
ALM	Abnormal output	0.75 mm²	———
FG	Frame ground	2.0 mm²	green

<Caution>1. The above values are available for HIV heat resistant wire (75℃) used at ambient temperature 55℃.

2. In order not to mis-wire, use red wire as P(+) and blue or black wire as N(-) for DC power output lines.

(3) Installation example



6. SELECTION OF OTHER ENVIRONMENTAL UNIT

(1) No fuse breaker (MCB)
Select a MCB having an applicable current value and do not use one for semiconductor and one having instantaneous characteristics. Use delay characteristics as "delay 62" (2.2 to 20 sec. at 200% load).

(2) Noise filter (NF)

Model	Ampere	Mfg.
ZAG2220-11-P	20A	TDK
GT-2150R	15A	TOKIN CORP.
GT-2200R	20A	TOKIN CORP.
NFB2302H	30A	FDK

Note: Use a inpulse filter

(3) Magnet relay

Model	Ampere	Mfg.
MA415A	15A	OMRON
LC1-D163A60	18A	OMRON
LC1-D253A60	26A	OMRON

(4) DC power unit

Model	Voltage	Ampere	Mfg.
S82H-0124	24V	0.6A	OMRON
S82H-0324	24V	1.3A	OMRON
S82H-0524	24V	2.3A	OMRON

(5) Serge absorber (ZNR)

Model	Mfg.	Capacity
RAV-201BX	OKAYA ELECTRIC IND. CO.	1KA
ERZ-A20EL221	MATSUSHITA ELECTRIC CO.	5KA

(6) Serge killer

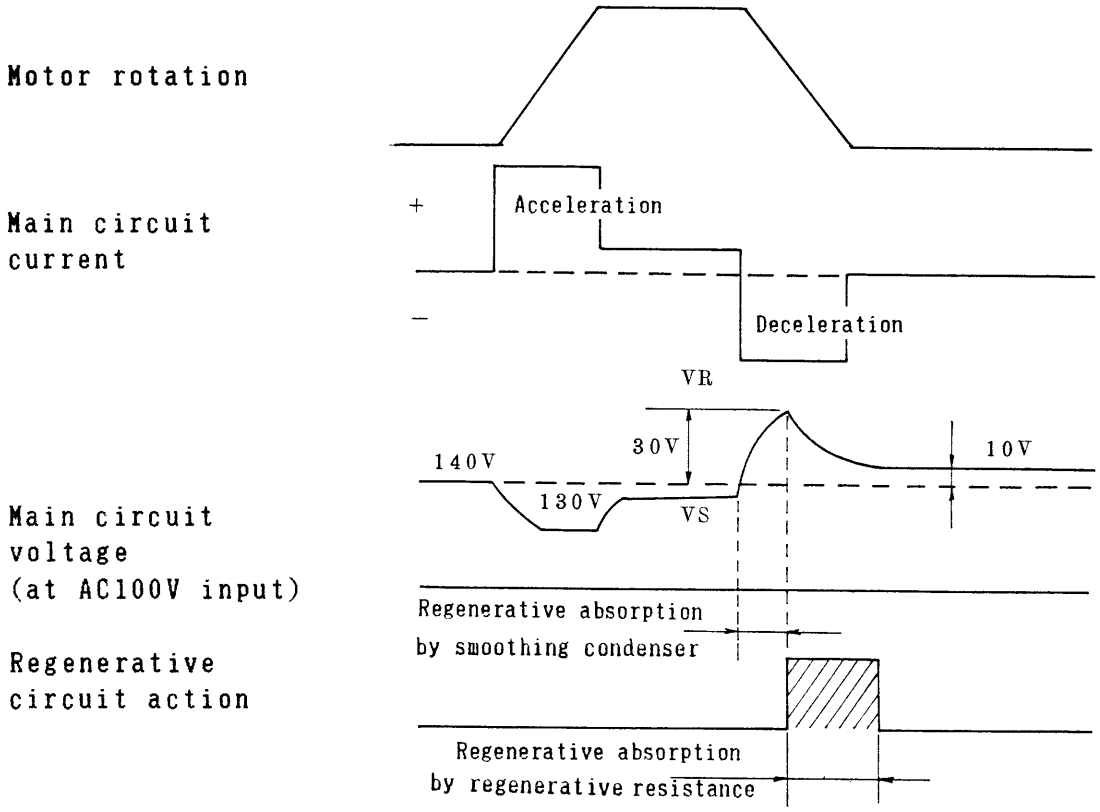
Model	CR value	Mfg.
CR-50500	50Ω to 0.5μF	OKAYA ELECTRIC IND. CO.
S2-A-0	200Ω to 0.1μF	OKAYA ELECTRIC IND. CO.
CRE-50500	50Ω to 0.5μF	OKAYA ELECTRIC IND. CO.

