

#### FACTORY AUTOMATION

## MULTIFUNCTION REGENERATION CONVERTER FR-XC

Versatile and feature-rich converter for power regeneration [Addition of 400 V class 75K, 160K, and 220K models]



## GLOBAL IMPACT OF MITSUBISHI ELECTRIC



Through Mitsubishi Electric's vision, "Changes for the Better" are possible for a brighter future.

#### Changes for the Better

"Changes for the Better" represents the Mitsubishi Electric Group's attitude to "always strive to achieve something better", as we continue to change and grow. Each one of us shares a strong will and passion to continuously aim for change, reinforcing our commitment to creating "an even better tomorrow". Mitsubishi Electric is involved in many areas including the following:

#### **Energy and Electric Systems**

A wide range of power and electrical products from generators to large-scale displays.

#### **Electronic Devices**

A wide portfolio of cutting-edge semiconductor devices for systems and products.

#### **Home Appliance**

Dependable consumer products like air conditioners and home entertainment systems.

#### Information and Communication Systems

Commercial and consumer-centric equipment, products and systems.

#### **Industrial Automation Systems**

Maximizing productivity and efficiency with cutting-edge automation technology.



The Mitsubishi Electric Group is actively solving social issues, such as decarbonization and labor shortages, by providing production sites with energy-saving equipment and solutions that utilize automation systems, thereby helping towards a sustainable society.

Features	4
Common specifications	16
Outline Dimensions	17
Terminal Specifications	28
Parameter List	30
Common bus regeneration mode	32
Harmonic suppression mode	46
Power regeneration mode 2	60
Protective Functions	72
Option list	73
Precautions on Selection and Operation	74
Warranty	76

## Single Solution for Both Harmonic Suppression and Power Regeneration

Choose the suitable function for your needs by using the FR-XC converter with the FR-XCB, FR-XCL, or FR-XCG reactor.



	Harmonic suppression mode	Common bus regeneration mode	Power regeneration mode 2	
Energy saving by power regeneration	***	***	***	
Power supply harmonic current suppression	***	_	-	
Reduction in the power supply capacity or the facility size by power factor improvement	**	*	-	
Use as a common converter	**	**	-	
Initial cost reduction	*	**	***	
Less wiring work	***	**	☆☆	
Smaller enclosure size	**	**	\$ \$	

★★★: Highly effective ★★: Moderately effective ★: Slightly effective -: N/A





#### Compact design offering solution to harmonic problems

#### Harmonic suppression mode

The FR-XC-(H)15K or lower does not have the harmonic suppression function.



#### Harmonic suppression (K5 = 0) achieved

• The FR-XC series converter is classified as the self-excitation three-phase bridge circuit under the "Harmonic Suppression Guidelines for Specific Consumers" and achieves K5 = 0 (conversion factor for equivalent capacity) when its harmonic suppression function is enabled and in use with the dedicated box-type reactor FR-XCB. (It is assumed that the converter generates no harmonics.)

The total harmonic distortion of the input current (THDi) is 5% or less\*1, which facilitates compliance with the overseas standards related to harmonic suppression.

- \*1 When the input voltage is distorted, harmonic contents increase because power harmonics flow into the FR-XC series converter.
- The waveform with high peaks, which is typical of the input current to the inverter section from the converter section in an inverter unit, is rounded to make a sine wave with a lower input current effective value.

#### Power supply capacity reduced by power factor improvement

• With the reduced effective value of the input current to the inverter section, it is possible to install a power transformer, MCCB, cables, etc. with smaller capacity on the converter input side to reduce the equipment cost.

#### Wire and space saving

The slim converter requires less space, and the FR-XCB box-type reactor<sup>2</sup> enables wiring reduction as it contains peripheral devices such as reactors.

\*2 Used for the FR-XC converter in harmonic suppression mode.

#### Space saving by increasing the current rating

When the 40°C rating of surrounding air temperature is selected within the temperature derating range, the current rating and the current to be applied can be increased. When the FR-XC series converter is intended for the use at the surrounding air temperatures less than 40°C, a model with a smaller capacity is applicable. With smaller converter, less space is required.

For selection, refer to the following pages: page 51 (harmonic suppression mode), page 37 (common bus regeneration mode), page 64 (power regeneration mode 2).

# Reactor 1 Outside box Reactor 2 Wirsting Image: Conventional model Box-type reactor

#### Installation space reduced by 40% or more

FR-XC-H75K: Width is reduced from 1000 mm to 600 mm.



FR-XC-H160K: Width is reduced from 1800 mm to 1000 mm.



Box-type reactor package

#### Power regeneration contributing to energy saving

While the motor rotates to drive the machine during power driving, the machine rotates the motor during regenerative driving, which results in energy saving since the motor serves as a generator which returns the power to the power supply. For example, when a power of 70 kW is required for power driving and a power of 30 kW is required for regenerative driving, the power consumption is reduced by 30%. One of the two regeneration modes can be selected depending on the application.



FR-XC + FR-XCL

Using regenerative power can increase power efficiency and reduce the CO<sub>2</sub> emission (power consumption) of the equipment. This creates the new added value of contributing to carbon neutrality.

Common bus regeneration mode Harmonic suppression mode

#### Total cost reduction by connecting up to 10 inverters

The FR-XC series converter can connect to up to 10 inverters<sup>73</sup> together, though its predecessor FR-CV series converter is designed to connect to up to 6 inverters.

The power returned from an inverter during regenerative driving can be supplied to another inverter, saving the overall energy.

None of the inverters requires a brake unit, which enables total space and cost reduction.

\*3 If you want to connect 11 or more inverters, contact your sales representative.



#### Power regeneration mode 2

#### Space saving achievable depending on the regenerative power

For power driving, the inverter supplies power. For regenerative driving, the FR-XC series converter returns power to the power supply. (In this mode, the FR-XC series converter cannot be used as a common converter.)

The capacity of the FR-XC series converter is selectable according to the regenerative power of the system. Thus, the compact converter is applicable for the regenerative power smaller than the inverter capacity, which contributes to space saving. (Refer to page 64 for selection.)

For example, if you use the 30 kW inverter and the regenerative power of your system is 5.5 kilowatts, you can choose the 7.5 kW converter instead of the 30 kW converter.

The converter with its harmonic suppression function disabled can be used in the power regeneration mode.

### 30 kW (power driving) Motor Inverter 5.5 kW (regenerative driving)



FR-XC + FR-XCG

For details on the control modes, refer to the following pages.

#### **Stock reduction**

#### Single converter usable in different modes or with the control function enabled/disabled

The regeneration mode is changed with the selection switch, and the harmonic suppression function is enabled or disabled according to the parameter setting.

A single FR-XC series converter can be used as a backup converter for different applications. (Use the converter in combination with the dedicated stand-alone reactor (FR-XCL) or the dedicated box-type reactor (FR-XCB).)



#### Network compatibility

RS-485 communication is supported as standard. With the FR-A8NC communication option, the converter also supports CC-Link communication.

- As power can be monitored during both power driving and regenerative driving, the energy saving effect can be checked any time.
- Monitoring of faults and the voltage of each phase allows you to analyze the fault cause easily.



The power regeneration function (enabled continuously with 100%<sup>\*1</sup> torque or for 60 seconds with the maximum torque of 150%) offers a large braking force, eliminating the need for brake units.

\*1 100% refers to the following values.

Harmonic suppression mode: applicable inverter capacity (Refer to page 48.) Common bus regeneration mode: applicable inverter capacity (Refer to page 34.) Power regeneration mode 2: potential regenerative capacity (Refer to page 62.)



Regenerative braking torque (FR-XC-7.5K, 11K, 15K, 22K, 30K, 37K and 55K)



Short-time permissible regenerative power WRS (kW)

#### Easy wiring of the control circuit

#### Spring clamp terminals (control circuit terminals)

Spring clamp terminals<sup>\*2</sup> provide high reliability and easy wiring.

- \*2 The main circuit terminals are screw terminals.
- Easy wiring

Wiring is completed only by inserting the dedicated blade terminal of each cable. Without using the blade terminal, the loose wires can also be connected using a flathead screwdriver.



#### High reliability Internal\_termin

Internal terminal contacts are spring-type. Therefore, wires can be protected against loosening or contact faults due to vibrations during operation on a bogie or during transport.

 Maintenance-free No additional screw tightening is required.

#### Long life components and life check function

#### Long life components

- The service life of the cooling fans is designed for 10 years\*3.
- The capacitors' life is also designed for 10 years\*3\*4.
- Estimated service lifespan of the long-life parts

Components	Estimated lifespan	Guideline of JEMA*5
Cooling fan	10 years	2 to 3 years
Main circuit smoothing capacitor	10 years	5 years
Printed board smoothing capacitor	10 years	5 years

#### Life check function

- The remaining lifetime can be estimated for wear and tear parts (main circuit capacitor, cooling fan) and inrush current limit circuit by checking the deterioration.
- Using the self-diagnosis function, the part life warning can be output<sup>\*6</sup> to prevent a fault.
  - \*3 Surrounding air temperature: Annual average of 40°C (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.
  - The design life is a calculated value and is not a g
  - \*4 Input current: 80% of the converter rating
  - \*5 Excerpts from "Periodic check of the transistorized inverter" of JEMA (Japan Electrical Manufacturer's Association).
  - \*6 A warning is output when any of the control circuit capacitors, inrush current limit circuit, and cooling fan reaches its output level.

#### Installation inside the enclosure Option

The 30K converter or lower can be installed inside the enclosure by using the optional installation attachment FR-XCCP (the 37K and 55K converters do not need the attachment for installation in the enclosure).



#### Protection against hazardous environments

The FR-XC series converters with circuit board coating (IEC 60721-3-3:1994 3C2/3S2) and plated conductors are available for improved environmental resistance. (The converter model name ends with "-60" or "-06".)

#### **Global compatibility**

- The FR-XC converter is compliant with UL, cUL, EC Directives (CE marking), and Radio Waves Act (South Korea, KC marking). It is also certified as compliant with the Eurasian Conformity (EAC).
- The converter is compliant with the EU RoHS Directive (Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), friendly to people and to the environment.



#### IP20 compliant protective structure Option

The 37K and 55K converters can have the IP20compliant protective structure when the optional IP20 compatible attachment FR-XCCU is attached.



## **Application Examples**

Ceiling crane

The regenerative power from the motor is returned the power supply to save energy. The capacity of the FR-XC series converter is selectable according to the regenerative power of the system, which contributes to space saving. Power regeneration mode 2



**Printing machines** Common bus regeneration mode Harmonic suppression mode The regenerative power from the unwinding shaft can be supplied to another inverter, saving the overall energy. When the harmonic suppression function is enabled, power supply harmonics of inverters can be suppressed. Unwinding shaft Reference shaf FR-XC FR-XCB Inverter Inverter Inverter 1 10 Winding shaft Regenerative driving Air conditioning of buildings Harmonic suppression mode Power supply harmonics of inverters can be suppressed, minimizing the effects on Point other equipment. Compatibility with networks (RS-485 communication, CC-Link) enables central control of systems in multiple locations. The effects of energy saving can be checked easily.



#### Conveyor

FR-XCL

Spinning

FR-XC

Regenerative driving

FR-XC

FR-XCI

saving on the energy consumption.

Inverter

Inverter

-

shafts to a common bus.

Inverte

The FR-XC series converter supports the system with more than 6 inverters (up to 10 inverters).

Regenerative driving

The regenerated energy of the inverter for the lift application is used by another inverter mode for the driving application. If there is still an excess, it is returned to the power supply,

Features

Common bus regeneration mode

Harmonic suppression mode

#### Pump (water treatment plant)

Point

Power supply harmonics of inverters can be suppressed, allowing the compliance with the harmonic suppression guidelines. The FR-XCB box-type reactor enables wiring

na/lowerina

Traveling

G

As unwinding shafts are driven by a load, operation is always in regenerative driving state. The regenerative power can be used efficiently by connecting inverters of other drive

Twiste

Inverter

Winding

Axis

reduction as it contains peripheral devices.





## Lineup

#### Multifunction regeneration converter model

•: Released, O: To be released, --: Not applicable Specifications of the models to be released are subject to change without prior notice.



#### Dedicated stand-alone reactor (option) model

A stand-alone reactor for use with the FR-XC converter in common bus regeneration mode.

A stand-alone reactor for use with the FR-XC converter in power regeneration mode 2.

I	FR	- X (	CL	-		2	2	Κ			FF	<b>२</b> -	X	С	G	-		22 K
		Symbol	Voltag	e		React	tor cap	acity					Symb	ol	Voltag	е		Reactor capacity
		None	200 V cla	ass		Cap	bacity (k'	VV)					None	2	200 V cla	ass		Capacity (kW)
		Н	400 V cla	ass									Н	4	100 V cla	ass		
	Voltage	Mod	el	7.5	11	15	22	30	37	55	75	90	132	160	185	220	250	
	000.1/	FR-XCL	[ ]K				•				_	_	_	-	-	_	-	
200 V		FR-XCG	3-[]K	•	•	•		•	•	•	_	-	—	-	_	-	-	
	400.1/	FR-XCL-	-H[]K	•	•	•	•	•	•	•	•	٠	_	٠	•	٠	٠	
400 V	FR-XCG	-H[]K											٠			_		

#### Dedicated box-type reactor (option) model

A stand-alone box-type reactor for use with the FR-XC converter in harmonic suppression mode.



#### Dedicated contactor box (option) model

A dedicated contactor box used for coordination with the charging circuit.



#### Combination in common bus regeneration mode • 200 V class

Multifunction regener	Dedicated stand-alone reactor	
Model	周囲温度定格	FR-XCL-[]K
FR-XC-7.5K		7.5
FR-XC-11K		11
FR-XC-15K	50°C/40°C rating	15
FR-XC-18.5K-PWM		22
FR-XC-22K		
FR-XC-22K-PWM		30
FR-XC-30K		
FR-XC-37K		37
FR-XC-37K-PWM		
FR-XC-55K		55
FR-AG-SOK-PWW		

• 400 V class

Multifunction regener	Dedicated stand-alone reactor	
Model	周囲温度定格	FR-XCL-H[]K
FR-XC-H7.5K		7.5
FR-XC-H11K		11
FR-XC-H15K		15
FR-XC-H18.5K-PWM		22
FR-XC-H22K	50°C/40°C	22
FR-XC-H22K-PWM	rating	20
FR-XC-H30K	_	
FR-XC-H37K FR-XC-H37K-PWM		37
FR-XC-H55K FR-XC-H55K-PWM		55
FR-XC-H75K	50°C rating	75
FR-XC-H75K-PWM	40°C rating	90
FR-XC-H160K	50°C rating	160
FR-XC-H160K-PWM	40°C rating	185
FR-XC-H220K	50°C rating	220
FR-XC-H220K-PWM	40°C rating	250

Multifunction regene	Dedicated stand-alone reactor			
Model	周囲温度定格	FR-MCB-H[]		
FR-XC-H75K	50°C rating	150		
FR-XC-H75K-PWM	40°C rating	130		
FR-XC-H160K FR-XC-H160K-PWM FR-XC-H220K FR-XC-H220K-PWM	50°C rating	400		
	40°C rating	400		
	50°C rating	400		
	40°C rating	800		

#### Combination in harmonic suppression mode • 200 V class

Multifunction regene	Dedicated stand-alone reactor	
Model	周囲温度定格	FR-XCB-[]K
FR-XC-18.5K-PWM		18.5
FR-XC-22K-PWM	50°C/40°C rating	
FR-XC-30K		22
FR-XC-37K FR-XC-37K-PWM		37
FR-XC-55K FR-XC-55K-PWM		55

• 400 V class

Multifunction regener	Dedicated stand-alone reactor	
Model	周囲温度定格	FR-XCB-H[]K
FR-XC-H18.5K-PWM		19.5
FR-XC-H22K		16.5
FR-XC-H22K-PWM		22
FR-XC-H30K	50°C/40°C	22
FR-XC-H37K	rating	37
FR-XC-H37K-PWM		51
FR-XC-H55K		55
FR-XC-H55K-PWM		
FR-XC-H75K	50°C rating	75
FR-XC-H75K-PWM	40°C rating	15
FR-XC-H160K	50°C rating	160
FR-XC-H160K-PWM	40°C rating	100
FR-XC-H220K	50°C rating	220
FR-XC-H220K-PWM	40°C rating	220

Multifunction regener	Dedicated stand-alone reactor	
Model	周囲温度定格	FR-MCB-H[]
FR-XC-H75K	50°C rating	150
FR-XC-H75K-PWM	40°C rating	150
FR-XC-H160K	50°C rating	400
FR-XC-H160K-PWM	40°C rating	400
FR-XC-H220K	50°C rating	100
FR-XC-H220K-PWM	40°C rating	400

#### Combination in power regeneration mode 2 • 200 V class

Multifunction regener	Dedicated stand-alone reactor	
Model	周囲温度定格	FR-XCG-[]K
FR-XC-7.5K		7.5
FR-XC-11K	50°C/40°C rating	11
FR-XC-15K		15
FR-XC-18.5K-PWM		22
FR-XC-22K		
FR-XC-22K-PWM		30
FR-XC-30K		
FR-XC-37K		37
FR-XC-37K-PWM		
FR-XC-55K FR-XC-55K-PWM		55

#### • 400 V class

Multifunction regener	Dedicated stand-alone reactor				
Model	周囲温度定格	FR-XCG-H[]K			
FR-XC-H7.5K		7.5			
FR-XC-H11K		11			
FR-XC-H15K		15			
FR-XC-H18.5K-PWM	50°C/40°C rating	00			
FR-XC-H22K					
FR-XC-H22K-PWM		30			
FR-XC-H30K					
FR-XC-H37K FR-XC-H37K-PWM		37			
FR-XC-H55K FR-XC-H55K-PWM		55			
FR-XC-H75K	50°C rating	75			
FR-XC-H75K-PWM	40°C rating	90			
FR-XC-H160K	50°C rating	132			
FR-XC-H160K-PWM	40°C rating	160			
FR-XC-H220K	50°C rating	185			
FR-XC-H220K-PWM	40°C rating	220			

## Lineup

#### Converter installation attachment for enclosure (option) model

An attachment for installation of the FR-XC series converter in an enclosure.



#### IP20 compatible attachment (option) model

An attachment for achieving the IP20 compliant protective structure of the FR-XC series converter.



