MITSUBISHI ELECTRIC

Changes for the Better

for a greener tomorrow eco Changes

HIGH POWER FACTOR CONVERTER

FREQROL-HC2

Compatible with the Harmonic Suppression Guidelines

Effectively suppresses inverter's power supply harmonics.

Renewed FR-HC

HC2

1 Greatly suppressed power supply harmonics

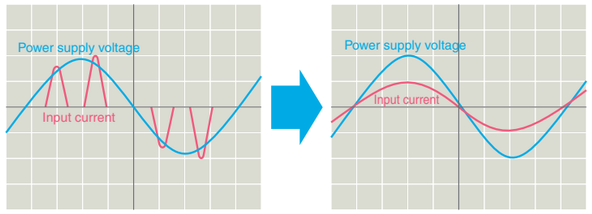
●The HC2 converters, being the self-excitation three-phase bridge circuit under "the Harmonic Suppression Guidelines for Specific Consumers", take the conversion coefficient of the equivalent capacity (K5 = 0).

■Harmonic Conversion Coefficient of the Equivalent Capacity (Excerpt from the Guidelines Appendix)

Classification	Circuit type		Conversion coefficient	Application examples
1	Three-phase bridge	6-pulse converter	K11 = 1	Railway substation
		12-pulse converter	K12 = 5.5	Electro-chemistry
		24-pulse converter	K13 = 0.25	Other
3	Three-phase bridge (smoothing capacitor)	Without a reactor	K31 = 3.4	General-purpose inverter
		With a reactor (on AC side)	K32 = 1.8	Lift
		With a reactor (on DC side)	K33 = 1.8	Refrigerating air conditioner
		With reactors (on AC/DC sides)	K34 = 1.4	Other
5	Self-excitation three-phase bridge		K5 = 0	PWM converter

●The waveform with high peaks, which is typical of inverter's input current, is reshaped to be a sine wave with lower input current effective values.

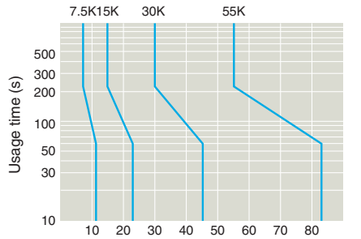
●The lowered effective value enables adoption of smaller power-supply-side devices, such as a power supply transformer, MCCB, and cables. Such smaller equipment saves the cost of equipment.



[Without FR-HC2] [With FR-HC2]

2 Power regeneration function for energy saving

The power regeneration function, which comes as a standard feature, eliminates the need for brake units. The power regeneration function gives a great breaking capability. (Regeneration is available continuously with 100% torque, and for 60s with the maximum of 150% torque.)
The regenerative power from the motor is returned to the power source, and such a system significantly saves energy.

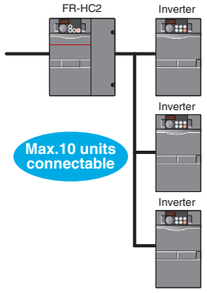


[55K or lower]

3 Connectable to multiple inverters

The common converter method enables the connection to up to 10 inverters.*1
The power returned during regenerative driving can be supplied to another inverter, saving the overall energy.

*1 : Be sure to use a converter with the capacity higher than the total capacities of the inverters. (Refer to page 8.)



4 Compact design for space saving

The high power factor converters (excluding 15K) and input reactors (75K or higher) have become much smaller than their conventional models (FR-HC, MT-HC).

5 Long life parts and life diagnosis function

(1) Longer life parts

●The service life of the cooling fans is now 10 years*1 and that can be even longer with the ON/OFF control of the cooling fan.

●Capacitors with a design life of 10 years*1*2 are adapted. (Using a surrounding air temperature of 105˚C for 5000 hours). With these capacitors, the service life of the converter is further extended.

*1 : Surrounding air temperature: Annual average of 40ºC (free from corrosive gas, flammable gas, oil mist, dust and dirt).
The design life is a calculated value and is not a guaranteed product life.
*2 : Input current: 80% of the high power factor converter rating

●Estimated service lifespan of the consumable parts

Part name	Estimated lifespan	Reference value by JEMA*3
Cooling Fan	10 years	2 to 3 years
Main circuit smoothing capacitor	10 years	5 years
Smoothing capacitors on the printed board	10 years	5 years

*3 : Excerpt from "The Periodic Inspection Recommendations on General-purpose Inverters" by the Japan Electrical Manufactures Association (JEMA).

(2) The leading-edge life diagnosis function

●The degree of deterioration of the main circuit capacitor, cooling fan, and inrush current limit circuit can be diagnosed on the monitor.

●Using the self-diagnosis function, the part life warning can be output and the deterioration degree can be monitored. Thus, the self-diagnosis function prevents troubles from occurring.

*4 : A warning is output when any of the control circuit capacitor, inrush current limit circuit, and cooling fan reaches its output level.

6 Operation panel equipped with the setting dial (FR-DU07-CNV)

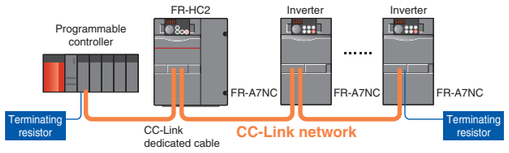
●Parameters can be copied using the operation panel (FR-DU07-CNV).
The setting values of the parameters can be stored to the operation panel and the option parameter unit (FR-PU07).

●Items such as input current, input voltage, input power (with the regenerative display), bus voltage, etc. can be monitored.

●Operation can be easily performed with the setting dial.

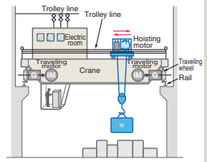
7 Supporting more network protocols

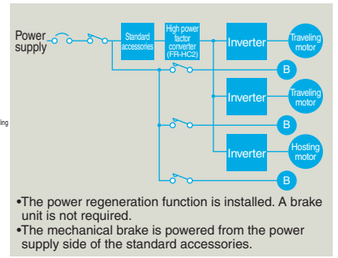
●HC2 supports RS-485 as a standard. With the option FR-A7NC, HC2 also supports CC-Link.
•The power can be monitored during driving/regenerative driving, and this monitoring tells you the energy saving effect.
•Alarm functions and voltage monitors of each phase help you to spot the cause of the alarm.



Applications

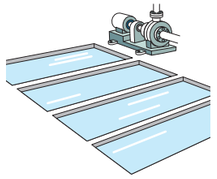
[Ceiling crane]

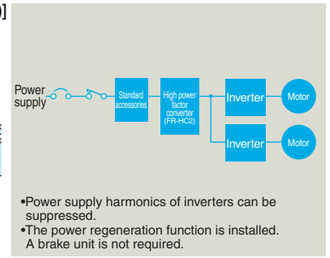




•The power regeneration function is installed. A brake unit is not required.
•The mechanical brake is powered from the power supply side of the standard accessories.

[Water treatment plant (pump)]





•Power supply harmonics of inverters can be suppressed.
•The power regeneration function is installed. A brake unit is not required.

Extensive lineup

■Model

FR-HC2-□ 7.5K

High power factor converter basic model name

Symbol	Voltage
No sign	200V class
H	400V class

Symbol	Applicable capacity
7.5K to 560K	Represents the capacity kW.

Capacity (kW)	7.5	15	30	55	75	110	160	220	280	400	560
Three-phase 200V class	●	●	●	●	●	–	–	–	–	–	–
Three-phase 400V class	●	●	●	●	●	●	●	●	●	●	●

●: Available model –: Not available

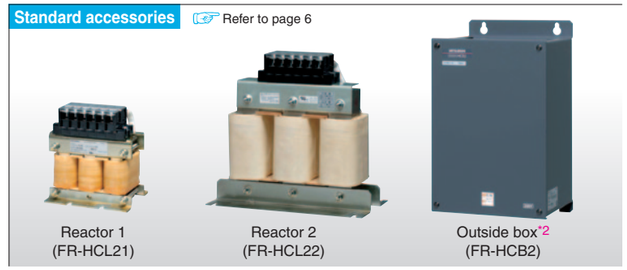
Compatible with UL, cUL, EC Directives (CE marking) as standard.

Compliant with the RoHS Directive. Friendly to people and to the environment.

To obtain higher environmental resistance, the FR-HC2 has coated printed circuit boards and copper plated conductors.
Magnetic contactors also have anti-corrosive coatings on.
The coated printed circuit board model (FR-HC-□K-60) of the conventional series is replaceable with the standard model of this series.
[Note]
•These coating treatments do not guarantee an operation environment beyond the range indicated in the product specification.
•Coating is applied to the printed circuit board areas excluding its LEDs, connectors, terminal blocks and their peripherals, where coating cannot be applied.
•As for the anti-corrosive treatment of the magnetic contactor, plating is applied to the copper areas where no surface treatment is applied.

High power factor converter*1 (FR-HC2)

Standard accessories (Refer to page 6)



Reactor 1 (FR-HCL21) Reactor 2 (FR-HCL22) Outside box*2 (FR-HCB2)

*1 : Use in combination with standard accessories. Cables for connecting standard accessories are not provided.
*2 : Peripheral devices are separately provided for 280K or higher (not provided as the outside box).

Three-phase AC power supply
Use within the permissible power supply specifications of the converter.

Moulded case circuit breaker (MCCB), earth leakage current breaker (ELB), or fuse
The breaker must be selected carefully since an inrush current flows in the converter at power ON.

Magnetic contactor (MC)
Install the magnetic contactor to ensure safety.
Do not use this magnetic contactor to start and stop the high power factor converter and the inverter. Doing so will shorten the life of the inverter and the converter.

Reactor 1 (FR-HCL21)
Confirm that the capacity of the reactor is selected according to the capacity of the converter.

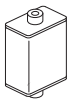
Outside box (FR-HCB2) *
Check that the capacity of the outside box matches with the capacity of the high power factor converter.
* Outside box is not available for 280K or higher. Connect filter capacitors, inrush current limit resistors, and magnetic contactors.

Reactor 2 (FR-HCL22)
Confirm that the capacity of the reactor is selected according to the capacity of the converter.

High power factor converter (FR-HC2)
Install and wire correctly.
Do not install the moulded case circuit breaker (MCCB) between terminals P and P, or N and N of the converter and the inverter.

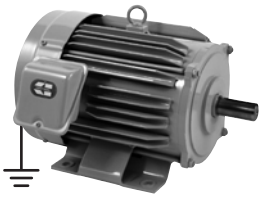
R4 S4 T4

P N



Fuse
Installation of a fuse is recommended for safety.
Select a fuse according to the connected motor capacity.
(Refer to page 24)

Inverter
Confirm that this is a FR-HC2 supporting inverter. *(Refer to page 25)*
Connect an inverter that corresponds with the each capacity of the converter.
Match the control logic (sink logic / source logic) of the converter and the inverter.



Motor
Connect the motor corresponds to the each capacity.

Devices connected to the output
Do not install a power factor correction capacitor, surge suppressor or radio noise filter on the output side of the inverter. When installing a moulded case circuit breaker on the output side of the inverter, contact each manufacturer for selection of the moulded case circuit breaker.

Earth (Ground)
To prevent an electric shock, always earth (ground) the motor and inverter.

Earth (Ground)

●200V

Model name FR-HC2-☐K	7.5	15	30	55	75
Applicable inverter capacity (kW)	7.5	15	30	55	75
Rated output capacity (kW) *3	10.7	19.8	38	71	92
Rated input voltage (V)	Three-phase 200V to 220V 50Hz/200V to 230V 60Hz *2				
Rated input current (A)	33	61	115	215	278
Overload current rating *5	150% 60s				
Permissible power supply voltage fluctuation	170V to 242V 50Hz 170V to 253V 60Hz				170V to 230V 50Hz/60Hz
Permissible power supply frequency fluctuation	±5%				
Input power factor	0.99 or more (when load ratio is 100%)				
Power supply capacity (kVA)	14	25	47	88	110
Protective structure of the converter *6	Enclosed type (IP20) *7		Open type (IP00)		
Cooling system	Forced air cooling				
Approximate mass (kg) *8	7	12	24	39	53

●400V

Model name FR-HC2-H☐K *1	7.5	15	30	55	75	110	160	220	280	400	560
Applicable inverter capacity (kW)	7.5	15	30	55	75	110	160	220	280	400	560
Rated output capacity (kW) *3	11.0	20.2	37	73	92	135	192	264	336	476	660
Rated input voltage (V) *4	Three-phase 380V to 460V 50Hz/60Hz *2										
Rated input current (A)	17	31	57	110	139	203	290	397	506	716	993
Overload current rating *5	150% 60s										
Permissible power supply voltage fluctuation	323V to 506V 50/60Hz				323V to 460V 50/60Hz						
Permissible power supply frequency fluctuation	±5%										
Input power factor	0.99 or more (when load ratio is 100%)										
Power supply capacity (kVA)	14	26	47	90	113	165	235	322	410	580	804
Protective structure of the converter *6	Enclosed type (IP20)*7		Open type (IP00)								
Cooling system	Forced air cooling										
Approximate mass (kg) *8	9	9	26	43	37	56	120	120	160	250	250

*1 Model name of the 400V class ends with H.

