



MITSUBISHI

POWER REGENERATION CONVERTER

FR-RC

– INSTRUCTION MANUAL –

Thank you for choosing the Mitsubishi Transistorized inverter option unit.

This instruction manual gives handling information and precautions for use of this equipment.

Incorrect handling might cause an unexpected fault. Before using the inverter, please read this manual carefully to use the equipment to its optimum.

Please forward this manual to the end user.

This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect the inverter until you have read through this instruction manual and appended documents carefully and can use the equipment correctly.

Do not use the inverter until you have a full knowledge of the equipment, safety information and instructions.

In this manual, the safety instruction levels are classified into "WARNING" and "CAUTION".



Assumes that incorrect handling may cause hazardous conditions, resulting in death or severe injury.



Assumes that incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause physical damage only.

Note that even the CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety.

SAFETY INSTRUCTIONS

1. Electric Shock Prevention

 **WARNING**

- While power is on or when the inverter is running, do not open the front cover. You may get an electric shock.
- Do not run the inverter option with the front cover removed. Otherwise, you may access the exposed high-voltage terminals or the charging part of the circuitry and get an electric shock.
- Before starting wiring or inspection, switch power off, wait for more than 10 minutes, and check for residual voltage with a meter (refer to chapter 4 for further details) etc.
- Earth the 200V class regenerative converter unit in a class D or higher protective grounding method, and the 400V class in a class C or higher method.
- Any person who is involved in the wiring or inspection of this equipment should be fully competent to do the work.
- Always install the inverter option before wiring. Otherwise, you may get an electric shock or be injured.
- Operate the switches and potentiometers with dry hands to prevent an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise, you may get an electric shock.

2. Fire Prevention

 **CAUTION**

- Mount the regenerative converter unit to incombustible material. Mounting it directly to or near combustible material can cause a fire.
- Do not connect a resistor directly to the DC terminals P/+, N/-. This could cause a fire.

3. Injury Prevention

 **CAUTION**

- Apply only the voltage specified in the instruction manual to each terminal to prevent damage etc.
- Ensure that the cables are connected to the correct terminals. Otherwise, damage etc. may occur.
- Always make sure that polarity is correct to prevent damage etc.
- While power is on or for some time after power-off, do not touch the power regeneration converter as it is hot. Doing so can cause you to get burnt.

4. Additional instructions

Also note the following points to prevent an accidental failure, injury, electric shock, etc.

(1) Transportation and installation

 **CAUTION**

- When carrying products, use correct lifting gear to prevent injury.
- Do not stack the inverter boxes higher than the number recommended.
- Ensure that installation position and material can withstand the weight of the inverter option. Install according to the information in the Instruction Manual.
- Do not install or operate the regenerative converter unit if it is damaged or any of its parts are missing.
- Do not hold the inverter option by the front cover or operation panel; it may fall off.
- Do not stand or rest heavy objects on the inverter option.
- Check the inverter option mounting orientation is correct.
- Prevent screws, wire fragments or other conductive bodies or oil or other flammable substance from entering the regenerative converter unit.
- The regenerative converter unit is precision equipment. Do not drop it or subject it to impact.
- Use the inverter option under the following environmental conditions:

Environment	Ambient temperature	-10°C to +50°C (non-freezing)
	Ambient humidity	90%RH or less (non-condensing)
	Storage temperature	-20°C to +65°C *
	Ambience	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)
	Altitude, vibration	Maximum 1000m above sea level for standard operation. After that derate by 3% for every extra 500m up to 2500m (91%). 5.9m/s ² or less (conforming to JIS C 0040)

*Temperatures applicable for a short time, e.g. in transit.

(2) Operation

WARNING

- Do not modify the equipment.

(3) Maintenance, inspection and parts replacement

CAUTION

- Do not perform a megger test (insulation resistance measurement) on the control circuit of the regenerative converter unit.

(4) Disposing of the inverter option

CAUTION

- Treat as industrial waste.

(5) General instructions

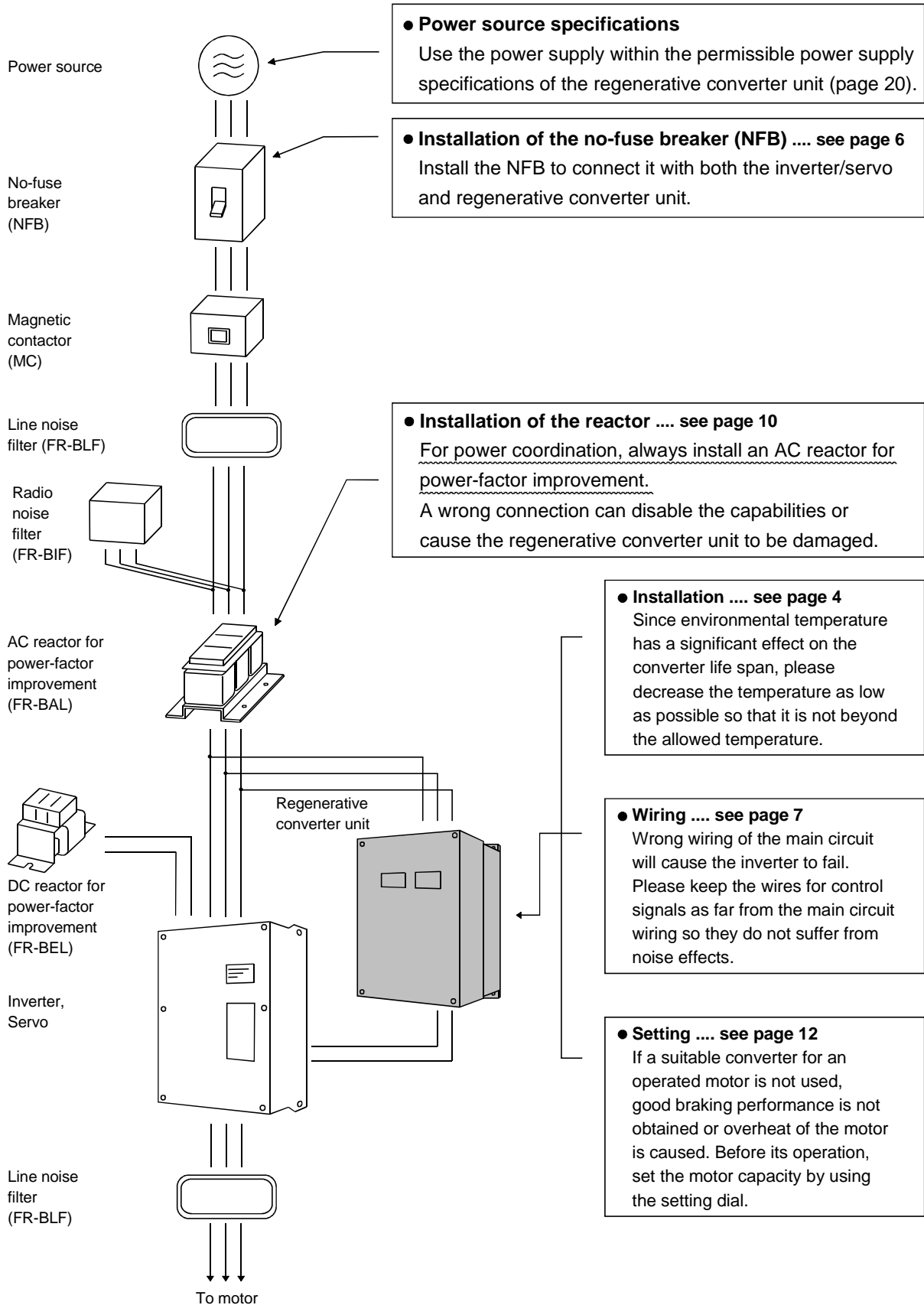
Many of the diagrams and drawings in this instruction manual show the inverter option without a cover, or partially open. Never operate the inverter option like this. Always replace the cover and follow this instruction manual when operating the inverter option.

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EXPLANATION OF HANDLING

Incorrect handling might cause the inverter option to operate improperly, its life to be reduced considerably, or at the worst, the inverter option to be damaged. Handle the inverter option properly in accordance with the information in each section as well as the precautions and instructions of this manual to use it correctly.