Combination matrix of FR-XCCP and FR-XC(-PWM)

Multifunction regeneration converter	Converter installation attachment for enclosure
Model	FR-XCCP[]
FR-XC-7.5K FR-XC-H7.5K	01
FR-XC-11K FR-XC-H11K	01
FR-XC-15K FR-XC-H15K	02
FR-XC-22K FR-XC-H22K	
FR-XC-30K FR-XC-H30K	00
FR-XC-18.5K-PWM FR-XC-H18.5K-PWM	03
FR-XC-22K-PWM FR-XC-H22K-PWM	

#### Combination matrix of FR-XCCU and FR-XC(-PWM)

•: Released

Multifunction regeneration converter	IP20 compatible attachment
Model	FR-XCCU[]
FR-XC-37K FR-XC-37K-PWM	01
FR-XC-H55K FR-XC-H55K-PWM	01
FR-XC-55K FR-XC-55K-PWM	02
FR-XC-H37K FR-XC-H37K-PWM	03

**Features** 

## MEMO

#### **Common specifications**

Control	Input	frequer	ncy range	50 to 60 Hz
n	Input	signal (	(3)	The following signals can be assigned to <b>Pr.3</b> , <b>Pr.4</b> , or <b>Pr.7</b> (Input terminal function selection): Converter stop (SOF), Converter reset (RES), External thermal relay input (OH), and Box-type reactor overheat protection (LOH).
Operatio	Outpu Open Relay	ut signa collecto output	l or output (3)∗6 (1)	The following signals can be assigned to <b>Pr.11</b> , <b>Pr.12</b> , or <b>Pr.16 (Output terminal function selection)</b> : Inverter run enable (RDY), During converter reset (RSO), Converter running (CVO), Overload warning (OL), Power supply phase detection (PHS), Instantaneous power failure detection (IPF), Regenerative drive recognition (Y7), Electronic theorem (DN), During the set of
		Operati	ion status	retry (RTY), Life alarm (Y14), Maintenance timer alarm (Y15), Instantaneous power failure detection hold (Y16), PU stopped (PS), Box-type reactor overheat pre-alarm (FTP), Alarm (LF), and Fault (ALM).
			Converter	Input power value (with regenerative driving indication)
cation	Status monitoring FR-DU08/ FR-PU07			Input current, input voltage, bus voltage (output voltage), fault indication, power supply frequency, electronic thermal relay load factor, input power, cumulative power, cumulative energization time, input power with regenerative driving indication, I/O terminal status, electricity cost, option connector status
ndi	Converter			When a protective function is activated, a fault indication is displayed.
-	monitoring FR-DU08/ FR-PU07			When a protective function is activated, a fault indication is displayed, and the latest monitored value of input voltage, input current, bus voltage, cumulative energization time are recorded. The last eight fault records are stored.
Prote functi	Protective function Alarm, Warning, Error message		Fault	Overcurrent trip, Overvoltage trip, Converter overload trip (electronic thermal relay function), Heatsink overheat, Instantaneous power failure, Undervoltage, Input phase loss, External thermal relay operation*3, Communication option fault*4, Parameter storage device fault, PU disconnection*3, Retry count excess*3, CPU fault, Internal circuit fault, 24 VDC power output short circuit, Inrush current limit circuit fault, Connection mode fault, Unsupported control selection, Box-type reactor overheat protection, Box-type reactor power supply short circuit protection, Option fault*4, Main circuit power supply detection fault, Input power supply fault 1
			Alarm, Warning, Error message	Overload signal detection, Electronic thermal relay function pre-alarm, PU stop, Maintenance signal output*3, Power supply not detected, Converter operation disabled, Box-type reactor overheat pre-alarm, Fan alarm, Operation panel lock*5, Write disable error*5, Copy operation fault*5
	Surro	ounding	air temperature	-10 to +50°C (non-freezing)*1
	Surrounding air humidity		air humidity	With circuit board coating (conforming to IEC 60721-3-3:1994 3C2/3S2): 95% RH or less (non-condensing), without circuit board coating: 90% RH or less (non-condensing)
ent	Storage temperature*2		perature*2	-20 to +65°C
nn	Atmosphere			Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt)
Enviro	Altitude			2500 m or less (For the installation at an altitude above 1000 m, consider a 3% reduction in the rated current per 500 m increase in altitude.)
Ξ	Vibration			[55K or lower] 5.9 m/s <sup>2</sup> or less at 10 to 55 Hz in X, Y, and Z directions. [75K or higher] Frequency range 10 to 57 Hz: maximum amplitude 0.075 mm. Frequency range 57 to 150 Hz: maximum acceleration speed 9.8 m/s <sup>2</sup> .

\*1

\*1 \*2 \*3 \*4 \*5 \*6

-10 to +40°C (non-freezing) at the 40°C rating. Applicable to conditions for a short time, for example, in transit. Not enabled in the initial state. Available when the FR-A8NC is installed. Displayed on the operation panel (FR-DU08) only. Signal assignment is not available for one of the three terminals (terminal RYB).

#### **Outline Dimensions**

#### Multifunction regeneration converter FR-XC(-PWM)

• FR-XC-(H)7.5K, (H)11K



• FR-XC-(H)15K



#### **Outline Dimensions**

FR-XC-(H)22K, (H)30K
FR-XC-(H)18.5K-PWM, (H)22K-PWM



(Unit: mm)

**Outline Dimensions** 

- FR-XC-55KFR-XC-55K-PWM



- FR-XC-H75KFR-XC-H75K-PWM



(Unit: mm)

 $\left[ \bigcirc \right]$ 

С

0

0

0

0

3.2

(Unit: mm)

#### **Outline Dimensions**

- FR-XC-H160K, H220K
- FR-XC-H160K-PWM, H220K-PWM



(Unit: mm)

#### Dedicated stand-alone reactor FR-XCL (option)

FR-XCL-(H)7.5K, (H)11K, (H)15K, (H)22K, (H)30K, (H)37K, (H)55K, H75K, H90K





• FR-XCL-H160K, H185K, H220K, H250K





200 V class	200 V class											
Model	w	W1	W2	Н	D	D1	Mounting screw size	Terminal screw size	Mass			
FR-XCL-7.5K	165			105	120	80±2		ME	3.9 kg			
FR-XCL-11K	105	<b>FF</b>	8	120	120	73±2	M6	IVI O	3.6 kg			
FR-XCL-15K	102	55		130	130	100±2		M6	5.5 kg			
FR-XCL-22K	192				140	110±2			6.3 kg			
FR-XCL-30K	240	70		150	160	119±2			10.0 kg			
FR-XCL-37K	248	200	10	100	240	120±5	M8	M10	12.0 kg			
FR-XCL-55K	250	225		190	260	135±5	IVIO		15.5 kg			

#### 400 V class

Model	w	W1	W2	Н	D	D1	Mounting screw size	Terminal screw size	Mass
FR-XCL-H7.5K					120	73±2			3.7 kg
FR-XCL-H11K	165	55		125	120	80±2		M5	4.2 kg
FR-XCL-H15K			8		135	110±2	M6		6.0 kg
FR-XCL-H22K	240	70		150	150	109±2		M6	9.0 kg
FR-XCL-H30K	240	10		150	170	129±2		IVIO	12.0 kg
FR-XCL-H37K	220	220 200 100 120	120±5			12.0 kg			
FR-XCL-H55K	250	225	10	190	200	135±5	MQ	M8	16.0 kg
FR-XCL-H75K	200	270	10	335	200	140±2	IVIO		50.0 kg
FR-XCL-H90K	300	270		360	210	150±2			60.0 kg
FR-XCL-H160K	120	200		600	190	140			95.0 kg
FR-XCL-H185K	430	290	15	000			M10	M12	115.0 kg
FR-XCL-H220K	500	460		640	210	160			150.0 kg
FR-XCL-H250K	500	460		660					160.0 kg

#### Dedicated stand-alone reactor FR-XCG (option)

FR-XCG-(H)7.5K, (H)11K, (H)15K, (H)22K, (H)30K, (H)37K, (H)55K, H75K, H90K •







Þ

D max

• FR-XCG-H132K, H160K, H185K, H220K





#### (Unit: mm)

200 V class									
Model	w	W1	W2	н	D	D1	Mounting screw size	Terminal screw size	Mass
FR-XCG-7.5K				185	115	60±1.5		M5	5 kg
FR-XCG-11K	220	200	6	105	120	75±1.5	M5	IVIJ	8 kg
FR-XCG-15K				190	130	90±1.5			11 kg
FR-XCG-22K	255	225	Q	240	140	85±1.5	Me	M6	16 kg
FR-XCG-30K	200	225	0	240	155	100+1 5	WIO		20 kg
FR-XCG-37K	200	270	10	005	180	100±1.5	140	M40	25 kg
FR-XCG-55K	300	210	10	200	190	130±1.5		WITU	40 kg

#### 400 V class

Model	w	W1	W2	Н	D	D1	Mounting screw size	Terminal screw size	Mass
FR-XCG-H7.5K					115	60±1.5			5 kg
FR-XCG-H11K	220	200	6	185	120	75±1.5	M5	M5	8 kg
FR-XCG-H15K					120	90±1.5			11 kg
FR-XCG-H22K	255	225	Q	240	130	85±1.5	M6	Me	16 kg
FR-XCG-H30K	200	225	0	240	140	100+1.5	IVIO	IVIO	20 kg
FR-XCG-H37K			10	205	180	10011.5		M8	25 kg
FR-XCG-H55K	200	070		200	190	130±1.5	M8		40 kg
FR-XCG-H75K	300	270		335	200	140±2			50 kg
FR-XCG-H90K				360	210	150±2			60 kg
FR-XCG-H132K				560	195	140+2		M12	80.0 kg
FR-XCG-H160K	430	390	15	600	190	14012	M12		95.0 kg
FR-XCG-H185K				000	210	160+2			115.0 kg
FR-XCG-H220K	500	460		650	210	100±2			150.0 kg

#### Dedicated box-type reactor FR-XCB (option)

• FR-XCB-(H)18.5K, (H)22K, (H)37K, (H)55K



(Unit: mm)



				$\oplus$
0	0	0	0	0
	0			
• •	0			•
0				
Ô				
0				
<u> </u>				
••••••	-			
	°			
Ê	•	。[F	AN	
	0	0	0	
				U I
_		D		_
-			(Unit: I	mm)

200 V class	-							
Model	w	W1	н	H1	D	d	Screw size	Mass
FR-XCB-18.5K	265	200	470	440	275	10	M8	26.0 kg
FR-XCB-22K	200	200	470	044	210	10	MO	20.0 Kg
FR-XCB-37K	250	270	600	676	220	10	M10	56.9 kg
FR-XCB-55K	330	210	000	515	550	12	WITU	68.5 kg

400 V c
---------

400 V Class									
Model	w	W1	н	H1	D	d	Screw size	Mass	
FR-XCB-H18.5K	265	200	470	440	275	10	MR	26.0 kg	
FR-XCB-H22K	205	200	470	440	215	10	INIO	20.9 Kg	
FR-XCB-H37K	350	270	600	575	330			63.0 kg	
FR-XCB-H55K	330	210	000	575	330	12	M10	73.0 kg	
FR-XCB-H75K	240	80	915	885	410			120.0 kg	

#### **Outline Dimensions**

• FR-XCB-H160K, H220K



Model	Mass
FR-XCB-H160K	230 kg
FR-XCB-H220K	260 kg

#### Dedicated contactor box FR-MCB

• FR-MCB-H150, H400, H800



Model	W	W1	Н	H1	D	d	Screw size	Mass
FR-MCB-H150		185	350	325	320	8	M6	17.0 kg
FR-MCB-H400	240	175	540	518	270	10		29.0 kg
FR-MCB-H800		175	880	858	370	10		51.0 kg

- Converter installation enclosure attachment FR-XCCP (option)
- FR-XCCP01, 02, 03



#### Protruding the heat sink through a panel

When encasing the multifunction regeneration converter in an enclosure, the heat generated in the enclosure can be greatly reduced by exposing the heat sink of the converter. (The 30K converters or lower are designed to be installed in an enclosure with its heat sink protruded through the panel of the enclosure.)

This installation method is recommended when installing the converter in a compact enclosure.

[30K converters or lower]

Refer to page 17 for instructions on cutting the panel of the enclosure.

#### • NOTE

Use the FR-XCCP (converter installation attachment for enclosure) to install the 30K converter or lower in the enclosure.

#### [37K converters or higher]

Panel cutting

Cut the panel of the enclosure as follows.



Multifunction regeneration converter	W	W1	Н	H1	H2	d
FR-XC-(H)37K, H55K FR-XC-(H)37K-PWM, H55K-PWM	315	270	490	530	20	M8
FR-XC-55K FR-XC-55K-PWM	360	300	560	600	20	
FR-XC-H75K FR-XC-H75K-PWM	210	165	760	825	32.5	
FR-XC-H160K FR-XC-H160K-PWM	250	175	1255	1300	22.5	M10
FR-XC-H220K FR-XC-H220K-PWM	250	175	1255	1500	22.5	

Mount point change of installation frame from the rear to the front

The upper and lower installation frames are attached on the multifunction regeneration converter (one for each position). Change the mount point of the upper and lower installation frames from the rear to the front as shown in the figure. When reattaching the installation frames, make sure that the installation orientation is correct.



Installation of the multifunction regeneration converter in the enclosure Place the converter in an enclosure so that the converter's heat sink section protrudes from the hole through the panel of the enclosure. Fasten the converter to the panel with screws through holes in the upper and lower installation frames.



Dimension of the converter's heat sink section protruded through the

Multifunction regeneration converter	Depth (mm)
FR-XC-(H)37K, H55K FR-XC-(H)37K-PWM, H55K-PWM	105
FR-XC-55K FR-XC-55K-PWM	135
FR-XC-H75K FR-XC-H75K-PWM	162
FR-XC-H160K FR-XC-H160K-PWM FR-XC-H220K FR-XC-H220K-PWM	215.5

To avoid interference with the cooling fan on top of the heat sink, the thickness of the panel of the enclosure should not exceed 10 mm and the space around the fan should be cleared.



- As the heat sink section protruded through the panel includes a cooling fan, this type of installation is not suitable for environment in which the converter may be exposed to drops of water, oil mist, dust, etc. • Make sure that screws, debris etc. do not get into the converter and cooling fan.

#### **Terminal Specifications**

indicates that terminal functions can be selected using **Pr.3**, **Pr.4**, or **Pr.7** (Input terminal function selection) or **Pr.11**, **Pr.12**, or **Pr.16** (Output terminal function selection).

Туре	Terminal symbol	Terminal name	Description						
	R/L1, S/L2, T/L3	Power supply phase detection	These terminals are used to detect the phase and voltage of the power control circuit. Connect each of them to terminals of the same name on reactor. Operating the inverter without connecting them will damage the	supply, and to input power to the both the power supply and the converter.					
	R2/L12, S2/L22, T2/L32	AC power input	Connect each of them to terminals of the same name on the reactor.						
÷	R1/L11, S1/L21	Power supply for the control circuit	These terminals are connected to the phase detection terminals R/L1 a retain the fault display and fault output, remove the jumpers (cables) and these terminals.	d to the phase detection terminals R/L1 and S/L2 in the initial status. To It output, remove the jumpers (cables) and apply external power through					
ircui	R3/L13, S3/L23*1	Terminals for the charge circuit	Connect these terminals to the power supply. Otherwise, the converter	will not start.					
Main c	P/+, N/-	DC output for the common bus regeneration mode / harmonic suppression mode	Connect them to the inverter terminals P/+ and N/						
	P4, N/-	DC output for the power regeneration mode 2	Connect them to the inverter terminals P/+ and N/						
		Earth (ground)	For earthing (grounding) the converter chassis. This must be earthed (g	grounded).					
	RES	Reset	Use this signal to reset a fault output provided when a protective function is activated. Turn ON the RES signal for 0.1 seconds or longer, then turn it OFF.						
	SOF	Converter stop	Turn ON this signal to stop the regenerative driving. The function can be changed using <b>Pr.4</b> .	Input resistance: 4.7 kΩ, voltage when contacts are					
ct input	LOH	Box-type reactor overheat protection	Used to monitor the speed of cooling fan in the FR-XCB reactor for overheat protection. When the sink logic is selected, connect this terminal to terminal LOH1 on the reactor. When the source logic is selected, connect this terminal to terminal LOH2 on the reactor.	open: 21 to 27 VDC, current when contacts are short-circuited: 4 to 6 mADC					
it/conta		Contact input common (sink) (initial setting)	Common terminal for the contact input terminal (sink logic).						
ntrol circu	SD	External transistor common (source)	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the source logic to avoid malfunction by undesirable current.	_					
õ		24 VDC power supply common	Common output terminal for 24 VDC 0.1A power supply (PC terminal). Isolated from terminals 5, SE, and SE2.						
	PC	External transistor common (sink) (initial setting)	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the sink logic to avoid malfunction by undesirable current.	Power supply voltage range: 19.2 to 28.8 VDC,					
		Contact input common (source) 24 VDC power supply	Common terminal for contact input terminal (source logic) Can be used as a 24 VDC 0.1 A power supply.	permissible load current: 100 mA					
erminal for FR-MCB Terminal for magnetic contactor (MC)	MC43(23), MC44(24) *1	Auxiliary contact input for MC	Auxiliary contact (NO contact) input terminals for the magnetic contactor (MC). The operation of the MC can be monitored. When the FR-MCB is used (the FR-XC operates in common bus regeneration mode), connect these terminals to terminals 43 (23) and 44 (24) of the FR-MCB. When the FR-MCB. When the FR-MCB is not used (the FR-XC operates in power regeneration mode 2), connect these terminals to auxiliary contacts (NO contacts) of the MC. These terminals are provided only for the FR-XC-H75K(-PWM).	Voltage when contacts are open: 21 to 27 VDC, current when contacts are short- circuited: 6 to 8 mA.					

Ту	ре	Terminal symbol	Terminal name	Description	
		RYA	Inverter run enable (NO contact)	Turns ON when the multifunction regeneration converter becomes ready for operation. Signal OFF: Inverter cannot run Signal ON: Inverter can run	
iit/output signal )pen collector		RYB	Inverter run enable (NC contact)	Turns ON at alarm occurrence or at input of the Reset (RES) signal. Connect this terminal to the inverter terminal which the X10 signal is assigned to or the inverter terminal MRS. Terminal RYB is used with the normally closed (NC contact) specification. Turning ON the RYB signal stops the inverter. Signal OFF: Inverter can run Signal ON: Inverter cannot run	Permissible load: 24 VDC (27 VDC at maximum) 0.1 A (The voltage drop is 2.8 V at maximum while the signal is ON.)
ontrol circ		RSO	Converter reset	Turns ON during a converter reset (RES-ON). Connect this terminal to the inverter terminal which the RES signal is assigned to. Turning ON the RSO signal resets the inverter.	
ŭ		SE	Open collector output common	Common terminal for terminals RYA, RYB, and RSO. Connect it to the inverter terminal SD (sink logic).	—
	Relay	A, B, C	Fault contact	1 changeover contact output that indicates that an converter's protective function has been activated and the outputs are stopped. Fault: discontinuity across B and C (continuity across A and C), Normal: continuity across B and C (discontinuity across A and C)	Contact capacity: 230 VAC 0.3 A (power factor = 0.4), Output: 30 VDC 0.3 A
Terminal for FR-MCB	Terminal for magnetic contactor (MC)	<b>A1, A2</b> ∗ı	Command signal for MC	Contact output terminals for the operation command for the magnetic contactor (MC). When the FR-MCB is used (the FR-XC operates in common bus regeneration mode), connect terminal A1 to terminal SY/L2Y of the FR-MCB, and terminal A2 to terminal A2 of the FR-MCB. When the FR-MCB is not used (the FR-XC operates in power regeneration mode 2), the power supply for MC driving coil is required. Connect terminal A1 to the power supply for MC driving coil and terminal A2 to the coil terminal of the MC. These terminals are provided only for the FR-XC-H75K(-PWM).	Contact capacity: 250 VAC 10 A (cosφ = 1.0), 250 VAC 5 A (cosφ = 0.4) 30 VDC 10 A
supply	fan	FAN/ FAN1*2	Reactor fan power supply	Power supply terminal for the fan on the FR-XCB reactor. Connect it to terminal FAN1 on the reactor.	
Power	for	SD/FAN2*2	Reactor fan power supply common	Common terminal for terminal FAN. Connect it to terminal FAN2 on the reactor. Use it in either the sink or se	purce logic.
DC 485	001-02		PU connector	RS-485 communication can be made through the PU connector (for con Conforming standard: EIA-485 (RS-485) Transmission format: Multidrop link Communication speed: 4800 to 38400 bps Wiring length: 500 m	nnection on a 1:1 basis only).

Provided for 75K or higher.
 Differs depending on the capacity (55K or lower / 75K or higher).