*2 The permissible voltage imbalance ratio is 3% or less. (Imbalance ratio = (highest voltage between lines - average voltage between three lines) / average voltage between three lines × 100).

*3 DC output capacity when the input voltage is 200VAC (400V for the 400V class).

*4 Change the MC power supply stepdown transformer tap according to the input voltage. *(Refer to the Instruction Manual)*

*5 The % value of the overload current rating indicates the ratio of the overload current to the converter's rated input current. For repeated duty, allow time for the converter and the inverter to return to or below the temperatures under 100% load.

*6 The protective structure is IP40 for FR-DU07-CNV (except the PU connector) and IP00 for the outside box (220K or lower) and the reactor regardless of their capacities.

*7 When the hook of the converter front cover is cut off for installation of the plug-in option, the protective structure changes to the open type (IP00).

*8 Mass of FR-HC2 alone.

Control specification	Control method		PWM control
	Power supply frequency range		50Hz to 60Hz
	Current limit level		Current limit value selectable (0 to 220% variable)
Operation specification	Input signal (Five terminal)		The following signals can be assigned to *Pr. 3 to Pr. 7 (input terminal function selection)*: converter stop, monitor switching, converter reset, external thermal relay, and inrush resistance overheat detection.
	Output signal Open collector output (Five terminals) Relay output (One terminal)		The following signals can be assigned to *Pr. 11 to Pr. 16 (output terminal function selection)*: inverter run enable signal, converter reset, converter running, overload alarm, power supply phase detection, output voltage match, instantaneous power failure detection, regenerative drive recognition, electronic thermal relay pre-alarm, fan alarm, heatsink overheat pre-alarm, during retry, input current detection, zero current detection,life alarm, maintenance timer, instantaneous power failure detection hold, alarm, and fault output.
		Operating status	
	For meter Pulse train output (Max. 2.4kHz: one terminal) Analog output (Max. 10VDC: one terminal)		The following signals can be assigned to *Pr. 54 FM terminal function selection (pulse train output)* and *Pr. 50 AM terminal function selection (analog output)*: power supply frequency, input current, input voltage, converter output voltage, electronic thermal relay load factor, input power, reference voltage output.
Indication	Operation panel (FR-DU07-CNV) Parameter unit (FR-PU07)	Operating status	Power supply frequency, input current, input voltage, fault or alarm indication, converter output voltage, electronic thermal relay load factor, cumulative energization time, cumulative power, input power, input power (with regenerative display), I/O terminal status*1, power/regenerative drive indication, option fitting states *2
		Fault record	Fault definition is displayed when a fault occurs. Past eight fault records and the data right before the fault (input voltage/current/bus voltage/cumulative energization) are stored.
		Interactive guidance	Function (help) for operation guide *2
Protective/warning function		Protective function	Overcurrent, overvoltage, converter protection thermal, fin overheat, instantaneous power failure, undervoltage, input phase loss, HC2 dedicated board disconnection, input power supply fault, external thermal relay operation *4, parameter error, PU disconnection *4, retry count excess *4, converter CPU fault, operation panel power supply short circuit, 24VDC power output short circuit, input current detection value exceeded *4, inrush current limit circuit fault, internal circuit fault, option fault *5, communication option fault *5.
		Warning functions	Fan alarm, overload signal detection, electronic thermal relay pre-alarm, PU stop, maintenance timer alarm *4, parameter write error, copy operation error, operation panel lock, parameter copy alarm, no-phase detection
Environment	Surrounding air temperature		-10°C to +50°C (non-freezing)
	Ambient humidity		90%RH or less (non-condensing)
	Storage temperature *3		-20°C to +65°C
	Atmosphere		Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt etc.)
	Altitude/ vibration		Maximum 1,000m above sea level, 5.9m/s^2 or less *6 at 10 to 55Hz (directions of X, Y, Z axes)

*1 Can be displayed only on the operation panel (FR-DU07-CNV).
*2 Can be displayed only on the option parameter unit (FR-PU07).
*3 Temperature applicable for a short time, e.g. in transit.
*4 This protective function is not available in the initial status.
*5 This protective function is enabled when FR-A7NC is mounted.
*6 2.9m/s^2 or less for the 160K or higher.

Checking peripheral devices

- **Peripheral devices**

Always install the included peripheral devices. Check the model name of the each peripheral device.
For the 400V class peripheral devices, H is indicated in front of the model name.

- **FR-HC2-7.5K to 75K, FR-HC2-H7.5K to H220K**

Peripheral Device Model Name	Description	Quantity
FR-HC2-(H)☐K	High power factor converter	1
FR-HCL21-(H)☐K	Filter reactor 1	1
FR-HCL22-(H)☐K	Filter reactor 2	1
FR-HCB2-(H)☐K	Outside box *	1

* Terminal screws are enclosed for FR-HCB2-7.5K, 15K, FR-HCB2-H7.5K to H30K. (M5 × 6)

- **FR-HC2-H280K to H560K**

Peripheral Device Model Name	Model Name of Consisting Parts	Description	Quantity		
			280K	400K	560K
FR-HC2-H☐K	FR-HC2-H☐K	High power factor converter	1	1	1
FR-HCL21-H☐K	FR-HCL21-H☐K	Filter reactor 1	1	1	1
FR-HCL22-H☐K	FR-HCL22-H☐K	Filter reactor 2	1	1	1
FR-HCC2-H☐K	FR-HCC2-H☐K	Filter capacitor	1	2	3
	MDA-1	Filter capacitor alarm detector	—	2	3
FR-HCR2-H☐K	0.96OHM BKO-CA1996H21	Inrush current limit resistor (without thermostat)	8	15	15
	0.96OHM BKO-CA1996H31	Inrush current limit resistor (with thermostat)	1	3	3
FR-HCM2-H☐K	1PH 630VA BKO-CA2001H06	MC power supply stepdown transformer (400V-200V)	1	1	1
	S-N400FXYS AC200V 2A2B	Inrush current limit MC	—	3	3
	S-N600FXYS AC210V 2A2B	Inrush current limit MC	1	—	—
	SR-N4FX AC210V 4A	Buffer relay	1	2	2
	TS-807BXC-5P	Terminal block	6	—	—
	C152C481H21	Terminal block shorting conductor	6	—	—
	C152C423H21	MC shorting conductor	—	6	6
	MYQ4Z AC200/220	Mini relay for filter capacitor alarm detector	—	1	1
	PYF14T	Mini relay terminal block	—	1	1
	PYC-A1	Mini relay clip	—	2	2
	M12×50 ZENNEJI	MC shorting conductor bolt (M12 × 50)	—	24	24
	M12	MC shorting conductor nut (M12)	—	24	24
	MIGAKI 12	MC shorting conductor washer (flat washer)	—	48	48
	BANE 12	MC shorting conductor washer (spring washer)	—	24	24
	SW-PW-P-NA M5 × 12	Inrush current limit resistor screw (M5 × 12)	—	54	54

Compatible inverter for the high power factor converter

Refer to the table below for the compatible inverter capacities when connecting one inverter to a converter. (Other combinations are not applicable.)

○: Compatible

—: The converter can be used as a common converter or a regenerative converter, but its harmonic suppression effect reduces.

× : Not compatible (Not applicable)

Inverter capacity		2.2K or lower	3.7K	5.5K	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K	75K
200V	FR-HC2-7.5K	—	○	○	○	×	×	×	×	×	×	×	×	×
	FR-HC2-15K	—	—	—	○	○	○	×	×	×	×	×	×	×
	FR-HC2-30K	—	—	—	—	—	○	○	○	○	×	×	×	×
	FR-HC2-55K	—	—	—	—	—	—	—	—	○	○	○	○	×
	FR-HC2-75K	—	—	—	—	—	—	—	—	—	○	○	○	○
400V	FR-HC2-H7.5K	—	○	○	○	×	×	×	×	×	×	×	×	×
	FR-HC2-H15K	—	—	—	○	○	○	×	×	×	×	×	×	×
	FR-HC2-H30K	—	—	—	—	—	○	○	○	○	×	×	×	×
	FR-HC2-H55K	—	—	—	—	—	—	—	—	○	○	○	○	×
	FR-HC2-H75K	—	—	—	—	—	—	—	—	—	○	○	○	○

Inverter capacity		45K or lower	55K	75K	90K	110K	132K	160K	185K	200K	220K	250K
400V	FR-HC2-H110K	—	○	○	○	○	×	×	×	×	×	×
	FR-HC2-H160K	—	—	—	○	○	○	○	×	×	×	×
	FR-HC2-H220K	—	—	—	—	○	○	○	○	○	○	×
	FR-HC2-H280K	—	—	—	—	—	—	○	○	○	○	○
	FR-HC2-H400K	—	—	—	—	—	—	—	—	○	○	○
	FR-HC2-H560K	—	—	—	—	—	—	—	—	—	—	—

Inverter capacity		280K	315K	355K	375K	400K	450K	500K	530K	560K
400V	FR-HC2-H280K	○	×	×	×	×	×	×	×	×
	FR-HC2-H400K	○	○	○	○	○	×	×	×	×
	FR-HC2-H560K	○	○	○	○	○	○	○	○	○

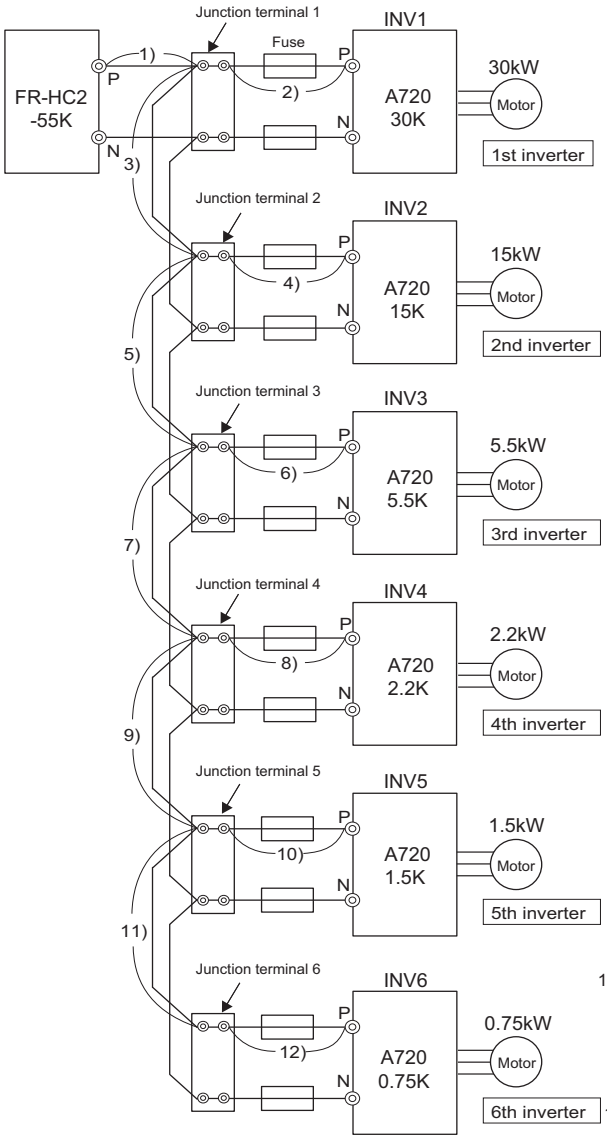
Wiring of several inverters to one converter

Up to ten inverters can be connected to one converter. Be sure to use a converter with the capacity higher than the total capacities of inverters. Additionally, the total capacity of the inverters needs to be higher than half the converter capacity.
If the total inverter capacity is less than half the converter capacity, the converter can be used as a common converter or a regenerative converter. However, it's harmonic suppression effect reduces.

(1) Junction terminals or cross wiring are used to connect several inverters, so carefully select the wire gauge. Start adding the inverter capacities from the furthest inverter.
(2) When connecting several inverters, connect starting with the inverter with the highest capacity.
(3) Installation of a fuse, which corresponds with each motor capacity, is recommended for each inverter when connecting several inverters to one converter. Select a fuse according to the motor capacity.
When using a motor, of which capacity is smaller than the inverter capacity by two ranks or more, select the converter capacity according to the inverter capacity. *(Refer to page 24)*
(4) Keep the total wiring length within 50m.

●Main circuit wiring example

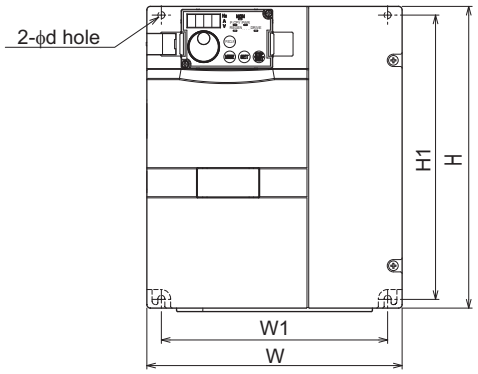
The following diagram shows a connection example when connecting six inverters in total (FR-A720-30K, 15K, 5.5K, 2.2K, 1.5K, and 0.75K) to FR-HC2-55K.