7. ABSORPTION OF REGENERATIVE ENERGY

This unit has a regenerative control circuit in order to absorb regenerative energy. The circuit protects from abnormal increase of DC main voltage.

7.1 Action of regenerating circuit

Action of regenerating circuit is as follows:



Calculation of absorption power

Regenerative absorption valve is calculated as follows:

(1) Absorption by the smoothing condenser.

$P_C = 0.5C(V_R^2 - V_S^2)$ (J) C means a capacity of the smoothing condenser.

R88S-S107 3280(μF)

R88S-S110 4920(μF)

In case of S107

$P_C = 0.5 \times 3280 \times 10^{-6} (170^2 - 130^2) \fallingdotseq 19.5$(J)

In case of S110

$P_C = 0.5 \times 4920 \times 10^{-6} (170^2 - 130^2) \fallingdotseq 29.5$ (J)

The regenerative control circuit does not function if the regenerative energy is less than the above value.

When the regenerative control circuit functions, the regenerative value adjusted by the smoothing condenser might be about half (1/2) of the above value.

(2) Absorption by the regenerative resistance

$$Pr = \frac{(V_R - 10)^2}{R} \quad (W)$$

R as the regenerative resistance
R88S-S107 40 Ω - 80W
R88S-S110 30 Ω - 120W

In case of S107

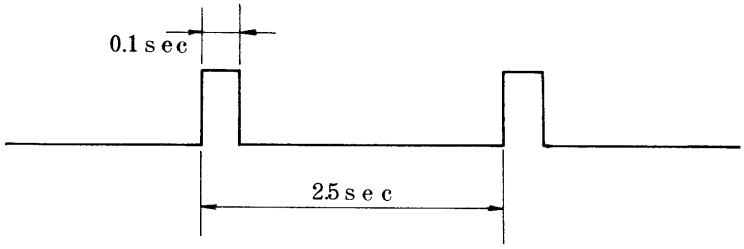
$$P_R = \frac{(170 - 10)^2}{40} = 640(W)$$

In case of S110

$$P_R = \frac{(170 - 10)^2}{30} = 852(W)$$

However, the regenerative resistance cannot absorb the above value continuously. Actually, average power is 20W as S107, 30W as S110 for your reference. A duty cycle might be 1/25 of duty time in one clycle at above calculated value.

Regenerative motion



8. ADJUSTMENT

(1) Test operation

Confirmation items prior to operation (see "test operation" item in servo driver's manual, too.)

1. Reconfirm wiring for polarity in P and N at the main circuit DC current power. Miswiring may instantly damage the servo driver.
2. Supply voltage should be within AC85 to 110V.
3. When a pole is to be grounded, connect to FG.
   (Note:For confirmation of grounding line, confirm with tester etc.)
4. Make a circuit to open supply power to the power unit with abnormal signal from the servo driver.
5. Motor axis should be free from mechanical load while in test operation.
   If disconnection from mechanical load is not possible, operate under condition allowing emergency stop.