1. Construction

1-1 External view and name of each part

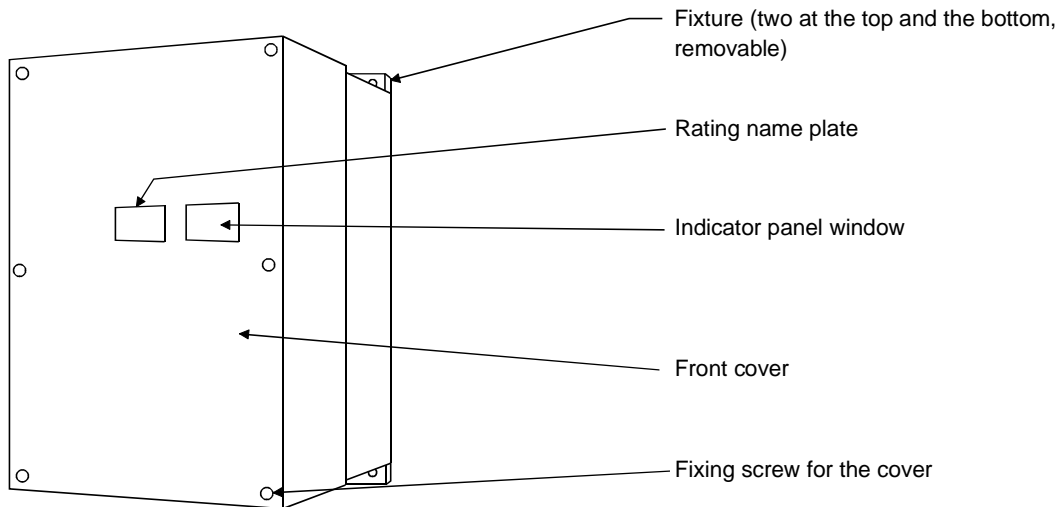
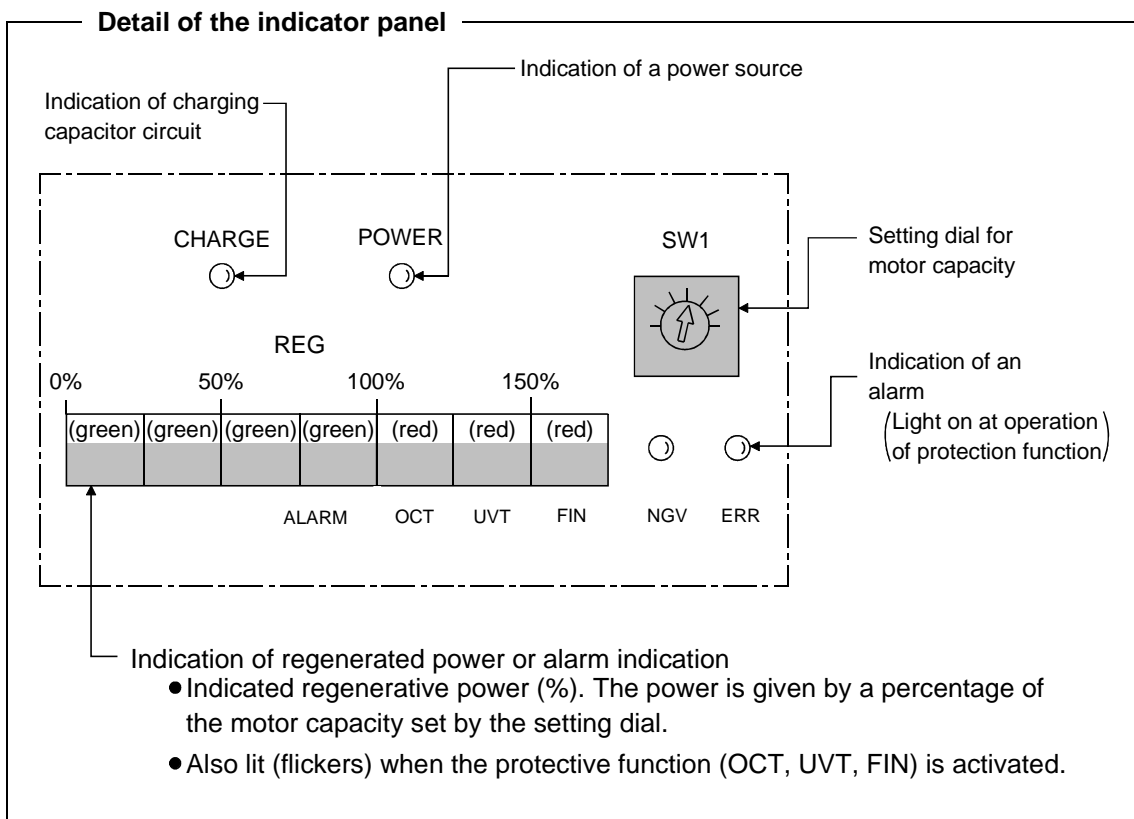


Fig. 1 External view of the converter

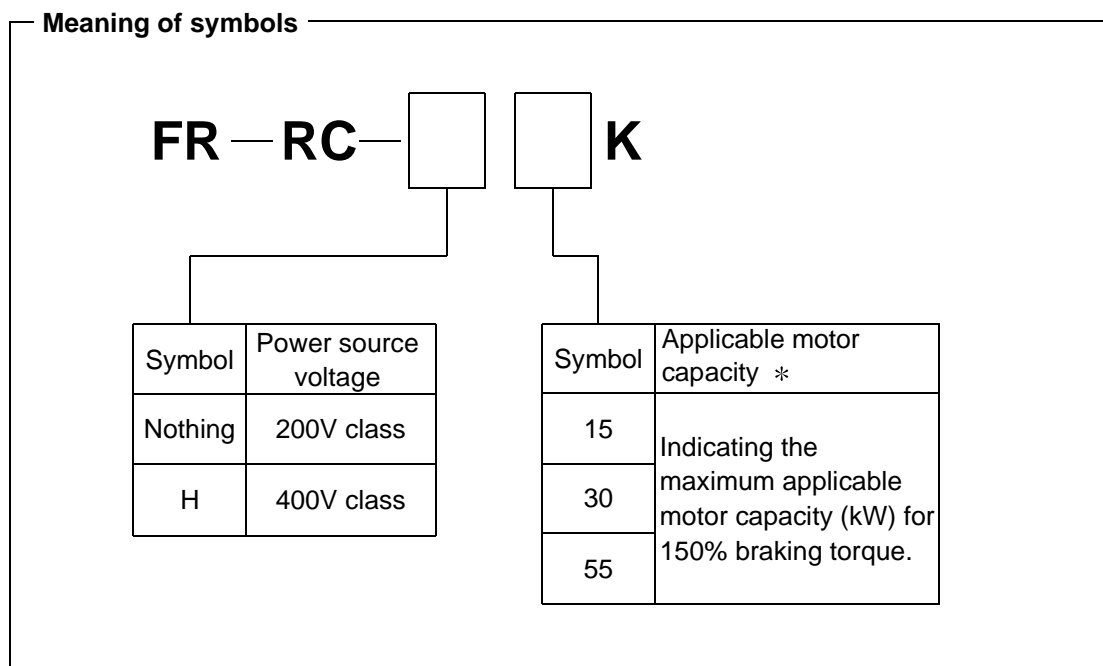


2. Unpacking

After unpacking, please make sure of the following.

- (1) Check the rating plate on the power regeneration converter to make sure that this converter is the type you ordered.
- (2) Please make sure that there is no damage due to the transportation.

If you have any questions or the converter has a damage, please contact to either the purchasing shop, our company branch or the nearest Mitsubishi sales representative.



* Applicable motor capacity depends on the braking capacity and %ED. (see page 21)

3. Installation

3-1 Transportation

Since the power regeneration converter generates heat, leave adequate clearances around it to dissipate heat.

3-2 Installation place

(1) Do not install the converter in the following places:

A place directly exposed to the sunlight. A hot and humid place. A place where oil mist, cotton dust, and dust are floating. A place sprinkled with water, oil, and polishing liquid.

A place sprinkled with iron powder. A place exposed to a corrosive gas. A place exposed to inflammable gas. A place where vibration is applied.

(2) When the power regeneration converter is contained in an enclosed box, make sure that generation of its own heat is fully considered to determine the cooling system and box dimensions.

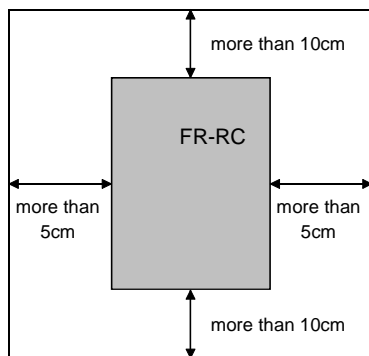
It is very important to check that not only the ambient temperature of the power regeneration converter but also that of the inverter contained together in the same box fall within their permissible ranges.

(3) When the unit is used in a containing box for continuous regenerative operation, it is recommended to install it in the method given in Section 3-4.

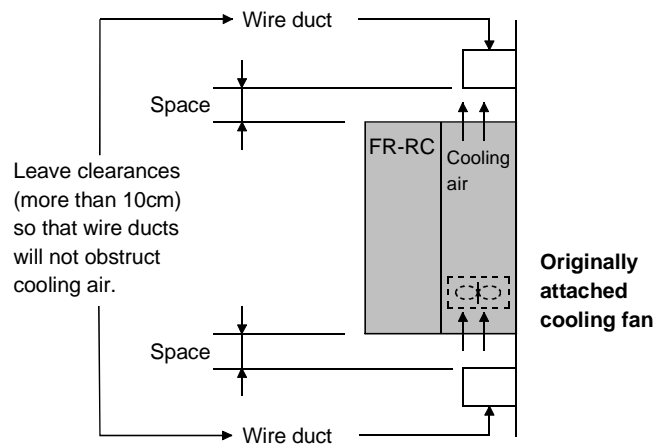
3-3 Installation direction and spacing

(1) Vertically attach the converter on a flat base without any step so that the letter "FR-RC" on the name plate is visible from the front and tightly fix it by bolts.

(2) Since the power regeneration converter generates heat, leave sufficient space around it to dissipate heat.

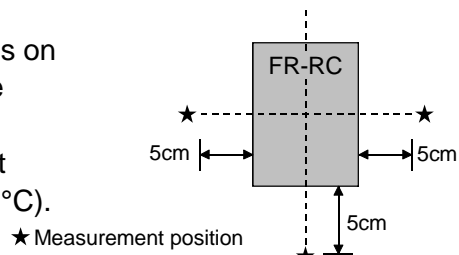


Room for the converter



Suggestion of environmental temperature

The life span of the converter greatly depends on the environmental temperature. Please make sure that the temperature at the positions indicated in the figure at the right side are not beyond the allowed ambient temperature (50°C).



3-4 When the heat sink is placed outside the containing box

The power regeneration converter generates more heat in applications where a regenerative status lasts long, e.g. winding or long-time, negative-torque lifting operation.

If the unit is used in a containing box to perform such operation, the temperature in the box will rise significantly. To prevent this, it is recommended to place the heat sink of the power regeneration converter outside the box as shown in Fig. 3.

The FR-RC power regeneration converter is compatible with this mounting method by changing the setting position of its fixtures.