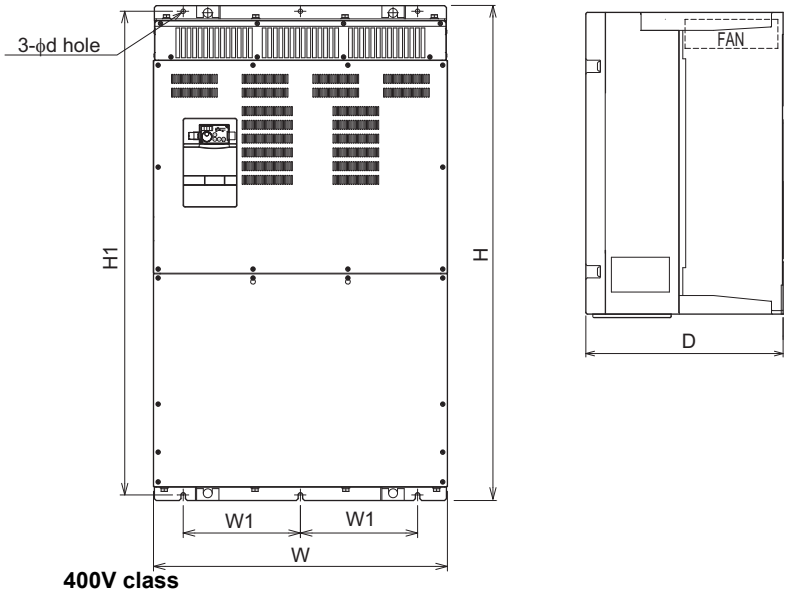
1) Wire gauge between FR-HC2 and the junction terminal 1 is 100mm^2 according to the FR-HC2 capacity.
2) Wire gauge between the junction terminal 1 and the inverter is 60mm^2 because the inverter capacity is 30K.
3) Wire gauge between the junction terminal 1 and junction terminal 2 can be calculated as follows: 15+5.5+2.2+1.5+0.75=24.95K, and 24.95K rounds up to 30K, so the wire gauge is 60mm^2.
4) The Wire gauge between the junction terminal 2 and the inverter is 22mm^2 because the inverter capacity is 15K.
5) Wire gauge between the junction terminal 2 and junction terminal 3 can be calculated as follows: 5.5+2.2+1.5+0.75=9.95K, and 9.95K rounds up to 11K, so the wire gauge is 14mm^2.
6) Wire gauge between the junction terminal 3 and the inverter is 14mm^2 because the inverter capacity is 5.5K.
7) Wire gauge between the junction terminal 3 and junction terminal 4 can be calculated as follows: 2.2+1.5+0.75=4.45K, and 4.45 K rounds up to 5.5K, so the wire gauge is 5.5mm^2.
8) Wire gauge between the junction terminal 4 and the inverter is 2mm^2 because the inverter capacity is 2.2K.
9) Wire gauge between the junction terminal 4 and junction terminal 5 can be calculated as follows: 1.5+0.75=2.25K, and 2.25K rounds down to 2.2K, so the wire gauge is 2mm^2.
10) Wire gauge between the junction terminal 5 and the inverter is 2mm^2 because the inverter capacity is 1.5K.
11) Wire gauge between the junction terminal 5 and junction terminal 6 is 2mm^2 because the inverter capacity is 0.75K.
12) Wire gauge between the junction terminal 6 and the inverter is 2mm^2 because the inverter capacity is 0.75K.

● Converter (FR-HC2)

FR-HC2-75K or lower
FR-HC2-H110K or lower
(Dimension drawing example: FR-HC2-7.5K)



FR-HC2-H160 to H560K
(Dimension drawing example: FR-HC2-H560K)



200V class

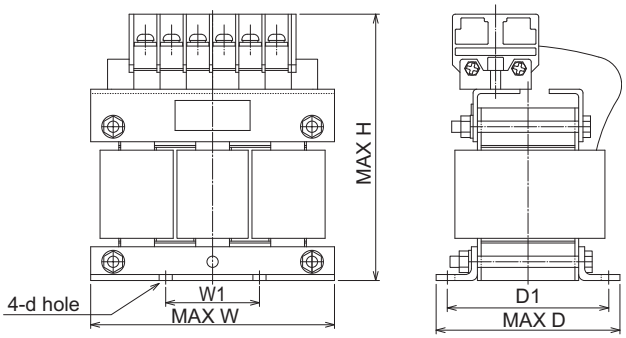
Model	W	W1	H	H1	D	d
FR-HC2-7.5K	220	195	260	245	170	6
FR-HC2-15K	250	230	400	380	190	10
FR-HC2-30K	325	270	550	530	195	10
FR-HC2-55K	370	300	620	595	250	10
FR-HC2-75K	465	400	620	595	300	12

400V class

Model	W	W1	H	H1	D	d
FR-HC2-H7.5K, H15K	220	195	300	285	190	6
FR-HC2-H30K	325	270	550	530	195	10
FR-HC2-H55K	370	300	670	645	250	10
FR-HC2-H75K	325	270	620	595	250	10
FR-HC2-H110K	465	400	620	595	300	12
FR-HC2-H160K, H220K	498	200	1010	985	380	12
FR-HC2-H280K	680	300	1010	984	380	12
FR-HC2-H400K, H560K	790	315	1330	1300	440	12

(Unit: mm)

● Reactor 1 (FR-HCL21) (Dimension drawing example : FR-HCL21-7.5K)



200V class

Model	W*	W1	H	D*	D1	d
FR-HCL21-7.5K	132	50 ±0.5	150	100	86 $^{+0}_{-2.5}$	M6
FR-HCL21-15K	162	75 ±0.5	172	126	107 $^{+0}_{-2.5}$	M6
FR-HCL21-30K	195	75 ±0.5	210	150	87 $^{+0}_{-2.5}$	M6
FR-HCL21-55K	210	75 ±0.5	180	200.5	97 $^{+0}_{-2.5}$	M6
FR-HCL21-75K	240	150 ±1	215	215.5	109 $^{+0}_{-2.5}$	M8

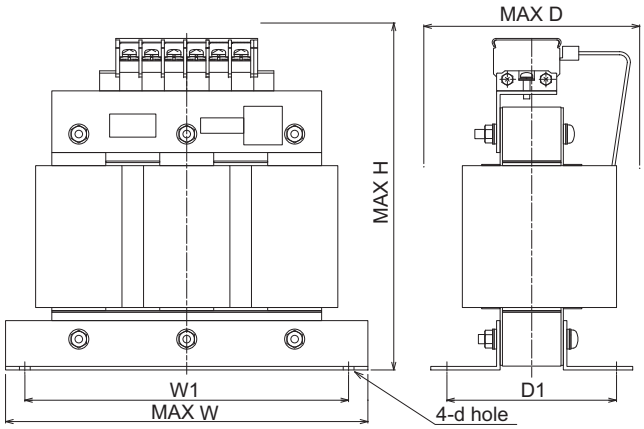
400V class

Model	W*	W1	H	D*	D1	d
FR-HCL21-H7.5K	132	50 ±0.5	140	105	90 $^{+0}_{-1}$	M6
FR-HCL21-H15K	162	75 ±0.5	170	128	105 $^{+0}_{-1}$	M6
FR-HCL21-H30K	182	75 ±0.5	195	145.5	90 $^{+0}_{-1}$	M6
FR-HCL21-H55K	282.5	255 ±1.5	245	165	112 ±1.5	M6
FR-HCL21-H75K	210	75 ±1	175	210.5	105 $^{+0}_{-2.5}$	M6
FR-HCL21-H110K	240	150 ±1	230	220	99 $^{+0}_{-5}$	M8
FR-HCL21-H160K	280	150 ±1	295	274.5	150 $^{+0}_{-5}$	M8
FR-HCL21-H220K	330	170 ±1	335	289.5	150 $^{+0}_{-5}$	M10
FR-HCL21-H280K	330	170 ±1	335	321	203 $^{+0}_{-5}$	M10
FR-HCL21-H400K	402	250 ±1	460	550	305 ±10	M10
FR-HCL21-H560K	452	300 ±1	545	645	355 ±10	M12

(Unit: mm)

* The sizes indicated by W and D are not the sizes of the legs. These indicate the sizes of whole reactors.

● Reactor 2 (FR-HCL22) (Dimension drawing example : FR-HCL22-7.5K)



200V class

Model	W*	W1	H	D*	D1	d
FR-HCL22-7.5K	237.5	210 ±1.5	230	140	110 ±1.5	M6
FR-HCL22-15K	257.5	230 ±1.5	260	165	120 ±1.5	M6
FR-HCL22-30K	342.5	310 ±1.5	305	180	130 ±1.5	M8
FR-HCL22-55K	432.5	270 ±1.5	380	280	240 ±1.5	M8
FR-HCL22-75K	474	430 ±2	460	280	128 ±2	M12

400V class

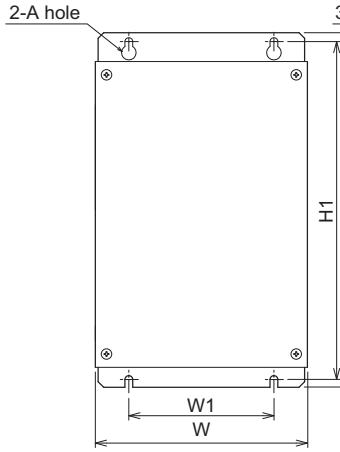
Model	W*	W1	H	D*	D1	d
FR-HCL22-H7.5K	237.5	210 ±1.5	220	140	110 ±1.5	M6
FR-HCL22-H15K	257.5	230 ±1.5	260	165	120 ±1.5	M6
FR-HCL22-H30K	342.5	310 ±1.5	300	180	130 ±1.5	M8
FR-HCL22-H55K	392.5	360 ±1.5	365	200	130 ±1.5	M8
FR-HCL22-H75K	430	265 ±1.5	395	280	200 ±1.5	M10
FR-HCL22-H110K	500	350 ±1.5	440	370	260 ±1.5	M10
FR-HCL22-H160K	560	400 ±1.5	520	430	290 ±1.5	M12
FR-HCL22-H220K	620	400 ±1.5	620	480	320 ±1.5	M12
FR-HCL22-H280K	690	500 ±2	700	560	350 ±2	M12
FR-HCL22-H400K	632	400 ±2	675	705	435 ±10	M12
FR-HCL22-H560K	632	400 ±2	720	745	475 ±10	M12

* The sizes indicated by W and D are not the sizes of the legs. These indicate the sizes of whole reactors.

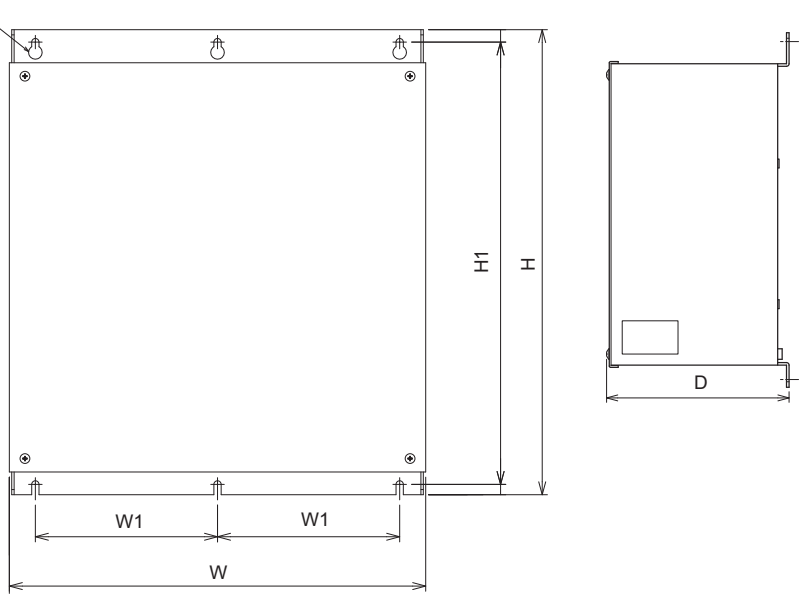
(Unit: mm)

●Outside box (FR-HCB2)*

FR-HCB2-55K or lower
FR-HCB2-H75K or lower
(Dimension drawing example : FR-HCB2-7.5K)



FR-HCB2-75K
FR-HCB2-H110K, H160K, H220K
(Dimension drawing example : FR-HCB2-75K)



200V class

Model	W	W1	H	H1	D
FR-HCB2-7.5K, 15K	190	130	320	305	165
FR-HCB2-30K, 55K	270	200	450	435	203
FR-HCB2-75K	400	175	450	428	250

400V class

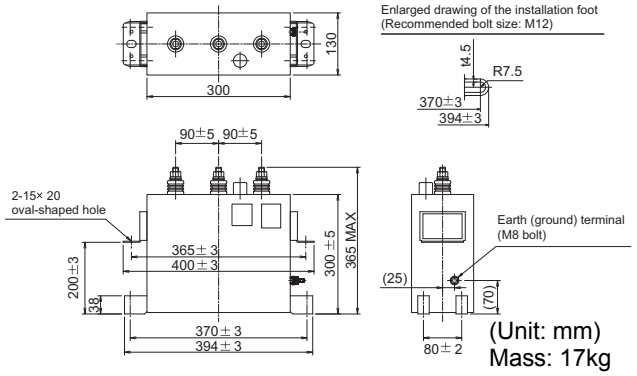
Model	W	W1	H	H1	D
FR-HCB2-H7.5K to H30K	190	130	320	305	165
FR-HCB2-H55K	270	200	450	435	203
FR-HCB2-H75K	300	250	350	328	250
FR-HCB2-H110K	350	125	450	428	380
FR-HCB2-H160K, H220K	400	175	450	428	440

* Peripheral devices are separately provided for the FR-HC2-H280K or higher (not provided as the outside box).