#### **Parameter List**

Parameter read/write requires the operation panel (FR-DU08) or the optional parameter unit (FR-PU07 or FR-PU07BB(-L)). The PU can be installed on an enclosure surface. Use the option FR-CB2[] or the following connector and cable available on the market. (To install the operation panel, the optional connector (FR-ADP) is also required.)

#### • NOTE

- Image: Simple mode parameters.
- The setting of parameters in highly colored cell ( ) is changeable during operation even if "1" (write disabled) is set to **Pr.77 Parameter write selection**.

Pr.	Name	Setting range	Minimum setting increment	Initial value	Customer setting
©0	Simple mode selection	0, 9999	0	0	
©1	Maximum power supply frequency	60 Hz (Read only)	-	60 Hz	
©2	Minimum power supply frequency	50 Hz (Read only)	-	50 Hz	
3	LOH terminal function selection		1	5	
4	SOF terminal function selection	0, 3 to 5, 9999	1	0	
7	<b>RES terminal function selection</b>		1	3	
8	SOF input selection	0 to 2	1	0	
9	OH input selection	0, 1	1	0	
11	RSO terminal function selection	0 to 4, 6 to 11, 14 to 18, 98, 99,	1	1	
12	RYA terminal function selection	101 to 104, 106 to 111, 114 to 118,	1	0	
16	ABC terminal function selection	198, 199, 9999	1	99	
<b>@22</b> *4	Current limit level	0 to 190%	0.1%	150	
<b>23</b> *4	Current limit level (regenerative)	0 to 190%, 9999	0.1%	9999	
31	Life alarm status display	0, 1, 4, 5, 8, 9, 12, 13 (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 warning output set time	0 to 9998, 9999	1	9999	
44	Instantaneous power failure detection signal clear	0, 9999	1	9999	
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	
©52	PU main monitor selection	0, 5 to 10, 25, 28	1	0	
<b>©57</b>	Restart selection	0, 9999	1	9999	
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 to 4	1	0	
©67	Number of retries at fault occurrence	0 to 10, 101 to 110, 1001 to 1010, 1101 to 1110	1	0	
©68	Retry waiting time	0.1 to 600 s	0.1 s	1 s	
©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	
<b>80</b> *4	Voltage control proportional gain	0 to 1000%	1%	100	
<b>81</b> *4	Voltage control integral gain	0 to 1000%	1%	100	
<b>82</b> *4	Current control proportional gain	0 to 200%	1%	100	
83*4	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	U to 2	1	2	
121	PU communication retry count	U to 10, 9999	1	1	
123	PU communication waiting time setting	0 to 150 ms, 9999	1 ms	9999	

Pr.	Name	Setting range	Minimum setting increment	Initial value	Customer setting
124	PU communication CR/LF selection	0 to 2	1	1	
©145	PU display language selection	0 to 7	1	0	
168				•	
169	Parameter for manufacturer setting. Do r	not set.			
269					
342	Communication EEPROM write selection	0, 1	1	0	
415	SW2 setting status	55K or lower: 0 to 15 (Read-only) 75K or higher: 0 to 13 (Read-only)	1	15	
416	Control method selection	0, 1, 9999	1	9999	
<b>©500</b> *1	Communication error execution waiting time	0 to 999.8 s	0.1 s	0 s	
<b>©501</b> *1	Communication error occurrence count display	0	1	0	
<b>©502</b> *1	Stop mode selection at communication error	0, 3	1	0	
520	Parameter for manufacturer setting. Do r	not set.		-	
<b>©542</b> *1, *2, *3	Station number (CC-Link)	1 to 64	1	1	
<b>©543</b> *1, *2, *3	Transmission speed selection (CC-Link)	0 to 4	1	0	
<b>©544</b> *1, *2	CC-Link extended setting	0, 1, 12	1	0	
896	Power unit cost	0 to 500	0.01	0	
989	Parameter for manufacturer setting. Do r	not set.	r		
990	PU buzzer control	0, 1	1	1	
991	PU contrast adjustment	0 to 63	1	58	
Pr.CLR	Parameter clear	(0), 1	1	0	
ALL.C	All parameter clear	(0), 1	1	0	
Err.CL	Fault history clear	(0), 1	1	0	
Pr.CPY	Parameter copy	(0), 1 to 3	1	0	
*1 *2 *3 *4	The setting is available only when a communica The setting is applied after the converter reset o [L.ERR] LED indicator on the FR-A8NC blinks w OFF. The setting is available only when the harmonic	tion option (FR-A8NC) is installed. r next power-ON. hen a setting is changed. The setting is suppression is enabled.	applied after the con	verter reset, and the	[L.ERR] turns

#### Common bus regeneration mode

#### Example Connection

55K or lower



Always earth (ground) the converter, the dedicated reactor FR-XCL the inverter, and the motor.

Earth (ground)

Motor

Earth (ground)

Motor

Earth (ground)



Devices on the inverter's output side

Do not install a power factor correction capacitor or surge suppressor or capacitor type filter on the inverter's output side.

When installing a molded case circuit breaker (MCCB) on the inverter's output side, contact the manufacturer of MCCB for MCCB selection.

Earth (ground)

Always earth (ground) the converter, the dedicated reactor FR-XCL or FR-XCB, the dedicated contactor box, the inverter, and the motor.



#### Rating (FR-XC-(H)[]K)

200 V class

	Model FR-XC	-[ ]K*1	7.5	11	15	22	3	0	37	55		
	Applicable inverte	r capacity (kW)	7.5	11	15	22	30	37	7	55		
	Applicable motor	current (A)	33	46	61	90	115	14	15	215		
	Rated input	Power driving	33	47	63	92	124	15	51	223		
50°C	current (A)	Regenerative driving	26	37	51	74	102	12	25	186		
luting	Continuous rating /		100% co	100% continuous / 150% 60 s								
	Power supply cap	acity (kVA)*2	17	20	28	41	52	66	6	100		
	Applicable inverte	r capacity (kW)	7.5	11	15	22	30	37	7	55		
	Applicable motor	current (A)	36	50	67	99	127	16	60	236		
	Rated input	Power driving	36	51	69	101	136	16	66	245		
40°C rating	current (A)	Regenerative driving	28	40	56	81	112	13	38	204		
J	Continuous rating overload current r	/ ating	100% co	ontinuous	/ 150% 6	) s						
	Power supply capa	acity (kVA)*2	19	22	31	45	57	73	3	110		
	Rated input AC vo	Itage/frequency	Three-p	hase 200	to 240 V,	50/60 H	Z*8					
Power	Permissible AC vo	Itage fluctuation	Three-p	hase 170	to 264 V,	50/60 H	z					
Source	Permissible freque	ency fluctuation	±5%									
Protection (IEC 60529)	rating of structure		IP00*4									
Cooling sy	stem		Forced a	air								
Number of	connectable inverte	ers	10*6									
Approx. ma	ass (kg)∗⁊		5	5	6	10.5	10.5	28	3	38		
• 400 V cl	ass											
	Model FR-XC-	<b>H[]K</b> *1	7.5	11	15	22	30	37	55	75	160	220
	Applicable inverte	r capacity (kW)	7.5	11	15	22	30	37	55	75	160	220
	Applicable motor	current (A)	17	23	31	44	57	71	110	144	325	432
50°C	Applicable motor of Rated input	current (A) Power driving	17 18	23 25	31 34	44 49	57 65	71 80	110 118	144 158	325 331	432 450
50°C rating	Applicable motor of Rated input current (A)	current (A) Power driving Regenerative driving	17 18 14	23 25 20	31 34 27	44 49 39	57 65 54	71 80 66	110 118 98	144 158 135	325 331 288	432 450 396
50°C rating	Applicable motor of Rated input current (A) Continuous rating overload current r	current (A) Power driving Regenerative driving / ating	17 18 14 100% co	23 25 20 ontinuous	31 34 27 / 150% 6	44 49 39 D s	57 65 54	71 80 66	110 118 98	144 158 135	325 331 288	432 450 396
50°C rating	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa	current (A) Power driving Regenerative driving / ating acity (kVA)*3	17 18 14 100% cc 17	23 25 20 ontinuous 20	31 34 27 / 150% 6 28	44 49 39 0 s 41	57 65 54 52	71 80 66 66	110 118 98 100	144 158 135 133	325 331 288 279	432 450 396 379
50°C rating	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Applicable inverte	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW)	17 18 14 100% cc 17 7.5	23 25 20 ontinuous 20 11	31 34 27 / 150% 6 28 15	44 49 39 0 s 41 22	57 65 54 52 30	71 80 66 66 37	110 118 98 100 55	144 158 135 133 90	325 331 288 279 185	432 450 396 379 250
50°C rating	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply cap Applicable inverte Applicable motor of	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW) current (A)	17 18 14 100% cc 17 7.5 18	23 25 20 ontinuous 20 11 25	31 34 27 / 150% 6 28 15 34	44 49 39 0 s 41 22 48	57 65 54 52 30 63	71 80 66 66 37 78	110 118 98 100 55 120	144 158 135 133 90 180	325 331 288 279 185 361	432 450 396 379 250 481
50°C rating 40°C	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply cap Applicable inverte Applicable motor of Rated input	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW) current (A) Power driving	17 18 14 100% cc 17 7.5 18 20	23 25 20 ontinuous 20 11 25 27	31 34 27 / 150% 6 28 15 34 37	44 49 39 0 s 41 22 48 53	57 65 54 52 30 63 72	71 80 66 37 78 88	110 118 98 100 55 120 129	144 158 135 133 90 180 189	325 331 288 279 185 361 382	432 450 396 379 250 481 515
50°C rating 40°C rating	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply cap Applicable inverte Applicable motor of Rated input current (A)	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW) current (A) Power driving Regenerative driving	17 18 14 100% cd 17 7.5 18 20 15	23 25 20 20 20 11 25 27 21	31       34       27       / 150% 6       28       15       34       37       29	44 49 39 0 s 41 22 48 53 42	57 65 54 52 30 63 72 59	71 80 66 37 78 88 72	110           118           98           100           55           120           129           107	144 158 135 135 133 90 180 189 162	325 331 288 279 185 361 382 333	432 450 396 250 481 515 450
50°C rating 40°C rating	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Applicable inverte Applicable motor of Rated input current (A) Continuous rating overload current r	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW) current (A) Power driving Regenerative driving / ating	17 18 14 100% cd 17 7.5 18 20 15 100% cd	23 25 20 20 11 25 27 21 21	31           34           27           / 150% 6           28           15           34           37           29           / 150% 6	44 49 39 0 s 41 22 48 53 42 0 s	57 65 54 52 30 63 72 59	71 80 66 37 78 88 72	110 118 98 100 55 120 129 107	144 158 135 133 90 180 189 162	325 331 288 279 185 361 382 333	432 450 396 379 250 481 515 450
50°C rating 40°C rating	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply cap Applicable inverte Applicable motor of Rated input current (A) Continuous rating overload current r Power supply cap	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW) current (A) Power driving Regenerative driving / ating acity (kVA)*3	17 18 14 100% cc 17 7.5 18 20 15 100% cc 19	23 25 20 20 11 25 27 21 21 22	31           34           27           / 150% 6           28           15           34           37           29           / 150% 6           30	44 49 39 0 s 41 22 48 53 42 0 s 44	57 65 54 30 63 72 59 58	71 80 66 37 78 88 72 73	110       118       98       100       55       120       129       107	144 158 135 133 90 180 189 162 162	325 331 288 279 185 361 382 333 333	432 450 396 250 481 515 450 434
50°C rating 40°C rating Power	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Applicable inverte Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Rated input AC vo	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW) current (A) Power driving Regenerative driving / ating acity (kVA)*3 Itage/frequency	17 18 14 100% cd 17 7.5 18 20 15 100% cd 19 Three-p	23 25 20 20 11 25 27 21 27 21 20 21 22 22 22	31           34           27           / 150% 6           28           15           34           37           29           / 150% 6           30           to 500 V,	44 49 39 0 s 41 22 48 53 42 0 s 44 50/60 H:	57 65 54 52 30 63 72 59 58 Z*8	71 80 66 37 78 88 72 73	110       118       98       100       55       120       129       107       110	144 158 135 133 90 180 189 162 160 Three- V, 50/6	325 331 288 279 185 361 382 333 322 phase 380 60 Hz+8+9	432 450 396 250 481 515 450 434 0 to 500
50°C rating 40°C rating Power source	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Applicable inverte Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Rated input AC vo Permissible AC vo	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW) current (A) Power driving Regenerative driving / ating acity (kVA)*3 Itage/frequency Itage fluctuation	17 18 14 100% cc 17 7.5 18 20 15 100% cc 19 Three-p Three-p	23 25 20 20 11 25 27 21 27 21 20 11 25 27 21 21 20 21 22 hase 380 hase 323	31           34           27           / 150% 6           28           15           34           37           29           / 150% 6           30           to 500 V,           to 550 V,	44 49 39 0 s 41 22 48 53 42 0 s 44 50/60 H: 50/60 H:	57 65 54 52 30 63 72 59 58 z*8 z	71 80 66 37 78 88 72 73	110 118 98 100 55 120 129 107 107	144 158 135 135 133 90 180 189 162 160 Three- V, 50/6	325 331 288 279 185 361 382 333 322 phase 380 00 Hz+8+9	432 450 396 250 481 515 450 434 0 to 500
50°C rating 40°C rating Power source	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Applicable inverte Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Rated input AC vo Permissible AC vo	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW) current (A) Power driving Regenerative driving / ating acity (kVA)*3 Itage/frequency Itage fluctuation ency fluctuation	17 18 14 100% cc 17 7.5 18 20 15 100% cc 19 Three-p ±5%	23 25 20 20 11 25 27 21 25 27 21 21 21 22 hase 380 hase 323	31           34           27           / 150% 6           28           15           34           37           29           / 150% 6           30           to 500 V,           to 550 V,	44 49 39 0 s 41 22 48 53 42 0 s 44 50/60 H: 50/60 H:	57 65 54 30 63 72 59 58 z*8 z	71 80 66 37 78 88 72 73	110         118         98         100         55         120         129         1007	144 158 135 133 90 180 189 162 160 Three- V, 50/6	325 331 288 279 185 361 382 333 333 322 phase 380 00 Hz+8+9	432 450 396 250 481 515 450 434 0 to 500
50°C rating 40°C rating Power source Protection (IEC 60529)	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Applicable inverte Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Rated input AC vo Permissible AC vo Permissible freque rating of structure	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW) current (A) Power driving Regenerative driving / ating acity (kVA)*3 Itage/frequency Itage fluctuation ency fluctuation	17 18 14 100% cc 17 7.5 18 20 15 100% cc 19 Three-p ±5% IP00*4	23 25 20 20 11 25 27 21 21 21 21 22 hase 380 hase 323	31           34           27           / 150% 6           28           15           34           37           29           / 150% 6           30           to 500 V,           to 550 V,	44 49 39 0 s 41 22 48 53 42 0 s 44 50/60 H: 50/60 H:	57 65 54 30 63 72 59 58 z*8 z	71 80 66 37 78 88 72 73	110 118 98 100 55 120 129 107 107 110	144 158 135 135 133 90 180 189 162 160 Three- V, 50/6	325 331 288 279 185 361 382 333 322 phase 380 60 Hz+8+9	432 450 396 250 481 515 450 434 0 to 500 and FR-
50°C rating 40°C rating Power source Protection (IEC 60529) Cooling sy:	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Applicable inverte Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Rated input AC vo Permissible AC vo Permissible freque rating of structure	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW) current (A) Power driving Regenerative driving / ating acity (kVA)*3 Itage/frequency Itage fluctuation ency fluctuation	17 18 14 100% cd 17 7.5 18 20 15 100% cd 19 Three-p ±5% IP00*4 Forced a	23 25 20 20 11 25 27 21 27 21 21 21 22 hase 380 hase 323	31           34           27           / 150% 6           28           15           34           37           29           / 150% 6           30           to 500 V,           to 550 V,	44 49 39 0 s 41 22 48 53 42 0 s 44 50/60 H: 50/60 H:	57 65 54 30 63 72 59 58 z*8 z	71 80 66 37 78 88 72 73	110 118 98 100 55 120 129 107 107	144 158 135 135 133 90 180 189 162 160 Three- V, 50/6	325 331 288 279 185 361 382 333 322 phase 380 50 Hz+8+9 5 (FR-XCB ncluded)	432 450 396 250 481 515 450 434 0 to 500 and FR-
50°C rating 40°C rating Power source Protection (IEC 60529) Cooling sy: Number of	Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Applicable inverte Applicable motor of Rated input current (A) Continuous rating overload current r Power supply capa Rated input AC vo Permissible AC vo Permissible freque rating of structure ) stem	current (A) Power driving Regenerative driving / ating acity (kVA)*3 r capacity (kW) current (A) Power driving Regenerative driving / ating acity (kVA)*3 Itage/frequency Itage fluctuation ency fluctuation ency fluctuation ency	17 18 14 100% cc 17 7.5 18 20 15 100% cc 19 Three-p ±5% IP00*4 Forced a 10*6	23 25 20 20 11 25 27 21 27 21 27 21 27 21 20 ntinuous 22 hase 380 hase 323	31           34           27           / 150% 6           28           15           34           37           29           / 150% 6           30           to 500 V,           to 550 V,	44 49 39 0 s 41 22 48 53 42 0 s 44 50/60 H: 50/60 H:	57 65 54 30 63 72 59 58 z*8 z	71 80 66 37 78 88 72 73	110 118 98 100 55 120 129 107 110	144 158 135 135 133 90 180 189 162 160 Three- V, 50/6	325 331 288 279 185 361 382 333 333 322 phase 380 50 Hz+8+9 5 (FR-XCB ncluded)	432 450 396 250 481 515 450 434 0 to 500 and FR-

The harmonic suppression function is not pre-enabled in this model. Selection example for 220 V power supply voltage. Selection example for 440 V power supply voltage. \*1

\*2 \*3 \*4 \*5 \*6 \*7 IP00 for the FR-XCL.

IPO0 when the side wiring cover of the FR-XC is removed. If you want to connect 11 or more inverters, contact your sales representative. Mass of the FR-XC alone.