(2) Input power

1. Input power to the servo driver and confirm whether there is no abnormal condition. Then input power of the power unit.
2. Confirm that the LED for power indication is ON. When it is not ON, check supply AC power.
3. Confirm that the mail circuit DC power voltage (P, N) is between DC120 to 185V.
4. After confirmation of above, switch OFF power once. The voltage charged to smoothing condenser is then radiated through regenerative circuit, with 3 to 5 times flicker of generative indication LED. Then confirm that the voltage between P and N terminals is less than DC40V.
5. Input main circuit AC power again, and adjust the servo driver by referring "adjustment" item in servo driver's manual.
6. The power unit turns to less than DC40V 3 sec.s after power shut off. However, it will take another few minutes to discharge completely. Therefore, be careful that short circuit of output terminals does not produce spark.

9. OPERATION

1. Operation condition indicator
   These are the following two LEDs (light emitting diodes) for condition indication in the unit.

Power indication	Indicates when main AC power source applies to the unit. Even after shut-off of main AC power, slightly indicates with remaining DC output voltage. Therefore, confirm that this indication is completely "OFF" before touching this unit.
Regenerative indication	Put ON when regenerative operation functions by the supply of regenerative voltage from the servo motor. This also indicates by discharge voltage of the smoothing electrolysis condenser when AC power source shut-off.(indicates three to 5 times)

2. Protection functions
   This unit has the following protection functions.

Protection function	Motion	Causes
Main circuit fuse	Blows up when an excessive current is applied to main circuit	· short between output terminals · long-time operation at more than the continuous output current.
Temperature rise of a radiation fin	Functions when a temperature of the radiation fin rises to more than 85℃ by the rising temperature of the main circuit rectifier or the regenerative resistance.	· Load current exceeds the rated value at high ambient temperature. · Load condition exceeds the capacity of regenerative system.

Use the following as protection fuse element:

R88S-S107	MFOINM 250V-15A
R88S-S110	MFOINM 250V-20A

Blow characteristics:
less than 60 minutes at 135%,
less than 2 minutes at 200% of the rated ampere.

10. CAUTIONS AT OPERATION

(1) Never short between output terminals during operation.
A spark with the flow of instantaneous big current, within the smoothing electrolysis condenser may occur.

(2) Never misconnect DC main power output.
Misconnection of P from N and vise-versa will damage inverter section of the servo driver.

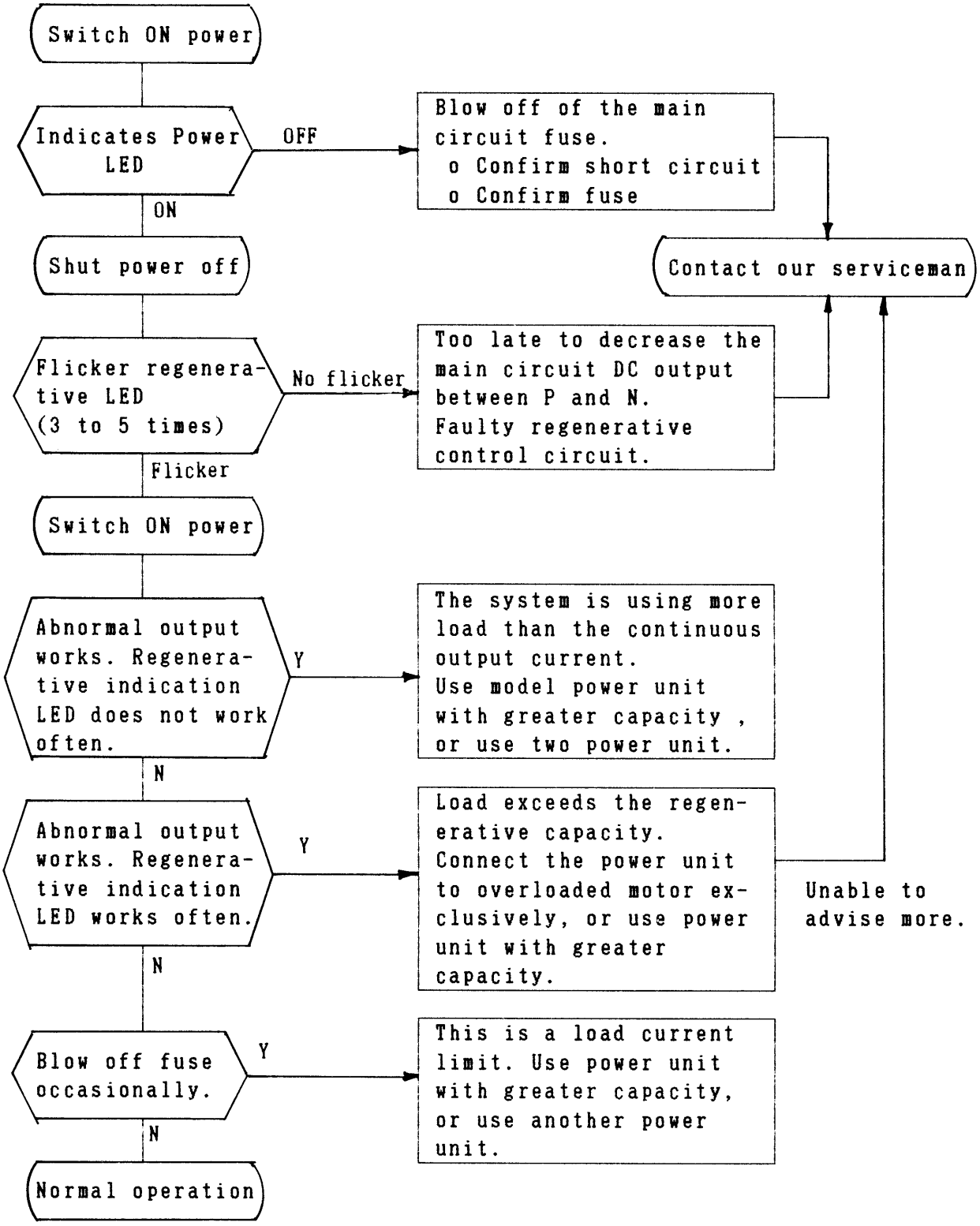
(3) Never touch terminals of the unit within one minute after shutting off AC main power as voltage remains through inner circuit.