(Unit: mm)

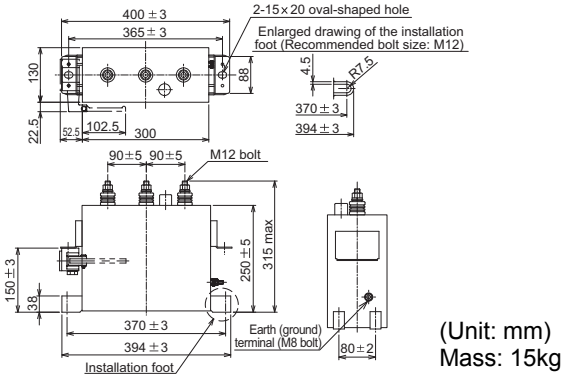
●Filter capacitor (FR-HCC2)

FR-HCC2-H280K



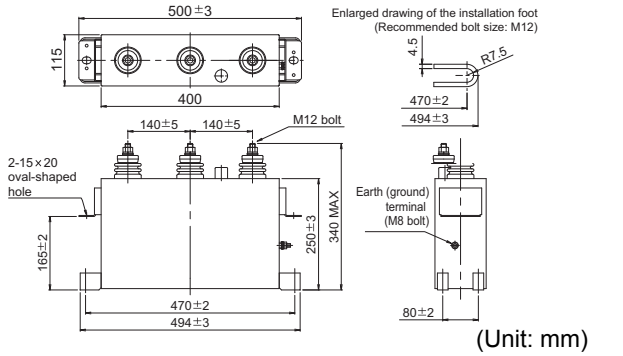
(Unit: mm)
Mass: 17kg

FR-HCC2-H400K



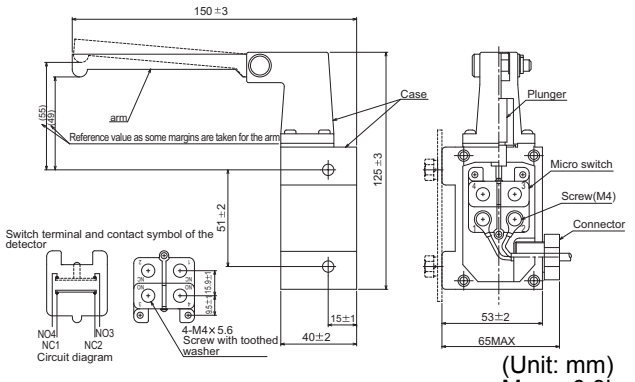
(Unit: mm)
Mass: 15kg

FR-HCC2-H560K



(Unit: mm)
Mass: 21kg

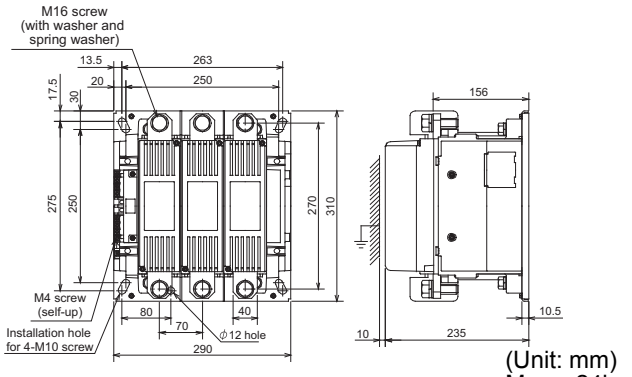
Filter capacitor alarm detector (MDA-1) (FR-HCC2-H400K, H560K)



(Unit: mm)
Mass: 0.3kg

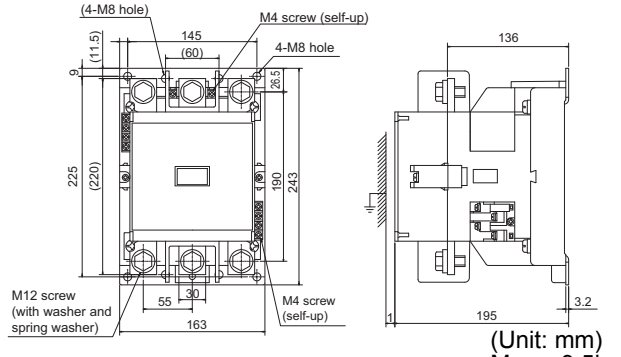
●FR-HCM2

Contactor (S-N600FXYS AC210V 2A2B) (FR-HCM2-H280K)



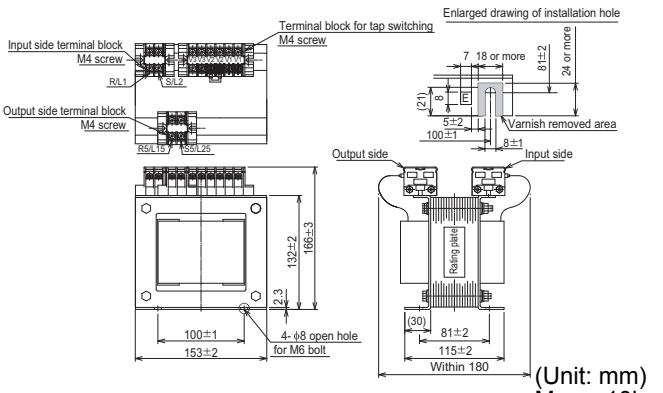
(Unit: mm)
Mass: 24kg

Contactor (S-N400FXYS AC200V 2A2B) (FR-HCM2-H400K, H560K)



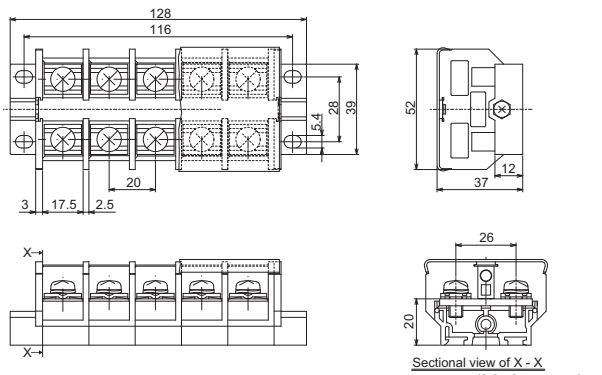
(Unit: mm)
Mass: 9.5kg

MC power supply stepdown transformer (BKO-CA2001H06) (FR-HCM2-H280K to H560K)



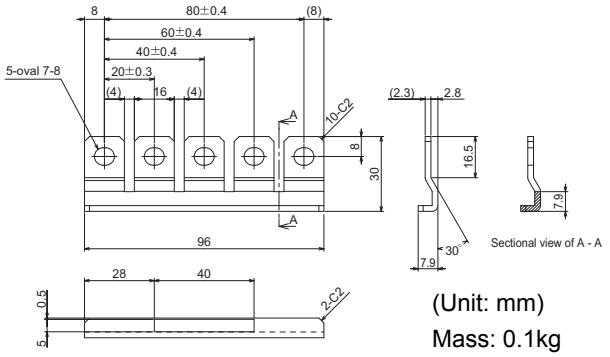
(Unit: mm)
Mass: 10kg

Terminal block (TS-807BXC-5P) (FR-HCM2-H280K)



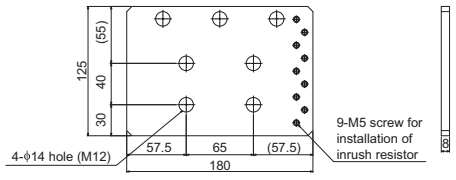
(Unit: mm)
Mass: 0.3kg

Terminal block shorting conductor (C152C481H21) (FR-HCM2-H280K)



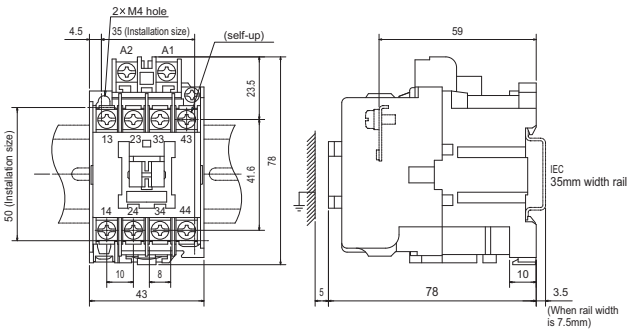
(Unit: mm)
Mass: 0.1kg

MC shorting conductor (C152C423H21) (FR-HCM2-H400K, H560K)



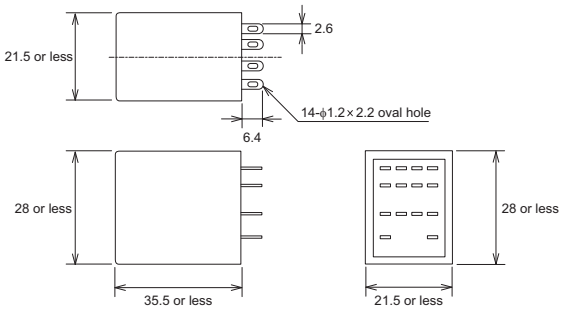
(Unit: mm)
Mass: 1.6kg

Buffer relay for driving MCs (SR-N4FX AC210V 4A) (FR-HCM2-H280K to H560K)



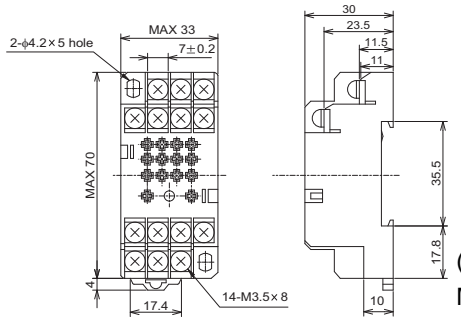
(Unit: mm)
Mass: 0.3kg

Mini relay for filter capacitor alarm detector (MYQ4Z AC200/220) (FR-HCM2-H400K, H560K)



(Unit: mm)
Mass: 35kg

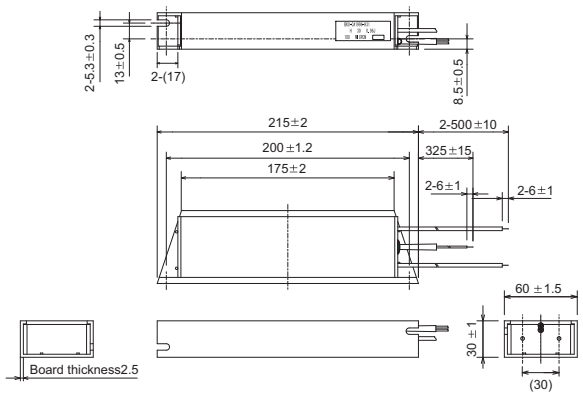
Mini relay terminal block (PYF14T) (FR-HCM2-H400K, H560K)



(Unit: mm)
Mass: 53kg

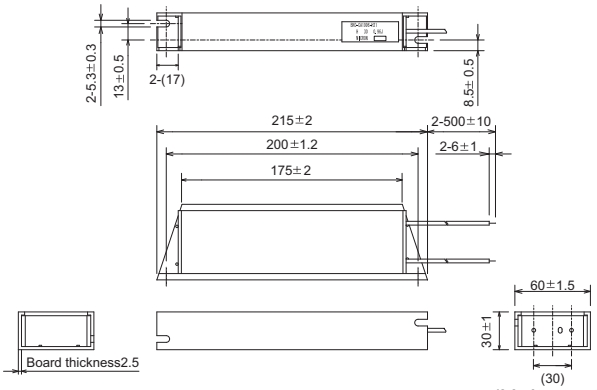
●Inrush current limit resistor (FR-HCR2)

With thermostat (BKO-CA1996H31) (FR-HCR2-H280K to H560K)



(Unit: mm)
Mass: 0.8kg

Without thermostat (BKO-CA1996H21) (FR-HCR2-H280K to H560K)



(Unit: mm)
Mass: 0.8kg

Protruding the heatsink

When installing a converter inside an enclosure, the heat generated in the enclosure can be greatly reduced by protruding the heatsink of the converter.
This installation method is recommended when downsizing the enclosure and such.