The permissible voltage imbalance ratio is 3% or less. (Unbalance factor = Max | Line voltage - Mean of three line voltages | / Mean of three line voltages × 100) The rated voltage of the FR-MCB is three-phase 380 to 480 V, 50/60 Hz. \*8 \*9

160

220

220

432

450

396

379

250

481

515

450

434

#### Rating (FR-XC-(H)[]K-PWM)

#### • 200 V class

• 200 V CI	d55						-	
	Model FR-XC-[]	K-PWM*1	18.5	22	37	55		
	Applicable inverte	r capacity (kW)	22	30	37	55		
	Applicable motor	current (A)	90	115	145	215		
50°C	Rated input	Power driving	92	124	151	223		
rating	current (A)	Regenerative driving	74	102	125	186		
	Continuous rating / overload current rating		100% co	ntinuous /	150% 60	s		
	Power supply capacity (kVA)*2		41	52	66	100		
	Applicable inverter capacity (kW)		22	30	37	55		
	Applicable motor current (A)		99	127	160	236		
Rated input		Power driving	101	136	166	245		
rating	current (A)	Regenerative driving	81	112	138	204		
	Continuous rating overload current r	/ ating	100% co	ntinuous /	150% 60	s	]	
	Power supply cap	acity (kVA)*2	45	57	73	110		
	Rated input AC vo	Itage/frequency	Three-ph	nase 200 t	o 240 V, 5	0/60 Hz*8	1	
Power	Permissible AC vo	ltage fluctuation	Three-ph					
Source	Permissible freque	ency fluctuation	±5%	1				
Protection	rating of structure	(IEC 60529)	IP00*4					
Cooling sy	stem		Forced a	1				
Number of	connectable invert	ers	10*6					
Approx. m	ass (kg)∗7		10.5	10.5	28	38	1	
• 400 V cl	ass						•	
	Model FR-XC-H[	]K-PWM*1	18.5	22	37	55	75	16
	Applicable inverte	r capacity (kW)	22	30	37	55	75	160
	Applicable motor	current (A)	44	57	71	110	144	325
	Rated input	Power driving	49	65	80	118	158	331
50°C rating	current (A)	Regenerative driving	39	54	66	98	135	288
	Continuous rating / overload current rating		100% continuous / 150% 60 s					
	Power supply cap	acity (kVA)*3	41	52	66	100	133	279
	Applicable inverte	r capacity (kW)	22	30	37	55	90	185
	Applicable motor	current (A)	48	63	78	120	180	361
40%0	Rated input	Power driving	53	72	88	129	189	382
rating	current (A)	Regenerative driving	42	59	72	107	162	333
	Continuous rating overload current r	/ ating	100% co	ntinuous /	150% 60	s	-	
	Power supply cap	acity (kVA)*3	44	58	73	110	160	322
							Three-p	hase (

ohase 380 to 500 V, Rated input AC voltage/frequency Three-phase 380 to 500 V, 50/60 Hz\*8 50/60 Hz\*8\*9 Power Three-phase 323 to 550 V, 50/60 Hz source Permissible AC voltage fluctuation Permissible frequency fluctuation ±5% IP20 \*5 (FR-XCB and FR-MCB included) Protection rating of structure (IEC 60529) IP00\*4 Cooling system Forced air Number of connectable inverters 10\*6 Approx. mass (kg)\*7 10.5 10.5 28 28 45 96 96

The harmonic suppression mode is selected initially. Set **Pr.416** = "0" to select the common bus regeneration mode. Selection example for 220 V power supply voltage. \*1

\*2 Selection example for 440 V power supply voltage IP20 for the FR-XCB.

\*3 \*4

\*5 IP00 when the side wiring cover of the FR-XC is removed.

\*6 \*7 If you want to connect 11 or more inverters, contact your sales representative. Mass of the FR-XC alone.

\*8 The permissible voltage imbalance ratio is 3% or less. (Unbalance factor = Max | Line voltage - Mean of three line voltages | / Mean of three line

voltages × 100) The rated voltage of the FR-MCB is three-phase 380 to 480 V, 50/60 Hz. \*9

#### • Amount of heat generated from the converter

• FR-XC

• 200 V class						
Model	Amount of heat generated (W)					
	50°C rating	40°C rating				
FR-XC-7.5K	220	240				
FR-XC-11K	315	345				
FR-XC-15K	460	505				
FR-XC-22K FR-XC-18.5K-PWM	685	755				
FR-XC-30K FR-XC-22K-PWM	810	890				
FR-XC-37K FR-XC-37K-PWM	890	980				
FR-XC-55K FR-XC-55K-PWM	1080	1190				

• 400 V class

Model	Amount of heat generated (W)				
Woder	50°C rating	40°C rating			
FR-XC-H7.5K	130	145			
FR-XC-H11K	200	220			
FR-XC-H15K	280	305			
FR-XC-H22K FR-XC-H18.5K-PWM	365	395			
FR-XC-H30K FR-XC-H22K-PWM	435	485			
FR-XC-H37K FR-XC-H37K-PWM	590	650			
FR-XC-H55K FR-XC-H55K-PWM	880	965			
FR-XC-H75K FR-XC-H75K-PWM	1170	1290			
FR-XC-H160K FR-XC-H160K-PWM	2470	2715			
FR-XC-H220K FR-XC-H220K-PWM	3390	3720			

#### • FR-XCL

• 200 V class

Madal	Amount of heat generated (W)				
WOder	50°C rating	40°C rating			
FR-XCL-7.5K	55	60			
FR-XCL-11K	72	79			
FR-XCL-15K	90	99			
FR-XCL-22K	98	108			
FR-XCL-30K	116	128			
FR-XCL-37K	144	159			
FR-XCL-55K	168	185			

#### • 400 V class

Model	Amount of heat generated (W)		
	50°C rating	40°C rating	
FR-XCL-H7.5K	62	69	
FR-XCL-H11K	72	78	
FR-XCL-H15K	72	79	
FR-XCL-H22K	89	97	
FR-XCL-H30K	109	121	
FR-XCL-H37K	116	128	
FR-XCL-H55K	180	197	
FR-XCL-H75K	465		
FR-XCL-H90K	515		
FR-XCL-H160K	940		
FR-XCL-H185K	1020		
FR-XCL-H220K	1040		
FR-XCL-H250K	1165		

#### • FR-MCB

Model	Amount of heat generated (W)	
	50°C rating	40°C rating
FR-MCB-H150	395	
FR-MCB-H400	745	
FR-MCB-H800	965	
### Operating condition

Observe t	the	following	inverter	selection	conditions
0030170	uic	lonowing	inventor	3010011	conditions.

Item	Condition
Inverter capacity	The total capacity of the connected inverters (regardless of the rating or model of the inverters) must not exceed the applicable inverter capacity (kW) shown in the converter's rated specifications (refer to <b>page 34</b> ).
Motor rated current	The total of the rated current of the connected motors (rated current for the selected rating) must not exceed the applicable motor current (A) shown in the converter's rated specifications (refer to <b>page 34</b> ).
Number of inverters	The number of inverters actually connected must not exceed the number of connectable inverters shown in the converter's rated specifications (refer to <b>page 34</b> ).
Inverter with the HD rating*1	For the HD rating, 200% of the total rated current of the connected motors must not exceed 150% of the applicable motor current (A) shown in the converter's specifications (refer to <b>page 34</b> ).

For the HD rating of the inverter, refer to the inverter Instruction Manual. \*1

To use the converter with the inverter, Pr.30 Regenerative function selection must be set in the inverter. The parameter setting differs by the inverter series. For the parameters and the inverters not listed in the table, refer to the Instruction Manual of the inverter

Inverter capacity	Pr.30 Regenerative	V/F control	Other than V/F control
inverter capacity	function selection	Pr.19 Base frequency voltage	Pr.83 Rated motor voltage
FR-A800, FR-F800	2 or 102		
FR-E800, FR-E700, FR-F700PJ, FR-D700	0 (initial value), 2 (automatic restart after instantaneous power failure is enabled)	Rated motor voltage	



· For details of the inverter capacity, refer to the rating specifications in the Instruction Manual of the inverter.

Example: FR-A820

						-
Model ED A920 []			00046	00077	00105	
Woder	FR-A020-[]	(	0.4K	0.75K	1.5K	)
	SLD	$\overline{}$	0.75	1.5	2.2	$\nearrow$

• Fo	<ul> <li>For the FR-V500(L) inverter, the capacity used for selection is as follows.</li> </ul>													
apacity of e FR-V500 (kW)	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	<b>75</b> *1

Capacity of the FR-V500 (kW)	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75*
Capacity used for selection (kW)	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	55	132
*1 The	75K or	hiaher in	verters a	are the F	R-V540L	inverter	rs.							

The 75K or higher inverters are the FR-V540L inverters. • Refer to page 34 for the details of the applicable inverter capacity, the applicable inverter current, and the number of connectable inverters

The power factor improving AC reactor or DC reactor cannot be used.

**90**\*1

132

**110**\*1

220

132\*1

### Terminal Connection Diagrams

· 55K or lower





• 75K or higher When using the FR-MCB



- Never connect the power supply to terminals R/L1, S/L2, and T/L3 on the inverter. Incorrect connection will damage the inverter and the converter. Connect between the inverter terminal P/+ and the converter terminal P/+ and between the inverter terminal N/- and the converter terminal N/- for polarity \*1 \*2
- consistency
- Connecting opposite polarity of terminals P/+ an N/- will damage the converter and the inverter. Confirm the correct phase sequence of three-phase current to connect between the reactor and the converter, and between the power supply and the converter \*3 (terminals R/L1, S/L2, and T/L3).
- Incorrect connection will damage the converter
- Always connect between the power supply and terminals R/L1, S/L2, and T/L3 of the converter. Operating the inverter without connecting them will damage the \*4 converter.
- Assign the X10 signal to any of the input terminals. \*5
- \*6
- Do not connect anything to terminal P4. Install the UL listed fuse (refer to the FR-XC Instruction Manual) on the input side of the reactor to meet the UL/cUL standards. \*7
- \*8
- Do not install an MCCB or MC between the reactor and the converter. Doing so disrupts proper operation. Always connect the power supply and terminals R3/L13 and S3/L23 on the converter. Otherwise, the control circuit power supply is not started and the converter \*9 will not be charged
- When the inverter has control circuit power supply terminals (R1/L11 and S1/L21), wire them as shown in the diagram. For inverters without terminals R1/L11 \*10 and S1/L21, wiring is not required. Connect either terminal RX2/L1X2 or RX3/L1X3 to the power supply according to the input power supply voltage as shown in the table below

\*11

Input voltage	Terminal
380 V or more to less than 427 V	RX2/L1X2
427 V to 500 V	RX3/I 1X3

\*12 Fuses between the converter and the inverter are not required for the following combinations as

the internal fuses of the converter can be used

FR	Inverter (kW)	
	50°C rating	75
rr-xo-n/sk	40°C rating	75, 90
	50°C rating	160
	40°C rating	160, 185
ER-XC-H220K	50°C rating	220
FR-AC-H220K	40°C rating	220, 250

\*13 Instead of connecting the terminals to the AC power supply, the control circuit can be powered by connecting terminal R1/L11 to terminal P/+ and terminal S1/L21 to terminal N/-. In this case, do not connect the terminals to the AC power supply. Doing so will damage the inverter.

inverte R/L1 Power supply S/L2 Remove the jumpers. T/L3 R1/L11 Connect terminal R1/L11 and S1/L21 ninal P/+ and con ct terminal P/+ S1/L21 and terminal N/-. N/-

Connected to terminals P/+ and N/- of the FR-XC.

### Cable gauge

Select a recommended gauge size cable to ensure that the voltage drop ratio is within 2%.

The following indicates selection examples when the wiring length from the power supply to the converter is 20 m. • 55K or lower



<ul> <li>200 V class</li> </ul>															
			Cable gauge												
		н	IV cables	, etc. (mm	<b>2</b> )*1	A	WG/MCM	*2	P	VC cables	, etc. (mm	<b>2</b> ) *3			
Model	Rating	Location in the connection diagram			Earth	Location	in the co diagram	nnection	Location	n in the co diagram	nnection	Earth			
		a, b	<b>C</b> *6	d	(ground)	a, b	С	d	a, b	С	d	(ground)			
ER-XC-7.5K	50°C	8	8	1 25	5.5	8	8	16	10	10	15	10			
FR-X0-7.5R	40°C	5.5	0	1.25	5.5	0	0	10	10	10	1.5	10			
	50°C	14	14	1.25	9	6	6	16	10	16	15	16			
FR-AG-TIK	40°C	14	14	1.25	0	0	0	10	10	10	1.5	10			
FR-YC-15K	50°C	22	22	1 25	14	1	1	16	16	25	15	16			
110-70-150	40°C	22	22	1.20	14	7	7	10	10	20	1.5	10			
FR-XC-22K	50°C	38	38	1 25	22	2	2	16	25	25	15	16			
FR-XC-18.5K-PWM	40°C	50	50	1.20	22	2	2	10	20	20	1.5	10			
FR-XC-30K	50°C	60	60	1 25	22	1	1/0	16	35	50	15	25			
FR-XC-22K-PWM	40°C	00	00	1.20	~~	1/0	1/0	10	55	50	1.5	20			
FR-XC-37K	50°C	80	80	1 25	22	2/0	2/0	16	50	70	15	35			
FR-XC-37K-PWM	40°C	80 80	00	1.20	22	2/0	3/0	10	50	10	1.5	35			
FR-XC-55K	50°C	100	100	1 25	38	4/0	1/0	16	95	95	15	50			
FR-XC-55K-PWM	40°C	100	100	1.20	50	4/0	4/0	10	30	30	1.5	50			

• 400 V class

						C	able gaug	je					
		н	IV cables	, etc. (mm	<b>2</b> )*1	A	WG/MCM	*4	P۱	/C cables	, etc. (mm	<b>2)</b> *5	
Model	Rating	Location in the connection diagram			Earth	Location in the connection diagram			Location	Earth			
		a, b	<b>C</b> *6	d	(ground)	a, b	С	d	a, b	С	d	(ground)	
	50°C	3.5	3.5	1.25	3.5	10	12	16	4	4	15	4	
FR-X0-H7.5R	40°C	5.5	5.5	1.25	5.5	12	12	10	4	4	1.5	4	
	50°C	5 5	5 5	1.05	5 5	10	10	16	6	6	15	6	
FR-AG-MIIK	40°C	5.5	5.5	1.20	5.5	10	10	10	0	0	1.5	0	
	50°C	8	0	0	1.05	E E	0	0	16	10	10	1 5	10
FR-AC-MISK	40°C		0	1.25	5.5	0	0	10	10	10	1.5	10	
FR-XC-H22K	50°C	14	22	1.05	14	6	6	16	10	16	15	16	
FR-XC-H18.5K-PWM	40°C	14	22	1.20	14	0	0	10	10	10	1.5	10	
FR-XC-H30K	50°C	22	22	1.05	14	4	4	16	16	25	15	16	
FR-XC-H22K-PWM	40°C	22	22	1.20	14	4	4	10	25	25	1.5	10	
FR-XC-H37K	50°C	20	20	1.05	14	4	2	16	25	25	15	16	
FR-XC-H37K-PWM	40°C 38	30	30	1.20	14	2	<b> </b> <i>_</i>	10	35	30	1.5	10	
FR-XC-H55K	50°C	60	60	1 25	22	2	2	16	35	35	4 5	16	
FR-XC-H55K-PWM	40°C	00	00	1.23	22	2	1	10	55	50	1.5	25	

- \*1 It is the gauge of a cable with the continuous maximum permissible temperature of 75°C (HIV cable (600 V grade heat-resistant PVC insulated wire), etc.). It assumes a surrounding air temperature of 50°C or less (40°C or less for the 40°C rating) and the wiring distance of 20 m or less from the power supply to the converter.
- \*2 The cable size is that of the THHW cable with continuous maximum permissible temperature of 75°C. It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. (For the use in the United States or Canada, refer to the FR-XC Instruction Manual.)
- (For the RF-XC-15K or lower, it is the gauge of a cable with the continuous maximum permissible temperature of 70°C (PVC cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. For the FR-XC-22K / FR-XC-18.5K-PWM or higher, it is the gauge of a cable with the continuous maximum permissible temperature of 90°C (PVC cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. For the FR-XC-22K / FR-XC-18.5K-PWM or higher, it is the gauge of a cable with the continuous maximum permissible temperature of 90°C (PVC cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. (Selection example mainly for use in Europe.)
- \*4 For the FR-XC-H37K or lower, it is the gauge of the cable with the continuous maximum permissible temperature of 75°C (THHW cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. For FR-XC-H35K, the cable gauge is with the continuous maximum permissible temperature of 90°C (THHN cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. For FR-XC-H35K, the cable gauge is with the continuous maximum permissible temperature of 90°C (THHN cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. (For the use in the United States or Canada, refer to the FR-XC Instruction Manual.)
- \*5 For the FR-XC-H37K or lower, it is the gauge of the cable with the continuous maximum permissible temperature of 70°C (PVC cable). For FR-XC-H55K, the cable gauge is with the continuous maximum permissible temperature of 90°C (XLPE cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. (Selection example mainly for use in Europe.)
- If a cable thinner than the recommended cable size is used, it may not be protected by the DC fuse. (Refer to page 43 for the fuse selection.)
   When using a separate power supply for the control circuit, remove the jumpers connected to terminals R1/L11 and S1/L21.

#### • 75K or higher



e: Power supply	to FR-XC
-----------------	----------

								Cable	gauge																																
			HIV ca	bles, et	tc. (mm <sup>2</sup>	<b>2)</b> *1	AWG/MCM *2					PVC ca	ables, et	tc. (mm <sup>2</sup>	<b>2)</b> *3																										
Model Rating		Locat	ion in th diag	ie conn Iram	ection	Earth	Location in the connection diagram				Location in the connection diagram				Earth																										
		a, b	<b>C</b> *4	d	е	(ground)	a, b	С	d	е	a, b	С	d	е	(ground)																										
FR-XC-H75K	50°C	60	60		35	22	1/0	2/0		11	70	70		1	35																										
FR-XC-H75K-PWM	40°C	00 00	00		0.0	22	2/0	2/0		11	70	10		4	35																										
FR-XC-H160K	50°C	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150 150	1.25		20	200	200	16		150	150	15		70
FR-XC-H160K-PWM	40°C	150	150	1.20	1.25	30	300	300	16	0	150	150	1.5	10	70																										
FR-XC-H220K	50°C	200	200		0	60	400	400		8	195	195	1	10	05																										
FR-XC-H220K-PWM	40°C	200	200			00	400	400			103	103			90																										

\*1 It is the gauge of the cable with continuous maximum permissible temperature of 90°C or more (LMFC (heat resistant flexible cross-linked polyethylene insulated cable), etc.). It assumes a surrounding air temperature of 50°C or less and the wiring distance of 20 m or less from the power supply to the converter.

\*2 It is the gauge of the cable with the continuous maximum permissible temperature of 90°C (THHN cable).

(For the use in the United States or Canada, refer to the FR-XC Instruction Manual.)

\*3 It is the gauge of the cable with the continuous maximum permissible temperature of 90°C (XLPE cable)

(Selection example mainly for use in Europe.)

\*4 If a cable thinner than the recommended cable size is used, it may not be protected by the DC fuse. (Refer to page 43 for the fuse selection.)
 \*5 When using a separate power supply for the control circuit, remove the jumpers connected to terminals R1/L11 and S1/L21.

### Circuit breaker and magnetic contactor

Check the model of the purchased multifunction regeneration converter. Appropriate peripheral devices must be selected according to the capacity.

For the converter in common bus regeneration mode, refer to the following table to prepare appropriate peripheral devices. • 200 V class

FR-XC series converter	Molded case circuit breaker (MCCB)*1/ earth leakage circuit breaker (ELB) (NF, NV type)		Magnetic contactor (MC)*2		
model	50°C rating	40°C rating	50°C rating	40°C rating	
FR-XC-7.5K	60 A	60 A	S-T35	S-T35	
FR-XC-11K	75 A	75 A	S-T35	S-T35	
FR-XC-15K	125 A	125 A	S-T50	S-T50	
FR-XC-22K FR-XC-18.5K-PWM	175 A	175 A	S-T65	S-T80	
FR-XC-30K FR-XC-22K-PWM	225 A	225 A	S-T100	S-T100	
FR-XC-37K FR-XC-37K-PWM	250 A	250 A	S-N150	S-N150	
FR-XC-55K FR-XC-55K-PWM	400 A	400 A	S-N180	S-N180	
<ul> <li>400 V class</li> </ul>					

FR-XC series converter	Molded case circuit earth leakage circuit bre	t breaker (MCCB)∗1/ aker (ELB) (NF, NV type)	Magnetic contactor (MC)/ dedicated contactor box (option)*2		
moder	50°C rating	40°C rating	50°C rating	40°C rating	
FR-XC-H7.5K	30 A	30 A	S-T21	S-T21	
FR-XC-H11K	50 A	50 A	S-T21	S-T21	
FR-XC-H15K	60 A	60 A	S-T35	S-T35	
FR-XC-H22K FR-XC-H18.5K-PWM	100 A	100 A	S-T35	S-T35	
FR-XC-H30K FR-XC-H22K-PWM	125 A	125 A	S-T50	S-T50	
FR-XC-H37K FR-XC-H37K-PWM	150 A	150 A	S-T65	S-T65	
FR-XC-H55K FR-XC-H55K-PWM	200 A	200 A	S-T100	S-T100	
FR-XC-H75K FR-XC-H75K-PWM	225 A	250 A	FR-MCB-H150 or S-N150 200 VAC*3		
FR-XC-H160K FR-XC-H160K-PWM	500 A	500 A	FR-MCB-H400 or S-N300 AC200V*3	FR-MCB-H400 or S-N400 AC200V*3	
FR-XC-H220K FR-XC-H220K-PWM	700 A	700 A	FR-MCB-H400 or S-N400 AC200V*3	FR-MCB-H800 or S-N600AB AC200V*3	

\*1 Select an MCCB according to the power supply capacity. Install one MCCB per converter.