- Preparation
- Panel cutout of the enclosure.....see page 19 for size of the hole
 - Changing position of fixtures (two for upper and lower sides) see Fig. 4

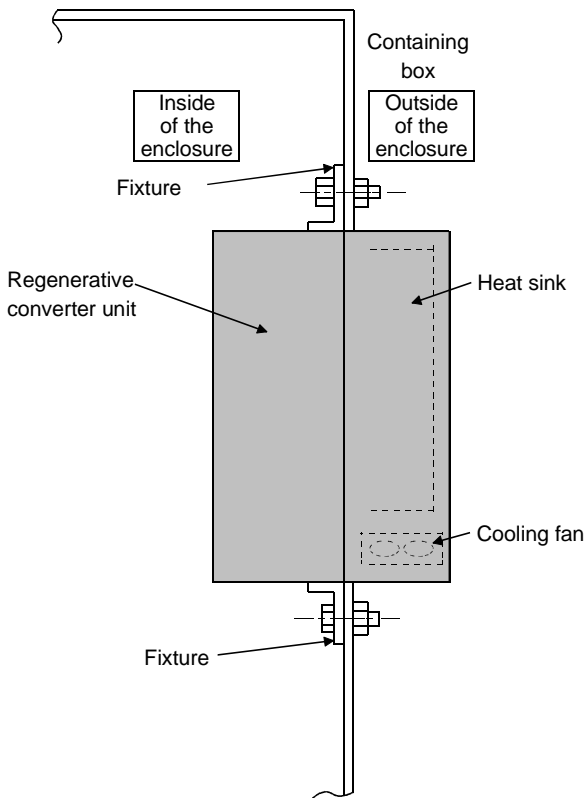


Fig. 3 Fixing method of heat sink outside the enclosure

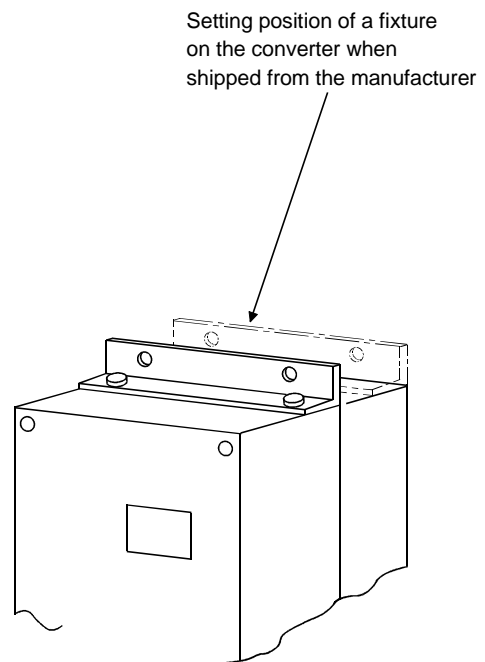
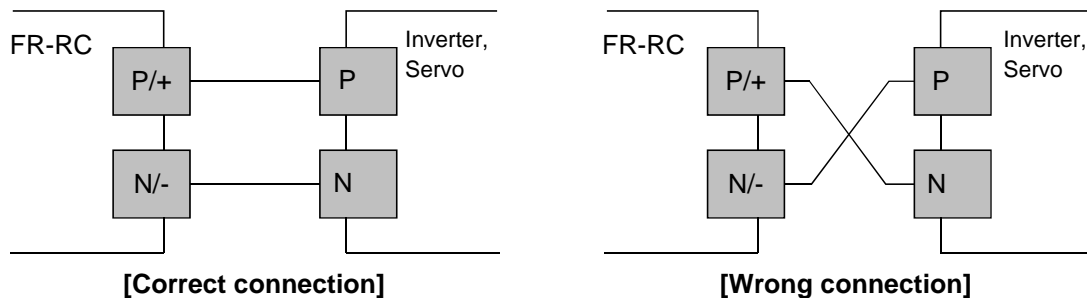


Fig. 4 Exchange of fixtures

4. Wiring

• Suggestions for wiring

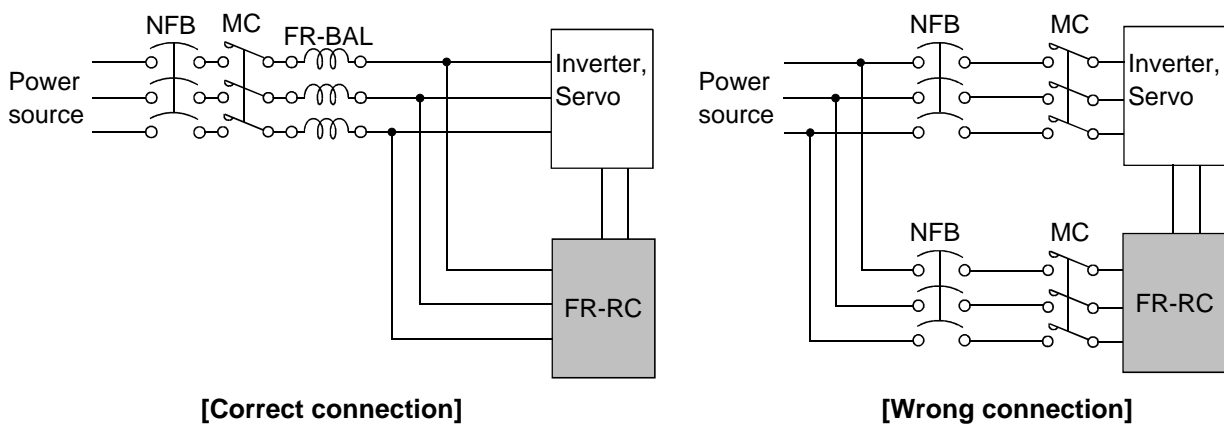
- (1) Connect the terminals P/+ and N/- with the inverter/servo terminals P and N correctly. If the connection is wrong, the power regeneration converter will display an alarm and will not operate properly.



- (2) Always connect the FR-BAL AC reactor for power-factor improvement on the power source side of the inverter. (see page 7)
- (3) The wiring distance from the inverter/servo terminals P and N should be within 5m.
Please use the wire of which the cross section is larger than the recommended one (see page 21).
- (4) The controlling circuit terminals common 5, SD, and SE are insulated between each other. Do not ground them.
- (5) A shielded wire or a twisted wire must be used for the connecting wire to the controlling circuit. It must be away from the main circuit (High voltage circuit, 200V sequence circuit etc.).
- (6) Pay attention not to fall cutting pieces of the wires into inside of the converter during work of wiring.
Please work covering the ventilating hole of the converter.
- (7) Securely ground using the grounding terminal.

• Check list for design of wiring

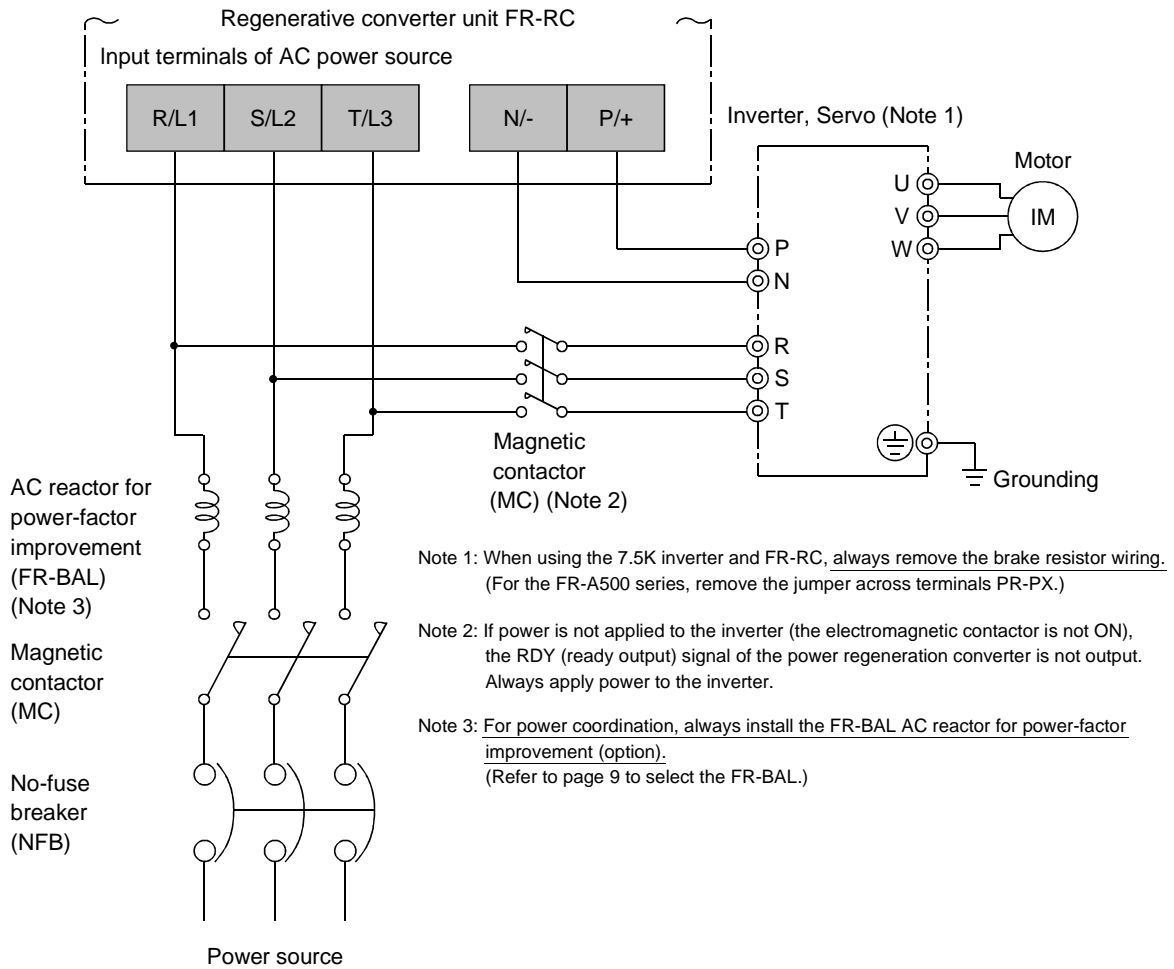
- (1) Install the NFB and MC so that the power regeneration converter and the inverter or servo may be powered on/off at the same time.



- (2) Do not apply a voltage to the RES terminal of the controlling circuit.
- (3) Do not apply a voltage to the alarm output terminals A, B, and C without a load (relay coil, lamp etc.).
- (4) Since the input signals to the control circuit are on a low level, use two parallel micro signal contacts or a twin contact for contact inputs to prevent a contact fault.