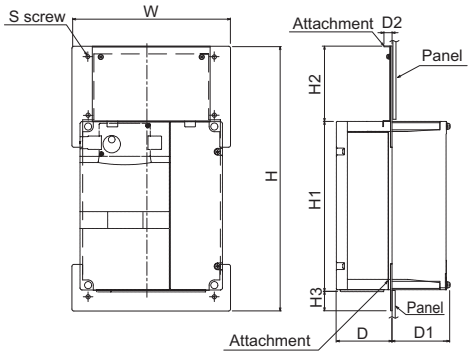
●When using a heatsink protrusion attachment (FR-A7CN)

For the FR-HC2-7.5K to 75K and FR-HC2-H7.5K to H110K, a heatsink can be protruded outside the enclosure using a heatsink protrusion attachment (FR-A7CN). (For the 160K or higher, the attachment is not necessary when the heatsink is to be protruded.)
Refer to the table below for the applicable heatsink protrusion attachments.
(For the details of FR-A7CN, refer to the Instruction Manual of the option FR-A7CN.)
(1) Heatsink protrusion attachments

Model Name	Applicable converter
FR-A7CN02	FR-HC2-7.5K
FR-A7CN03	FR-HC2-H7.5K, H15K
FR-A7CN04	FR-HC2-15K
FR-A7CN05	FR-HC2-30K FR-HC2-H30K
FR-A7CN09	FR-HC2-75K FR-HC2-H110K

∗ For a combination other than above, please contact your sales representative.

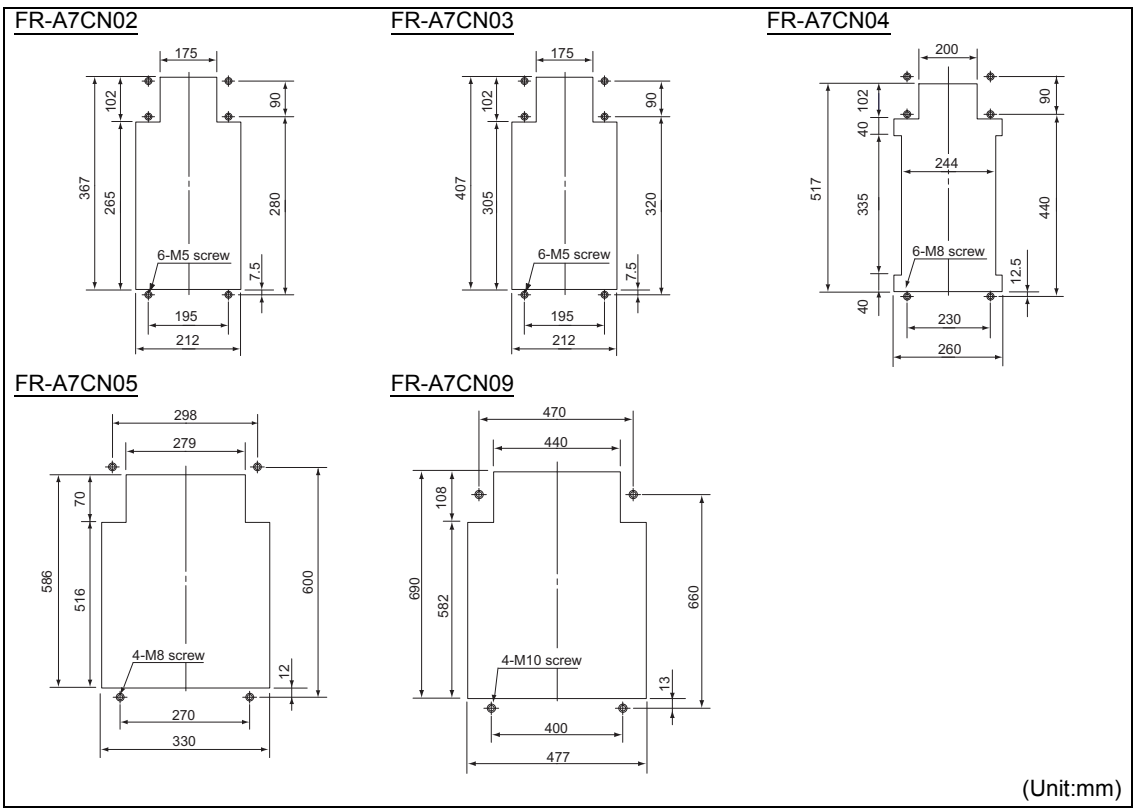
(2) Drawing after attachment installation (when used with the FR-A7CN)



Model	W	H	H1	H2	H3	D	D1	D2	S
FR-A7CN02	245	408.5	260	116.5	32	86	89.4	12.3	M5
FR-A7CN03	245	448.5	300	116.5	32	89	106.4	20	M5
FR-A7CN04	280	554	400	122	32	88.5	110.6	45.3	M8
FR-A7CN05	338	645	480	130	35	123.5	71.5	105	M8
FR-A7CN09	510	725	535	150	40	116.5	183.5	45	M10

(Unit:mm)

(3) Panel cut dimension drawing (when used with the FR-A7CN)



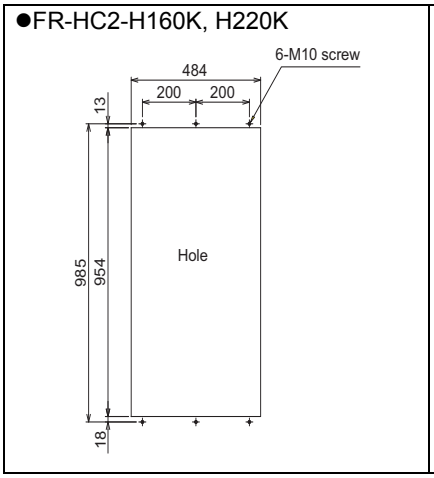
(Unit:mm)

●Heatsink protrusion for 160K or higher

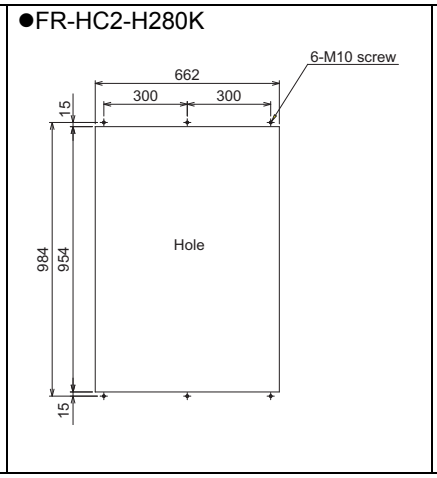
(1) Enclosure cut

Cut the enclosure according to the capacity of the converter.

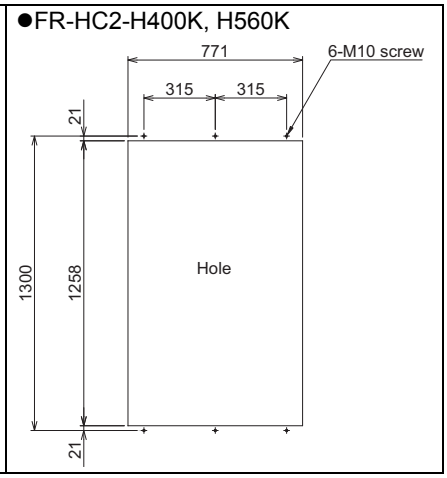
●FR-HC2-H160K, H220K



●FR-HC2-H280K



●FR-HC2-H400K, H560K



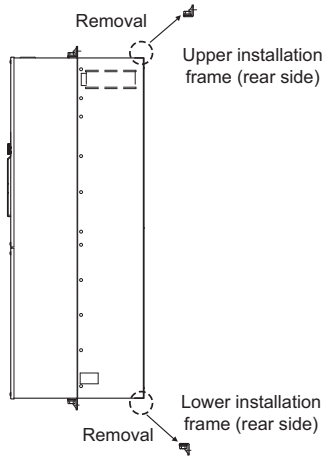
(2) Moving and removing the back installation frames

●FR-HC2-H160K to H280K

One installation frame is attached to each of the upper and lower parts of the converter. Change the position of the rear side installation frame on the upper and lower sides of the converter to the front side as shown on the right. When changing the installation frames, make sure that the installation orientation is correct.

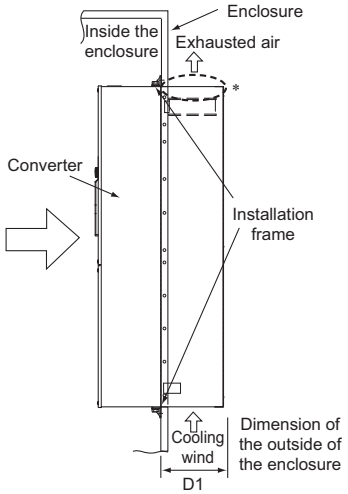
●FR-HC2-H400K, H560K

The converter has installation frames: two on the top and the two on the bottom. As shown on the right, remove the back installation frames on the top and bottom of the converter.

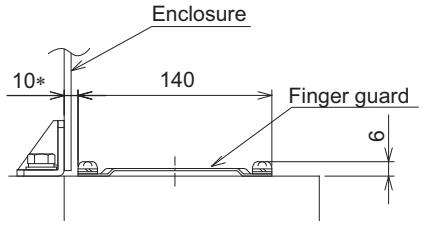


(3) Installing the converter to the enclosure

Protrude the heatsink of the converter from the installation enclosure, and secure the converter using the top and bottom installation frames.



* The enclosure enclosing FR-HC2-H160K and higher has a finger guard on its back. The thickness of the enclosure should be less than 10mm (*), and do not place anything around the finger guard to avoid contact with the finger guard.



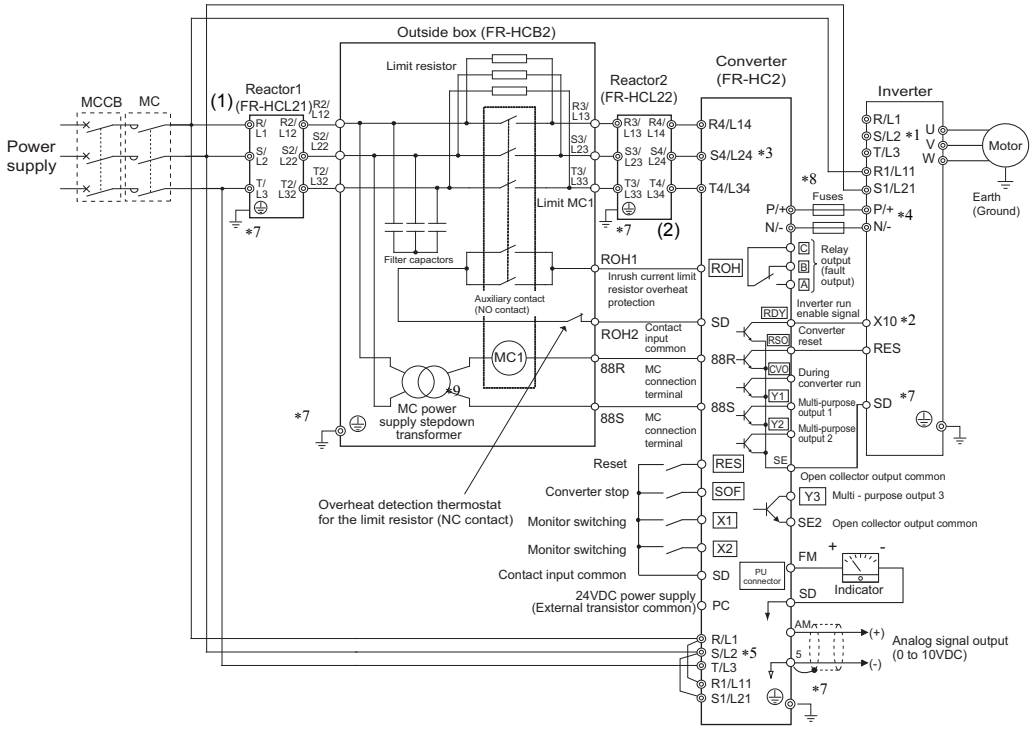
Converter model	D1
FR-HC2-H160K, H220K	185
FR-HC2-H280K to H560K	184

NOTE

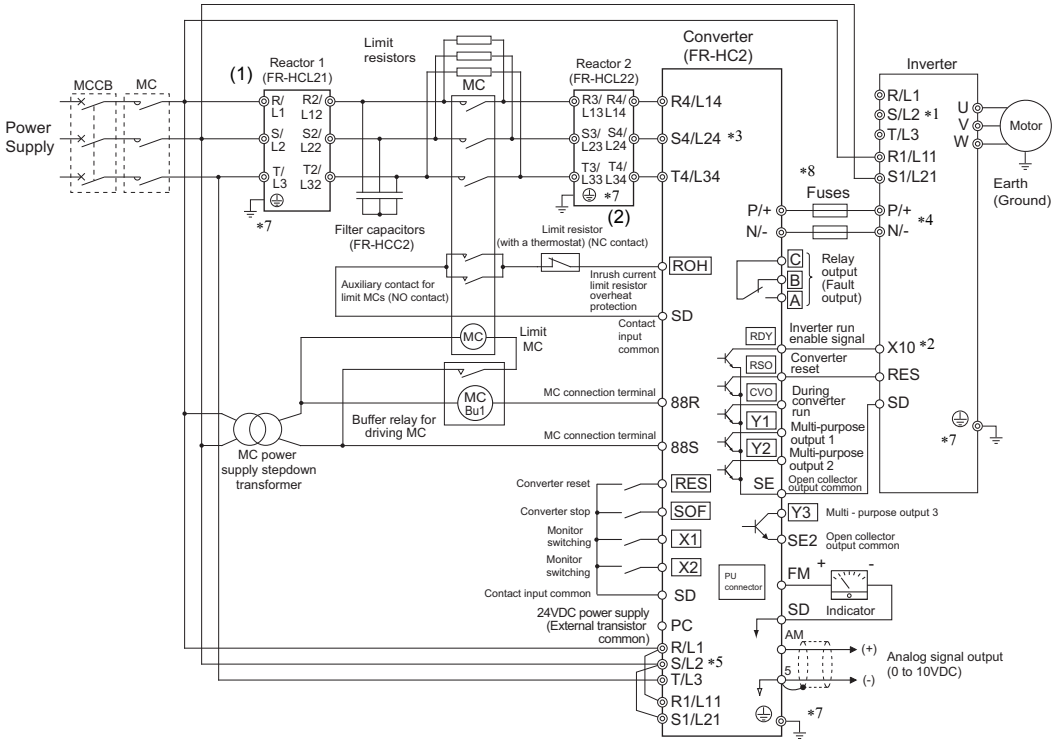
- **Protruding area contains a cooling fan, so it cannot be used in the environment where water drops, oil mist, dust and other substances exist.**
- **Foreign substances such as screws and dust must be prevented to enter in the converter or the cooling fan section.**

Before making connections, check the cable size and connection method to each device in the Instruction Manual.