(4) Never switch ON/OFF AC main power repeatedly.
At shortest, turn power on one minute after last power switch-off. Otherwise, the break-in current protection resistance will be damaged and a inner fuse blows. And, as a result, it will damage inner parts.

(5) Never operate the unit at less than AC85V supply power source.
Otherwise, an inner break-in current protection relay will not function. And, as a result, the inner temperature fuse will blow.

11. TROUBLESHOOTING

While in operation, if trouble occurs, confirm causes and execute remedies referring to the following troubleshooting guide:



12. SPECIFICATION

12.1 General specification

Ambient operating temperature	0 ± 55℃
Ambient operating humidity	35～90% RH(without dew condensation)
Ambient stock temperature	-10～70℃
Operating atmosphere	Without corrosive gases
Structure	Inside of a box installation type (IP-30)
Insulation resistance	Between outer terminal and the case, 5MΩ or more (at 500V mega.)
Voltage proof	Between the outer terminal and the case, AC1500V 50/60Hz, one minute
Vibration proof	JIS C0911 item B3 (30 minutes 16.7Hz, vibration range=3mm, each X,Y,Z direction)
Shock proof	JIS C0912 or equivalent (10G, each 3 time at X,Y,Z directions)

12.2 Capacity specification

Item	R88S-S107	R88S-S110
Input power voltage	Single phase AC100V 50/60Hz	
Allowable range of input voltage	AC85V～110V(in case of 60Hz, AC85～121V)	
Required input power capacity	1.5KVA	2KVA
Continuous output current	7A	10A
Instantaneous max. output current	400A^{2}t(17A·sec)	600A^{2}t(20A·sec)
Total capacity of applicable motor wattage	600W	800W
Continuous regenerative absorption power	20W	30W
Max. input current	AC14A(RMS)	AC20A(RMS)
Break-in current	100A(peak)	100A(peak)
Fuse capacity	15A	20A
Weight	2.3kg	2.7kg
Protection function	1. protection against short between output terminals, overload protection with fuse. 2. Protection against overload with a thermal at the radiation fin. (85℃ ± 5℃)	
Abnormal output	Open contact at abnormal condition contact capacity = AC120V-5A,DC24V-2A	

12.3 Model designation