\*2

(For the use in the United States or Canada, refer to the FR-XC

- <u>MCCB</u>- <u>FR-XC</u> <u>Inverter</u> M <u>MCCB</u>- <u>FR-XC</u> <u>Inverter</u> M

Instruction Manual.) The 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 stops during motor driving, the electrical durability is 25 times. (Note that the dedicated contactor box is not intended for emergency stop.) If using an MC for emergency stop during motor driving or using it on the motor side during commercial power supply operation, select an MC with the class AC-3 rated current for the rated motor current.

\*3 Select an MC whose operation coil section has a surge absorbing function. To use the MC to shut off the power supply in case of emergency, set Pr.460 Operation selection after MC external shutoff. (refer to the FR-XC Instruction Manual)

### Common bus regeneration mode

### Fuse

Installation of a fuse between the multifunction regeneration converter and the inverter is recommended.

When using the converter in the common bus regeneration mode, select a fuse according to the capacity of the connected motor. When using a motor whose 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.

<ul> <li>200 V class</li> </ul>			
Motor capacity (kW)	Fuse rating (A)	Model (Part number/Item number) *1	Fuse holder (2 poles)
0.1	5	6.900 CP GR 10.38 0005 (FR10GR69V5)	
0.2	10	6.900 CP GR 10.38 0010 (FR10GR69V10)	
0.4	16	6.900 CP GR 10.38 0016 (FR10GR69V16)	or CUS102 (without fuse light melting indicator)
0.75	20	6.900 CP GR 10.38 0020 (FR10GR69V20)	or ocorrozi (with fuse light filelding indicator)
1.5	25	6.900 CP GR 10.38 0025 (FR10GR69V25)	
2.2	50	6.9 URD 30 TTF 0050	-
3.7	63	6.9 URD 30 TTF 0063	-
5.5	100	6.9 URD 30 TTF 0100	—
7.5	125	6.9 URD 30 TTF 0125	—
11	160	6.9 URD 30 TTF 0160	-
15	200	6.9 URD 30 TTF 0200	—
18.5	250	6.9 URD 30 TTF 0250	—
22	315	6.9 URD 30 TTF 0315	—
30	400	6.9 URD 30 TTF 0400	—
37	500	6.9 URD 30 TTF 0500	-
45	630	6.9 URD 31 TTF 0630	_
55	700	6.9 URD 31 TTF 0700	_

400 V class

Motor capacity (kW)	Fuse rating (A)	Model (Part number/Item number) *1	Fuse holder (2 poles)
0.4	12.5	6.900 CP GR 10.38 0012.5 (FR10GR69V12.5)	
0.75	16	6.900 CP GR 10.38 0016 (FR10GR69V16)	
1.5	16	6.900 CP GR 10.38 0016 (FR10GR69V16)	or CUS102 (without fuse light melting indicator)
2.2	20	6.900 CP GR 10.38 0020 (FR10GR69V20)	
3.7	30	6.900 CP GR 10.38 0030 (FR10GR69V30)	
5.5	50	6.9 URD 30 TTF 0050	—
7.5	50	6.9 URD 30 TTF 0050	—
11	80	6.9 URD 30 TTF 0080	_
15	125	6.9 URD 30 TTF 0125	—
18.5	125	6.9 URD 30 TTF 0125	—
22	160	6.9 URD 30 TTF 0160	_
30	200	6.9 URD 30 TTF 0200	—
37	250	6.9 URD 30 TTF 0250	—
45	315	6.9 URD 30 TTF 0315	—
55	350	6.9 URD 30 TTF 0350	—
75	450	6.9 URD 30 TTF 0450	—
90	500	6.9 URD 30 TTF 0500	—
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 (parallel connection)*2	—
250	1250	6.9 URD 33 TTF 1250 or 6.9 URD 31 TTF 700 × 2 (parallel connection)*2	_

Manufacturer: Mersen Japan KK \*1

Contact: Sun-Wa Technos Corporation When installing fuses in parallel, leave a space of 12 mm or more between the fuses. \*2

## • NOTE

- Install fuses across terminals P/+ and P/+, and across terminals N/- and N/- of the converter and the inverter.
- Fuses between the converter and the inverter are not required for the following combinations as the internal fuses of the converter can be used.

FR-XC		h	nverter (kW)			
	50°C rating		75			
FR-AC-H/SK	40°C rating		75, 90			
	50°C rating		160			
FR-AC-MIOUN	40°C rating		160, 185			
	50°C rating		220			
FR-X0-H220K	40°C rating	220, 250				
[Estimated lifespan of fuses]						
Components	Estimated lifespan*1		Replacement	method		
Fuse	10 years		Replace by n	ew one		

\*1 Estimated lifespan for when the yearly average surrounding air temperature is 50°C. (without corrosive gas, flammable gas, oil mist, dust and dirt etc.)



• If the fuse melts down, wiring failure such as a short circuit may be the cause. Find out the cause and remove it before replacing the fuse.

# MEMO

### Harmonic suppression mode

### Example Connection

55K or lower



Motor

Earth (ground)

MCCB for MCCB selection. Earth (ground)

FR-XCB, the inverter, and the motor.

Always earth (ground) the converter, the dedicated reactor

7



Devices on the inverter's output side

Do not install a power factor correction capacitor or surge suppressor or capacitor type filter on the inverter's output side.

When installing a molded case circuit breaker (MCCB) on the inverter's output side, contact the manufacturer of MCCB for MCCB selection. Earth (ground)

Always earth (ground) the converter, the dedicated reactor FR-XCB, the dedicated contactor box, the inverter, and the motor. Earth (ground)

Earth (ground)

### Rating (FR-XC-(H)[]K)

#### • 200 V class

200 1 0.	Model FR-XC	-[ ]K*1	22	30	37	55
Applicable inverter capacity (kW)		18.5	22	37	55	
	Applicable motor of	current (A)	76	90	145	215
50°C rating	Rated input current (A)	Power/regenerative driving	69	82	134	198
	Continuous rating overload current rational current rati	/ ating	100% continuous / 150% 60 s			
	Power supply capa	acity (kVA)*2	30	35	57	84
	Applicable inverter capacity (kW)		18.5	22	37	55
	Applicable motor of	current (A)	83	99	160	236
40°C rating	Rated input current (A)	Power/ regenerative driving	75	90	147	217
9	Continuous rating / overload current rating		100% continuous / 150% 60 s			
	Power supply capa	acity (kVA)*2	32	38	62	92
	Rated input AC vo	Itage/frequency	Three-phase 200 to 230 V, 50/60 Hz*5*10			
Power source	Permissible AC vo	Itage fluctuation	Three-phase 170 to 253 V, 50/60 Hz			
Permissible frequency fluctuation		ency fluctuation	±5%			
Input power factor		0.99 or more (when load ratio is 100%)				
Protection rating of structure (IEC 60529)		IP00*4				
Cooling system		Forced air				
Number of	connectable inverte	ers	10*7			
Approx. ma	ass (kg)*8		10.5	10.5	28	38

### 400 V class

									-
Model FR-XC-H[]K*1		22	30	37	55	75	160	220	
	Applicable inverte	r capacity (kW)	18.5	22	37	55	75	160	220
	Applicable motor current (A)		38	44	71	110	144	325	432
50°C Rated input current (A) Power/ regenerative driving Continuous rating / overload current rating		Power/ regenerative driving	37	43	71	104	139	290	397
		100% co	ntinuous /	150% 60 s	6				
	Power supply capa	acity (kVA)∗₃	32	37	60	88	118	245	334
	Applicable inverte	r capacity (kW)	18.5	22	37	55	90	185	250
	Applicable motor current (A)		42	48	78	120	180	361	481
40°C	Rated input current (A)	Power/ regenerative driving	40	47	78	113	168	335	450
unig	Continuous rating overload current rational current rati	/ ating	100% continuous / 150% 60 s						
	Power supply capa	acity (kVA)∗₃	34	40	66	96	142	282	379
_	Rated input AC vo	Itage/frequency	Three-phase 380 to 480 V, 50/60 Hz*6*10						
Power	Permissible AC vo	Itage fluctuation	Three-phase 323 to 506 V, 50/60 Hz						
	Permissible freque	ency fluctuation	±5%						
Input power factor			0.99 or more (when load ratio is 100%)						
Protection rating of structure (IEC 60529)		IP00+4 IP20 +9 (FR-XCB and FR- MCB included)						nd FR-	
Cooling system			Forced air						
Number of	connectable inverte	ers	10*7						
Approx. ma	ass (kg)∗ଃ		10.5	10.5	28	28	45	96	96

For the FR-XC-[]K, the common bus regeneration mode is selected initially. For the FR-XC-[]K-PWM, the harmonic suppression mode is selected \*1 For the FR-XC-[[K, the common bus regeneration mode is selected initially. For the FR-XC-[[K-PWM, the harmonic suppression mode is selection initially. Selection example for 220 V power supply voltage. Selection example for 440 V power supply voltage. IP00 for the FR-XCL. The DC bus voltage is approx. 297 VDC at an input voltage of 200 VAC, approx. 327 VDC at 220 VAC, and approx. 342 VDC at 230 VAC. The DC bus voltage is approx. 594 VDC at an input voltage of 400 VAC, approx. 653 VDC at 440 VAC, and approx. 713 VDC at 480 VAC. If you want to connect 11 or more inverters, contact your sales representative. Mass of the FR-XC alone. IP00 when the side wiring cover of the FR-XC is removed

\*2

\*3 \*4

\*5 \*6 \*7

\*8

IPO0 when the side wining cover of the FR-XC is removed.
 The permissible voltage imbalance ratio is 3% or less. (Unbalance factor = Max | Line voltage - Mean of three line voltages | / Mean of three line voltages × 100)

### Rating (FR-XC-(H)[]K-PWM)

### • 200 V class

Model FR-XC-[ ]K-PWM*1			18.5	22	37	55
Applicable inverter capacity (kW)			18.5	22	37	55
	Applicable motor of	current (A)	76	90	145	215
50°C rating	Rated input current (A)	Power/ regenerative driving	69	82	134	198
	Continuous rating overload current ra	/ ating	100% continuous / 150% 60 s			
	Power supply capa	acity (kVA)*2	30	35	57	84
	Applicable inverte	r capacity (kW)	18.5	22	37	55
	Applicable motor current (A)		83	99	160	236
40°C	Rated input current (A)	Power/ regenerative driving	75	90	147	217
	Continuous rating overload current rational current rati	100% continuous / 150% 60 s				
	Power supply capa	acity (kVA)*2	32	38	62	92
	Rated input AC vo	Itage/frequency	Three-phase 200 to 230 V, 50/60 Hz*5*10			
Power source	Permissible AC vo	Itage fluctuation	Three-phase 170 to 253 V, 50/60 Hz			
	Permissible freque	ency fluctuation	±5%			
Input power factor			0.99 or more (when load ratio is 100%)			
Protection rating of structure (IEC 60529)			IP00*4			
Cooling system			Forced air			
Number of	connectable inverte	ers	10*7			
Approx. ma	ass (kg)∗8		10.5	10.5	28	38

### • 400 V class

	Model FR-XC-H[]	K-PWM*1	18.5	22	37	55	75	160	220
	Applicable inverter capacity (kW)         1           Applicable motor current (A)         3		18.5	22	37	55	75	160	220
			38	44	71	110	144	325	432
50°C rating	Rated input current (A)	Power/ regenerative driving	37	43	71	104	139	290	397
5	Continuous rating overload current rational current rati	/ ating	100% co	ntinuous /	150% 60 s	6			
	Power supply capa	acity (kVA)*3	32	37	60	88	118	245	334
	Applicable inverte	r capacity (kW)	18.5	22	37	55	90	185	250
	Applicable motor current (A)		42	48	78	120	180	361	481
40°C rating	Rated input current (A)	Power/regenerative driving	40	47	78	113	168	335	450
	Continuous rating overload current rational current rati	/ ating	100% continuous / 150% 60 s						
	Power supply capa	acity (kVA)*3	34	40	66	96	142	282	379
_	Rated input AC vo	Itage/frequency	Three-phase 380 to 480 V, 50/60 Hz*6*10						
Power	Permissible AC vo	Itage fluctuation	Three-phase 323 to 506 V, 50/60 Hz						
	Permissible freque	ency fluctuation	±5%						
Input power factor			0.99 or more (when load ratio is 100%)						
Protection rating of structure (IEC 60529)		IP00*4 IP20 *9 (FR-XCB and FR- MCB included)						nd FR-	
Cooling sys	stem		Forced a	ir					
Number of	connectable inverte	ers	10*7						
Approx. ma	ass (kg)*8		10.5	10.5	28	28	45	96	96

The harmonic suppression mode is selected initially. Selection example for 220 V power supply voltage. Selection example for 440 V power supply voltage.

\*1 \*2 \*3 \*4 \*5

Selection example for 440 V power supply voltage. IP20 for the FR-XCB. The DC bus voltage is approx. 297 VDC at an input voltage of 200 VAC, approx. 327 VDC at 220 VAC, and approx. 342 VDC at 230 VAC. The DC bus voltage is approx. 594 VDC at an input voltage of 400 VAC, approx. 653 VDC at 440 VAC, and approx. 713 VDC at 480 VAC. If you want to connect 11 or more inverters, contact your sales representative. Mass of the FR-XC alone. ID20 when the cide wiring cover of the FR-XC is removed.

\*6 \*7 \*8

\*10 integration in the rest and it.
 \*10 integration in the rest and it.
 \*10 integration is ide wining cover of the FR-XC is removed.
 \*10 The permissible voltage imbalance ratio is 3% or less. (Unbalance factor = Max | Line voltage - Mean of three line voltages | / Mean of three line voltages × 100)

### • Amount of heat generated from the converter

• FR-XC

• 200 V class						
Model	Amount of heat generated (W)					
	50°C rating	40°C rating				
FR-XC-22K FR-XC-18.5K-PWM	745	810				
FR-XC-30K FR-XC-22K-PWM	895	980				
FR-XC-37K FR-XC-37K-PWM	1395	1530				
FR-XC-55K FR-XC-55K-PWM	1865	2030				

• 400 V class

Model	Amount of heat generated (W)				
Woder	50°C rating	40°C rating			
FR-XC-H22K FR-XC-H18.5K-PWM	795	855			
FR-XC-H30K FR-XC-H22K-PWM	940	1025			
FR-XC-H37K FR-XC-H37K-PWM	1470	1615			
FR-XC-H55K FR-XC-H55K-PWM	1915	2080			
FR-XC-H75K FR-XC-H75K-PWM	2025	2450			
FR-XC-H160K FR-XC-H160K-PWM	4320	4995			
FR-XC-H220K FR-XC-H220K-PWM	5940	6735			

### • FR-XCB

• 200 V class

Model	Amount of heat generated (W)				
Woder	50°C rating	40°C rating			
FR-XCB-22K	355	385			
FR-XCB-30K	380	420			
FR-XCB-37K	575	630			
FR-XCB-55K	730	800			

### • 400 V class

Madal	Amount of hea	t generated (W)
Woder	50°C rating	40°C rating
FR-XCB-H22K	495	530
FR-XCB-H30K	510	560
FR-XCB-H37K	790	870
FR-XCB-H55K	965	1050
FR-XCB-H75K	1265	1810
FR-XCB-H160K	2170	2775
FR-XCB-H220K	2565	3220

### • FR-MCB

Model	Amount of heat generated (W)								
woder	50°C rating	40°C rating							
FR-MCB-H150	395								
FR-MCB-H400	745								
FR-MCB-H800	965								

### Operating condition

Observe the following inverter selection conditions.

Item	Condition
Inverter capacity	The total capacity of the connected inverters (regardless of the rating or model of the inverters) must not exceed the applicable inverter capacity (kW) shown in the converter's rated specifications (refer to <b>page 48</b> ).
Motor rated current	The total of the rated current of the connected motors (rated current for the selected rating) must not exceed the applicable motor current (A) shown in the converter's rated specifications (refer to <b>page 48</b> ).
Number of inverters	The number of inverters actually connected must not exceed the number of connectable inverters shown in the converter's rated specifications (refer to <b>page 48</b> ).
Inverter with the HD rating*1	For the HD rating, 200% of the total rated current of the connected motors must not exceed 150% of the applicable motor current (A) shown in the converter's specifications (refer to <b>page 48</b> ).

\*1 For the HD rating of the inverter, refer to the inverter Instruction Manual.

To use the converter with the inverter, Pr.30 Regenerative function selection must be set in the inverter. The parameter setting differs by the inverter series. For the parameters and the inverters not listed in the table, refer to the Instruction Manual of the inverter

Invertor consoity	Pr.30 Regenerative	V/F control	Other than V/F control			
inverter capacity	function selection	Pr.19 Base frequency voltage	Pr.83 Rated motor voltage			
FR-A800, FR-F800	2 or 102					
FR-E800, FR-E700, FR-F700PJ, FR-D700	0 (initial value), 2 (automatic restart after instantaneous power failure is enabled)	Rated motor voltage				



· For details of the inverter capacity, refer to the rating specifications in the Instruction Manual of the inverter.

Example: FR-A820

						-
Model	D_A820_[1		00046	00077	00105	
Woderr	-K-A020-[ ]	(	0.4K	0.75K	1.5K	)
:	SLD	$\overline{}$	0.75	1.5	2.2	

<ul> <li>For the FR-V500(I</li> </ul>	L) inverter, the cap	acity used for selection	on is as follows.

Capacity of the FR-V500 (kW)	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	<b>75</b> *1	<b>90</b> *1	<b>110</b> *1	<b>132</b> *1
Capacity used for selection (kW)	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	55	132	132	220	220

The 75K or higher inverters are the FR-V540L inverters.
Refer to page 48 for the details of the applicable inverter capacity, the applicable inverter current, and the number of connectable inverters.

The power factor improving AC reactor or DC reactor cannot be used.

Terminal Connection Diagrams

55K or lower



\*11 Instead of connecting the terminals to the AC power supply, the control circuit can be powered by connecting terminal R1/L11 to terminal P/+ and terminal S1/L21 to terminal N/-. In this case, do not connect the terminals to the AC power supply. Doing so will damage the inverter..



\*12 The terminal symbols differ depending on the manufacture year and month of the FR-XCB. (Refer to the FR-XC Instruction Manual.)