● FR-HC2-7.5K to 75K, FR-HC2-H7.5K to H220K



● FR-HC2-H280K



∗1 Do not connect anything to the inverter power input terminals R/L1, S/L2 and T/L3. Incorrect connection will damage the inverter. Connecting opposite polarity of terminals P and N will damage the converter and the inverter.

∗2 Use input terminal function selection to assign the terminal used for X10 signal. (Refer to the Inverter Instruction Manual.)

∗3 The power phases of the terminals R4/L14, S4/L24, and T4/L34 and the terminals R/L1, S/L2, and T/L3 must be matched.

∗4 Do not insert MCCB between terminals P and N (P and P, N and N).

∗5 Always connect the terminal R/L1, S/L2, T/L3 of the converter to the power supply. If the inverter is operated without connecting the terminals to the power supply, the converter will be damaged.

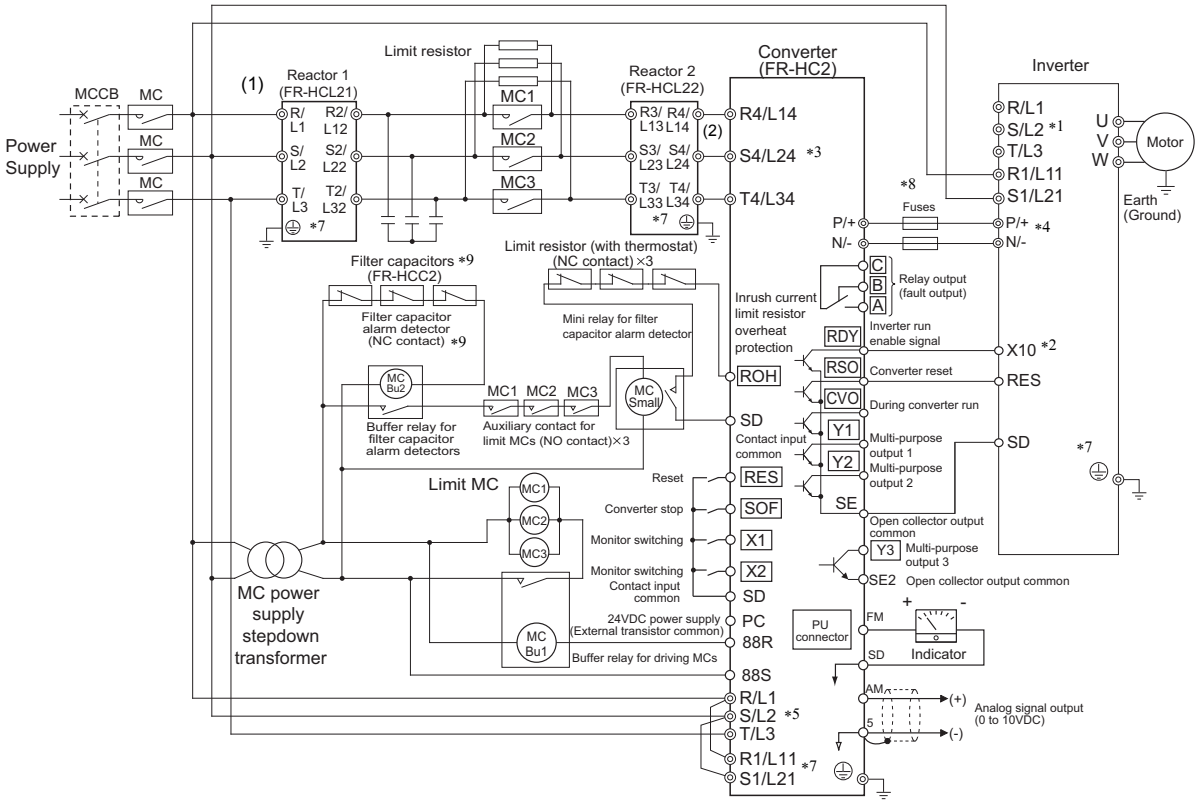
∗6 Do not insert MCCB or MC between (1) (terminal R/L1, S/L2, and T/L3 input of the Reactor 1) and (2) (terminal R4/L14, S4/L24, and T4/L34 input of the converter) of the above diagram. It will not operate properly.

∗7 Securely perform grounding (earthing) by using the grounding (earthing) terminal.

∗8 Installation of a fuse is recommended. *(Refer to page 24)*

∗9 The MC power supply stepdown transformer is only equipped in the 400V class models.

● FR-HC2-H400K, H560K



*1 Do not connect anything to the inverter power input terminals R/L1, S/L2, and T/L3. Incorrect connection will damage the inverter. Connecting opposite polarity of terminals P and N will damage the converter and the inverter.

*2 Use input terminal function selection to assign the terminal used for X10 signal. (Refer to the Inverter Instruction Manual.)

*3 The power phases of the terminals R4/L14, S4/L24, and T4/L34 and the terminals R/L1, S/L2, and T/L3 must be matched.

*4 Do not insert MCCB between terminals P/+ and N/- (P and P, N and N).

*5 Always connect the terminal R, S, and T of the converter to the power supply. If the inverter is operated without connecting the terminals to the power supply, the converter will be damaged.

*6 Do not insert MCCB or MC between (1) (terminal R/L1, S/L2, T/L3 input of the converter) and (2) (terminal R4/L14, S4/L24, T4/L34 input of the converter) of the above diagram. It will not operate properly (except for the inrush current limit MC).

*7 Securely perform grounding (earthing) by using the grounding (earthing) terminal.

*8 Installation of a fuse is recommended. *(Refer to page 24)*

*9 The number of filter capacitors and filter capacitor alarm detectors differs by the capacity. Connect two sets of filter capacitors and filter capacitor alarm detectors for H400K, and connect three sets for H560K.

NOTE

- **When connecting the converter to the inverter, match the control logic (sink logic (initial setting)/source logic). The converter does not operate properly if the control logic is different.**
  (Refer to Instruction Manual for the switching of the control logic. Refer to Inverter Instruction Manual for the switching of the control logic of the inverter.)
- **Keep the wiring length between terminals as short as possible.**
- **When sudden large distortion or depression of power supply occurs, reactor may generate abnormal acoustic noise. This acoustic noise is caused by the power supply fault and not by the damage of the converter.**
- **Do not connect the DC reactor to the inverter when using a high power factor converter.**
- **When using a sine wave filter with FR-HC2 (75K or higher), select MT-BSL-HC as a reactor for the sine wave filter.**

Terminal specifications

Type		Terminal Symbol	Terminal Name	Description		
Main circuit		R/L1, S/L2, T/L3	Power input	These terminals are used to detect power phase and power voltage, and to input control power. Connect them to the commercial power supply. If the inverter is operated without connecting them to the commercial power supply, the converter will be damaged.		
		R4/L14, S4/L24, T4/L34	Power input	Connect them to the reactor 2. The voltage phases of the terminals R4/L14, S4/L24 and T4/L34 and the terminals R/L1, S/L2 and T/L3 must be matched. If these terminals are not connected correctly, the converter does not operate properly.		
		R1/L11, S1/L21	Power supply for control circuit	These terminals are connected to the phase detection terminals R/L1 and S/L2 in the initial status. To retain the fault display and fault output, remove the jumpers (cables) and apply external power to these terminals.		
		P/+, N/-	Inverter connection	Connect them to the inverter terminals P/+ and N/-.		
		⏚	Earth (Ground)	For earthing (grounding) the converter chassis. It must be earthed (grounded).		
Control circuit/input signal		RES	Reset	Used to reset fault output provided when a fault occurs. Turn ON the RES signal for more than 0.1s, then turn it OFF.		Input resistance : 4.7kΩ Voltage at opening: 21 to 27VDC Contacts at short-circuited: 4 to 6mADC
		SOF	Converter stop	Turning ON the SOF signal stops the converter. RDY signal turns OFF, limit MC turns ON		
		ROH	Inrush current limit resistor overheat protection	200V class 7.5K to 75K 400V class 7.5K to 220K	Connect this terminal to terminal ROH1 of the outside box (FR-HCB2). The ROH signal is input to stop the converter operation when the limit resistor may overheat.	
				400V class 280K to 560K	An auxiliary contact (NO contact) of a limit resistor MC, a limit resistor (with thermostat) (NC contact), and a filter capacitor alarm detector (NC contact, 400K and 560K) are connected to stop the converter operation when overheating of the limit resistor becomes a concern and when a filter capacitor is faulty.	
		X1 X2	Monitor switching	FM and AM output or PU monitor display can be switched by a combination of ON/OFF of X1 signal and X2 signal.		
		SD	Contact input common (sink) (initial setting)	Common terminal for contact input terminal (sink logic) and terminal FM.		—
			External transistor common (source)	When connecting the transistor output (open collector output), such as a programmable controller in source logic, connect the external power supply common for transistor output to this terminal to prevent a malfunction caused by undesirable currents.		
			24VDC power supply common	Common output terminal for 24VDC 0.1A power supply (terminal PC). Isolated from terminals 5, SE and SE2.		
		PC	External transistor common (sink) (initial setting)	When connecting the transistor output (open collector output), such as a programmable controller in sink logic, connect the external power supply common for transistor output to this terminal to prevent a malfunction caused by undesirable currents.		Power supply voltage range 19.2 to 28.8VDC Permissible load current 100mA
			External transistor common (sink) (initial setting)	Common terminal for contact input terminal (source logic)		
			24VDC power supply	Can be used as 24VDC 0.1A power supply.		
Control circuit/output signal	Open collector	RDY	Inverter run enable signal	Turns ON at alarm occurrence and reset (RES) signal input. Connect this terminal to the terminal MRS or a terminal where the X10 signal is assigned to in the inverter. Turning ON RDY signal stops the inverter. RYD signal OFF: Inverter can run RYD signal ON: Inverter cannot run		Permissible load 24VDC (27VDC maximum) 0.1A (A voltage drop is 2.8V maximum when the signal is ON.)
		CVO	During converter run	Signal is output during harmonic suppression.		
		Y1	Multi-purpose output 1	Output item: OL signal (overload alarm) (initial setting) Turns ON at an occurrence of overcurrent (150% overload or more).		
		Y2	Multi-purpose output 2	Output item: PHS signal (power phase detection) (initial setting) Turns ON when power phase detection is locked.		
		RSO	Converter reset	Turns ON at a converter reset (RES-ON). Connect this terminal to the inverter terminal of which RES signal is assigned to. Reset the connected inverter by turning ON the RSO.		
		SE	Open collector output common	Common terminal for the terminals RDY, CVO, OL, Y1, Y2 Connect it to the inverter terminal SD (sink logic).		—
	Pulse	FM	For meter	Select one monitor item from multiple monitor items such as input current and bus voltage. Not output during a converter reset. The output signal is proportional to the magnitude of the corresponding monitoring item. Monitor item can be switched by ON/OFF of terminals X1 and X2.		Permissible load current 2mA At rated input current of the converter: 1440 pulses/s
	Analog	AM	Analog signal output			Output signal 0 to 10VDC Permissible load current 1mA Load impedance 10kΩ
		5	Analog signal output common	Common terminal for analog signal output		—
	Relay	A, B, C	Fault contact	1 changeover contact output indicates that the converter's protective function is activated and the output is stopped. Fault: No conduction across B and C (Conduction across A and C), Normal: Conduction across B and C (No conduction across A and C)		Contact capacity AC230V 0.3A (Power factor=0.4) 30VDC output 0.3A
		88R, 88S	MC connection terminal	Controls the MC for the limit resistor.		—

Type		Terminal Symbol	Terminal Name	Description	
Output signals of FR-HC2 dedicated board	Open collector	Y3	Multi-purpose output 3	Output item: Y5 signal (output voltage match) (initial setting) Turns ON when the detected bus voltage equals to the commanded bus voltage.	Permissible load: 24VDC 0.1A
		SE2	Open collector output common	Common terminal for terminal Y3	—
Communication	RS-485	—	PU connector	With the PU connector, communication can be made through RS-485. (for connection on a 1:1 basis only) •Conforming standard : EIA-485 (RS-485) •Transmission format : Multidrop •Communication speed : 4800 to 38400bps •Overall length : 500m	

NOTE

- **If the inverter is operated without connecting the terminals R/L1, S/L2, T/L3 of the converter to the power supply, the converter will be damaged.**
- **indicates that terminal functions can be selected using *Pr. 3 to Pr. 7 (input terminal function selection)* and *Pr. 11 to Pr. 16 (output terminal function selection)*.**

REMARKS

◎ indicates simple mode parameters.

The parameters shaded in ▭ allow their settings to be changed during operation even if "1" (write disabled) is set to *Pr. 77 Parameter write selection*.

Parameter	Name	Range	Increments	Initial value	Customer setting
◎ 0	Simple mode selection	0, 9999	1	0	
◎ 1	Maximum power supply frequency	60Hz (Read only)	—	60Hz	
◎ 2	Minimum power supply frequency	50Hz (Read only)	—	50Hz	
3	ROH terminal function selection	0 to 5, 9999	1	5	
4	SOF terminal function selection		1	0	
5	X1 terminal function selection		1	1	
6	X2 terminal function selection		1	2	
7	RES terminal function selection		1	3	
8	SOF input selection	0, 1, 2	1	0	
9	OH input selection	0, 1	1	0	
10	RDY signal logic selection	0, 100	1	100	
11	RSO terminal function selection	0 to 16, 98, 99, 100 to 116, 198, 199, 9999	1	1	
12	CVO terminal function selection		1	2	
◎ 13	Y1 terminal function selection		1	3	
◎ 14	Y2 terminal function selection		1	4	
◎ 15	Y3 terminal function selection		1	5	
16	ABC terminal function selection		1	99	
◎ 22	Current limit level	0 to 220%	0.1%	150%	
23	Current limit level (regenerative)	0 to 220%, 9999	0.1%	9999	
24	OL signal output timer	0 to 25s, 9999	0.1s	0s	
25	Input current detection level	0 to 220%	0.1%	150%	
26	Input current detection signal delay time	0 to 10s	0.1s	0s	
27	Input current detection signal retention time	0 to 10s, 9999	0.1s	0.1s	
28	Input current detection operation selection	0, 1	1	0	
29	Zero current detection level	0 to 220%	0.1%	5%	
30	Zero current detection time	0 to 1s	0.01s	0.5s	
31	Life alarm status display	0 to 15 (Read only)	1	0	
32	Inrush current limit circuit life display	0 to 100% (Read only)	1%	100%	
33	Control circuit capacitor life display	0 to 100% (Read only)	1%	100%	
34	Maintenance timer	0 (1 to 9998)	1	0	
35	Maintenance timer alarm output set time	0 to 9998, 9999	1	9999	
36	Cooling fan operation selection	0, 1	1	1	
44	Instantaneous power failure detection signal clear	0, 9999	1	9999	
45	AM output filter	0 to 5s	0.01s	0.01s	
46	Watt-hour meter clear	0, 10, 9999	1	9999	
47	Energization time carrying-over times	Read only	1	0	
48	Cumulative power monitor digit shifted times	0 to 4, 9999	1	9999	
49	Power supply frequency monitoring reference	45Hz to 65Hz	0.01Hz	60Hz	
◎ 50	AM terminal function selection	1 to 3, 5, 6, 7, 21, 1111 to 4444	1	1234	
◎ 51	Input power monitoring reference	0 to 100kW/0 to 3600kW *1	0.01kW/ 0.1kW *1	Rated power	
◎ 52	DU/PU main display data selection	0, 5 to 10, 25, 1111 to 4444	1	1234	
◎ 53	Input voltage monitoring reference	0 to 500V	0.1V	220V/440V*2	
◎ 54	FM terminal function selection	1 to 3, 5, 6, 7, 21, 1111 to 4444	1	1234	
◎ 55	Bus voltage monitoring reference	0 to 1000V	0.1V	340V/680V*2	
◎ 56	Current monitoring reference	0 to 500A/0 to 3600A *1	0.01A/0.1A *1	Rated current	
◎ 57	Restart selection	0, 9999	1	9999	

Parameter	Name	Range	Increments	Initial value	Customer setting
58	Free parameter 1	0 to 9999	1	9999	
59	Free parameter 2	0 to 9999	1	9999	
61	Key lock operation selection	0, 10	1	0	
◎ 65	Retry selection	0, 1, 2, 3, 4	1	0	
◎ 67	Number of retries at fault occurrence	0 to 10, 101 to 110	1	0	
◎ 68	Retry waiting time	0.1 to 360s	0.1s	1s	
◎ 69	Retry count display erase	0	1	0	
75	Reset selection/disconnected PU detection/ PU stop selection	0 to 3, 14 to 17	1	14	
◎ 77	Parameter write selection	1, 2	1	2	
80	Voltage control proportional gain	0 to 1000%	1%	100%	
81	Voltage control integral gain	0 to 1000%	1%	100%	
82	Current control proportional gain	0 to 200%	1%	100%	
83	Current control integral gain	0 to 200%	1%	100%	
117	PU communication station number	0 to 31	1	0	
118	PU communication speed	48, 96, 192, 384	1	192	
119	PU communication stop bit length	0, 1, 10, 11	1	1	
120	PU communication parity check	0, 1, 2	1	2	
121	Number of PU communication retries	0 to 10, 9999	1	1	
123	PU communication waiting time setting	0 to 150ms, 9999	1ms	9999	
124	PU communication CR/LF selection	0, 1, 2	1	1	
◎ 145	PU display language selection	0 to 7	1	0	
168	Parameter for manufacturer setting. Do not set.				
169					
269					
342	Communication EEPROM write selection	0, 1	1	0	
500 *3	Communication error execution waiting time	0 to 999.8s	0.1s	0s	
501 *3	Communication error occurrence count display	0	1	0	
502 *3	Stop mode selection at communication error	0, 3	1	0	
542 *3, *4, *5	Communication station number (CC-Link)	1 to 64	1	1	
543 *3, *4, *5	Baud rate (CC-Link)	0 to 4	1	0	
544 *3, *4	CC-Link extended setting	0, 1, 12	1	0	
C0(900) *6	FM terminal calibration	—	—	—	
C1(901) *6	AM terminal calibration	—	—	—	
989	Parameter copy alarm release	10, 100	1	10/100 *1	
990	PU buzzer control	0, 1	1	1	
991	PU contrast adjustment	0 to 63	1	58	
Pr.CL	Parameter clear	0, 1	1	0	
ALLC	All parameter clear	0, 1	1	0	
Er.CL	Fault history clear	0, 1	1	0	
PCPY	Parameter copy	0, 1, 2, 3	1	0	

*1 Differ according to capacities. (55K or lower/75K or higher)
*2 Differs according to the voltage class. (200V class/400V class)
*3 Parameters which can be set when the plug-in option (FR-A7NC) is mounted.
*4 The setting is reflected after converter reset or at the next power-ON.
*5 "L.ERR" LED on FR-A7NC flickers when a setting is changed. If the converter is reset, the setting is reflected and LED turns off.
*6 The parameter number in parentheses is the one for use with the parameter unit (FR-PU07).

When a fault occurs in the converter, the protective function activates to trip the converter, and the PU display automatically changes to one of the following fault or alarm indications.

Operation Panel Indication			Name
Error message ∗2	E - - -	**E - - -**	Faults history
	HOLd	**HOLD**	Operation panel lock
	Er 1	**Er1**	Parameter write error
	rE 1~ rE4	**rE1 to 4**	Copy operation fault
	Err.	**Err.**	Error
Warning ∗3	OL	**OL**	Overload signal detection
	PS	**PS**	PU stop
	rH	**TH**	Electronic thermal relay pre-alarm
	MT	**MT**	Maintenance signal output ∗7
	CP	**CP**	Parameter copy
	SL	**SL**	Power supply not detected
Alarm ∗4	Fn	**FN**	Fan fault
Fault ∗5	E.OC2	**E.OC2**	Overcurrent trip
	E.Ov2	**E.OV2**	Overvoltage trip
	E.THT	**E.THT**	Converter overload trip (electronic thermal relay function) ∗1
	E.FIn	**E.FIN**	Fin overheat
	E.IPF	**E.IPF**	Instantaneous power failure
	E.UvT	**E.UVT**	Undervoltage
	E.ILF	**E.ILF**	Input phase loss
	E.OHT	**E.OHT**	External thermal relay operation ∗6 ∗7
	E. 2	**E. 2**	HC2 dedicated board disconnection
	E. 3	**E. 3**	Option fault
	E.OP3	**E.OP3**	Communication option fault
	E. PE	**E.PE**	Parameter storage device fault (control circuit board)
	E.PE2	**E.PE2**	Parameter storage device fault (main circuit board)
	E.PUE	**E.PUE**	PU disconnection ∗7
	E.rET	**E.RET**	Retry count excess ∗7
	E. 6 E. 7 E.CPU	**E. 6** **E. 7** **CPU**	CPU fault
	E. 8	**E. 8**	Input power supply fault 1
	E. 9	**E. 9**	Input power supply fault 2
	E.CTE	**E.CTE**	Operation panel power supply short circuit, RS-485 terminal power supply short circuit
	E.P24	**E.P24**	24VDC power output short circuit
	E.CdO	**E.CDO**	Input current detection value exceeded ∗7
	E.IOH	**E.IOH**	Inrush current limit circuit fault
	E. 13	**E. 13**	Internal circuit fault

∗1 Resetting the converter initializes the cumulative value of the internal thermal relay.
∗2 The error message shows an operational error. The converter does not trip.
∗3 Warnings are messages given before faults occur. The converter does not trip.
∗4 Alarms warn the operator of failures with output signals. The converter does not trip.
∗5 When faults occur, the protective functions are activated to trip the converter and output the fault signals.
∗6 Assign the OH signal to one of *Pr.3 to Pr.7 (Input terminal function selection)* to enable the external thermal relay operation.
∗7 This protective function is not available in the initial status.

Option List

Name			Type	Applications, Specifications, etc.	Applicable converter
Plug-in Type	Communication	CC-Link communication	FR-A7NC	Converter operation, monitoring, and parameter setting can be commanded from a programmable controller.	Shared among all models
Stand-alone shared		Parameter unit (8 languages)	FR-PU07	Interactive parameter unit with LCD display	Shared among all models
		Parameter unit with battery pack	FR-PU07BB	Parameter unit enables parameter setting without supplying power to the converter.	Shared among all models
		Parameter unit connection cable	FR-CB20☐	Cable for connection of operation panel or parameter unit ☐ indicates a cable length. (1m, 3m, 5m)	Shared among all models
		Operation panel connection connector	FR-ADP	Connector to connect the operation panel (FR-DU07-CNV) and connection cable	Shared among all models
		Heatsink protrusion attachment	FR-A7CN 02 to 05, 09	Attachment for protruding the converter heatsink at the back of the enclosure. Refer to *page 13* for the enclosure cut dimensions.	According to capacities
		Radio noise filter	FR-BIF(H)	For radio noise reduction (connect to the input side)	Shared among all models
		Line noise filter	FR-BSF01/ FR-BLF	For line noise reduction	Shared among all models

Peripheral devices/cable size list

●cable size*1

•200V class

Model	FR-HC2-☐		FR-HCB2-☐	FR-HCL21-☐	FR-HCL22-☐
	R4/L14, S4/L24, T4/L34	P/+, N/- *2	R2/L12, S2/L22, T2/L32 R3/L13, S3/L23, T3/L33	R/L1, S/L2, T/L3 R2/L12, S2/L22, T2/L32	R3/L13, S3/L23, T3/L33 R4/L14, S4/L24, T4/L34
7.5K	8	5.5	8	8	8
15K	22	14	22	22	22
30K	60	38	60	60	60
55K	100	100	125	125	125
75K	100	100	100	100	100

•400V class

Model	FR-HC2-☐		FR-HCB2/FR-HCC2-☐	FR-HCL21-☐	FR-HCL22-☐
	R4/L14, S4/L24, T4/L34	P/+, N/- *2	R2/L12, S2/L22, T2/L32 R3/L13, S3/L23, T3/L33	R/L1, S/L2, T/L3 R2/L12, S2/L22, T2/L32	R3/L13, S3/L23, T3/L33 R4/L14, S4/L24, T4/L34
H7.5K	3.5	2	3.5	3.5	3.5
H15K	5.5	5.5	5.5	5.5	5.5
H30K	22	14	22	22	22
H55K	60	38	60	60	60
H75K	38	38	38	38	38
H110K	60	60	60	60	60
H160K	100	125	100	100	100
H220K	150	2 × 100	150	150	150
H280K	200	2 × 125	60	200	200
H400K	2 × 200	2 × 200	60	2 × 200	2 × 200
H560K	2 × 250	3 × 250	38	2 × 250	2 × 250

*1 For the 55K or lower, the cable size is that of the cable (HIV cable (600V class 2 vinyl-insulated cable) etc.) with continuous maximum permissible temperature of 75°C. It assumes that the surrounding air temperature is 50°C or less and the wiring distance is 20m or less.
For the 75K or higher, the recommended cable size is that of the cable (LMFC (heat resistant flexible cross-linked polyethylene insulated cable) etc.) with continuous maximum permissible temperature of 90°C. It assumes that the surrounding air temperature is 50°C or less and wiring is performed in an enclosure.

*2 If a cable thinner than the recommended cable size is used, it may not be protected by the DC fuse. (*Refer to page 24* for the fuse selection.)

●Circuit breakers and magnetic contactors

Check the model of the converter and select peripheral devices according to the capacity. Refer to the table below to prepare appropriate peripheral devices.

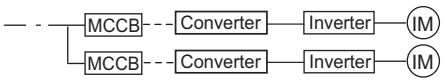
•200V class

Converter Model	Moulded Case Circuit Breaker (MCCB) ∗1 or Earth Leakage Circuit Breaker (ELB) ∗2 (NF, NV type)	Magnetic Contactor (MC) ∗3
FR-HC2-7.5K	50A	S-N25
FR-HC2-15K	75A	S-N50
FR-HC2-30K	150A	S-N80
FR-HC2-55K	300A	S-N180
FR-HC2-75K	350A	S-N300

•400V class

Converter Model	Moulded Case Circuit Breaker (MCCB) ∗1 or Earth Leakage Circuit Breaker (ELB) ∗2 (NF, NV type)	Magnetic Contactor (MC) ∗3
FR-HC2-H7.5K	30A	S-N18
FR-HC2-H15K	50A	S-N20
FR-HC2-H30K	75A	S-N35
FR-HC2-H55K	150A	S-N80
FR-HC2-H75K	175A	S-N95
FR-HC2-H110K	250A	S-N180
FR-HC2-H160K	400A	S-N300
FR-HC2-H220K	500A	S-N400
FR-HC2-H280K	700A	S-N600
FR-HC2-H400K	900A	S-N800
FR-HC2-H560K	1500A	S-N400 (three in parallel)

∗1 •Select an NFB according to the power supply capacity.
•Install one NFB per converter.



∗2 For the use in the United States or Canada, provide the appropriate UL and cUL listed fuse that is suitable for branch circuit protection. *(Refer to the instruction manual)*

∗3 Magnetic contactor is selected based on the AC-1 class.The electrical durability of magnetic contactor is 100,000 times.When the magnetic contactor is used for emergency stop during motor driving, the electrical durability is 25 times.
When using the MC for emergency stop during motor driving or using on the motor side during commercial-power supply operation, select the MC with class AC-3 rated current for the motor rated current.

NOTE

- **When the MCCB on the converter input side trips, check for the wiring fault (short circuit), damage to internal parts of the converter, etc. Identify the cause of the trip, then remove the cause and power ON the breaker.**
- **Configure a system where the magnetic contactor at the converter input side shuts off the power supply at a failure of the converter or the connected inverter. (The converter does not shut off the power supply by itself.) Failure to do so may overheat and burn the resistors in the converter and the connected inverter.**

●Fuse

Installation of a fuse is recommended between a high power factor converter and an inverter.
Select a fuse according to the capacity of the connected motor. When using a motor, of which the capacity is smaller than the inverter capacity by two ranks or more, select the fuse with the capacity that is one rank lower than the inverter capacity.
Select a fuse from the table below, and install it to both of the P side and the N side between the high power factor converter and the inverter.

[Fuse selection table]

Motor capacity (kW)	200V class		400V class	
	Fuse rating (A)	Model ∗1	Fuse rating (A)	Model ∗1
0.1	5	6.900 CP GR 10.38 0005 ∗2	—	—
0.2	10	6.900 CP GR 10.38 0010 ∗2	—	—
0.4	16	6.900 CP GR 10.38 0016 ∗2	12.5	6.900 CP GR 10.38 0012.5 ∗2
0.75	20	6.900 CP GR 10.38 0020 ∗2	16	6.900 CP GR 10.38 0016 ∗2
1.5	25	6.900 CP GR 10.38 0025 ∗2	16	6.900 CP GR 10.38 0016 ∗2
2.2	50	6.9 URD 30 TTF 0050	20	6.900 CP GR 10.38 0020 ∗2
3.7	63	6.9 URD 30 TTF 0063	30	6.900 CP GR 10.38 0030 ∗2
5.5	100	6.9 URD 30 TTF 0100	50	6.9 URD 30 TTF 0050
7.5	125	6.9 URD 30 TTF 0125	50	6.9 URD 30 TTF 0050
11	160	6.9 URD 30 TTF 0160	80	6.9 URD 30 TTF 0080
15	200	6.9 URD 30 TTF 0200	125	6.9 URD 30 TTF 0125
18.5	250	6.9 URD 30 TTF 0250	125	6.9 URD 30 TTF 0125
22	315	6.9 URD 30 TTF 0315	160	6.9 URD 30 TTF 0160
30	400	6.9 URD 30 TTF 0400	200	6.9 URD 30 TTF 0200
37	500	6.9 URD 30 TTF 0500	250	6.9 URD 30 TTF 0250
45	630	6.9 URD 31 TTF 0630	315	6.9 URD 30 TTF 0315
55	700	6.9 URD 31 TTF 0700	350	6.9 URD 30 TTF 0350
75	800	6.9 URD 31 TTF 0800	450	6.9 URD 30 TTF 0450
90	—	—	500	6.9 URD 30 TTF 0500
110	—	—	550	6.9 URD 31 TTF 0550
132	—	—	630	6.9 URD 31 TTF 0630
160	—	—	800	6.9 URD 31 TTF 0800
185	—	—	900	6.9 URD 32 TTF 0900
220	—	—	1000	6.9 URD 32 TTF 1000 or 6.9 URD 31 TTF 0630 × 2 in parallel ∗3
250	—	—	1250	6.9 URD 33 TTF 1250 or 6.9 URD 31 TTF 0700 × 2 in parallel ∗3
280	—	—	1400	6.9 URD 33 TTF 1400 or 6.9 URD 31 TTF 0800 × 2 in parallel ∗3
315	—	—	1600	6.9 URD 232 TTF 1600 or 6.9 URD 31 TTF 0800 × 2 in parallel ∗3
355	—	—	1800	6.9 URD 232 TTF 1800 or 6.9 URD 32 TTF 0900 × 2 in parallel ∗3
400	—	—	1800	6.9 URD 232 TTF 1800 or 6.9 URD 32 TTF 0900 × 2 in parallel ∗3
450	—	—	2500	6.9 URD 33 TTF 1250 × 2 in parallel ∗3
500	—	—	2700	6.9 URD 32 TTF 0900 × 3 in parallel ∗3
560	—	—	2700	6.9 URD 32 TTF 0900 × 3 in parallel ∗3

∗1 Manufacturer: Mersen Japan K.K.
Contact: Sun-Wa Technos Corporation
∗2 For fuse holders (2-pole type), use US102 (no blowout indicator) or US102I (with blowout indicator).
∗3 When installing several fuses in parallel, leave 12mm or more between the fuses.

NOTE

- **Install a fuse across terminal P/+ of the inverter and the converter and across terminal N/- of the inverter and the converter.** *(Refer to page 8)*

[Estimated lifespan of fuse]

Part Name	Estimated lifespan∗	Replacement method
Fuse	10 years	Replace with a new one

∗ Estimated lifespan for when the yearly average surrounding air temperature is 50?C (without corrosive gas, flammable gas, oil mist, dust and dirt etc.)

NOTE

- **If the fuse melts down, wiring failure such as a short circuit may be the cause. Identify the problem and fix it before replacing the fuse.**

⚠ SAFETY INSTRUCTIONS

- To use the product safely and correctly, make sure to read "the Instruction Manual" before using the product.
- This product has not been designed or manufactured for use with any equipment or system operated under life-threatening conditions.
- Please contact our sales office when you are considering using this product in special applications such as passenger mobile, medical, aerospace, nuclear, power or undersea relay equipment or system.
- Although this product was manufactured under conditions of strict quality control, you are strongly advised to install safety devices to prevent serious accidents when it is used in facilities where breakdowns of the product or other failures are likely to cause a serious accident.
- Do not use this product for a load other than dedicated inverters.

Installation Precautions

Wiring distance

- For the wiring distance between the high power factor converter (FR-HC2) and inverter, refer to the following table.

Across terminals P and P / terminals N and N	50m or shorter
Other control signal lines	30m or shorter

- The total wiring distance between the high power factor converter (FR-HC2) and standard accessories must be 30m or shorter. For 280K or higher, refer to *the Instruction Manual*.)

Reactor installation at power supply side

- The terminals R/L1, S/L2, and T/L3 of the high power factor converter are control terminals to detect power phases of the power supply. When wiring, the voltage phases of terminals R4/L14, S4/L24, and T4/L34 and the voltage phases of terminals R/L1, S/L2, and T/L3 must be matched. Failure to connect these terminals correctly will lead to an improper operation of the high power factor converter.
- If the inverter is operated without connecting the terminals R/L1, S/L2, and T/L3 of the high power factor converter to the power supply, the high power factor converter will be damaged.

Operating Precautions

- The Guideline treats the converter as a no-harmonic-emitting device (K5 = 0), but the harmonic component is not completely 0.

Selection Precautions

Connectable inverter

- Connect to the inverter that can accept DC inputs.
- For the MELTRAC, FR-A500L, and FR-F500L series inverters, make sure the connecting inverter is compatible with the high power factor converter. Connection with an incompatible inverter will damage the inverter and the converter.

Sine wave filter selection precautions

- When using a sine wave filter with FR-HC2 (75K or higher), use MT-BSL-HC for the sine wave filter.

Peripheral Device Selection Precautions

Selection and installation of the moulded case circuit breaker

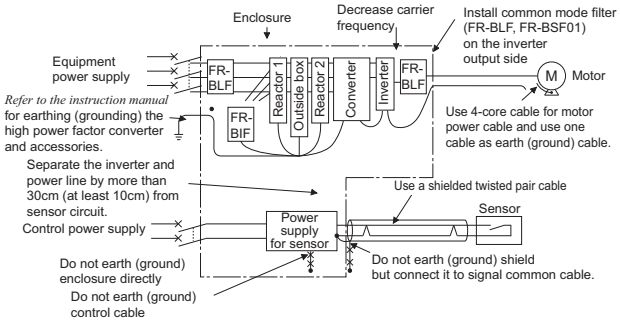
Install a moulded case circuit breaker (MCCB) on the power receiving side to protect the wiring at the converter's input side. For the MCCB selection, refer to *page 23.* (Refer to the materials related to the breaker.) For earth leakage circuit breakers, use the harmonic/surge compatible model provided by Mitsubishi.

Electromagnetic interference

Since the high power factor converter chops input voltage at high carrier frequency, it generates noises. If these noises cause peripheral devices to malfunction, countermeasures should be taken to suppress noises (EMI measures). The EMI measures differ depending on the noise transmission paths.

- The FR-BIF radio noise filter is useful to suppress noises on AM radio broadcasting.
- The FR-BSF01/FR-BLF line noise filters are useful for preventing malfunction of sensors, etc.
- For the noise emitted from power cables, take a distance of 30cm (at least 10cm) from the power cables, and use shielded twisted pair cables for signal cables. Do not earth (ground) the shield. Connect the shield to one common terminal.

EMI measure example



1. Gratis warranty period and coverage

[Gratis warranty period]

Note that an installation period of less than one year after installation in your company or your customer's premises or a period of less than18 months (counted from the date of production) after shipment from our company, whichever is shorter, is selected.

[Coverage]

(1) Diagnosis of failure

As a general rule, diagnosis of failure is done on site by the customer.
However, Mitsubishi or Mitsubishi service network can perform this service for an agreed upon fee upon the customer's request.
There will be no charges if the cause of the breakdown is found to be the fault of Mitsubishi.

(2) Breakdown repairs

There will be a charge for breakdown repairs, exchange replacements and on site visits for the following four conditions, otherwise there will be a charge.

1) Breakdowns due to improper storage, handling, careless accident, software or hardware design by your company and your customers.
2) Breakdowns due to modifications of the product without the consent of the manufacturer.
3) Breakdowns resulting from using the product outside the specified specifications of the product.
4) Breakdowns that are outside the terms of warranty.

Since the above services are limited to Japan, diagnosis of failures, etc. are not performed abroad.
If you desire the after service abroad, please register with Mitsubishi. For details, consult us in advance.

2. Exclusion of opportunity loss from warranty liability

Regardless of the gratis warranty term, compensation to opportunity loss incurred to your company or your customers by failures of Mitsubishi products and compensation for damages to products other than Mitsubishi products and other services are not covered under warranty.

3. Repair period after production is discontinued

Mitsubishi shall accept product repairs for seven years after production of the product is discontinued.

4. Terms of delivery

In regard to the standard product, Mitsubishi shall deliver the standard product without application settings or adjustments to the customer and Mitsubishi is not liable for on site adjustment or test run of the product.

Related Factory Automation Products

Contactors and Motor Starters | MS-N Series

Compact body with full satisfaction

* Lineup from 10A to 800A frames. Available in wide range of applications.
* Conforming to various international specifications as standard.
* Equipped with safe open function contact, applicable to circuits in “machine safety category 4”.
* CAN terminals achieved wiring rationalization and safety improvement.

⚠ Safety Warning

To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.

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