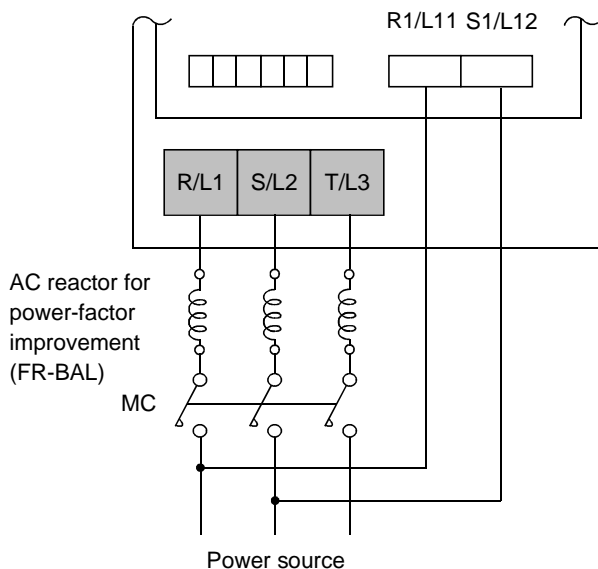
4-1 Main circuit

(1) Connection of the power source and the inverter or servo



(2) In the case where the controlling circuit is connected to another power source

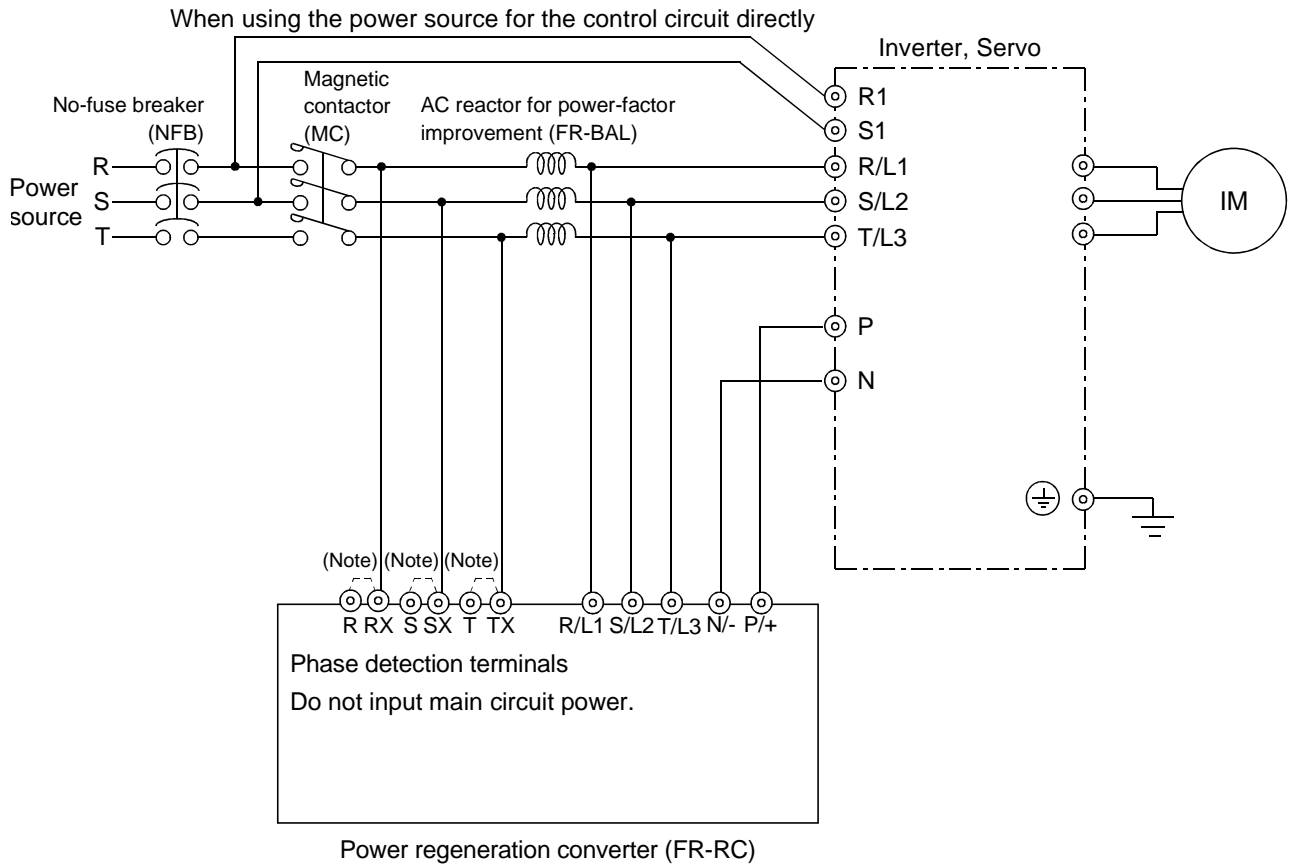
When a protection circuit operates and the MC of the power source is switched off, power is not supplied to the controlling circuit. So, an alarm signal (relay) and an alarm indication cannot be maintained. If their maintenance is required, please provide another power source or connect the controlling circuit input R1/L11-S1/L12 to the primary side of the MC.



(3) To prevent overcurrent due to distortion

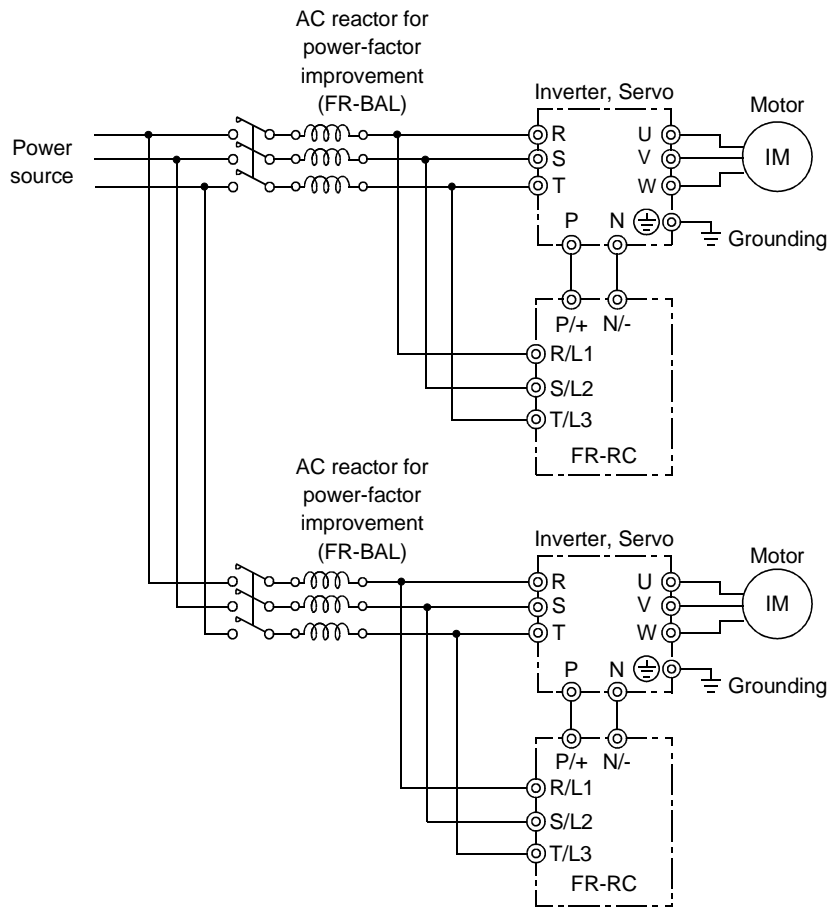
If a current of about 180% of the rated current flows in the power regeneration converter, the distortion of the voltage waveform may increase, activating the overcurrent protection (OCT).

Remove the jumpers across the phase detection terminals R-RX, S-SX, T-TX of the power regeneration converter, and wire the phase detection terminals RX, SX, TX to the primary side (power supply line) of the power factor improving reactor (FR-BAL). Keep the phase detection terminals R, S, T open.

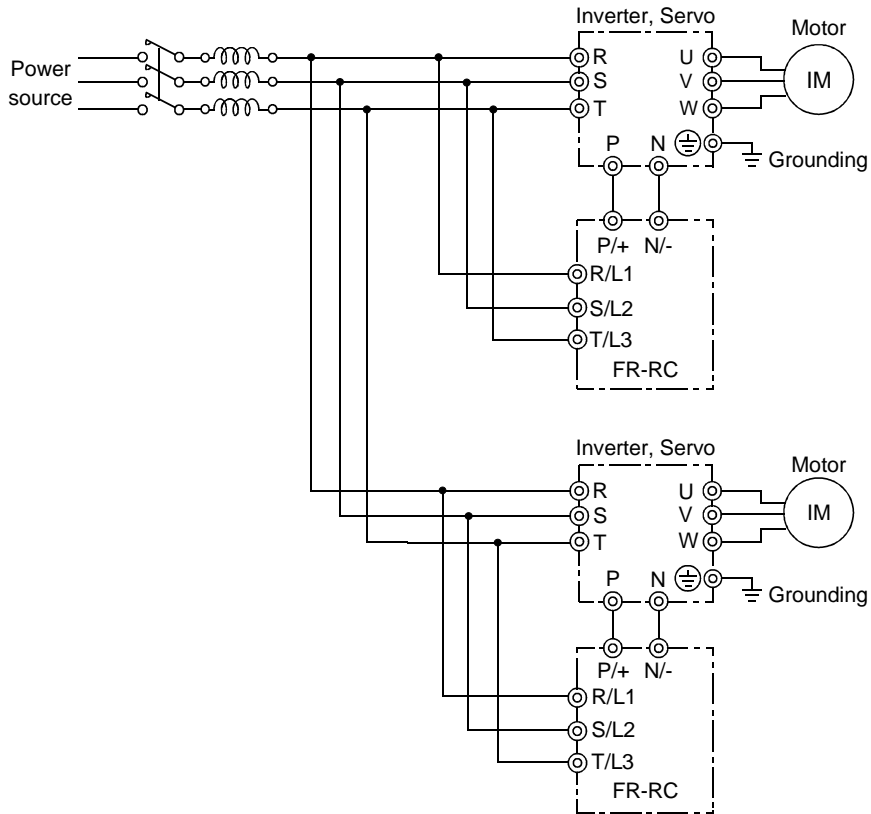


Note: When not using the phase detection terminals, fit jumpers across R-RX, S-SX, T-TX. The FR-RC will not operate if the jumpers are removed.