7

• 75K or higher When using the FR-MCB



- Never connect the power supply to terminals R/L1, S/L2, and T/L3 on the inverter. Incorrect connection will damage the inverter and the converter. \*1 Connect between the inverter terminal P/+ and the converter terminal P/+ and between the inverter terminal N/- and the converter terminal N/- for polarity \*2
- consistency. Connecting opposite polarity of terminals P/+ and N/- will damage the converter and the inverter. Confirm the correct phase sequence of three-phase current to connect between the reactor and the converter, and between the power supply and the converter \*3
- (terminals R/L1, S/L2, and T/L3). Incorrect connection will damage the converter. Always connect between the power supply and terminals R/L1, S/L2, and T/L3 of the converter. Operating the inverter without connecting them will damage the \*4 converter.
- Assign the X10 signal to any of the input terminals. \*5
- \*6 Do not connect anything to terminal P4.
- \*7 Install the UL listed fuse (refer to the FR-XC Instruction Manual) on the input side of the reactor to meet the UL/cUL standards.
- \*8 Do not install an MCCB or MC between the reactor and the converter. Doing so disrupts proper operation
- \*9 When the inverter has control circuit power supply terminals (R1/L11 and S1/L21), wire them as shown in the diagram. For inverters without terminals R1/L11 and S1/L21, wiring is not required.
- \*10 Always connect between the power supply and terminals R3 and S3 on the converter. Otherwise, the control circuit power supply is not started and the converter will not be charged

Connect either terminal RX2/L1X2 or RX3/L1X3 to the power supply according to the input power supply voltage as shown in the table below. supply volta

i ower suppry voltage	Terminan
380 V or more to less than 427 V	RX2/L1X2
427 V to 500 V	RX3/L1X3

\*12 Fuses between the converter and the inverter are not required for the following combinations as the internal fuses of the converter can be used

FR	-XC	Inverter (kW)				
	50°C rating	75				
FK-XU-11/3K	40°C rating	75, 90				
	50°C rating	160				
	40°C rating	160, 185				
	50°C rating	220				
	40°C rating	220, 250				

\*13 Terminal FAN is used in the FR-XC-(H)55K or lower. This terminal is not used in the FR-XC-H75K.
\*14 Instead of connecting the terminals to the AC power supply, the control circuit can be powered by connecting terminal R1/L11 to terminal P/+ and terminal S1/L21 to terminal N/-. In this case, do not connect the terminals to the AC power supply. Doing so will damage the inverter.



Connected to terminals P/+ and N/- of the FR-XC.

### Cable gauge

Select a recommended gauge size cable to ensure that the voltage drop ratio is within 2%.

The following indicates selection examples when the wiring length from the power supply to the converter is 20 m. • 55K or lower



### • 200 V class

						С	able gaug	e				
	_	Н	IV cables,	etc. (mm	<b>2)</b> *1	A	WG/MCM	*2	PVC cables, etc. (mm <sup>2</sup> ) *3			
Model	Rating	Location	in the cor diagram	nnection	Earth (ground)	Location	in the cor diagram	nnection	Location	Earth		
		a, b	<b>C</b> *6	d		a, b	С	d	a, b	С	d	(ground)
FR-XC-22K	50°C	22	20	1.05	22	4	4	16	16	16	1 5	16
FR-XC-18.5K-PWM	40°C	22	30	1.25	22	4	2	10	10	25	1.5	10
FR-XC-30K	50°C	20	38	1.25	22	4	2	16	16	25	1.5	25
FR-XC-22K-PWM	40°C	30				2			25	20		25
FR-XC-37K	50°C	60	90	1.05	22	1/0	2/0	16	50	70	1 5	05
FR-XC-37K-PWM	40°C	00	00	1.20	22	2/0	3/0	10	50	70	1.5	30
FR-XC-55K FR-XC-55K-PWM	50°C	100	100	1.05	20	3/0	4/0	16	70	05	4 5	50
	40°C	100	100	1.20	38	4/0 4/0		10	70	95	1.5	50

• 400 V class

						С	able gaug	je				
		н	IV cables,	etc. (mm	<b>2</b> )*1	A	WG/MCM	*4	P\	/C cables	, etc. (mm	<b>2</b> ) *5
Model	Rating	Location	in the cor diagram	nnection	Earth	Location	in the cor diagram	nnection	Location	Earth		
		a, b	<b>C</b> *6	d	(ground)	a, b	С	d	a, b	С	d	(ground)
FR-XC-H22K	50°C	0	14	1.25	0	0	6	16	10	10	15	10
FR-XC-H18.5K-PWM	40°C	0	14	1.20	0	0	0	10	10	10	1.5	10
FR-XC-H30K	50°C	14	22	1.25	14	6	6	16	10	16	1.5	10
FR-XC-H22K-PWM	40°C	14	14	1.20	14	0	4	10	10	10	1.5	10
FR-XC-H37K	50°C	22	20	1.05	14	4	2	16	25	25	15	40
FR-XC-H37K-PWM	40°C	22	30	1.20	14	4	2	10	25	30	1.5	10
FR-XC-H55K	50°C	60	60	1.25	22	2	2	16	25	25	1.25	25
FR-XC-H55K-PWM	40°C	38	60		22	2	1	10	20	30	1.20	20

- It is the gauge of a cable with the continuous maximum permissible temperature of 75°C (HIV cable (600 V grade heat-resistant PVC insulated wire), etc.). It assumes a surrounding air temperature of 50°C or less (40°C or less for the 40°C rating) and the wiring distance of 20 m or less from \*1 the power supply to the converter.
- It is the gauge of the cable with continuous maximum permissible temperature of 75°C (THHW cable). It assumes a surrounding air temperature of \*2 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. (For the use in the United States or Canada, refer to the FR-XC Instruction Manual.)
- It is the gauge of a cable with the continuous maximum permissible temperature of 90°C (PVC cable). It assumes a surrounding air temperature of \*3 40°C or less and the wiring distance of 20 m or less from the power supply to the converter.
- (Selection example mainly for use in Europe.) For the FR-XC-H37K or lower, it is the gauge of the cable with the continuous maximum permissible temperature of 75°C (THHW cable). It \*4 assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. For FR-XC-H55K, the cable gauge is with the continuous maximum permissible temperature of 90°C (THHN cable). (For the use in the United States or Canada, refer to the FR-XC Instruction Manual.)
- For the FR-XC-H37K or lower, it is the gauge of the cable with the continuous maximum permissible temperature of 70°C (PVC cable). For the FR-\*5 XC-H55K or higher, it is the gauge of the cable with the continuous maximum permissible temperature of 90°C (XLPE cable). For FR-XC-H55K, the cable gauge is with the continuous maximum permissible temperature of 90°C (XLPE cable). (Selection example mainly for use in Europe.)
- If a cable thinner than the recommended cable size is used, it may not be protected by the DC fuse. (Refer to **page 57** for the fuse selection.) When using a separate power supply for the control circuit, remove the jumpers connected to terminals R1/L11 and S1/L21. \*6

#### 75K or higher



								Cable	gauge						
			HIV ca	AWG/MCM *2					PVC ca	ıbles, et	c. (mm <sup>2</sup>	<b>2)</b> *3			
Model	Rating	Locat	ion in th diag	ie conn Iram	ection	Earth	Location in the connection diagram				Location in the connection diagram				Earth
		a, b	<b>C</b> *4	d	е	(ground)	a, b	С	d	е	a, b	С	d	е	(ground)
FR-XC-H75K FR-XC-H75K-PWM	50°C	60	60		3.5	22	1/0	2/0		11	50	70		4	25
	40°C	00						2/0			50	70			55
FR-XC-H160K	50°C	100	125	1 25	20	38	4/0 2	250	16		95	125	15		70
FR-XC-H160K-PWM	40°C	40°C 150 1	150	1.20	Q	30	300	10	Q	150	150	1.5	10	70	
FR-XC-H220K FR-XC-H220K-PWM	50°C	150	200	1	0	60	500	400		0	150	195		10	05
	40°C	200	200				400	400			185	105			95

It is the gauge of the cable with continuous maximum permissible temperature of 90°C or more (LMFC (heat resistant flexible cross-linked \*1 polyethylene insulated cable), etc.). It assumes a surrounding air temperature of 50°C or less and the wiring distance of 20 m or less from the power supply to the converter.

It is the gauge of the cable with the continuous maximum permissible temperature of 90°C (THHN cable). It assumes a surrounding air temperature of  $40^{\circ}$ C or less and the wiring distance of 20 m or less from the power supply to the converter. (For the use in the United States or Canada, refer to the FR-XC Instruction Manual.)

It is the gauge of the cable with the continuous maximum permissible temperature of 90°C (XLPE cable). It assumes a surrounding air temperature \*3 of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. (Selection example mainly for use in Europe.)

If a cable thinner than the recommended cable size is used, it may not be protected by the DC fuse. (Refer to page 57 for the fuse selection.) \*5 When using a separate power supply for the control circuit, remove the jumpers connected to terminals R1/L11 and S1/L21.

### Circuit breaker and magnetic contactor

Check the model of the purchased multifunction regeneration converter. Appropriate peripheral devices must be selected according to the capacity.

Refer to the following tables to prepare appropriate peripheral devices. 200 V class

Loo I oldoo						
FR-XC series converter	Molded case circuit earth leakage circuit bre	t breaker (MCCB)*1/ eaker (ELB) (NF, NV type)	Magnetic contactor (MC)*2			
moder	50°C rating	C rating 40°C rating 50°C r		40°C rating		
FR-XC-22K FR-XC-18.5K-PWM	125 A	125 A	S-T50	S-T50		
FR-XC-30K FR-XC-22K-PWM	125 A	125 A	S-T65	S-T65		
FR-XC-37K FR-XC-37K-PWM	200 A	200 A	S-T100	S-N150		
FR-XC-55K FR-XC-55K-PWM	300 A	300 A	S-N180	S-N180		

<ul> <li>400 V class</li> </ul>	
---------------------------------	--

FR-XC series converter	Molded case circuit earth leakage circuit bre	t breaker (MCCB)∗1/ aker (ELB) (NF, NV type)	Magnetic contactor (MC)/ dedicated contactor box (option)*2			
moder	model 50°C rating 40°C rating		50°C rating	40°C rating		
FR-XC-H22K FR-XC-H18.5K-PWM	60 A	60 A	S-T35	S-T35		
FR-XC-H30K FR-XC-H22K-PWM	75 A	75 A	S-T35	S-T35		
FR-XC-H37K FR-XC-H37K-PWM	100 A	100 A	S-T50	S-T65		
FR-XC-H55K FR-XC-H55K-PWM	150 A	150 A	S-T80	S-T80		
FR-XC-H75K FR-XC-H75K-PWM	175 A	225 A	FR-MCB-H150 or S-N150 200 VAC*3			
FR-XC-H160K FR-XC-H160K-PWM	400 A	500 A	FR-MCB-H400 or S-N300 200 VAC*3			
FR-XC-H220K FR-XC-H220K-PWM	500 A	600 A	FR-MCB-H400 or S-N400 200 VAC*3			
1 Calastan M	COD assessment to the message sum	all search in the				

\*1 Select an MCCB according to the power supply capacity Install one MCCB per converter. (For the use in the United States or Canada, refer to the FR-XC Instruction Manual.)

MCCB	FR-XC	Inverter	-M
MCCB-	FR-XC	Inverter	-(M)

\*2

The 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 stops during motor driving, the electrical durability is 25 times. (Note that the dedicated contactor box is not intended for emergency stop.) If using an MC for emergency stop during motor driving or using it on the motor side during commercial power supply operation, select an MC with

the class AC-3 rated current for the rated motor current. Select an MC whose operation coil section has a surge absorbing function. To use the MC to shut off the power supply in case of emergency, set **Pr.460 Operation selection after MC external shutoff**. (refer to the FR-XC Instruction Manual) \*3

### Fuse

Installation of a fuse between the multifunction regeneration converter and the inverter is recommended.

When using the converter in the common bus regeneration mode, select a fuse according to the capacity of the connected motor. When using a motor whose 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.

<ul> <li>200 V class</li> </ul>			
Motor capacity (kW)	Fuse rating (A)	Model (Part number/Item number) *1	Fuse holder (2 poles)
0.1	5	6.900 CP GR 10.38 0005 (FR10GR69V5)	
0.2	10	6.900 CP GR 10.38 0010 (FR10GR69V10)	]
0.4	16	6.900 CP GR 10.38 0016 (FR10GR69V16)	<ul> <li>CUS102 (without fuse light melting indicator)</li> <li>or CUS102 (with fuse light melting indicator)</li> </ul>
0.75	20	6.900 CP GR 10.38 0020 (FR10GR69V20)	
1.5	25	6.900 CP GR 10.38 0025 (FR10GR69V25)	
2.2	50	6.9 URD 30 TTF 0050	—
3.7	63	6.9 URD 30 TTF 0063	_
5.5	100	6.9 URD 30 TTF 0100	_
7.5	125	6.9 URD 30 TTF 0125	—
11	160	6.9 URD 30 TTF 0160	_
15	200	6.9 URD 30 TTF 0200	_
18.5	250	6.9 URD 30 TTF 0250	_
22	315	6.9 URD 30 TTF 0315	—
30	400	6.9 URD 30 TTF 0400	_
37	500	6.9 URD 30 TTF 0500	_
45	630	6.9 URD 31 TTF 0630	_
55	700	6.9 URD 31 TTF 0700	_

400 V class

Motor capacity (kW)	Fuse rating (A)	Model (Part number/Item number) *1	Fuse holder (2 poles)
0.4	12.5	6.900 CP GR 10.38 0012.5(FR10GR69V12.5)	
0.75	16	6.900 CP GR 10.38 0016(FR10GR69V16)	
1.5	16	6.900 CP GR 10.38 0016(FR10GR69V16)	CUS102 (without fuse light melting indicator) or CUS102I (with fuse light melting indicator)
2.2	20	6.900 CP GR 10.38 0020(FR10GR69V20)	
3.7	30	6.900 CP GR 10.38 0030(FR10GR69V30)	
5.5	50	6.9 URD 30 TTF 0050	-
7.5	50	6.9 URD 30 TTF 0050	-
11	80	6.9 URD 30 TTF 0080	-
15	125	6.9 URD 30 TTF 0125	-
18.5	125	6.9 URD 30 TTF 0125	-
22	160	6.9 URD 30 TTF 0160	-
30	200	6.9 URD 30 TTF 0200	1
37	250	6.9 URD 30 TTF 0250	-
45	315	6.9 URD 30 TTF 0315	-
55	350	6.9 URD 30 TTF 0350	
75	450	6.9 URD 30 TTF 0450	-
90	500	6.9 URD 30 TTF 0500	-
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 (parallel connection)*2	_
250	1250	6.9 URD 33 TTF 1250 or 6.9 URD 31 TTF 0700 × 2 (parallel connection)*2	_

Manufacturer: Mersen Japan KK \*1

Contact: Sun-Wa Technos Corporation When installing fuses in parallel, leave a space of 12 mm or more between the fuses. \*2



- Install fuses across terminals P/+ and P/+, and across terminals N/- and N/- of the multifunction regeneration converter and the inverter.
- Fuses between the converter and the inverter are not required for the following combinations as the internal fuses of the converter can be used.

FR-XC			nverter (kW)	
	50°C rating		75	
FR-AC-11/3K	40°C rating		75, 90	
	50°C rating		160	
	40°C rating		160, 185	
	50°C rating		220	
FR-AG-0220K	40°C rating		220, 250	
[Estimated lifespan of fuses]				
Components	Estimated lifespar	<b>1</b> *1	Replacement	method
Fuse	10 years		Replace by n	ew one

\*1 Estimated lifespan for when the yearly average surrounding air temperature is 50°C. (without corrosive gas, flammable gas, oil mist, dust and dirt etc.)



• If the fuse melts down, wiring failure such as a short circuit may be the cause. Find out the cause and remove it before replacing the fuse.

# MEMO

### Power regeneration mode 2

### Example Connection

55K or lower





### Rating (FR-XC-(H)[]K)

•	200	v	class
•	200	v	uass

	Model FR-XC-[ ]K	7.5	11	15	22	30	37	55			
	Potential continuous regenerative capacity (kW)*2	5.5	7.5	11	18.5	22	30	45			
50°C rating	Rated current (A) (regenerative driving)	19	26	37	62	74	102	152			
· • • • • • •	Continuous rating / overload current rating	100% co	ontinuous	s / 150% (	60 s						
	Potential continuous regenerative capacity (kW)*2	5.5	7.5	11	18.5	22	30	45			
40°C rating	Rated current (A) (regenerative driving)	21	28	40	68	81	112	167			
· • • • • • •	Continuous rating / overload current rating	100% co	ontinuous	s / 150% (	60 s						
	Rated input AC voltage/frequency	Three-p	hase 200	) to 240 V	, 50/60 H	<b>Z</b> *3					
Power	Permissible AC voltage fluctuation	Three-p	hase 170	) to 264 V	, 50/60 H	z					
	Permissible frequency fluctuation	±5%									
Protection	rating of structure (IEC 60529)	IP00									
Cooling sy	stem	Forced air									
Number of	connectable inverters	1									
Approx. ma	ass (kg)*1	5	5	6	10.5	10.5	28	38			
• 400 V cl	ass										
	Model FR-XC-H[ ]K	7.5	11	15	22	30	37	55	75	160	220
	Potential continuous regenerative capacity (kW)*2	5.5	7.5	11	18.5	22	30	45	75	132	185
rating	Rated current (A) (regenerative driving)	10	14	20	33	39	54	80	135	238	333
· · · · · · · · · · · · · · · · · · ·	Continuous rating / overload current rating	100% co	ontinuous	s / 150% (	60 s						
	Potential continuous regenerative capacity (kW)*2	5.5	7.5	11	18.5	22	30	45	90	160	220
40°C rating	Rated current (A) (regenerative driving)	11 15 21 36 42 59 88				162	288	396			
·	Continuous rating / overload current rating	100% continuous / 150% 60 s									
_	Rated input AC voltage/frequency	Three-p	hase 380	) to 500 V	, 50/60 H	<b>Z</b> *3					
Power		Three-phase 323 to 550 V, 50/60 Hz									
SOURCE	Permissible AC voltage fluctuation	Three-p	hase 323	5 to 550 V	, 50/60 H	2					
source	Permissible AC voltage fluctuation Permissible frequency fluctuation	Three-p ±5%	hase 323	s to 550 V	, 50/60 H	2					
source Protection	Permissible AC voltage fluctuation Permissible frequency fluctuation rating of structure (IEC 60529)	Three-p ±5% IP00	hase 323	to 550 V	, 50/60 H	2			IP20*4(F	R-XCB ir	icluded)
source Protection Cooling sys	Permissible AC voltage fluctuation Permissible frequency fluctuation rating of structure (IEC 60529) stem	Three-p ±5% IP00 Forced	hase 323 air	5 to 550 V	, 50/60 H.	2			IP20*4(F	R-XCB ir	icluded)
Source Protection Cooling sys Number of	Permissible AC voltage fluctuation Permissible frequency fluctuation rating of structure (IEC 60529) stem connectable inverters	Three-p ±5% IP00 Forced	hase 323 air	to 550 V	, 50/60 H.	<u>ک</u>			IP20*4(F	R-XCB ir	icluded)

Approx. mass (kg)\*1

Mass of the FR-XC alone. Maximum capacity of regenerative power generated from the Mitsubishi Electric standard 4-pole motor in each axis. The permissible voltage imbalance ratio is 3% or less. (Unbalance factor = Max | Line voltage - Mean of three line voltages | / Mean of three line \*1 \*2 \*3 voltages × 100) IP00 when the side wiring cover of the FR-XC is removed.

\*4

### Rating (FR-XC-(H)[]K-PWM)

### • 200 V class

	Model FR-XC-[ ]K-PWM	18.5	22	37	55
	Potential continuous regenerative capacity (kW)*2	18.5	22	30	45
50°C rating	Rated current (A) (regenerative driving)	62	74	102	152
	Continuous rating / overload current rating	100% continuous / 150% 60 s			6
	Potential continuous regenerative capacity (kW)*2	18.5	22	30	45
40°C rating	Rated current (A) (regenerative driving)	68	81	112	167
	Continuous rating / overload current rating	100% continuous / 150% 60 s			6
_	Rated input AC voltage/frequency	Three-ph	ase 200 to	o 240 V, 50	0/60 Hz*3
Power	Permissible AC voltage fluctuation	Three-phase 170 to 264 V, 50/60 H			)/60 Hz
Permissible frequency fluctuation		±5%			
Protection	on rating of structure (IEC 60529) IP00				
Cooling sy	stem	Forced air			
Number of connectable inverters 1					
Approx. ma	ass (kg)*1	10.5	10.5	28	38
• 400 V cl	ass				

#### Model FR-XC-H[]K-PWM 18.5 22 37 55 75 160 220 Potential continuous regenerative capacity (kW)\*2 18.5 22 30 45 75 132 185 50°C rating Rated current (A) (regenerative driving) 39 54 80 135 238 333 33 Continuous rating / overload current rating 100% continuous / 150% 60 s Potential continuous regenerative 18.5 22 30 45 90 160 220 capacity (kW)\*2 40°C rating Rated current (A) (regenerative driving) 59 88 162 288 396 36 42 Continuous rating / overload current rating 100% continuous / 150% 60 s Rated input AC voltage/frequency Three-phase 380 to 500 V, 50/60 Hz\*3 Power source Permissible AC voltage fluctuation Three-phase 323 to 550 V, 50/60 Hz Permissible frequency fluctuation ±5% IP00 IP20\*4(FR-XCB included) Protection rating of structure (IEC 60529) Cooling system Forced air Number of connectable inverters 1 10.5 Approx. mass (kg)\*1 10.5 28 28 45 96 96

Mass of the FR-XC alone. \*1

\*2

Maximum capacity of regenerative power generated from the Mitsubishi Electric standard 4-pole motor in each axis. The permissible voltage imbalance ratio is 3% or less. (Unbalance factor = Max | Line voltage - Mean of three line voltages | / Mean of three line \*3 voltages × 100) IP00 when the side wiring cover of the FR-XC is removed.

\*4

### Amount of heat generated from the converter

• FR-XC

• 200 V class		
Model	Amount of hea	t generated (W)
model	50°C rating	40°C rating
FR-XC-7.5K	220	240
FR-XC-11K	315	345
FR-XC-15K	460	505
FR-XC-22K FR-XC-18.5K-PWM	685	755
FR-XC-30K FR-XC-22K-PWM	810	890
FR-XC-37K FR-XC-37K-PWM	890	980
FR-XC-55K FR-XC-55K-PWM	1080	1190

• 400 V class

Model	Amount of heat generated (W)				
Woder	50°C rating	40°C rating			
FR-XC-H7.5K	130	145			
FR-XC-H11K	200	220			
FR-XC-H15K	280	305			
FR-XC-H22K FR-XC-H18.5K-PWM	365	395			
FR-XC-H30K FR-XC-H22K-PWM	435	485			
FR-XC-H37K FR-XC-H37K-PWM	590	650			
FR-XC-H55K FR-XC-H55K-PWM	880	965			
FR-XC-H75K FR-XC-H75K-PWM	1400	1540			
FR-XC-H160K FR-XC-H160K-PWM	2470	2715			
FR-XC-H220K FR-XC-H220K-PWM	3390	3720			

### • FR-XCG

• 200 V class

Model	Amount of heat	t generated (W)
Woder	50°C rating	40°C rating
FR-XCG-7.5K	60	73
FR-XCG-11K	82	92
FR-XCG-15K	99	115
FR-XCG-22K	118	142
FR-XCG-30K	135	162
FR-XCG-37K	172	205
FR-XCG-55K	210	243

### • 400 V class

Model	Amount of hea	t generated (W)
Woder	50°C rating	40°C rating
FR-XCG-H7.5K	68	82
FR-XCG-H11K	80	91
FR-XCG-H15K	91	105
FR-XCG-H22K	136	159
FR-XCG-H30K	156	178
FR-XCG-H37K	193	231
FR-XCG-H55K	232	275
FR-XCG-H75K	465	
FR-XCG-H90K	515	
FR-XCG-H132K	780	
FR-XCG-H160K	885	
FR-XCG-H185K	875	
FR-XCG-H220K	1030	

### Operating condition

- To select the converter, refer to page 62 for the potential regenerative capacity and overload current rating of the converter. Ensure
- that the selected converter is one with a larger regenerative power than that of the motor that will be used. Confirm that the converter is correctly selected, and select a dedicated stand-alone reactor (FR-XCG) by referring to "Combination matrix of FR-XCG and FR-XC(-PWM)" on **page 13**.

Selection example:

For the 50°C rating

For a motor which can supply 10 kW regenerative power with an overload capacity of 120% (12 kW) for 60 seconds, the FR-XC-15K (15 kW converter) should be selected.

	Model FR-XC-[ ]K *1	7.5	11	15	22	30	37	55
	Applicable inverter	7.5	11	15	22	30	37	55
	capacity (kW)		—	—	18.5	22	37	55
	· · · · · · · · · · · ·							
	Potential regenerative capacity (kW) •7	5.5	7.5	11	18.5	22	30	45
50°C rating	Rated current (A) (regenerative driving)	19	26	37	62	74	102	152
	Continuous rating / overload current rating		1	100% con	tinuous /	150% 60	s	
	Potential regenerative capacity (kW)	5.5	7.5	11	18.5	22	30	45
40°C rating	Rated current (A) (regenerative driving)	21	28	40	68	81	112	167
	Continuous rating / overload current rating	100% continuous / 150% 60 s						

When using a 75 kW inverter/motor or higher, also install the FR-HEL DC reactor (refer to the inverter Instruction Manuals). The following table shows applicable combinations of the converter and the inverter. • 200 V class

						In	verter ca	pacity					
Model	Rating	3.7K or lower	5.5K	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K	75K or higher
FR-XC-7.5K		×	Δ	Δ	0	0	0	0	0	0	0	0	0
FR-XC-11K		×	×	Δ	Δ	0	0	0	0	0	0	0	0
FR-XC-15K		×	×	×	Δ	Δ	0	0	0	0	0	0	0
FR-XC-22K	50°C/40°C rating	×	×	×	×	×	Δ	Δ	0	0	0	0	0
FR-XC-30K		×	×	×	×	×	×	Δ	Δ	0	0	0	0
FR-XC-37K		×	×	×	×	×	×	×	Δ	Δ	0	0	0
FR-XC-55K		×	×	×	×	×	×	×	×	×	Δ	Δ	0

#### • 400 V class

						In	verter ca	pacity					
Model	Rating	3.7K or lower	5.5K	7.5K	11K	15K	18.5K	22K	30K	37K	45K	55K	75K or higher
FR-XC-H7.5K		×	Δ	Δ	0	0	0	0	0	0	0	0	0
FR-XC-H11K		×	×	Δ	Δ	0	0	0	0	0	0	0	0
FR-XC-H15K		×	×	×	Δ	Δ	0	0	0	0	0	0	0
FR-XC-H22K	50°C/40°C rating	×	×	×	×	×	Δ	Δ	0	0	0	0	0
FR-XC-H30K		×	×	×	×	×	×	Δ	Δ	0	0	0	0
FR-XC-H37K		×	×	×	×	×	×	×	Δ	Δ	0	0	0
FR-XC-H55K		×	×	×	×	×	×	×	×	×	Δ	Δ	0

			Inverter capacity											
Model	Rating	55K or lower	75K	90K	110K	132K	160K	185K	220K	250K	280K	315K or higher		
	50°C rating	×	Δ	0	0	0	0	0	0	0	0			
FR-X0-H73R*1	40°C rating	×	×	Δ	0	0	0	0	0	0	0			
	50°C rating	×	×	×	×	Δ	0	0	0	0	0			
FR-AC-HIOUK	40°C rating	×	×	×	×	×	Δ	0	0	0	0	*1		
	50°C rating	×	×	×	×	×	×	Δ	0	0	0			
FR-XC-H220K	40°C rating	×	×	×	×	×	×	×	Δ	0	0	,		

o: Compatible, Δ: Compatible (common bus regeneration mode or harmonic suppression mode is recommended), ×: Not compatible

\*1 The FR-A840-06830(280K) or lower and the FR-F840-06830(315K) or lower are applicable to the converter in power regeneration mode 2. The following table shows compatibility between the converter and inverters

Inverter	Compatibility
FR-A840-06830(280K) or lower FR-F840-06830(315K) or lower	Compatible (Refer to <b>page 66</b> for wiring of the control signals.)
FR-A842-07700(315K) or higher FR-F842-07700(355K) or higher	Not compatible (To achieve compatibility, use the MC (refer to the FR-XC Instruction Manual) For the products manufactured in October 2022 or earlier, refer to the FR-XC Instruction Manual.)

# • NOTE

• Select an appropriate magnetic contactor (MC) according to the inverter capacity referring to the Instruction Manual of the inverter. For wiring, refer to the FR-XC Instruction Manual.

• Refer to the FR-XC Instruction Manual for wiring between the converter and the inverter.

**Terminal Connection Diagrams** 



- Connect between the inverter terminal P/+ and the converter terminal P4 and between the inverter terminal N/- and the converter terminal \*1 N/- for polarity consistency.
- Connecting the opposite polarity of terminals P/+ and N/- will damage the converter and the inverter. Confirm the correct phase sequence of three-phase current to connect between the reactor and the converter, and between the power supply and \*2 the reactor.
- Incorrect connection will damage the converter.
- Always connect between the power supply and terminals R/L1, S/L2, and T/L3 of the converter. Operating the inverter without connecting them will damage the converter. A branch point to each of these terminals must be placed between the power supply and the FR-HAL reactor. \*3
- \*4 Install the FR-XCG reactor between the power supply and the converter as shown in the figure. For information to select an appropriate model, refer to page 13. To connect a DC reactor, remove a jumper installed across terminals P1 and P/+ before installing the DC reactor. When using a separate power supply for the control circuit, remove the jumpers connected to terminals R1/L11 and S1/L21.
- \*5
- \*6
- \*7
- For selection of an MCCB for the converter, refer to **page 70**. Install the UL listed fuse (refer to the FR-XC Instruction Manual) on the input side of the FR-XCG reactor to meet the UL/cUL standards. \*8
- \*9 Do not install an MCCB or MC between the reactors and the converter. Doing so disrupts proper operation.

66

### • 75K or higher



- \*1 Connect between the inverter terminal P/+ and the converter terminal P4 and between the inverter terminal N/- and the converter terminal N/- for polarity consistency.
- Connecting the opposite polarity of terminals P/+ and N/- will damage the converter and the inverter.
- Confirm the correct phase sequence of three-phase current to connect between the reactor and the converter, and between the power supply and \*2 the reactor.
- Incorrect connection will damage the converter.
- \*3 Always connect between the power supply and terminals R/L1, S/L2, and T/L3 of the converter. Operating the inverter without connecting them will damage the converter.
- \*4 Install the FR-XCG reactor between the power supply and the converter as shown in the figure. For information to select an appropriate model, refer to page 13.
- \*5 To connect a DC reactor, remove a jumper installed across terminals P1 and P/+ before installing the DC reactor.
- When using a separate power supply for the control circuit, remove the jumpers connected to terminals R1/L11 and S1/L21. For selection of an MCCB for the converter, refer to **page 70**. \*6
- \*7
- \*8 Install the UL listed fuse (refer to the FR-XC Instruction Manual) on the input side of the FR-XCG reactor to meet the UL/cUL standards. \*9
- Do not install an MCCB or MC between the reactors and the converter. Doing so disrupts proper operation. Connect an appropriate magnetic contactor (MC) according to the inverter rated current. Use a 200 VAC class coil magnetic contactor and connect \*10 it to terminals A1, A2, 43 (23), and 44 (24) of the FR-XC. When using a magnetic contactor (MC) not shown in page 70, select one whose rated specifications of auxiliary contacts satisfy the rated specifications of terminals MC43 (23) and MC44 (24) (refer to page 28)
- \*11 Always connect between the power supply and terminals R3/L13 and S3/L23 on the converter. Otherwise, the control power supply is not started and the converter will not be charged.
- \*12 Prepare an appropriate 200 VAC class power supply to operate the magnetic contactor (MC). Do not use the power supply whose specification exceeds the rated specifications of terminals A1 and A2 of the FR-XC (refer to page 28). \*13
- Control signal cables must be 30 m or less long and 0.3 to 1.25  $\mbox{mm}^2$  thick To use the MC to shut off the power supply in case of emergency, set Pr.460 Operation selection after MC external shutoff. (Refer to the FR-XC \*14 Instruction Manual.)

### Cable gauge

Select a recommended gauge size cable to ensure that the voltage drop ratio is within 2%.

The following indicates selection examples when the wiring length from the power supply to the converter is 20 m. • 55K or lower



### • 200 V class

		Cable gauge															
		н	V cables	s, etc. (m	1 <b>m<sup>2</sup>)</b> *1	AV	NG/MCM	*2	PVC cables, etc. (mm <sup>2</sup> ) *3								
Model	Rating	Loc conne	ation in the ction diagram		Earth	Location in the connection diagram		the agram	Location in the connection diagram			Earth					
		a, b	<b>C</b> *5	d	(ground)	a, b	С	d	a, b	С	d	(ground)					
	50°C	2 5	5.5		5 5	14	10	16	4	4	1 5	10					
FR-AG-7.3K	40°C	3.5	3.5	1.05	5.5	12	12	10	4	4	1.5	10					
ER VC 44K	50°C	5 5	8	1.20	0	10	10	16	6	c	1.5	16					
FR-AU-TIN	40°C	0.0	5.5		ŏ	10	10	10	0	0		10					
ER VC 15K	50°C	8	Q	8	8	8	8	14	1 25	14	Q	9	16	10	10	1.5	16
FR-AG-15K	40°C		14	1.20	14	0	0	10	10	10	1.0	10					
FR-XC-22K	50°C	22	22	1.25	1.25 22 -	6	4	16	10	16	1 5	16					
FR-XC-18.5K-PWM	40°C	22	22			4	4	16	16	10	1.5	10					
FR-XC-30K	50°C	38	20	1.05	22	4	2	16	16	16	4.5	25					
FR-XC-22K-PWM	40°C	22	30	1.20	22	4	2	10	10	25	1.5	20					
FR-XC-37K	50°C	60	60	1 25	22	1	1	16	35	35	15	25					
FR-XC-37K-PWM	40°C	38	00	1.20	22	1	1/0	10	55	50	1.5	20					
FR-XC-55K	50°C	80	100	1 25	39	2/0	3/0	16	50	70	15	35					
FR-XC-55K-PWM	40°C	50	100	1.25	38 2	2/0 3/0		3/0 16		10	1.5	55					
<ul> <li>400 V class</li> </ul>																	

						C	able gau	ge					
		HI	V cables	s, etc. (m	1 <b>m<sup>2</sup>)</b> *1	A۱	NG/MCN	*2	PV	C cable	s, etc. (n	ոm²) ∗4	
Model	Rating	Loc conne	Location in the connection diagram		Earth	Location in the connection diagram			Loc conne	Earth			
		a, b	<b>C</b> *5	d	(ground)	a, b	С	d	a, b	С	d	(ground)	
	50°C	2 5	2 5		2.5	10	10	16	4	4	15	4	
FK-AC-H7.5K	40°C	3.5	3.0	1.05	5.5	12	12	10	4	4	1.5	4	
	50°C	3.5	3.5	1.25	3.5	12	12	16	4	4	15	4	
rk-AU-HIIK	40°C		3.5		3.5	12	12	10	4	4	1.5	4	
	50°C	2 5	2.5	5 5	1.05	5 5	10	12	16	4	4	15	4
FR-AC-HISK	40°C	3.5	5.5	1.20	5.5	12	10	10	4	4	1.5	4	
FR-XC-H22K	50°C	8	14	1.05	1 25 8	10	8	16	6	10	15	10	
FR-XC-H18.5K-PWM	40°C	0	8	1.20	0	8	0	10	0	10	1.5	10	
FR-XC-H30K	50°C	14	14	1 25	14	9	6	16	10	10	15	10	
FR-XC-H22K-PWM	40°C	8	14	1.25	14	0	0	10	10	10	1.5	10	
FR-XC-H37K	50°C	22	22	1.05	14	6	4	16	16	16	15	16	
FR-XC-H37K-PWM	40°C	14	22	1.20	14	0	4	10	10	10	1.5	10	
FR-XC-H55K	50°C	38	38	1 25	22	4	2	16	25	25	15	16	
FR-XC-H55K-PWM	40°C	50	50	1.25	1.25 22	2	14	10	25	25	1.5	10	

- It is the gauge of a cable with the continuous maximum permissible temperature of 75°C (HIV cable (600 V grade heat-resistant PVC insulated \*1 wire), etc.). It assumes a surrounding air temperature of 50°C or less (40°C or less for the 40°C rating) and the wiring distance of 20 m or less from the power supply to the converter.
- For the 200 V class converters and FR-XC-H37K or lower, it is the gauge of the cable with the continuous maximum permissible temperature of \*2 75°C (THHW cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter.

For FR-XC-H55K, the cable gauge is with the continuous maximum permissible temperature of 90°C (THHN cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. (For the use in the United States or Canada, refer to the FR-XC Instruction Manual.)

- For the FR-XC-15K or lower, it is the gauge of a cable with the continuous maximum permissible temperature of 70°C (PVC cable). It assumes a \*3 surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. For the FR-XC-22K / FR-XC-18.5K-PWM or higher, it is the gauge of a cable with the continuous maximum permissible temperature of 90°C (PVC cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter.
- (Selection example mainly for use in Europe.) For the FR-XC-H37K or lower, it is the gauge of the cable with the continuous maximum permissible temperature of 70°C (PVC cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. \*4 For FR-XC-H55K, the cable gauge is with the continuous maximum permissible temperature of 90°C (XLPE cable). It assumes a surrounding air temperature of 40°C or less and the wiring distance of 20 m or less from the power supply to the converter. (Selection example mainly for use in Europe.)
- If a cable thinner than the recommended cable size is used, it may not be protected by the DC fuse. (Refer to page 70 for the fuse selection.)
- \*6 Refer to the Inverter Instruction Manual.
- \*7 When using a separate power supply for the control circuit, remove the jumpers connected to terminals R1/L11 and S1/L21.

#### • 75K or higher



								Cable	gauge																		
			HIV ca	bles, et	c. (mm <sup>2</sup>	2) *1 AWG/MCM *2					PVC cables, etc. (mm <sup>2</sup> ) *3																
Model	Rating	Locat	Location in t dia		ocation in the connection diagram Eart			Earth	Earth Location in the connection diagram			ection	Location in the connection diagram				Earth										
		a, b	С	d	е	(ground)	a, b	С	d	е	a, b	С	d	е	(ground)												
FR-XC-H75K	50°C	60	60		35	22	1	1/0		11	50	70		4	35												
FR-XC-H75K-PWM	40°C	60	60	00	00	00	00	00	00	00	00	00	00	60	00		5.5	22	1/0	1/0			50	10		4	55
FR-XC-H160K	50°C	100	100	1 25		39	39	3/0	4/0	16		05	95	15		70											
FR-XC-H160K-PWM	40°C	100	125	1.25	0	50	4/0	4/0	10	0	90	120	1.5	10	10												
FR-XC-H220K	50°C	150	150		60	200	300		ð	150	150	1	10	05													
FR-XC-H220K-PWM 40°C	40°C	150	200			00	300	400	]		150	185	]		95												

\*1 It is the gauge of the cable with continuous maximum permissible temperature of 90°C or more (LMFC (heat resistant flexible cross-linked polyethylene insulated cable), etc.). It assumes a surrounding air temperature of 50°C or less and the wiring distance of 20 m or less from the power supply to the converter

\*2 It is the gauge of the cable with the continuous maximum permissible temperature of 90°C (THHN cable).