(4) Connecting multiple units in parallel



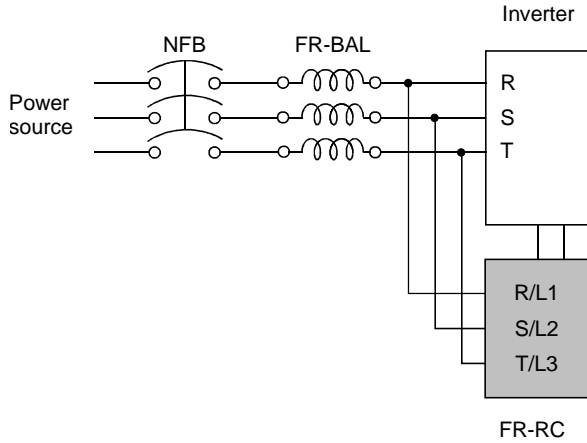
[Correct connection]



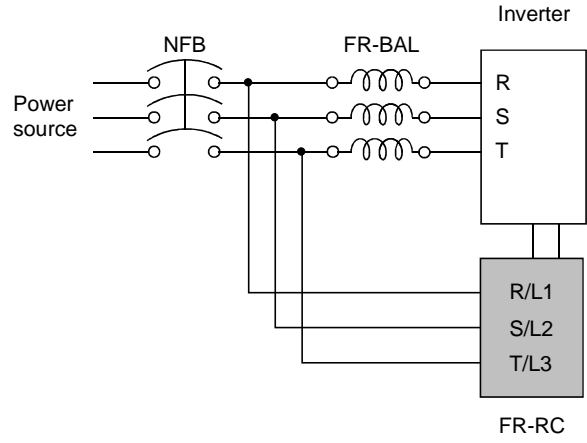
[Wrong connection]

**(5) In the case of connecting an AC reactor for power-factor improvement (FR-BAL (option))
(The FR-BAL must be connected for power coordination.)**

When using the power regeneration converter, always install the power factor improving AC reactor (FR-BAL) for power coordination. Connect it to both the inverter and power regeneration converter and install it on the power supply side of these units.



[Correct connection]

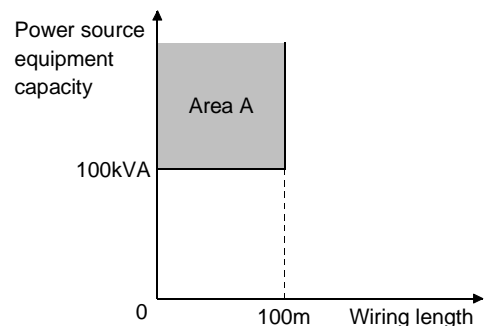


[Wrong connection]

Selection of the reactor for power-factor improvement (FR-BAL)

When applying the AC reactor for power-factor improvement to the power regeneration converter, make selection in accordance with the following selection table. Note that the reactor for area A should be selected if the power source equipment capacity is more than 100kVA and the wiring length is within 100m.

Power regeneration converter type	Applicable AC reactor	
	For other than area A	For area A
FR-RC-15K	FR-BAL-22K	FR-BAL-15K
FR-RC-30K	FR-BAL-37K	FR-BAL-30K
FR-RC-55K	FR-BAL-55K	FR-BAL-55K
FR-RC-H15K	FR-BAL-H22K	FR-BAL-H15K
FR-RC-H30K	FR-BAL-H37K	FR-BAL-H37K
FR-RC-H55K	FR-BAL-H55K	FR-BAL-H55K

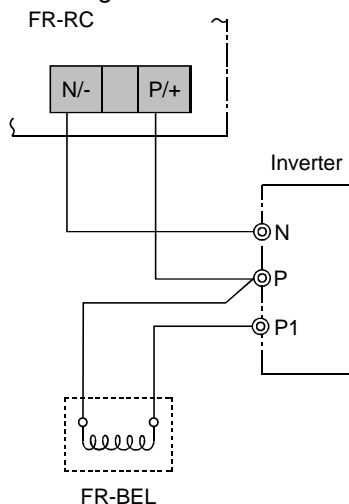


Stipulation chart by power source equipment capacity vs. wiring length

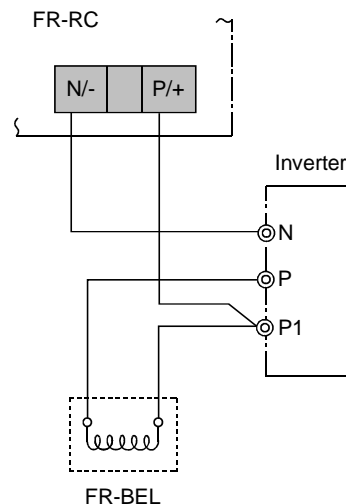
When using the power regeneration converter, select the AC reactor for power-factor improvement to meet the capacity of the power regeneration converter. (It does not depend on the inverter capacity, motor capacity and the number of units operated in parallel.)

(6) In the case of connecting a DC reactor for power-factor improvement FR-BEL (option)

Always connect the power regeneration converter terminal P/+ to the inverter terminal P.



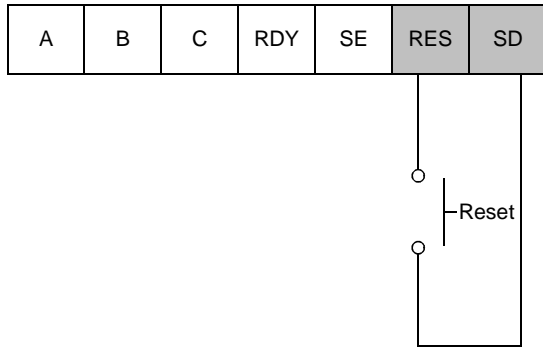
[Correct connection]



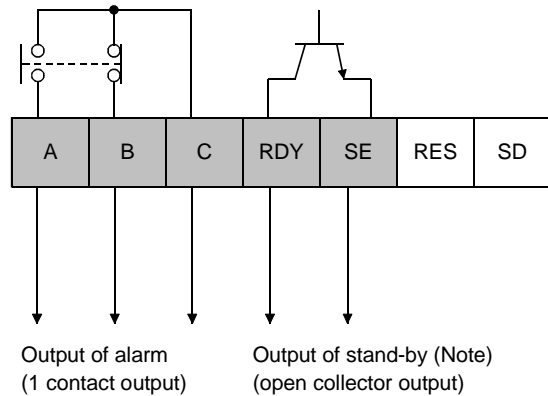
[Wrong connection]

4-2 Control circuit

(1) Input signal



(2) Output signal



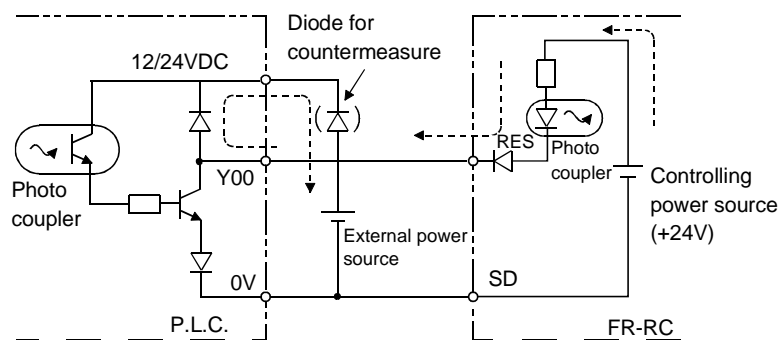
Note: When the voltages across P-N of the inverter and power regeneration converter are both equal to or more than the specified value, the output of the stand-by signal causes the open collector output transistor to turn ON (conduct) 1 second after the condition has held.

Suggestions for connecting the converter to a PLC

When the converter FR-RC is connected to a P.L.C.'s output unit (open collector output) and the controlling power voltage inside the FR-RC is higher than the external power voltage of the P.L.C., a current flows in the FR-RC as a command signal even if a transistor is not turned on as shown by a dotted line in the figure below.

● Countermeasures

- (1) Insert a diode for prevention of the reverse current.
- (2) Use independent type of output units for all terminals. (Example AY40A, etc.)
- (3) Make the external power source higher than the regenerative converter unit control power source.



5. Operation

5-1 Inspection before operation

After finishing the installation and the wiring, please inspect the following items before switching the power source on.

- (1) Mistakes in wiring. Especially, connection of the main circuit terminals P/+ and N/-.
- (2) A short circuit made by the cutting pieces of wire etc.
- (3) Loosening of a terminal screw.

☞ Insulation resistance test.

- Do not carry out a insulation resistance test of the power source power regeneration converter. (see P.14)

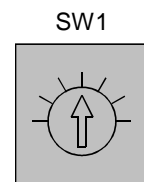
5-2 Setting before operation

Do not forget to adjust the setting dial of the motor capacity on the printed circuit board to the capacity of the motor to be operated.

If the adjustment is not correct, the rated ability of the regenerative is not obtained or overheat of the motor is caused.

Table 1 Dial figure and motor capacity

Type		Dial figure to set motor capacity					
		1	2	3	4	5	6
200V	FR-RC-15K	7.5kW	11kW	⊙15kW	18.5kW	22kW	—
	FR-RC-30K	15kW	18.5kW	22kW	⊙30kW	37kW	45kW
	FR-RC-55K	30kW	37kW	45kW	⊙55kW	—	—
400V	FR-RC-H15K	7.5kW	11kW	⊙15kW	18.5kW	22kW	—
	FR-RC-H30K	15kW	18.5kW	22kW	⊙30kW	37kW	45kW
	FR-RC-H55K	30kW	37kW	45kW	⊙55kW	—	—

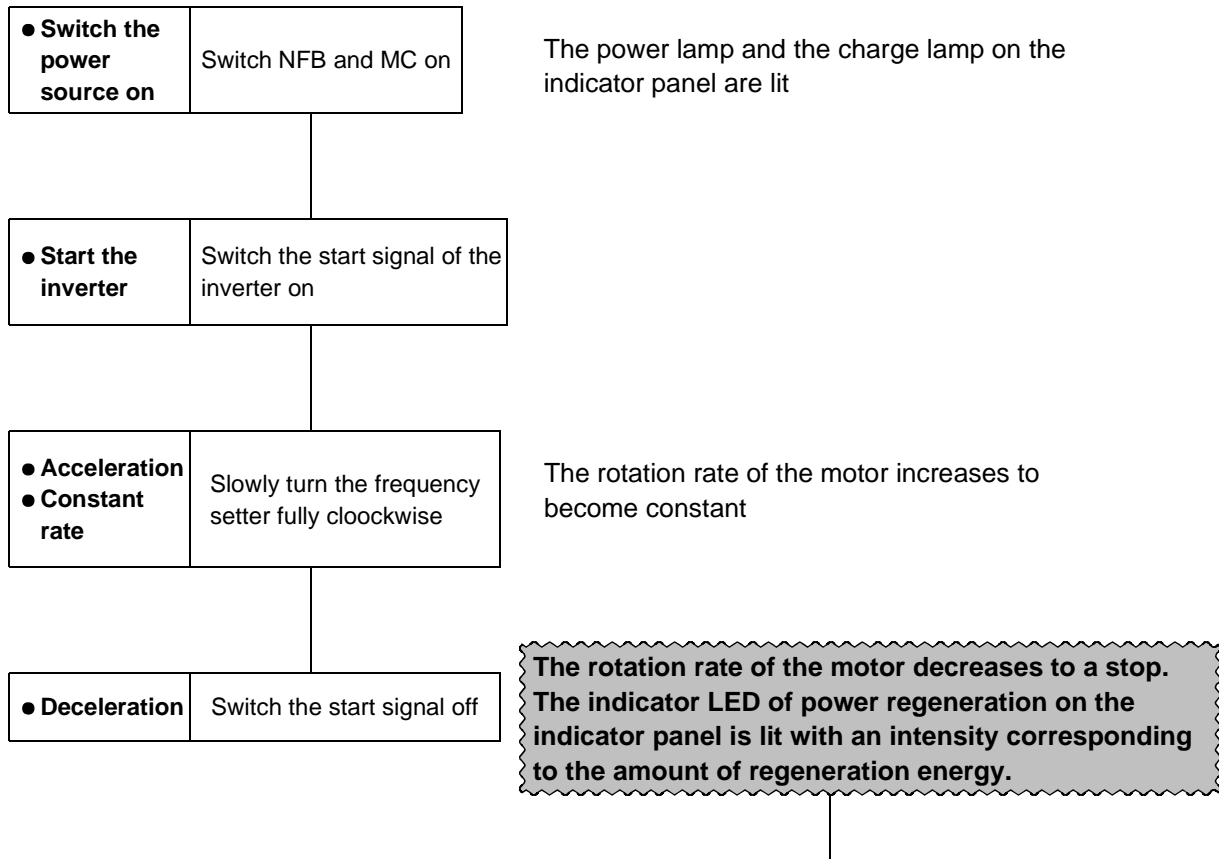


Setting dial for motor capacity

Note: The value marked by a double circle indicates the capacity set at the time of shipping.

5-3 Example of operation <In the case where acceleration and constant speed operation are driving mode and deceleration operation is regeneration mode>

- Preparation
- The start signal of the inverter is turned off.
 - The frequency (rate) command signal of the inverter is adjusted to zero. If a potentiometer is used, turn it fully to counterclockwise.



☞ Check point

- Lighting of the indicator LED of the power regeneration unit When the LED is not lit although the deceleration operation is made normally, check if setting of the motor section switch is too large. It is natural that the LED is not lit when the regenerated power is small.*
- The power regeneration indicator beyond 150% When this condition is continued for a long time, the converter may trip due to over-work.
- Lighting of alarm indicator LED Investigate the cause referring to the information on the protection functions.

Note: *1. When the regenerated power is less than 12.5% of the setting motor capacity (see Table 1, page 12), the power regeneration indicator LED is not lit.
 2. When the power regeneration converter has operated, the built-in reactor may beep but this is not a fault.

6. Maintenance and Inspection

The power regeneration converter is static equipment consisting mainly of semiconductor devices. Sufficient maintenance and inspection must be done to prevent trouble caused by environmental effects, aging and endurance life of the components.

6-1 Suggestions for maintenance and inspection

After the power source has been switched off, electrolytic capacitors in the converter are charged by a high voltage for a while. The inspection must be done after the change lamp on the indicator panel has been off and it has been assured by use of a voltmeter or another instrument that a DC voltage between the terminals P/+ and N/- is less than DC30V.

6-2 Inspection items

(1) Daily inspection

Please check for the following points during operation of the converter.

- Demonstration of the expected controlling ability
- Generation of abnormal vibration or sound
- Overheat or discoloration
- Cleaning of a filter or ventilator of the enclosure
- Trouble with the environment surrounding the installation place

(2) Periodic inspection

Please check the components which can be inspected only after stopping the converter and are required to be inspected periodically.

- Tightening of the fixing bolts again
- Corrosion and failure of conductors and insulators
- Checking and exchanging cooling fan, smoothing capacitor, and relay
- Trouble with the cooling system

(3) How to perform the insulation resistance test

- When making an insulation resistance test on the power source system, remove the connection cables to the power regeneration converter so that the test voltage is not applied.
- Perform an insulation resistance test on the power regeneration converter itself with the main circuit terminal block shorted as shown in Fig. 5. Note that the insulation resistance test should not be done on the control circuit.

Note: For the conduction test of the controlling circuit, please use a tester (meter) (for low and high ranges), not the insulation resistance tester nor a buzzer.

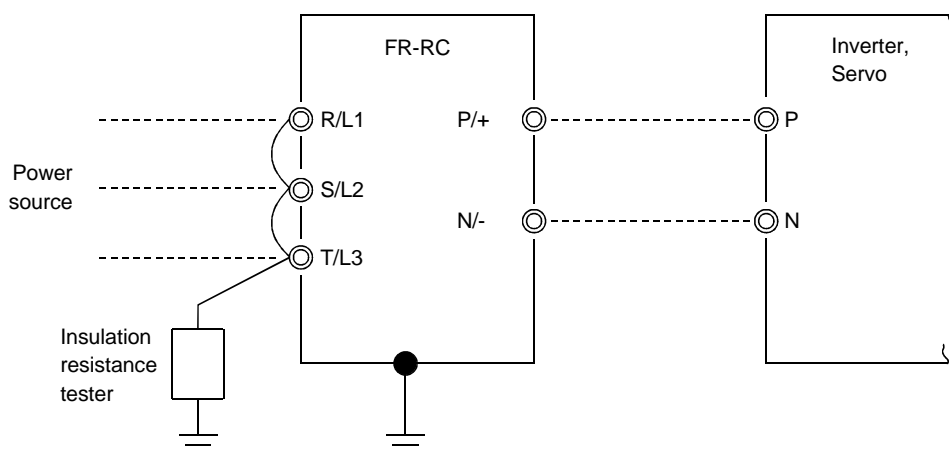


Fig. 5 Outline of a megger test

7. Problems and countermeasures

When a problem unfortunately occurs and the function of the converter is lost, please make its cause clear to take the countermeasures referring to the inspection items describes below.

7-1 Inspection according to the alarm indicator

Indicator LED	Protection function	Cause of the problem	Check point	Procedures
UVT	Insufficient voltage	Drop of power voltage	Has a large capacity of motor been started?	Check the power capacity and the power system.
OCT	Overcurrent	Excess regenerated current	<ul style="list-style-type: none"> • Steep change of the load? • Short-circuit and open phase at the power source side? • Check for power distortion 	Suppress the fluctuation of the load and check the wiring of the power (see P.8).
FIN	Overheat of heat sink	Overheat of cooling fin	Has the cooling fan stopped? Has there been an increase in environmental temperature?	Exchange cooling fan, lower the environmental temperature.
NGV	Reverse connection of P and N	Reverse connection of the inverter terminals P and N	Reverse connection of terminals P/+ and N- to N and P, respectively?	Connect correctly.
ERR	Trouble with control circuit	Trouble generated by the control circuit	Is there a source nearby generating noise?	Investigate the noise source and take the appropriate countermeasures to suppress it.
OCT UVT FIN Lit at the same time	Excess duty	Excessive regenerative load ratio	Is the power regeneration indicator beyond 150% for a long time?	Lower the load, or reconsider the capacity of the converter.
OCT flicker	Overload	Excess regenerated current (Current of more than the specified value flew for a long time)	Check whether the load is too large.	Lower the load, or reconsider the capacity of the converter.

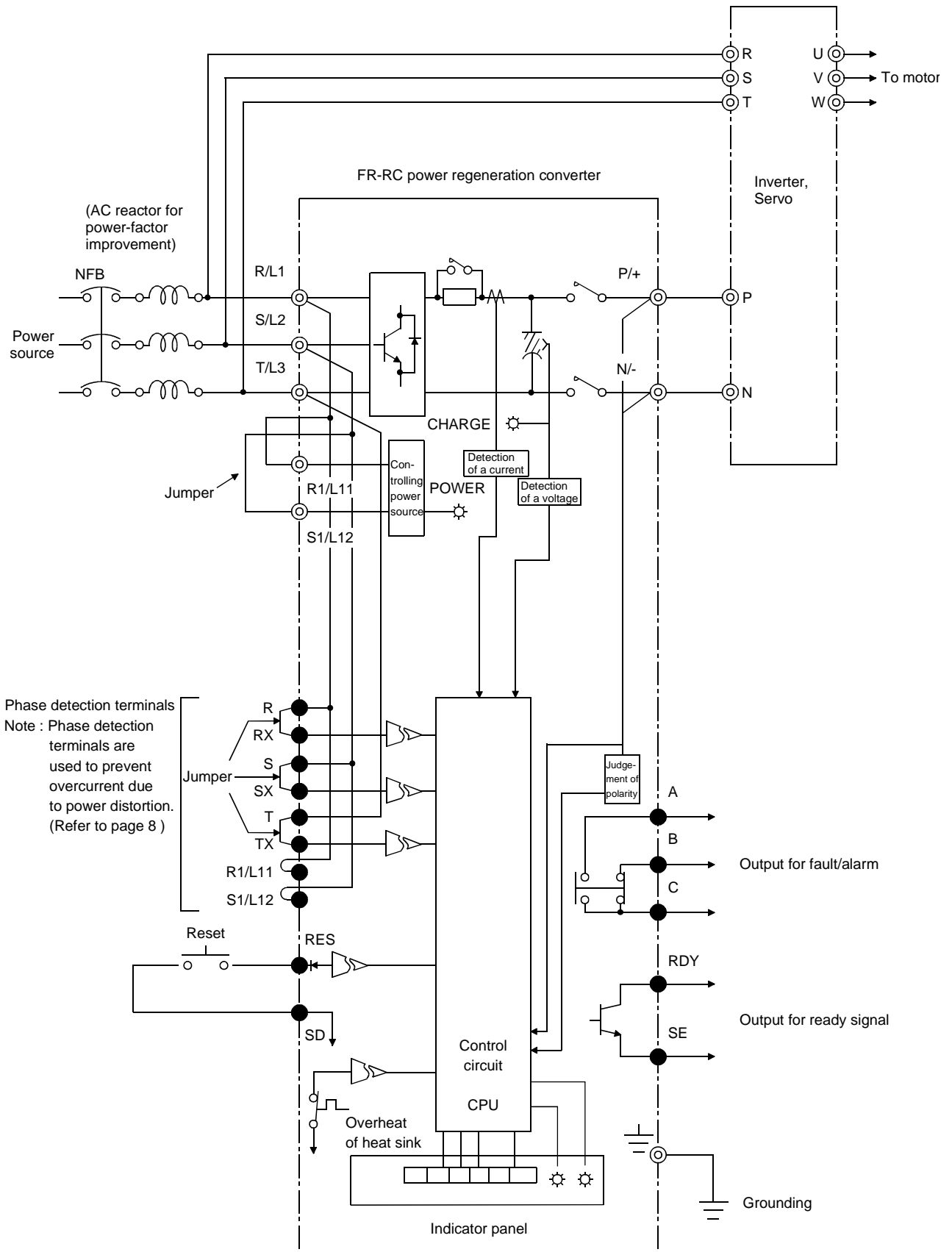
Note: When any of the above alarm indicator LEDs are lit, the power regeneration converter stops operating. Therefore, the "overcurrent", "overvoltage" or other protective function of the inverter may be activated. When the converter is operated again, reset the converter after the problem cause has been investigated and the cause has been removed.

7-2 Problem phenomena and their countermeasures


Check point		Countermeasure
1	Wrong wiring	Wire correctly
2	Setting of a wrong value for the motor capacity	Make sure of the setting value is correct
3	Lighting of the operation lamp for the protection function	Reset the converter after remove the cause of the alarm

8. Specifications

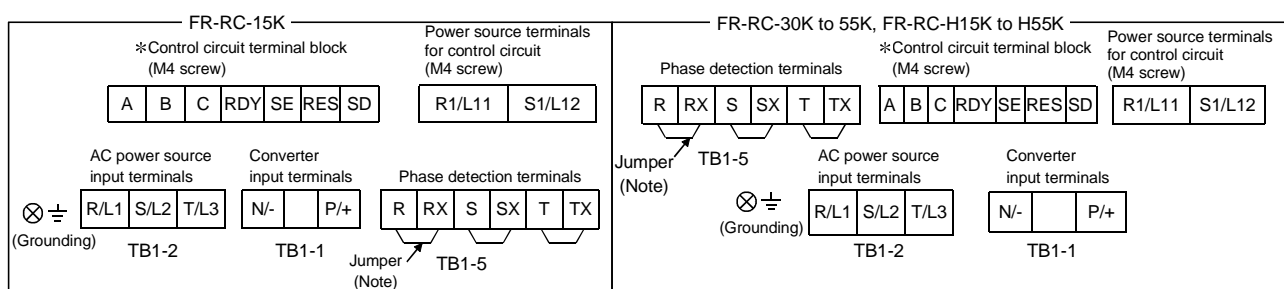
8-1 Block diagram



8-2 Explanation of the terminals

Terminal	Terminal name	Rating	Explanation		
Main circuit	P/+ N/-	Input terminals of the converter	—	Terminals for connection with the inverter or servo terminals P, N.	
	R/L1 S/L2 T/L3	Input terminals for AC power			
	R1/L11 S1/L12	Power source terminals for control circuit	3-phase ● 200V class 200V 50Hz 200 to 230V 60Hz ● 400V class (Note) 400V 50Hz 400 to 460V 60Hz	Terminals for connection of the same input power source as that of the inverter or servo. Connected to the power source terminals R/L1 and S/L2 by a short-circuit plate. When lighting of the trouble indicator lamp is desired, please remove the plate to connect an external power source (see page 7, page 8)	
		Grounding			—
	Control circuit	RES	Input terminal for resetting	Input resistance 4.7kΩ, during shorting between RES and SD 4 to 6mA DC	The remained operation condition of the protection circuit can be released by shorting a circuit between RES and SD for longer than 0.1s
		SD	Common terminal of RES		
A B C		Fault/alarm output terminals	1 contact 230V AC 0.3A 30V DC 0.3A	Output indicating the operation Normal: closed between B and C, open between A and C Fault : open between B and C, closed between A and C	
RDY		Output signal for ready	Open collector output Allowable load 24V DC 0.1A	Output signal indicating that the power regeneration converter is ready to operate. Switched Low when the unit is ready.	
SE		Common terminal of RDY			
R RX S SX T TX		Power phase detection terminals	—	Terminals used to prevent overcurrent due to distortion (refer to page 8) Recommended wire size: 1.25mm ² to 2mm ²	

8-3 Layout of terminals



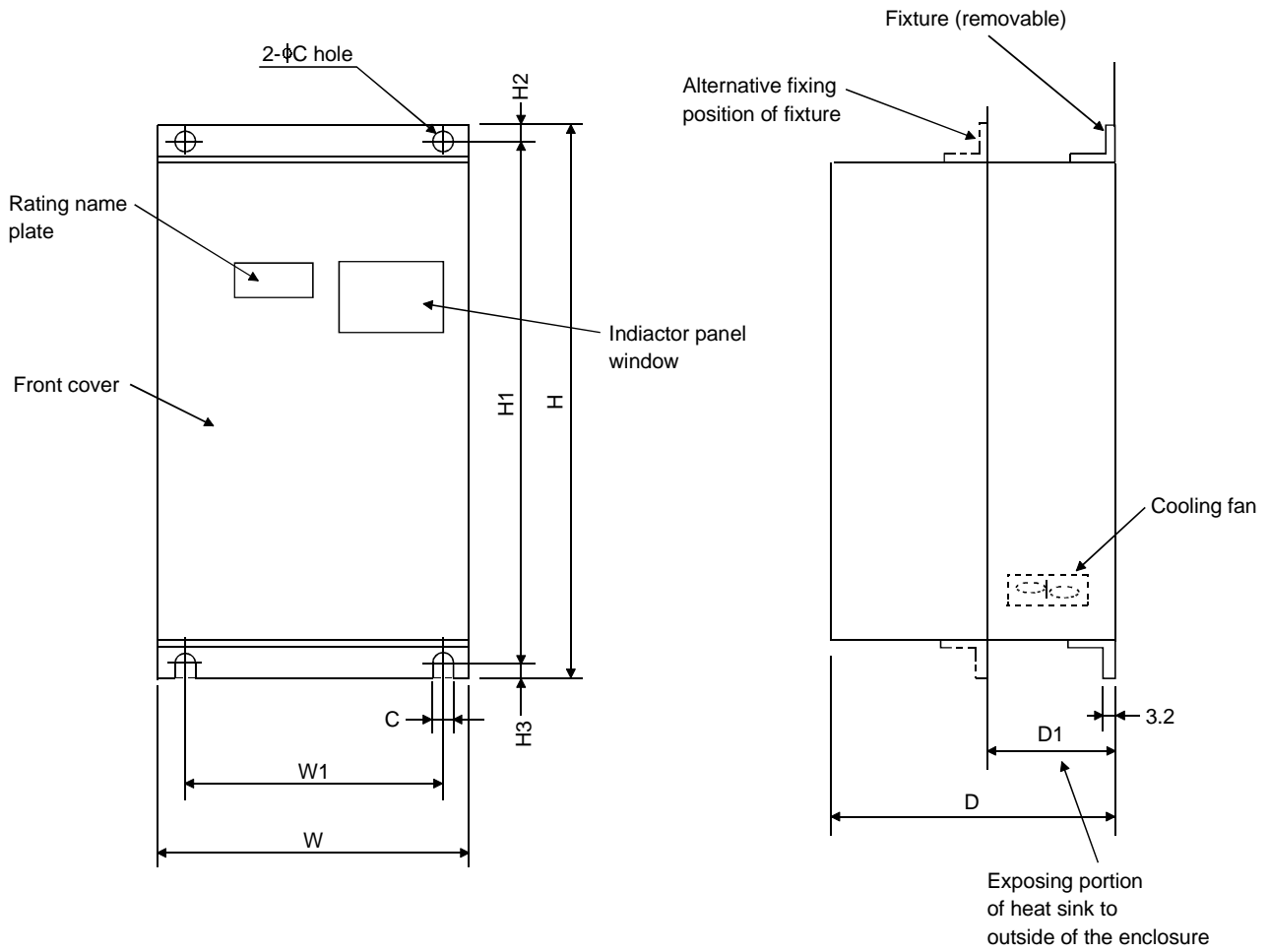
Note: Do not remove the jumpers for other than prevention of overcurrent due to power distortion.

Terminal screw size

Type		TB1-1	TB1-2	TB1-5	Grounding terminal
200V	FR-RC-15K	M5	M5	M3.5	M6
	FR-RC-30K	M6	M6	M3.5	M6
	FR-RC-55K	M8	M8	M3.5	M6
400V	FR-RC-H15K	M6	M6	M3.5	M6
	FR-RC-H30K	M6	M6	M3.5	M6
	FR-RC-H55K	M6	M6	M3.5	M6

8-4 Outline dimensions

- Power regeneration converter

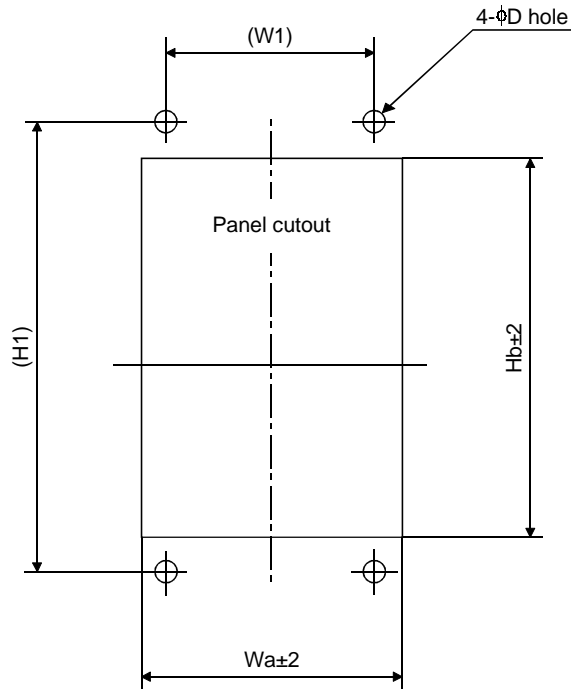


Unit: mm

Type		W	W1	H	H1	H2	H3	D	D1	C	Approximate weight
200V	FR-RC-15K	270	200	450	432	10	8	195	87	10	19kg
	FR-RC-30K	340	270	600	582	10	8	195	90	10	31kg
	FR-RC-55K	480	410	700	670	15	15	250	135	12	55kg
400V	FR-RC-H15K	340	270	600	582	10	8	195	90	10	31kg
	FR-RC-H30K	340	270	600	582	10	8	195	90	10	33kg
	FR-RC-H55K	480	410	700	670	15	15	250	135	12	56kg

● Dimension of panel cutout

When the unit is mounted inside an enclosed containing box, machine the mounting section of the containing box to the dimensions shown below for placement of the heat sink of the power regeneration converter outside the box for the purpose of heat dissipation.



Unit: mm

Type		Wa	Hb	D
200V	FR-RC-15K	260	412	10
	FR-RC-30K	330	562	10
	FR-RC-55K	470	642	12
400V	FR-RC-H15K	330	562	10
	FR-RC-H30K	330	562	10
	FR-RC-H55K	470	642	12

8-5 Standard specifications

Type FR-RC-□	15K	30K	55K	H15K	H30K	H55K
Rated input AC power source (Note 3)	200V class 3 phase 200V 50Hz, 200 to 230V 60Hz			400V class 3 phase 400V 50Hz, 400 to 460V 60Hz		
Allowable fluctuation of AC voltage	180 to 220V 50Hz, 180 to 253V 60Hz			360 to 440V 50Hz, 360 to 506V 60Hz		
Capacity of input power source (kVA) (Note 1)	28	52	100	28	52	100
Rated current (A) (Note 2)	31	63	91	16	31	58
Applicable motor capacity (servo)	Braking torque and %ED depend on the motor capacity applied. See page 21 and 22.					
Braking torque	The torque depends on the applied motor capacity and time rating (short time, continuous). See page 21 and 22 for details.					
%ED	The time rating depends on the applied motor capacity and the braking torque. See page 21 and 22 for details.					
Input and output signals	Input Signal	Resetting signal				
	Output Signal	Signal for standing by (open collector), alarm signal (1 contact)				
Setting function	Setting an usable motor capacity (setting dial)					
Protection function	Insufficient voltage, overcurrent, overheat of fin, reverse connection of P and N, over-duty, control problem					
Indication	Indication of the regenerated power condition by a bar type LED, indication of the alarm content by a LED					
Environment	Environmental temperature	-10 to +50 °C (non-freezing)				
	Environmental humidity	Less than 90% RH (non-condensing)				
	Storage temperature	-20 to +65 °C				
	Atmosphere	Indoors, free from corrosive gas, oil mist, inflammable gas, dust etc.				
	Altitude, vibration	Less than 1000m above sea level, acceleration of less than 5.9 m/s ² (according to JIS C 0040)				
Protection construction (JEM 1030)	Open type (IP00)					
Cooling method	forced-air cooling					

Note 1: The indicated value is the same as the power source capacity of the same capacity of inverter. When the power regeneration converter and the inverter are combined, make preparation so that the power source capacity is larger than this value.

Note 2: Current which flows in the main circuit DC bus (terminals P/+, N/-).

Note 3: The 400V class FR-RC cannot be used with the AC servo.

8-6 Selection of peripheral devices

Used power source voltage and type		Usable motor capacity (kW)	No-fuse breaker (NFB)	Magnetic contactor (MC)	Cable size (AWG) *	
					R/L1, S/L2, T/L3	P/+, N/-
200V	FR-RC-15K	7.5 to 15	225AF 125A	S-N65	5	5
	FR-RC-30K	15 to 30	225AF 225A	S-N125	5	5
	FR-RC-55K	30 to 55	400AF 400A	S-N220	4	4
400V	FR-RC-H15K	7.5 to 15	100AF 60A	S-N25	5	5
	FR-RC-H30K	15 to 30	225AF 125A	S-N65	5	5
	FR-RC-H55K	30 to 55	225AF 200A	S-N100	5	5

- * • Use cable of equal or greater cross sectional area than the value indicated above.
 • Set the internal dial according to the motor capacity.

Heat generated by the power regeneration converter (Reference values)

Applicable power source voltage and type		Heat generation (W)
200V	FR-RC-15K	500
	FR-RC-30K	1050
	FR-RC-55K	1850
400V	FR-RC-H15K	500
	FR-RC-H30K	1000
	FR-RC-H55K	1800

Note: Indicates the heat generated at continuous rating (braking torque 75%).

8-7 Selection guide

[Application to an inverter]

- ① Select a power regeneration unit suitable for the motor capacity.
- ② Even if only the inverter capacity is increased by more than one rank, the braking torque and %ED are given as the values indicated in the following table.

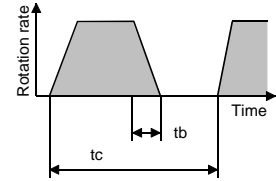
- %ED for 150% braking torque, 30-second short-duration rating

Motor capacity		7.5kW	11kW	15kW	18.5kW	22kW	30kW	37kW	45kW	55kW
Inverter	200V	7.5K	11K	15K	22K	22K	30K	37K	45K	55K
	400V	7.5K	15K	15K	22K	22K	37K	37K	55K	55K
200V	FR-RC-15K	%ED	45	45	25	—	—	—	—	—
	FR-RC-30K	%ED	—	—	45	30	25	25	—	—
	FR-RC-55K	%ED	—	—	—	—	—	45	35	25
400V	FR-RC-H15K	%ED	45	45	25	—	—	—	—	—
	FR-RC-H30K	%ED	—	—	45	45	45	25	—	—
	FR-RC-H55K	%ED	—	—	—	—	—	45	45	45

● Braking torque (%) for 50%ED, short-duration rating

Motor capacity		7.5kW	11kW	15kW	18.5kW	22kW	30kW	37kW	45kW	55kW	
Inverter	200V	7.5K	11K	15K	22K	22K	30K	37K	45K	55K	
	400V	7.5K	15K	15K	22K	22K	37K	37K	55K	55K	
200V	FR-RC-15K	Braking torque (%)	140	140	100	80	70	—	—	—	
	FR-RC-30K		—	—	140	110	100	100	80	70	—
	FR-RC-55K		—	—	—	—	—	140	120	100	100
400V	FR-RC-H15K	Braking torque (%)	140	140	100	80	70	—	—	—	
	FR-RC-H30K		—	—	140	140	140	100	80	70	—
	FR-RC-H55K		—	—	—	—	—	140	140	140	100

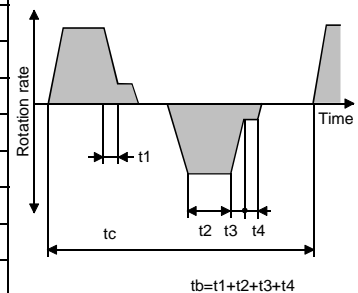
● Example 1 Travelling operation



● Braking torque for continuous rating (%)

Motor capacity		7.5kW	11kW	15kW	18.5kW	22kW	30kW	37kW	45kW	55kW	
Inverter	200V	7.5K	11K	15K	22K	22K	30K	37K	45K	55K	
	400V	7.5K	15K	15K	22K	22K	37K	37K	55K	55K	
200V	FR-RC-15K	Braking torque (%)	100	100	75	55	50	—	—	—	
	FR-RC-30K		—	—	100	80	75	75	55	50	—
	FR-RC-55K		—	—	—	—	—	100	85	75	75
400V	FR-RC-H15K	Braking torque (%)	100	100	75	55	50	—	—	—	
	FR-RC-H30K		—	—	100	100	100	75	55	50	—
	FR-RC-H55K		—	—	—	—	—	100	100	100	75

● Example 2 Lifting operation



Time ratio of power regeneration load %ED = $\frac{tb}{tc} \times 100$
 (Operation frequency)
 $tb < 30s$ (continuous operation time)

[Application to an AC servo]

The power regeneration converter can be used with the MELSERVO-H series 3.5kW (MR-H350□) to 22kW (MR-H22K□) AC servo. Always use the 200V class power regeneration converter with the AC servo. The 400V class power regeneration converter cannot be used.

The following tables indicate the characteristics for combinations of the servo amplifiers and power regeneration converter.

● Braking torque at continuous rating

Servo amplifier type	MR-H350□	MR-H500□	MR-H700□	MR-H111K□	MR-H15K□	MR-H22K□
FR-RC-15K	Braking torque (%)	300	225	150	100	75
FR-RC-30K		—	—	—	200	150
FR-RC-55K		—	—	—	—	—

● Maximum braking torque

Servo amplifier type	MR-H350□	MR-H500□	MR-H700□	MR-H111K□	MR-H15K□	MR-H22K□
FR-RC-15K	Braking torque (%)	300	300	300	200	150
FR-RC-30K		—	—	—	300	300
FR-RC-55K		—	—	—	—	—

REVISIONS

* The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Jul., 1991	IB(NA)-66330-A	First edition
Apr., 2000	IB(NA)-66330-B	<u>Additions</u> SAFETY INSTRUCTIONS <u>Modifications</u> <ul style="list-style-type: none">• Wiring method• Terminal block addition
Mar., 2001	IB(NA)-66330-C	<u>Partial addition</u> <ul style="list-style-type: none">• To prevent overcurrent due to distortion