(For the use in the United States or Canada, refer to the FR-XC Instruction Manual.) It is the gauge of the cable with the continuous maximum permissible temperature of 90°C (XLPE cable).

\*3

(Selection example mainly for use in Europe.) Refer to the Inverter Instruction Manual. \*4

When using a separate power supply for the control circuit, remove the jumpers connected to terminals R1/L11 and S1/L21. \*5

### Circuit breaker and magnetic contactor

•	200	V	class
---	-----	---	-------

FR-XC series converter model	Molded case circuit breaker (MCCB)/ earth leakage circuit breaker (ELB) (NF, NV type)
FR-XC-7.5K	50 A
FR-XC-11K	60 A
FR-XC-15K	75 A
FR-XC-22K FR-XC-18.5K-PWM	125 A
FR-XC-30K FR-XC-22K-PWM	175 A
FR-XC-37K FR-XC-37K-PWM	200 A
FR-XC-55K FR-XC-55K-PWM	250 A

#### • 400 V class

FR-XC series converter model	Molded case circuit breaker (MCCB)/ earth leakage circuit breaker (ELB) (NF, NV type)
FR-XC-H7.5K	30 A
FR-XC-H11K	30 A
FR-XC-H15K	40 A
FR-XC-H22K FR-XC-H18.5K-PWM	75 A
FR-XC-H30K FR-XC-H22K-PWM	100 A
FR-XC-H37K FR-XC-H37K-PWM	125 A
FR-XC-H55K FR-XC-H55K-PWM	150 A
FR-XC-H75K FR-XC-H75K-PWM	50°C rating: 200 A 40°C rating: 225 A
FR-XC-H160K FR-XC-H160K-PWM	400 A
FR-XC-H220K FR-XC-H220K-PWM	50°C rating: 500 A 40°C rating: 600 A

### Fuse

Installation of a fuse between the multifunction regeneration converter and the inverter is recommended. Select a fuse according to the capacity of the converter. (Refer to the FR-XC Instruction Manual for wiring between the converter and the inverter.)

### 200 V class

FR-XC series converter capacity (kW)	Fuse rating (A)	Model (Part number/Item number) *1
FR-XC-7.5K	125	6.9 URD 30 TTF 0125
FR-XC-11K	160	6.9 URD 30 TTF 0160
FR-XC-15K	200	6.9 URD 30 TTF 0200
FR-XC-22K FR-XC-18.5K-PWM	315	6.9 URD 30 TTF 0315
FR-XC-30K FR-XC-22K-PWM	400	6.9 URD 30 TTF 0400
FR-XC-37K FR-XC-37K-PWM	500	6.9 URD 30 TTF 0500
FR-XC-55K FR-XC-55K-PWM	700	6.9 URD 31 TTF 0700
<ul> <li>400 V class</li> </ul>		

FR-XC series converter capacity (kW)	Fuse rating (A)	Model (Part number/Item number) *1
FR-XC-H7.5K	50	6.9 URD 30 TTF 0050
FR-XC-H11K	80	6.9 URD 30 TTF 0080
FR-XC-H15K	125	6.9 URD 30 TTF 0125
FR-XC-H22K FR-XC-H18.5K-PWM	160	6.9 URD 30 TTF 0160
FR-XC-H30K FR-XC-H22K-PWM	200	6.9 URD 30 TTF 0200
FR-XC-H37K FR-XC-H37K-PWM	250	6.9 URD 30 TTF 0250
FR-XC-H55K FR-XC-H55K-PWM	350	6.9 URD 30 TTF 0350

\*1 Manufacturer: Mersen Japan KK Contact: Sun-Wa Technos Corporation

### NOTE :

 Install fuses across terminals P/+ and P/+, and across terminals N/- and N/- of the multifunction regeneration converter and the inverter.

[Estimated lifespan of fuses]

Components	Estimated lifespan*1	Replacement method
Fuse	10 years	Replace by new one

\*1 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. Find out the cause and remove it before replacing the fuse.

# MEMO

# **Protective Functions**

When a fault occurs in the converter, the protective function is automatically activated to shut off the converter output and show an indication on the PU and on the operation status 7-segment LED display of the converter.

Indication on the operation status 7-segment LED display of the converter		s 7-segment LED rter	Name
Error	—		Operation panel lock (HOLD)
message*2	_	_	Write disable error (Er1)
			Copy operation fault (FE1 to FE4)
	18	LB	Overload signal detection
	LL	LC	Electronic thermal relay function pre-alarm
	Lď	LD	PU stop
Warning*3	LE	LE	Maintenance signal output*7
_	[P	CP	Parameter copy
	LG	LG	Power supply not detected
	LH	LH	Converter operation disabled
	LJ	LJ	Box-type reactor overheat pre-alarm
Alarm*4	18	LA	Fan alarm
	8.8	E.A	Overcurrent trip
	Е.Ь	E.B	Overvoltage trip
	<i>2.3</i>	E.C	Converter overload trip (electronic thermal relay function)*1
	E.d	E.D	Heatsink overheat
	5.5	E.E	Instantaneous power failure
	E.F	E.F	Undervoltage
	<i>E.G</i>	E.G	Input phase loss
	E.H	E.H	External thermal relay operation*6*7
	E.J	E.J	PU disconnection+7
	<i>E.</i> R	E.K	Retry count excess*7
	£1	E.L	CPU fault
Fault*5	с.с с п	FM	Internal circuit fault 24 VDC power output short circuit
	<u> </u>	EN	
	с.л С.О	E.N	
	2.P	E.P	
-	6.9 C C	E.Q	
	£./	E.T	Connection mode fault
	E.U	E.U	Unsupported control selection
	<u>ξ.υ</u>	E.V	Box-type reactor overheat protection
	<i>E.8</i>	E.W	Box-type reactor power supply short circuit protection
	E. 1	E.1	Option fault
	8.8	E.6	Main circuit power supply detection fault
	8.3	E. 8	Input power supply fault 1

\*1 Resetting the converter initializes the internal cumulative heat value of the electronic thermal relay function.

\*2 \*3 \*4

A message regarding an operational fault or a setting fault on the PU is displayed. The converter output is not shut off. The converter output is not shut off even when a warning is displayed. However, failure to take appropriate measures will lead to a fault. The converter output is not shut off. The Alarm (LF) signal can be output depending on the parameter setting.

\*5 When a protective function is activated, the converter output is shut off and the Fault (ALM) signal is output. \*6

A protective function leading to the External thermal relay operation fault is enabled only when the OH signal is assigned to an input terminal by using **Pr.3**, **Pr.4**, or **Pr.7** (Input terminal function selection).

\*7 This protective function is not available in the initial status.
## **Option list**

	_	Name	Model	Applications, Specifications, etc.	
lone	Stand-alone reactor dedicated to the FR-XC series converter		FR-XCL-(H)[]K FR-XCG-(H)[]K	Used for the FR-XC series converter. FR-XCL: common bus regeneration mode, FR-XCG: power regeneration mode 2.	
Dedicated stand-a	Box-type reactor dedicated to the FR-XC series converter		FR-XCB-(H)[]K	Used for the FR-XC series converter in harmonic suppression mode.	
	Converter installation attachment for enclosure		FR-XCCP[]	Used to install the FR-XC series converter in an enclosure.	
	IP20 compatible attachment for the FR-XC converter		FR-XCCU[]	Used to achieve the IP20 compliant protective structure of the FR-XC series converter.	
Plug-in	Communication	CC-Link communication	FR-A8NC	Used to give commands to the FR-XC series converter from a programmable controller for operating or monitoring the converter or changing the parameter settings in the converter.	
e	Parameter unit (8 languages)		FR-PU07	Parameters can be set in an interactive manner on the LCD display.	
ommon stand-alon	Parameter unit with battery pack		FR-PU07BB	Parameters can be set without power supply from the FR-XC series converter.	
	Parameter unit connection cable		FR-CB20[]	Cable for connection of operation panel or parameter unit. [] indicates a cable length. (1 m, 3 m, 5 m)	
	Operation panel connection connector		FR-ADP	Used for the connection between the inverter operation panel (FR-DU08) and the parameter unit connection cable.	
	Radio noise filter		FR-BIF(H)	Used for radio noise reduction (when installed on the input side of the converter).	
Ö	Line noise filter		FR-BSF01/FR- BLF	Used for line noise reduction.	

## **Precautions on Selection and Operation**

#### Safety instructions

- To use the product safely and correctly, make sure to read the Instruction Manual of the product before the use.
- This product has not been designed or manufactured for use with any equipment or system operated under life-threatening conditions.
- Please contact our sales representative when 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, 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.
- Use only dedicated inverters.

## Precautions for installation

• Wiring distance:

For the wiring length, refer to the following tables.

[Wiring between the FR-XC series converter and the inverter]

	Common bus regeneration mode	Harmonic suppression mode	Power regeneration mode 2	
Main circuit	5 m or less	50 m or less	5 m or less	
Control circuit	30 m or less	30 m or less	30 m or less	

[Wiring between the FR-XCL reactor and the FR-XC series converter]

	Common bus	Harmonic	Power regeneration
	regeneration mode	suppression mode	mode 2
Main circuit	10 m or less	—	10 m or less

[Wiring between the FR-XCB reactor and the FR-XC series converter]

	Common bus regeneration mode	Harmonic suppression mode	Power regeneration mode 2
Main circuit	—	10 m or less	—
Control circuit	_	5 m or less	—

· Dedicated reactor installed between power supply and the FR-XC series converter:

The terminals R/L1, S/L2, and T/L3 on the converter are control terminals to detect power phases of the power supply. For wiring, the voltage phase must be consistent between terminals R2/L12, S2/L22, and T2/L32 and terminals R/L1, S/L2, and T/L3. If these terminals are not connected correctly, the converter does not operate properly.

If the inverter is operated while the converter terminals R/L1, S/L2, and T/L3 are not connected to the power supply, the converter will be damaged.

• In the common bus regeneration mode, always connect between the converter terminal RYB and the inverter terminal to which the X10 (MRS) signal is assigned, and also connect between the converter terminal SE and the inverter terminal SD. If the terminals are not connected, the converter may be damaged.

• For use of the FR-XC series converter in the common bus regeneration mode, the control logic (sink/source) of the converter and the inverter must be matched. The converter does not operate properly if the control logic is not consistent with each other. (Refer to the Instruction Manual of the converter/inverter for the switching of the control logic of the converter/inverter.)

• For use of the FR-XC series converter in the common bus regeneration mode, keep the wiring length between terminals as short as possible.

#### Precautions for use

 Since the FR-XC series converter in harmonic suppression mode achieves K5 (the conversion factor) = 0, it is assumed by the Harmonic suppression guidelines that the converter generates no harmonics. However, it does not mean that harmonic components completely disappear.

• To maintain the security (confidentiality, integrity, and availability) of the drive unit and the system against unauthorized access, DoS\*1 attacks, computer viruses, and other cyberattacks from external devices via network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

We shall have no responsibility or liability for any problems involving drive unit trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

\*1 DoS: A denial-of-service (DoS) attack disrupts services by overloading systems or exploiting vulnerabilities, resulting in a denial-of-service (DoS) state.

## Precautions when selecting the inverter and reactor

· Applicable Inverter:

Prepare an inverter that is compatible with DC input.

For the MELTRAC series inverters and FR-A500L/F500L series inverters, make sure that an inverter to be applied is compatible with the FR-XC series converter. Use of the FR-XC series converter with an incompatible inverter will damage the inverter and the converter.

Dedicated reactor:

Use the FR-XC series converter in combination with the dedicated stand-alone reactor (FR-XCL or FR-XCG) or the dedicated boxtype reactor (FR-XCB).

The combination depends on the connection mode.

Common bus regeneration mode: FR-XCL

Harmonic suppression mode: FR-XCB

Power regeneration mode 2: FR-XCG

## Precautions on peripheral device selection

Selection and installation of molded case circuit breaker
 Install a molded case circuit breaker (MCCB) on the input side of the FR-XC series converter to protect the wiring on that side. For selection of the MCCB, refer to the following pages: page 42 (common bus regeneration mode), page 56 (harmonic suppression mode), page 70 (power regeneration mode 2). (Check the documents related to the applicable breaker.) As an earth leakage current breaker, use the Mitsubishi Electric earth leakage current breaker designed for harmonics and surge suppression.

· EMI measures

The FR-XC series converter can generate electromagnetic noises. In a system including the converter in harmonic suppression mode, the noise created by the system increases when both the converter and an inverter are operated. If these noises cause peripheral devices to malfunction, EMI measures should be taken to suppress noises. Techniques differ slightly depending on EMI paths.

The FR-BIF radio noise filter is useful for suppressing noise on AM radio broadcasting.

The FR-BSF01/FR-BLF line noise filter is useful for preventing malfunction of sensors, etc.

As precautions against the induced noise emitted from power cables of the converter and inverter, it is preferable to keep a distance of 30 cm or more between the sensor circuit and noise sources such as the converter, the inverter, and their power cables. However if this is not possible, keep a distance of at least 10 cm. Use shielded twisted pair cable for signal cables of the sensor. Do not earth (ground) the shield, and connect the shield to the signal common terminal.



Do not use control cables for earthing (grounding).

#### Others

 It is not a fault if noise comes from the dedicated reactor during regenerative driving of the converter (in other words, it is a fault if noise comes despite the stop state of the converter by the Converter stop (SOF) signal).

If needed, devise methods of reducing noise by modifying the enclosure in which the reactor is installed.

11

## Warranty

When using this product, make sure to understand the warranty described below.

1. Warranty period and coverage

We will repair any failure or defect (hereinafter referred to as "failure") in our FA equipment (hereinafter referred to as the "Product") arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

#### [Term]

The term of warranty for Product is twelve months after your purchase or delivery of the Product to a place designated by you or eighteen months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

#### [Limitations]

- (1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule. It can also be carried out by us or our service company upon your request and the actual cost will be charged.
  - However, it will not be charged if we are responsible for the cause of the failure.
- (2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.
- (3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
  - 1) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
  - 2) a failure caused by any alteration, etc. to the Product made on your side without our approval
  - a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
  - 4) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
  - 5) any replacement of consumable parts (condenser, cooling fan, etc.)
  - 6) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
  - 7) a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
  - 8) any other failures which we are not responsible for or which you acknowledge we are not responsible for
- 2. Term of warranty after the stop of production
  - (1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.
  - (2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.
- 3. Service in overseas

Our regional FA Center in overseas countries will accept the repair work of the Product; however, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

- 4. Exclusion of loss in opportunity and secondary loss from warranty liability
  - Regardless of the gratis warranty term, Mitsubishi Electric shall not be liable for compensation to:
  - (1) Damages caused by any cause found not to be the responsibility of Mitsubishi Electric.
  - (2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi Electric products.
  - (3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi Electric products.
  - (4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.
- 5. Change of Product specifications
  - Specifications listed in our catalogs, manuals or technical documents may be changed without notice.
- 6. Application and use of the Product
  - (1) For the use of our product, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in product, and a backup or fail-safe function should operate on an external system to product when any failure or malfunction occurs.
  - (2) Our product is designed and manufactured as a general purpose product for use at general industries.
    - Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used.

In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.

We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

## MEMO

## MEMO

## MEMO

# Mitsubishi Electric's global FA network delivers reliable technologies and security around the world.



## Production bases Under the lead of Nagoya Works, we form a powerful network to optimize our manufacturing processes.

#### Domestic bases

## Nagoya Works



Shinshiro Factory Kani Factory

Production bases overseas
MDI Mitsubishi Electric Dalian Industrial Products Co., Ltd.



MEI Mitsubishi Electric India Pvt.



 MEAMC
 Mitsubishi Electric Automation Manufacturing (Changshu) Co., Ltd.

 MEATH
 Mitsubishi Electric Automation (Thailand) Co., Ltd.

Thailand MITSUBIS AUTOMA	FA Center SHI ELECTRIC FACTORY TION(THAILAND) CO.,LTD	Se	ame services as in Japan globally. stomers' business expansion.		
		F	Area	Our overseas	FA centers
		F		30	7
	1/ FA O I			25	1
	Korea FA Center			40	4
	MITSUBISHI ELECTRIC		ASIA	49	10
	AUTOMATION KOBEA CO. LTD.		Americas	19	6
			otal	132	33
			s of March 2021		
	MITSUBISHI ELECTRIC CORPORAT Factory Automation Systems Group			N A	North America FA Center
	Start Start				MITSUBISHI ELECTRIC AUTOMATION,INC.
	Taichung FA Center MITSUBISHI ELECTRIC TAIWAN CO.,LTD				Monterrey Office, Mitsubishi Electric Automation, Inc.
	Taipei FA Center SETSUYO ENTERPRISE CO.,LTD			Alar	Mexico FA Center Querétaro Office, Mitsubishi Electric Automation, Inc.
	Philippines FA Center MELCO FACTORY AUTOMATION PHILIPPINES INC.	Hanoi FA center Mitsubishi Electric Vietnam Company Limited		<u>J</u>	Mexico City FA Center Mexico FA Center Mexico Branch, Mitsubishi Electric Automation, Inc.
	Malaysia FA Center	Ho Chi Minh FA Center MITSUBISHI ELECTRIC VIETNAM COMPANY LIMITED			Brazil FA Center Mitsubishi Electric do Brasil Comércio e Serviços Ltda.
	ASEAN FA Center				Brazil Votorantim FA Center MELCO CNC do Brasil Comércio e Serviços S.A.



MITSUBISHI ELECTRIC ASIA PTE.LTD.

China





Tianjin FA Center — MITSUBISHI ELECTR AUTOMATION (CHINA







Shanghai FA Center MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.



Shenzhen FA Center MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.

# This solution solves customers' issues and concerns by enabling visualization and analysis that lead to improvements and increase availability at production sites.

Utilizing our FA and IT technologies and collaborating with e-F@ctory Alliance partners, we reduce the total cost across the entire supply chain and engineering chain, and support the improvement initiatives and one-step-ahead manufacturing of our customers.



Overall production information is captured in addition to energy information, enabling the realization of efficient production and energy use (energy savings).

# YOUR SOLUTION PARTNER



Mitsubishi Electric offers a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.

## A NAME TO TRUST

Since its beginnings in 1870, some 45 companies use the Mitsubishi name, covering a spectrum of finance, commerce and industry.

The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

Mitsubishi Electric Corporation, established in 1921, is active in space development, transportation, semi-conductors, energy systems, communications and information processing, audio visual equipment and home electronics, building and energy management and automation systems, and has 183 factories, laboratories and offices worldwide in over 140 countries. This is why you can rely on Mitsubishi Electric automation solution - because we know first hand about the need for reliable, efficient, easy-to-use automation and control in our own factories.

As one of the world's leading companies with a global turnover of over 4 trillion Yen (over \$40 billion), employing over 146,000 people, Mitsubishi Electric has the resource and the commitment to deliver the ultimate in service and support as well as the best products.



Low-voltage Power Distribution Products



Transformers, Med-voltage Distribution Products



Power Monitoring and Energy Saving Products



Power (UPS) and Environmental Products



Compact and Modular Controllers





Visualization: HMIs



Edge Computing Products



Numerical Control (NC)





Processing machines: EDM, Lasers

## MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BLDG., 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN