YASKAWA

YASKAWA AC Drive

CR700

For Cranes

200 V Class, 0.4 to 110 kW
400 V Class, 0.4 to 315 kW

Best Value for Your Cranes

Specialized high-performance drives for cranes

Our number one priority at Yaskawa Electric Corporation is to always keep the customer's perspective in mind by leading the industry in meeting demands with uncompromising quality and trust.
Our new CR700 was developed to further optimize cranes based on the concepts of Flexible, Easy, Sustainable.
Yaskawa can now deliver the most ideal "solutions" for various tasks related to the operation of cranes, including brake sequences that have evolved from the technologies we have developed to date.

Equipped with Specialized Crane Functions for Ensuring Site Safety

Shorter Takt Time Achieved with Priority Given to Safe Operation

Efficiency of Design and Adjustment Enhanced


FLEXIBLE
Best Value
for Your
Cranes
SUSTAINABLE
EASY

Contents

CR700 provides the best value for your application, whether it is development, design, production technology or after-sales service.

Development/ Design

Features of CR700

P.6-7 FLEXIBLE SUSTAINABLE **Equipped with Specialized Crane Functions for Ensuring Site Safety**

P.8-9 FLEXIBLE SUSTAINABLE **Shorter Takt Time Achieved with Priority Given to Safe Operation**

P.10-11 EASY **Efficiency of Design and Adjustment Enhanced**

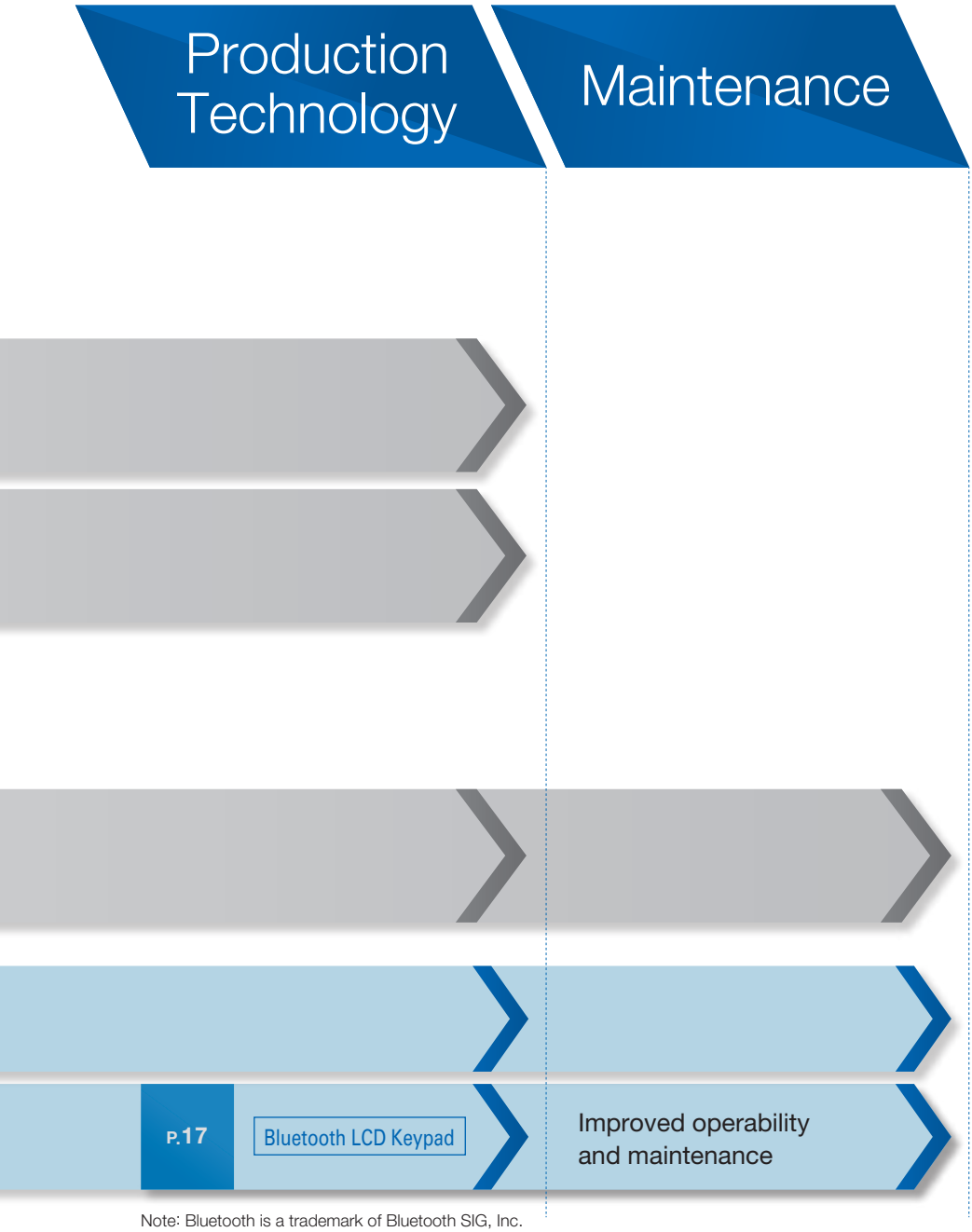
P.12-13 FLEXIBLE **Priority Given to Minimize Space and Initial Investment**

P.14-15 EASY SUSTAINABLE **Dead Time during Maintenance and Downtime Eliminated**

Support Tools

P.16 DriveWizard
Support from Machinery and Equipment Startup to Maintenance

P.17 YASKAWA Drive Cloud | DriveWizard Mobile
Use your smartphone to control everything, from drive startup to monitoring



Note: Bluetooth is a trademark of Bluetooth SIG, Inc.

Features 6

Model Number/Catalog Code / Selecting the Capacity 18

Basic Instructions 19

Standard Specifications 22

Standard Connection Diagram 26

Terminal Specifications 28

Dimensions 32

Fully-Enclosed Design and Drive Watt Loss Data 38

Peripheral Devices and Options 40

Application Notes 64

Warranty 71

Global Service Network 73

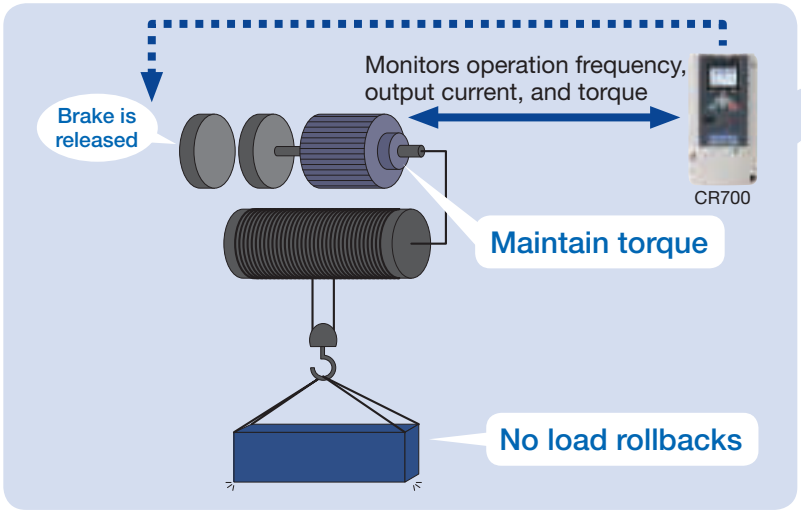
Equipped with Specialized Crane Functions for Ensuring Site Safety

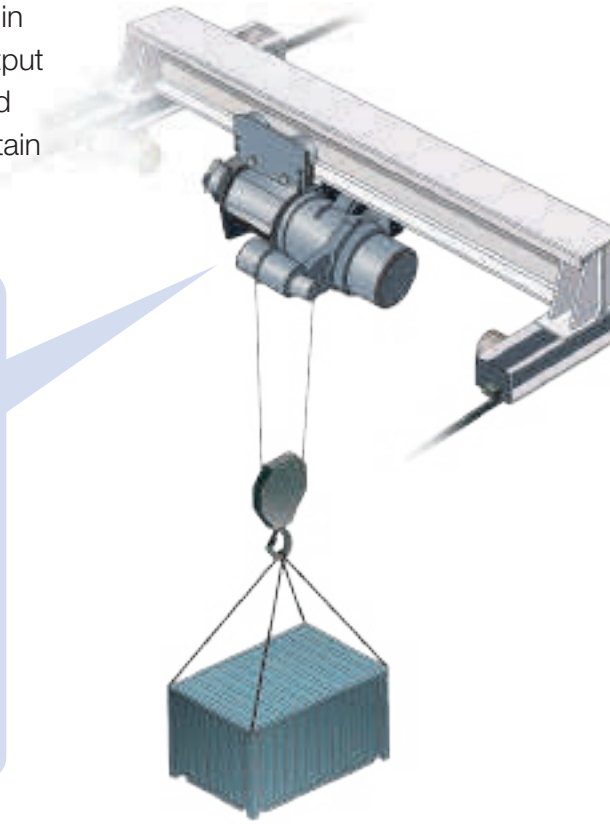
Equipped with specialized crane functions gained through years of active service of Yaskawa AC drives in the field.

For Cranes

Rollback Prevented by Integrated Brake Sequence

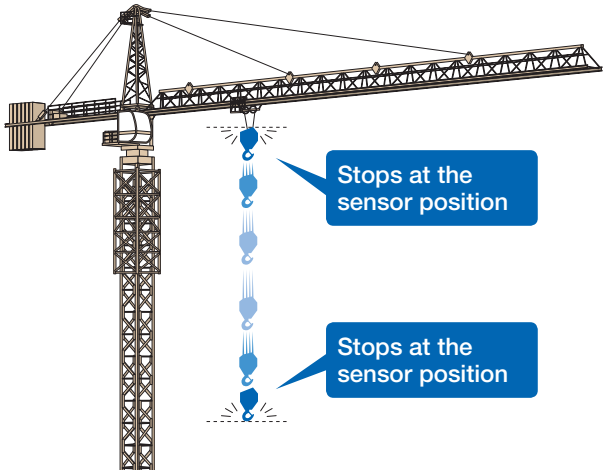
The break release command is judged and output in relation to the operation frequency of the drive, output current, and amount of torque. Brakes are released and applied while ensuring enough torque to maintain the load during starts and stops to prevent load rollback.





Travel Limit Function Ensures Safe Stops

The limit sensor set in the allowable movement range prevents over-traveling and overwinding.



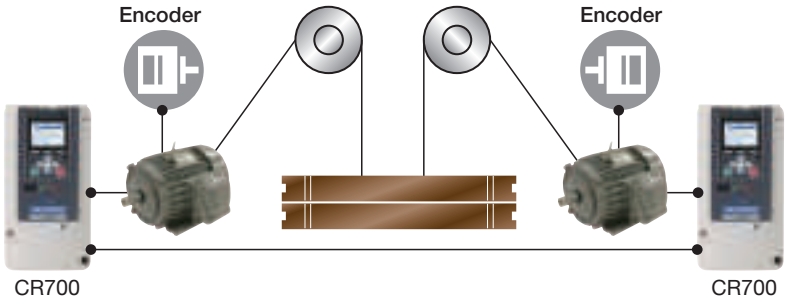
Slope Prevention Function Achieves Safe Traveling

High-precision control is performed in accordance with the operating conditions of machines to enable stable traveling and operation.

Synchronization Control*

Synchronization control is performed to prevent positional deviation that can occur when lifting a load jointly with two elevators using Closed Loop Vector Control. Separate equipment and control to reduce slope are not required.

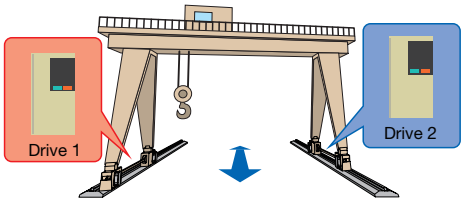
*: Contact your Yaskawa representative when applying synchronization control.

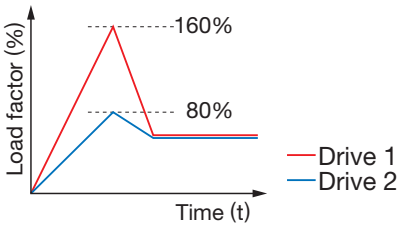


Load Balancing Function

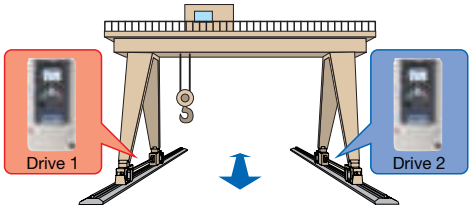
The load can be distributed evenly between drives without the use of encoders.

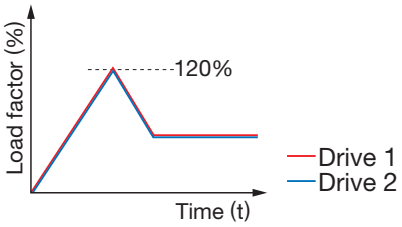
■Conventional drives





■CR700

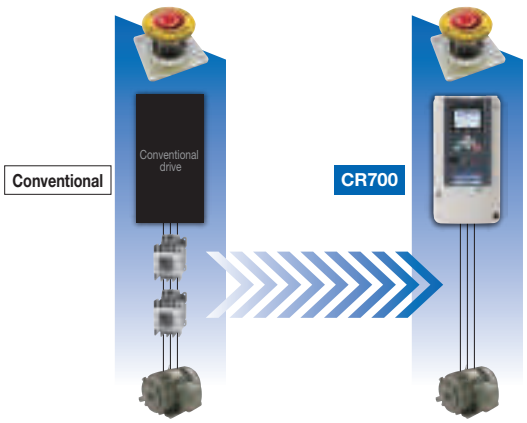




SIL3 Supported as Standard. Safety Ensured without the Need for Additional Equipment

STO from two-terminal input (safety shut-off torque) is equipped as standard. Complies with IEC/EN61508 SIL3 and ISO13849-1 Cat.3 PLe.

With this function, a high degree of safety can be built without additional equipment, such as an electromagnetic contactor. Saves wiring and space.



Shorter Takt Time Achieved with Priority Given to Safe Operation

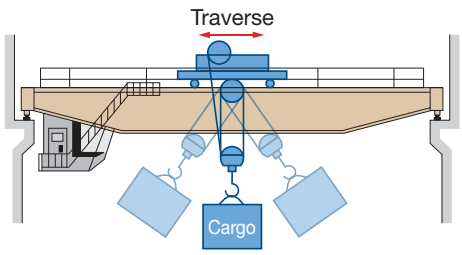
This drive offers the worthwhile advantage of achieving enhanced workability while ensuring safety.

For Cranes

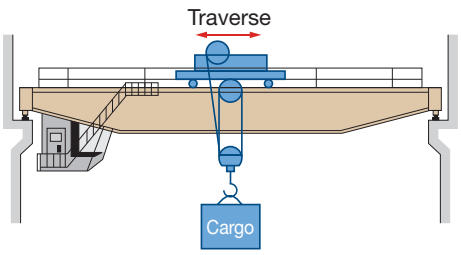
Workability Improved by Cargo Swing Suppression Function

Cargo swing during traverse motion can be reduced with the built-in Cargo Swing Suppression function.
This enables cargo to be lowered without any swing, which reduces takt times.

■ Disabled



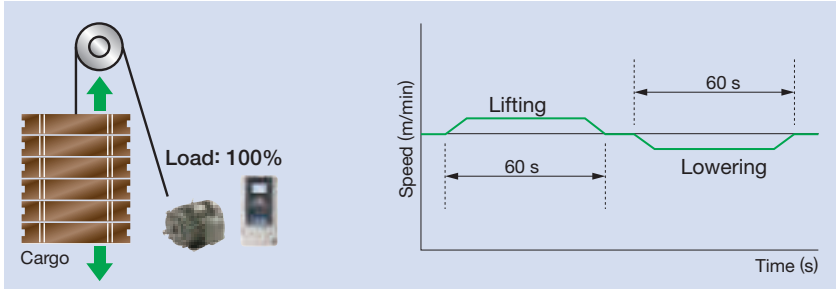
■ Enabled



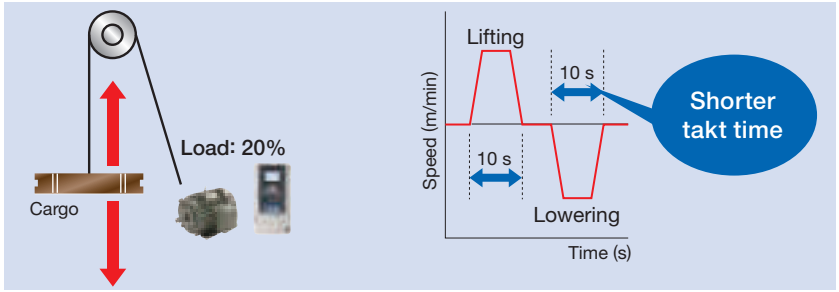
Light-load Acceleration Function Achieves Shorter Takt Time

With this light-load, high-speed function, our drive operates at optimal speed in accordance with the load. High-speed operation can be performed when handling light loads. This shortens the tact times when using long lifting cranes, such as those used in constructions.

■ Heavy loads



■ Light loads



Drive Functions Ensure Safe Operation

Run Command Adjustment Function

Reliable movement during inching. Our system prevents excessive current from flowing during lifting operations performed immediately after lowering operations.

Wire Length Detection

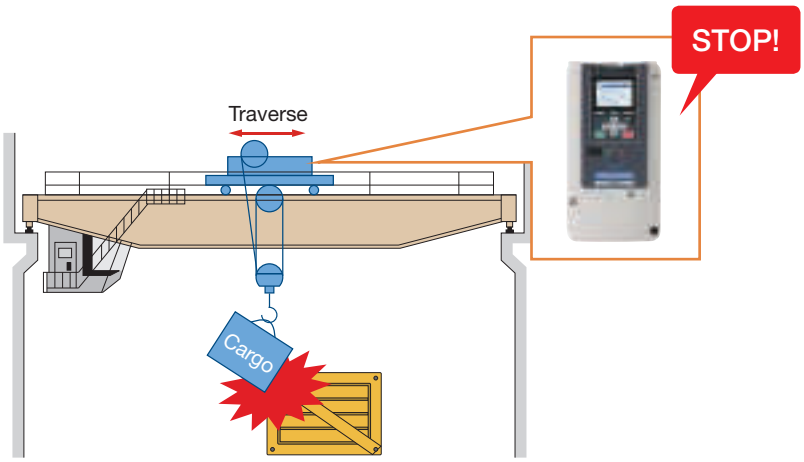
Information on the height of the hook that is not visible from the operating room can be externally output using only the drive.

Quick Deceleration Function

This function supports reverse phase braking (plugging) in conventional crane operations that are not operated with drives. The deceleration rate can be changed to quickly stop operation by inputting a Run command in reverse to the current running direction after a Stop command is received. This enables quick deceleration near the target location even when using high speed operation.

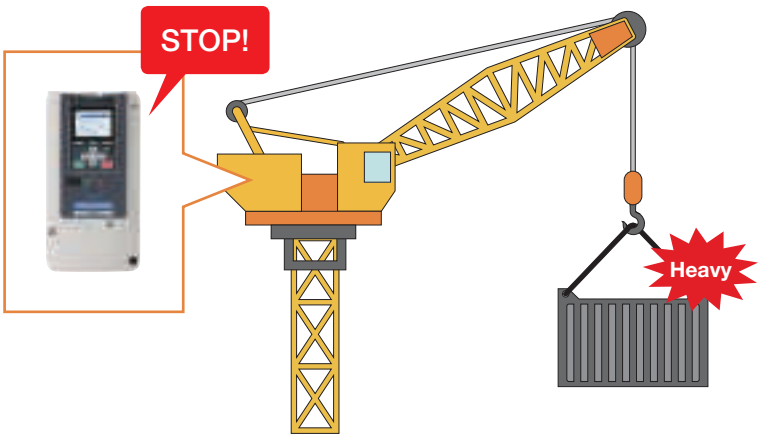
Overtorque Detection Function

Detects an increased torque value when a load comes into contact with an object.
The drive stops the motor automatically to prevent machine malfunctions and increase safety.



Overload Detection Function

The drive restricts the operation of the crane (lifting) when the load exceeds a predetermined upper limit value. The drive can be configured to display alarms and stop crane operation to prevent operation with an overload that could lead to a dangerous situation.



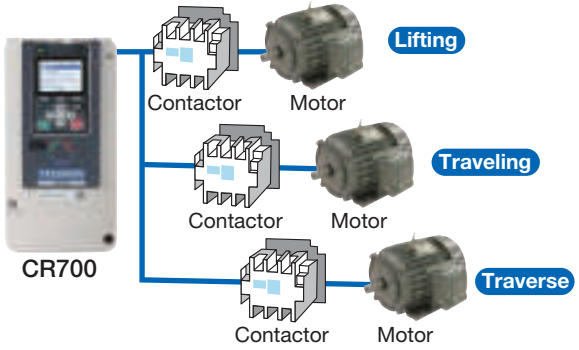
Efficiency of Design and Adjustment Enhanced

Ensuring that specifications required for crane operation are maintained helps shorten the time until machinery and equipment startup.

3-Motor Switching Function

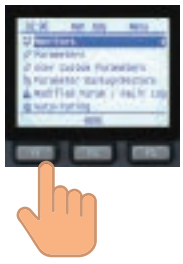
One drive can switch between and control motors with three axes for lifting/lowering, travelling, and transverse operations. Our drive can support individual brake sequences for each motor, so downtime during a drive failure can also be reduced as a result of the ability of drives to act as substitutes for other motors. Traditionally, one drive was needed for each motor. However, one drive can switch between motors to reduce the number of drives needed.

	Control mode	Application	Brake Sequence
Motor 1	Any	Any	Possible
Motor 2	Any except for Advanced Open Loop Vector Control	Any	Possible
Motor 3	V/f Control only	Traveling and turning	Only brake release and apply control can be set.



Application Preset Simplifies Setup

Simply set parameter A1-06 (Application Preset) matched to the intended crane application (lifting/traverse/traveling) to let the drive automatically set the best parameter settings for the selected application. This greatly reduces the task of setting parameters.



Application	A1-06
Hoist (lifting)	1
Crane (traverse/traveling)	2
Hoist with PG (lifting)	3

Contact Positioning Function

When the Stop command is valid while a contact position command is in effect for applications, such as transport lines, the drive detects collision and stops operating if the torque reference or output current are higher than the standard value.
Quick positioning can be performed using this contact positioning function.

Note: This is only enabled when ramp to stop mode is selected.
Do not use this function with machines such as trucks with wheels that may spin freely when there is a crash because the motor will not be constrained, and the torque reference or output current will not increase.

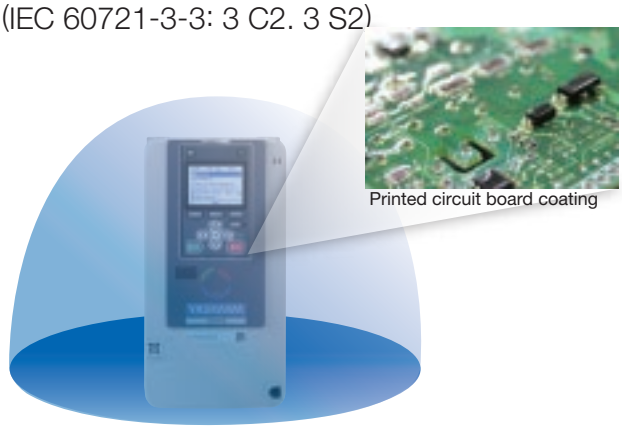
Wide range of protection for various environmental specifications

Resistant to vibration, gas, moisture, dust, and oil.

Note: Factory option

Varnish-Coated Printed Circuit Board

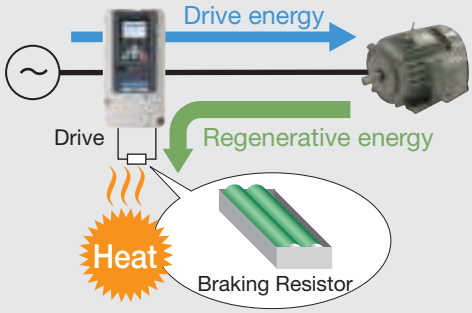
The printed circuit board is treated with varnish as standard and can be used under harsh environmental conditions.
(IEC 60721-3-3: 3 C2. 3 S2)



Minimal Drive Watt Loss and Energy Savings

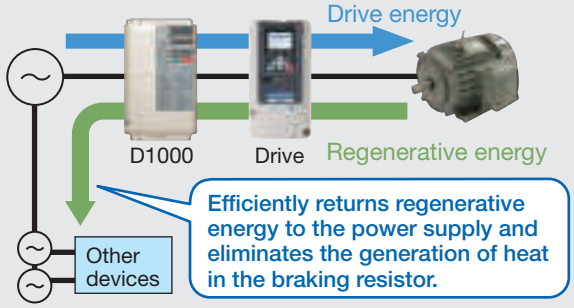
Regenerative energy that has conventionally been wasted as heat can be effectively used. The CR700 can minimize the generation of heat and avoid issues caused by heat in surrounding equipment.

Braking Resistance System

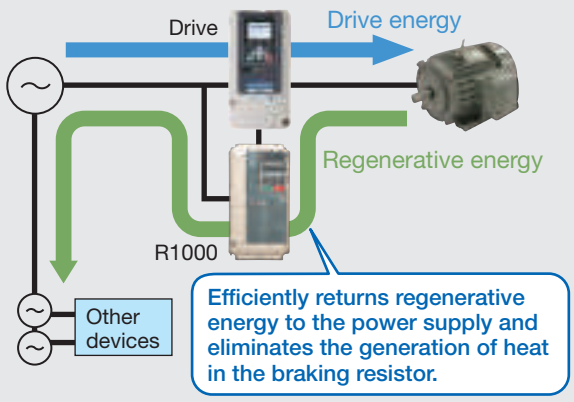


Power Source Regeneration System

Example using the Power Regenerative Converter D1000



Example using the Power Regenerative Unit R1000



■ How regenerative energy is processed

Merit \ Model	Dynamic Braking Option	Power Regenerative Converter D1000	Power Regenerative Unit R1000
Regenerative energy treatment	○	○	○
Use power regeneration to save energy.	×	○	○
Suppression of harmonics	×	○	△
Use with more than one drive	×	○	×
Reduction of power supply capacity	×	○	△

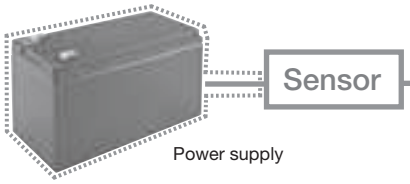
Priority Given to Minimize Space and Initial Investment

In designing this drive, we thoroughly looked into how far the number of required peripheral devices and installation space can be reduced.

Peripheral Device Functions Incorporated for Minimal Initial Investment

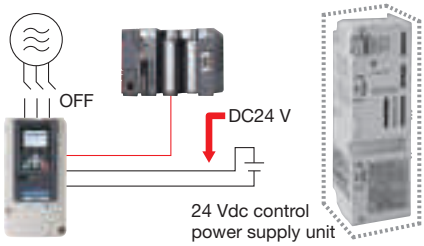
Built-in Power Supply for the Sensor

Separate power supply not required because the drive provides a 24 Vdc output (150 mA) for external sensors.



24 Vdc Control Power Input Terminal Standard Equipped

By using an external 24 VDC power supply, sequences and fault history can be checked even when the main circuit power supply is OFF.



SIL3* Correspondence STO Standard Equipped

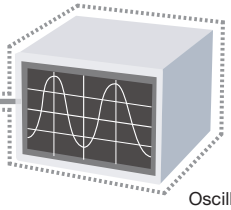
Two contactors are no longer needed.

*: Safety performance measurement under IEC/EN61508

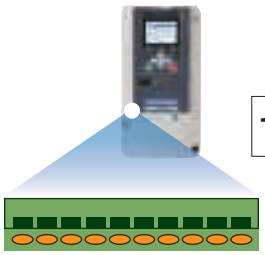
High Performance Control Even Without an Encoder

Oscilloscope Function

With the improved oscilloscope function performance for the DriveWizard support tool, adjustments can be made without the need for external measuring instruments.


Oscilloscope

10 input terminals Standard Equipped



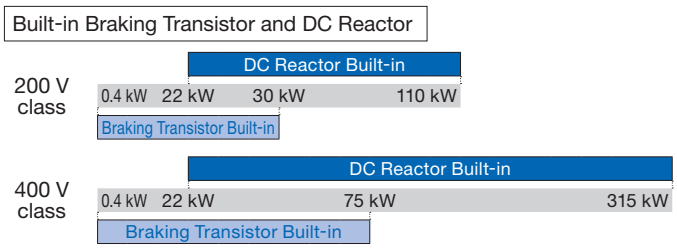
The digital frequency reference card DI-A3 input terminal can also be used as the multi-function input terminal. PG option cards and I/O option cards for the 1000 series can also be used.

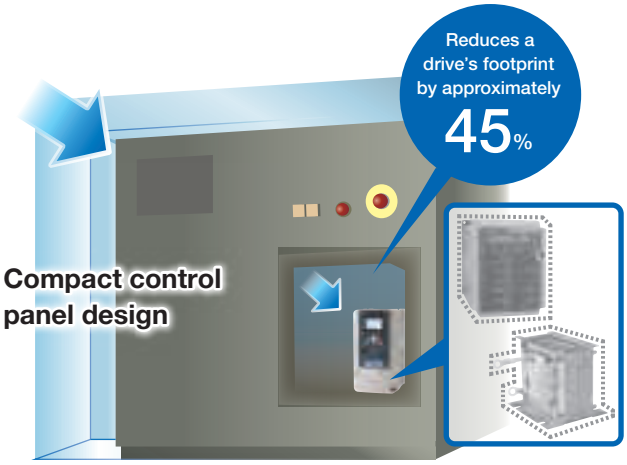
〔Applicable up to 75 kW for 200 V Class/400 V Class〕

Minimal Installation Space

Braking Transistor / DC Reactor Built-in

Harmonics resulting from built-in DC reactors are taken into consideration. The braking transistor is also built in to eliminate the need for a stand-alone braking unit. This reduces a drive's footprint by approximately 45% in comparison with the conventional drives, which enables the design for more compact control panels.

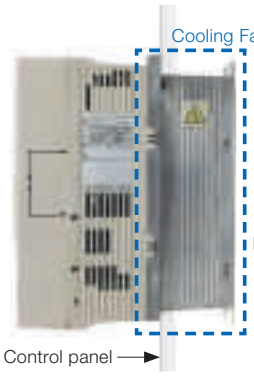




Note: Comparison with our conventional models.
In this case, a 400 V 110 kW model is used as an example.
Reductions in footprints vary depending on the capacity.

External Heatsink

The drive heatsink can be installed outside of the panel, and the control panel can be minimized.

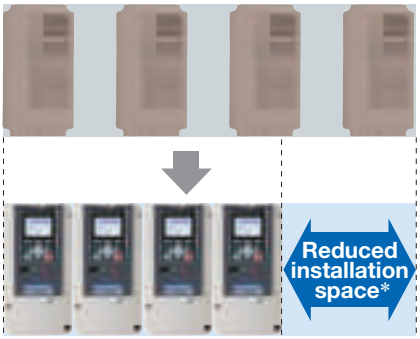


Note: An attachment may be needed depending on the drive capacity.
Refer to pages 38 to 39 for more information.

Side-by-Side Installation

Multiple drives can be installed in close proximity (side-by-side installation). Note: Derating must be considered.

(ex. 200 V class 0.4 kW)

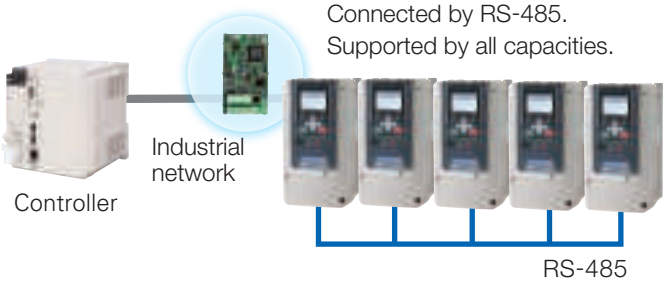


Compatible Models:
CR70A2003 to 2075
(200 V class 0.4 to 18.5 kW)
CR70A4002 to 4039
(400 V class 0.4 to 18.5 kW)

*: At least 30 mm of space is needed if installed near a wall.

Reduced Number of Parts

The network protocol for industrial use has been converted to RS-485 to enable control of up to five drives from a single communication option.



Enhanced Communication Option Card

A variety of field networks, including MECHATROLINK-Ⅱ, MECHATROLINK-Ⅲ, PROFIBUS-DP, DeviceNet, CC-Link, CANopen, LONWORKS, including Industrial Ethernet, such as EtherNet/IP, can be supported with the use of one communication option card.

Note: PROFIBUS is a trademark of PROFIBUS Nutzerorganisation e.V.
DeviceNet is a trademark of ODVA.
Ethernet is a trademark of Fuji Xerox Co., Ltd.

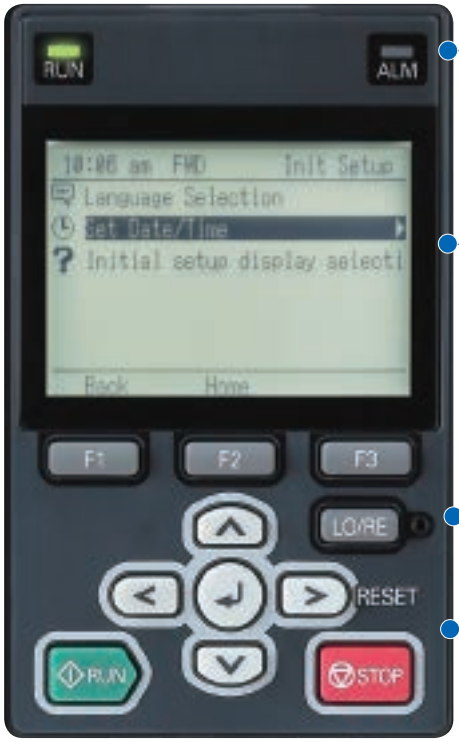
Dead Time During Maintenance and Downtime Eliminated

Monitor functions and tools are available that allow anyone to perform maintenance and recovery work quickly and easily.

Very Latest LCD Keypad Considerably Reduces Maintenance and Downtime

Reduced downtime

Downtime: Non-operating time due to equipment problems.



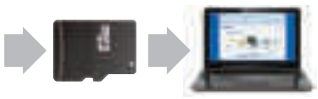
Built-in Clock Functions

Easily identify the time of the malfunction with the built-in clock function.

Note: Requires a Hitachi Maxell "CR2016 Lithium Manganese Dioxide Battery" or equivalent.

microSD Slot

Save log data to the microSD card. Saved data can be displayed as a waveform with the "DriveWizard" support tool, which helps you to understand what malfunction has occurred and simplifies analysis.

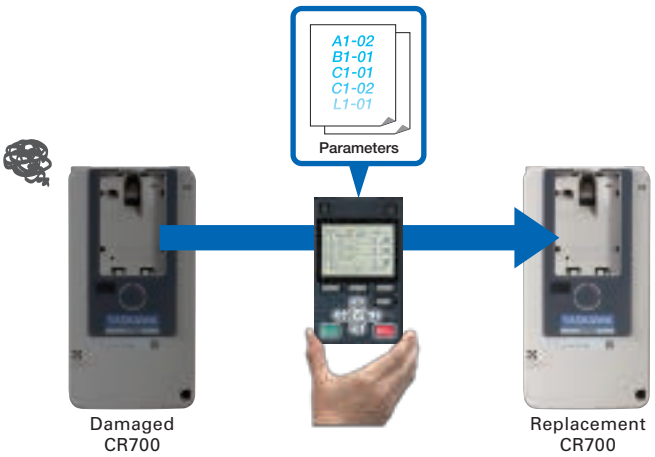


Capable of Storing Parameters of the Four Drives

The keypad can now store the parameters of up to four drives.

Automatic Parameter Backup Function

In the unlikely event that there is a problem with the drive, you can connect the keypad to the replacement drive and copy the parameters using the automatic parameter backup function.



Closed-Door Operations and Monitoring*1

By installing an LCD keypad on the surface of the control panel, you can operate and monitor the drive installed inside the panel without having to open a door.

*1: Requires compact Keypad Panel Mounting Kit (optional)

Crane Maintenance Monitor

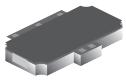
The monitor keeps a count of the number of brake commands. This information is helpful in determining brake maintenance schedules for inspecting system and replacing parts.

Monitor Performance Life

Performance Life Monitors

With performance life monitors, the approximate maintenance period of parts can be output as an alarm signal to notify users in advance. In addition, you can monitor the deterioration status of the parts which can help you to make a maintenance plan easier.

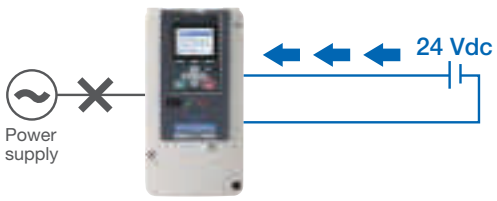
▼Limited lifetime service parts of drive

IGBT	Main circuit capacitors	Soft charge bypass relays	Cooling fans
			

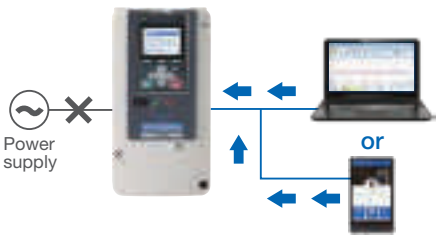
Quick Response

You can perform recovery work and confirm malfunctions without applying main circuit power.

Method 1: Supply power from 24Vdc external power supply



Method 2: Supply power from a computer or a smartphone via USB cable*2



DriveWizard P.16

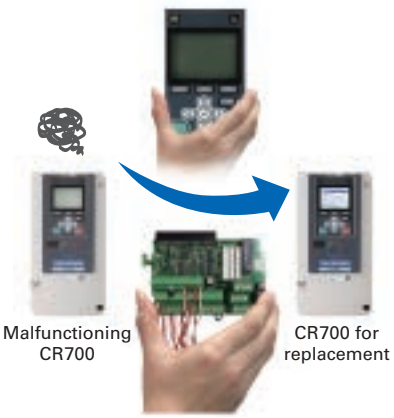
DriveWizard Mobile P.17

*2: A commercially-available USB cable can be used.

Less Downtime

There is no need to reprogram and rewire the replacement drive in the event of failure. Simply replace the LCD keypad and terminal board to quickly replace the drive securely. You can select various parameter backup methods.

- **Standard LCD keypad: Stores the parameters of up to four drives and is equipped with a built-in automatic parameter backup function.**
- **Easy replacement just by switching with a removable control circuit terminal block**



Support from Machinery and Equipment Startup to Maintenance

Support Tool DriveWizard

Simply connect the drive to a computer with a USB cable to centrally manage the parameters.
You can use the oscilloscope function to monitor operations and assist with maintenance.

Simple Connection

- **Connect using a commercially-available USB cable (Mini B to Type A)**
- **Connect even when no power is supplied to the drive**

Simple Adjustment

- **Read/write drive parameters**
- **Auto-Tuning**
- **Visual monitor that is easy to understand at a glance**

Easy Maintenance

- **Use the drive monitor to confirm the status of the machinery**
  - Output frequency (Motor Rotation Speed)
  - Load Current
  - Output voltage
  - Power consumption
  - Torque
  - Hours of operation
  - Maintenance period

Easy Fault Analysis

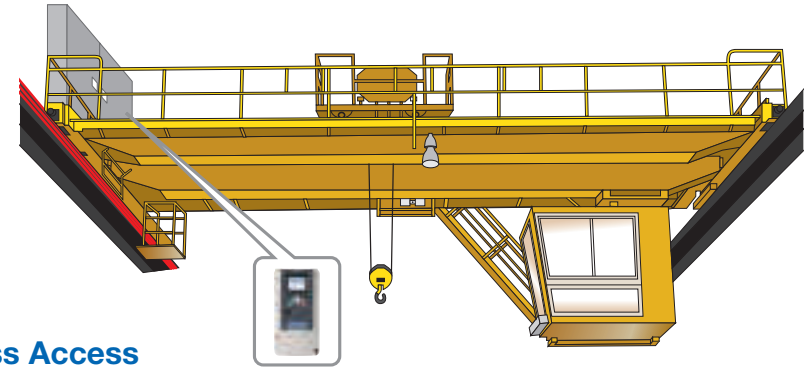
- **Displays the saved data on a microSD card as a waveform**
- **Displays the drive monitor data as a graph**
- **Displays the I/O terminal status**
- **Displays the fault history**

Use a Smartphone to Adjust the Drive and Perform Maintenance

Web Product Management Service YASKAWA Drive Cloud

Efficient Production Management via the Cloud

By registering the machinery and equipment data or the parameters to a dedicated customer page, you can efficiently perform maintenance of machinery and equipment.



Smartphone App

DriveWizard Mobile

Wireless Access with a Smartphone

By installing a Bluetooth integrated keypad (option) to the panel surface, you can remotely access the drive with a smartphone. Edit parameters, perform operations and check monitored data in real-time.

- **Monitor the operation status**
- **Stop operation and perform tuning**
- **Check fault history and parameter settings**

Download on the App Store

GET IT ON Google Play

Download DriveWizard Mobile for free from the App Store or Google Play.
You can also use hyper-links on Yaskawa's product and technical information website (http://www.e-mechatronics.com) to access the App Store and Google Play.

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QR Code is a trademark of DENSO WAVE INCORPORATED.
Bluetooth is a trademark of Bluetooth SIG, Inc.

Model Number

Drives can be customized according to your specifications.

CIPR- CR70 A 2 003 A B A A - G A A A A A

1 2 3 4 5 6 7 8 9 10 11 12 13 14

No	Description
1	Product series · CR700 series
2	Region code · A: Japan
3	Input power supply voltage · 2: 3-phase AC 200 V Class · 4: 3-phase AC 400 V Class
4	Output Current*1
5	EMC noise filter · A: No internal EMC filter (Standard) · B: Internal category C3 EMC filter · C: Internal category C2 EMC filter
6	Protection Design · B: IP20/UL Open Type (Standard) · F: IP20/UL Type 1
7	Environmental specification · A: Standard · K: Gas-resistant · M: Humidity-resistant and dust-resistant · N: Oil-resistant · P: Humidity-resistant, dust-resistant, and vibration-resistant · R: Gas-resistant and vibration-resistant · S: Vibration-resistant · T: Oil-resistant and vibration-resistant Note: Drives with these specifications do not guarantee complete protection for the environmental conditions indicated.
8	Design revision order

*1: Indicates the rated output current rounded off to the nearest whole number. Refer to Rated Output Current column on page 22 to 23 for detailed values.
*2: A separate cable must be purchased to connect the drive and the keypad. Refer to Keypad Extension Cable on page 60 for more details.

No	Description
9	Control circuit terminal board · G: 10 digital input, screw clamp terminal board type
10	Option card (connector CN5-A) · A: No option card (Standard) · D: AI-A3 (Analog Input) · E: DI-A3 (Digital Input) · F: SI-C3 (CC-Link) · G: SI-ET3 (MECHATROLINK-Ⅲ) · H: SI-N3 (DeviceNet) · J: SI-P3 (PROFIBUS-DP) · K: SI-T3 (MECHATROLINK-Ⅱ) · M: SI-S3 (CANopen) · S: SI-EP3 (PROFINET)
11	Option card (connector CN5-B) · A: No option card (Standard) · B: AO-A3 (Analog Monitor) · C: DO-A3 (Digital Output)
12	Option card (connector CN5-C) · A: No option card (Standard) · U: PG-B3 (Complementary Type PG) · V: PG-X3 (Motor PG Feedback Line Driver Interface) · Y: PG-RT3 (Motor Feedback Resolver TS2640N321E64 Interface)
13	Keypad · A: LCD keypad (Standard)*2 · B: LCD keypad (humidity-resistant and dust-resistant)*2 · D: Bluetooth LCD Keypad*2 · E: Bluetooth LCD Keypad (humidity-resistant and dust-resistant)*2 · F: LED keypad*2 · G: LED keypad (humidity-resistant and dust-resistant)*2
14	Special applications · A: Standard

Catalog Code

CR70 A 2 003 A B A

CR70 Series

No.	Input power supply voltage
2	3-Phase 200 V Class
4	3-Phase 400 V Class

Output Current
Note: Indicates the rated output current rounded off to the nearest whole number.

No.	EMC noise filter
A	No internal EMC filter
B	Internal EMC filter (C3)*
C	Internal EMC filter (C2)*

* CE, RCM Marking compliant model.

No.	Region Code
A	Japan

No.	Enclosure Type
B	IP20/UL Open Type
F	IP20/UL Type 1

No.	Environmental Specifications
A	Standard
K	Gas
M	Humidity, dust
N	Oil
P	Moisture, dust, vibration
R	Gas, vibration
S	Shock, vibration
T	Oil, vibration

Note: Drives with these specifications do not guarantee complete protection for the environmental conditions indicated.

Selecting the Capacity

When using the drive for shaft spinning, traversing, and traveling, the drive should be selected so that the rated output current of the drive output amps are equal to or greater than the motor rated current.
When using the drive for a lifting shaft, the current upon startup must be maintained to 150% or less of the rated output current.
Yaskawa recommends selecting the drive according to the following formula.

Formula: rated output current of the drive × coefficient (0.6 to 0.9) > motor rated current

Coefficient for each control mode
· Closed Loop Vector Control: 0.9
· Open Loop Vector Control, Advanced Open Loop Vector Control: 0.8
· V/f Control*, Closed Loop V/f Control: 0.7
*: When driving multiple motors using one drive, it is calculated with a coefficient of 0.6. Calculate the motor rated current by the total value of two or more motors.

Basic Instructions

Outstanding operability and quick setup

Keypad Names and Functions

① RUN LED
Lit while the drive is operating the motor.

② ALM LED
The drive lights up if a fault is detected.
Flashes when minor faults, tuning errors and operational errors occur.

⑤ LO/RE Selection Key
Press this to switch operation.
LED Lit(LOCAL) : When the keypad is selected for Run command and frequency reference control.
LED Off(REMOTE) : When a device other than the keypad is selected for Run command and frequency reference control.

⑥ RUN Key
Starts the drive in LOCAL mode.

⑦ STOP Key
Stops drive operation.

⑧ Com port
For connecting to a PC (DriveWizard), a USB copy unit or a LCD keypad.

⑨ LED Status Ring
The corresponding lamp lights depending on the operation status.

⑩ QR code
Import the dedicated smartphone application "DriveWizard Mobile" and use it to retrieve product information.

③ Function Keys: F1, F2, F3
The functions of the function key depend on the menu that is being displayed. The name of each function appears in the lower half of the display window.

④ Display Operation Keys:
LEFT Arrow Key
- Moves the cursor to the left.
- Returns to the previous screen.

UP Arrow Key / DOWN Arrow Key
- Scrolls up to display the next item.
- Scrolls down to display the previous item.
- Selects parameter numbers.
- Increments setting values.
- Decrements setting values.

RIGHT Arrow (RESET) Key
- Moves the cursor to the right.
- Proceeds to the next screen.
- Resets the drive to clear a fault.
- Used as the start key in Auto-Tuning Mode.

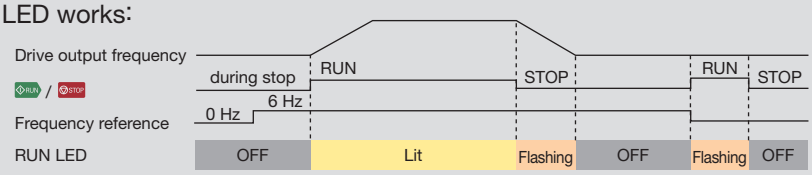
ENTER Key
- Inputs parameter numbers and setting values. Press to enter values, edit parameters and set the control mode.
- Switches between displays with selection of menu items.

Note: QR code is a trademark of DENSO WAVE INCORPORATED.

Keypad LED

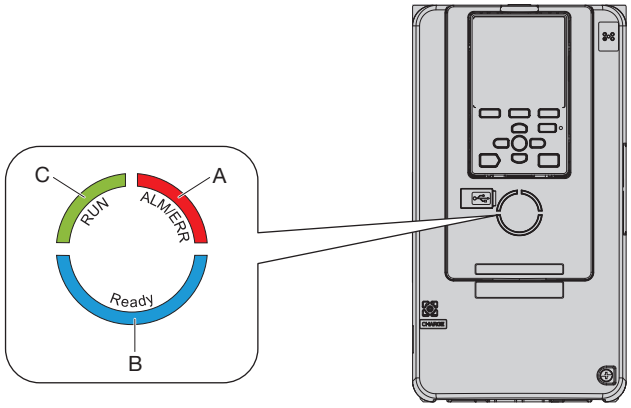
Indicator LED	Lit	Flashing	Flashing Quickly	OFF
RUN	Motor running.	• The motor is performing ramp to stop. • The Run command was inputted when the frequency reference was 0 Hz	• With a Run command inputted from an external command when the Run command source was in LOCAL, the Run command source switched to REMOTE. When the drive was not in the Drive Ready (READY) state, a Run command was inputted from an external command. • An emergency stop command has been inputted. • The Safe Disable input function was running and the drive output was shut off. • When the Run command source was REMOTE, the STOP key on the keypad was pressed and the motor was stopped. • The power supply for the drive is turned on when the Run command is inputted from an external source.	Drive is stopped.
ALM	A fault was detected.	• Minor fault was detected. • Operation error was detected. • Auto-Tuning was detected.	—	Normal operation
LO/RE	Sets the Run command source to the keypad (LOCAL).	—	—	Sets the Run command source to a non-keypad external command (REMOTE).

How the RUN LED works:



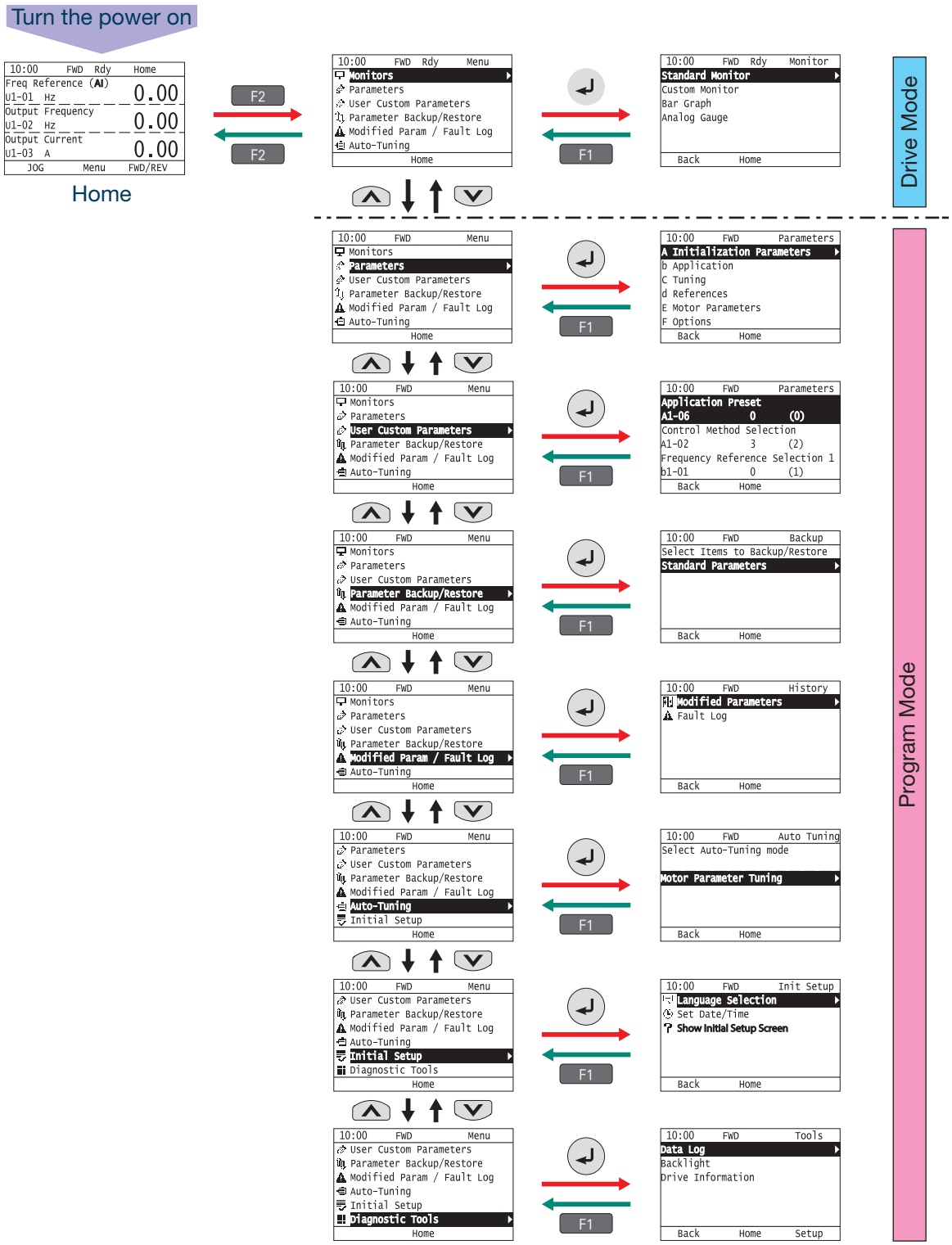
Basic Instructions (continued)

LED Status Ring



LED Status Ring		State	Content
A	ALM/ERR 	Lit	The drive detected a fault.
		Flashing	The drive has detected: · An error · An oPE · An error during Auto-Tuning. Note: If the drive detects a fault and an error at the same time, this LED will be lit to indicate the fault.
		OFF	The drive is in normal operation. There are no alarms of faults present.
B	Ready 	Lit	The drive is operating or is ready for operation.
		Flashing	When the drive is in STo [Safe Torque Off] mode. The drive is in STo [Safe Torque Off] mode.
		OFF	· The drive detected a fault. · There is no fault and the drive received an operation command, but the drive cannot operate (such as when in Programming Mode, or when is flashing).
C	RUN 	Lit	The drive is in regular operation.
		Flashing	· The drive is decelerating to stop. · The drive was issued a Run command and the frequency reference is 0 Hz. · A DC injection braking command is input via a multi-function digital input terminal while the drive is stopped.
		Flashing Quickly	· Entering a Run command via the input terminals, then switching to REMOTE while the drive is set to LOCAL. · Entering a Run command via the input terminals when the drive is not in Drive Mode. · Entering a Fast Stop command. · The safety function shuts off the drive output. · Pushing STOP on the keypad while the drive is running in REMOTE mode. · Setting b1-17 = 0 [Run Command at Power Up = Accept existing RUN command] and powering up the drive while the Run command is active.
		OFF	The motor is stopped.

Keypad Example



Note:
- Energizing the drive with factory defaults will display the initial start-up screen. Press F2 Key (Home) to display the Home screen.
  To prevent the drive from displaying the initial start-up screen, Select [No] from the [Show Initial Setup Screen] setting.
- Press Left Arrow Key from the Home screen to display the monitors.
- When U1-01 [Freq. Reference] is displayed on the Home screen in LOCAL mode, press ENTER Key to change parameter d1-01 [Frequency Reference].
- The keypad will display [Rdy] when the drive is in Drive Mode and ready to accept a Run command.

Standard Specifications

200 V Class

Catalog Code CR70A2⬚		003	005	008	011	014	018	025	033	047	060	075	088	115	145	180	215	283	346	415
Max. Applicable Motor Capacity*1	kW	0.4	0.75	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
Input	Rated Input Current	A	3.6	4.8	8.9	12.7	17	20.7	30	40.3	58.2	78.4	96	82	111	136	164	200	271	324	394
Output	Rated Output Current	A	3.2	5	8	11	14	17.5	25	33	47	60	75	88	115	145	180	215	283	346	415
	Overload Tolerance		150% of rated output current for 60 s Note: Derating may be required for applications that start and stop frequently.																	
	Carrier Frequency		Derating the output current enables a maximum of 15 kHz to be set. (Derating the output current is not necessary up to 8 kHz.)												Derating the output current enables a maximum of 10 kHz to be set. (Derating the output current is not necessary up to 5 kHz.)						
	Max. Output Voltage		Three-phase 200 to 240 V Note: The maximum output voltage is proportional to the input voltage.																	
	Max. Output Frequency		590 Hz The frequencies that can be set vary depending on the control mode used.																	
Measures for Harmonics	DC Reactor		External options										Built-in							
Braking Function	Braking Transistor		Built-in												External options					
EMC filter	EMC filter EN61800-3, C2/C3		Internal (factory option)																	
Power	Rated Voltage / Rated Frequency		· Three-phase AC power supply 200 V to 240 V 50/60 Hz · DC power supply 270 V to 340 V																	
	Allowable Voltage Fluctuation		−15% to 10%																	
	Allowable Frequency Fluctuation		±5%																	
	Power Supply*2	kVA	1.5	2.0	3.7	5.3	7.1	8.6	12.5	16.8	24.2	32.6	39.9	34.1	46.1	56.5	68.2	83.1	113	135	164

*1: For the most appropriate selection, contact your Yaskawa or nearest sales representative.
*2: Rated input capacity is calculated with a power line voltage of 240 V.

400 V Class

Catalog Code CR70A4⬚			002	003	005	006	007	009	015	018	024	031	039	045	060	075	091
Max. Applicable Motor Capacity*1		kW	0.4	0.75	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45
Input	Rated Input Current	A	1.9	3.5	4.7	6.7	8.9	11.7	15.8	21.2	30.6	41.3	50.5	43.1	58.3	71.5	86.5
Output	Rated Output Current	A	1.8	3.4	4.8	5.5	7.2	9.2	14.8	18	24	31	39	45	60	75	91
	Overload Tolerance		150% of rated output current for 60 s Note: Derating may be required for applications that start and stop frequently.														
	Carrier Frequency		Derating the output current enables a maximum of 15 kHz to be set. (Derating the output current is not necessary up to 8 kHz.)														
	Max. Output Voltage		Three-phase 380 to 480 V Note: The maximum output voltage is proportional to the input voltage.														
	Max. Output Frequency		590 Hz The frequencies that can be set vary depending on the control mode used.														
Measures for Harmonics	DC Reactor		External options											Built-in			
Braking Function	Braking Transistor		Built-in														
EMC filter	EMC filter EN61800-3, C2/C3		Internal (factory option)														
Power	Rated Voltage / Rated Frequency		· Three-phase AC power supply 380 V to 480 V 50/60 Hz · DC power supply 513 V to 679 V														
	Allowable Voltage Fluctuation		−15% to 10%														
	Allowable Frequency Fluctuation		±5%														
	Power Supply*2	kVA	1.5	2.8	3.7	5.3	7.1	9.3	13	17	24	33	40	34	46	57	69

Catalog Code CR70A4⬚			112	150	180	216	260	304	371	414	453	605
Max. Applicable Motor Capacity*1		kW	55	75	90	110	132	160	200	220	250	315
Input	Rated Input Current	A	105	142	170	207	248	300	373	410	465	584
Output	Rated Output Current	A	112	150	180	216	260	304	371	414	453	605
	Overload Tolerance		150% of rated output current for 60 s Note: Derating may be required for applications that start and stop frequently.									
	Carrier Frequency		Derating the output current enables a maximum of 10 kHz to be set. (Derating the output current is not necessary up to 5 kHz.)						Derating the output current enables a maximum of 5 kHz to be set. (Derating the output current is not necessary up to 2 kHz.)			
	Max. Output Voltage		Three-phase 380 to 480 V Note: The maximum output voltage is proportional to the input voltage.									
	Max. Output Frequency		590 Hz The frequencies that can be set vary depending on the control mode used.									
Measures for Harmonics	DC Reactor		Built-in									
Braking Function	Braking Transistor		Built-in		External options							
EMC filter	EMC filter EN61800-3, C2/C3		Internal (factory option)									
Power	Rated Voltage / Rated Frequency		· Three-phase AC power supply 380 V to 480 V 50/60 Hz · DC power supply 513 V to 679 V									
	Allowable Voltage Fluctuation		−15% to 10%									
	Allowable Frequency Fluctuation		±5%									
	Power Supply*2	kVA	84	113	136	165	198	239	297	327	370	465

*1: For the most appropriate selection, contact your Yaskawa or nearest sales representative.
*2: Rated input capacity is calculated with a power line voltage of 480 V.

Standard Specifications

Common Specifications

	Item	Specifications
Control Characteristics	Control Method	The following controls are selected by parameters. · V/f Control · Closed Loop V/f Control · Open Loop Vector Control · Closed Loop Vector Control · Advanced Open Loop Vector Control
	Maximum Output Frequency	· Advanced Open Loop Vector Control: 120 Hz · Closed Loop V/f Control, Closed Loop Vector Control: 400 Hz · V/f Control, Open Loop Vector Control: 590 Hz
	Frequency Accuracy (Temperature Fluctuation)	Digital reference: within ±0.01% of the max. output frequency (−10°C to +40°C) Analog reference: within ±0.1% of the max. output frequency (25°C ±10°C)
	Frequency Setting Resolution	Digital reference: 0.01 Hz Analog reference: 1/2048 of the maximum output frequency setting (11 bit plus sign)
	Output Frequency Resolution	0.001 Hz
	Frequency Setting Signal	Main frequency reference: −10 to +10 Vdc, 0 to 10 Vdc (20 kΩ), 4 to 20 mA (250 Ω), 0 to 20 mA (250 Ω)
	Starting Torque	· V/f Control: 150%/3 Hz · Closed Loop V/f Control: 150%/3 Hz · Open Loop Vector Control: 200%/0.3 Hz*1 · Closed Loop Vector Control: 200%/0 min^{-1}*1 · Advanced Open Loop Vector Control: 200%/0.3 Hz*1
	Speed Control Range	· V/f Control 1:40 · Closed Loop V/f Control 1:40 · Open Loop Vector Control 1:200 · Closed Loop Vector Control 1:1500 · Advanced Open Loop Vector Control 1:200
	Zero Speed Control	Possible in Closed Loop Vector Control.
	Torque Limit	Parameter settings allow separate limits in four quadrants in Open Loop Vector Control, Closed Loop Vector Control, and Advanced Open Loop Vector Control.
	Accel/Decel Time	0.0 s to 6000.0 s The drive allows four selectable combinations of independent acceleration and deceleration settings.
	Braking Torque	Approx. 20% Approx. 125% with a dynamic braking option · Short-time average deceleration torque Motor capacity 0.4/0.75 kW: over 100% Motor capacity 1.5 kW: over 50% Motors 2.2 kW and larger: over 20%, Overexcitation Braking allow for approx. 40% · Continuous regenerative torque: Approx. 20%. Dynamic braking option allows for approx. 125%, 10% ED, 10 s Note: · Catalog codes CR70A2003 to 2115 and 4002 to 4150 have a built-in braking transistor. · Set L3-04 = 0 [Disabled] (default setting) when connecting the regenerative converter, regenerative unit, braking unit and braking resistor unit. The drive may not stop within the specified deceleration time if L3-04 is changed to 1 through 5 [Enabled]. · Short-time deceleration torque refers to the torque required to decelerate the motor (uncoupled from the load) from the rated speed to zero. Actual specifications may vary depending on motor characteristics. · Continuous regenerative torque and short-time deceleration torque for motors 2.2 kW and larger vary depending on motor characteristics.
	V/f Characteristics	Select from 15 predefined V/f patterns, or a user-set V/f pattern.
	Main Control Functions	Droop Control, Feed Forward Control, Zero Servo Control, torque limit, 9 Step Speed (max.), accel/decel switch, S-curve accel/decel, Auto-Tuning (rotational, stationary), cooling fan on/off switch, slip compensation, torque compensation, Frequency Jump, Upper/lower limits for frequency reference, Injection Braking at start and stop, Overexcitation Deceleration, MEMOBUS/Modbus (RTU mode) Communications (RS-485, max. 115.2 kbps), Parameter Backup Function, Online Tuning, Overexcitation Deceleration, Inertia Tuning and ASR Tuning, Crane Sequence, etc.
Protection Function	Motor Protection	Motor overheat protection based on output current
	Momentary Overcurrent Protection	Drive stops when output current exceeds 200%*2 of rated output current.
	Overload Protection	Drive stops after 60 s at 150% of rated output current. Note: The drive may trigger the overload protection function at 150% of the drive rated output in under 60 s if the output frequency is less than 6 Hz.
	Overvoltage Protection	200 V class: Stops when DC bus exceeds approx. 410 V 400 V class: Stops when DC bus exceeds approx. 820 V
	Undervoltage Protection	200 V class: Stops when DC bus falls below approx. 190 V 400 V class: Stops when DC bus falls below approx. 380 V
	Heatsink Overheat Protection	Thermistor
	Braking Resistance Overheat Protection	Overheat sensor for braking resistor (optional ERF-type, 3% ED)
	Stall Prevention	Stall prevention during acceleration/deceleration and constant speed operation
	Ground Fault Protection	Protection by electronic circuit Note: Protection may not be provided under the following conditions as the motor windings are grounded internally during run: Low resistance to ground from the motor cable or terminal block. Drive already has a short-circuit when the power is turned on.
	Charge LED	Charge LED remains lit until DC bus has fallen below approx. 50 V

Item		Specifications
Environment	Area of Use	Indoors · chemical gas: IEC 60721-3-3: 3 C2 · solid particle: IEC 60721-3-3: 3 S2
	Power Supply	Overcurrent Category III
	Ambient Temperature	IP20/UL Open Type: -10°C to +50°C IP20/UL Type 1: −10°C to +40°C · Do not use the drive in a location where the temperature changes suddenly to improve the drive reliability. · When installing the drive in an enclosure, use a cooling fan or air conditioner to keep the internal air temperature in the permitted range. · Do not let the drive freeze. · To install IP20/UL Open Type drives in areas with ambient temperatures ≦ 60°C, derate the output current. · To install IP20/UL Type 1 drives in areas with ambient temperatures ≦ 50°C, derate the output current.
	Humidity	95% RH or less (no condensation)
	Storage Temperature	Short-term temperature during transportation is -20 °C to +70 °C
	Surrounding Area	Pollution degree 2 or less Install the drive in an area without: · Oil mist, corrosive or flammable gas, or dust · Metal powder, oil, water, or other unwanted materials · Radioactive materials or flammable materials, including wood · Harmful gas or fluids · Salt · Direct sunlight Keep wood or other flammable materials away from the drive.
	Altitude	1000 m or less*3
	Shock	· 10 Hz to 20 Hz, 1 G (9.8 m/s²) · 20 Hz to 55 Hz, Catalog code CR70A2003 to 2180, 4002 to 4150: 0.6 G (5.9 m/s²), Catalog code CR70A2215 to 2415, 4180 to 4605: 0.2 G (2.0 m/s²)
Standards Compliance		· UL61800-5-1 · EN61800-3:2004+A1:2012 · IEC/EN61800-5-1 · Two Safe Disable inputs and 1EDM output according to ISO/EN13849-1 Cat.3 Ple, IEC/EN61508 SIL3 Note: Used by setting functions to multi-function digital output terminals.
Protection Design		IP20/UL Open Type, IP20/UL Type 1 Note: Install a UL Type 1 kit on an IP20/UL Open Type drive to convert the drive to IP20/UL Type 1.

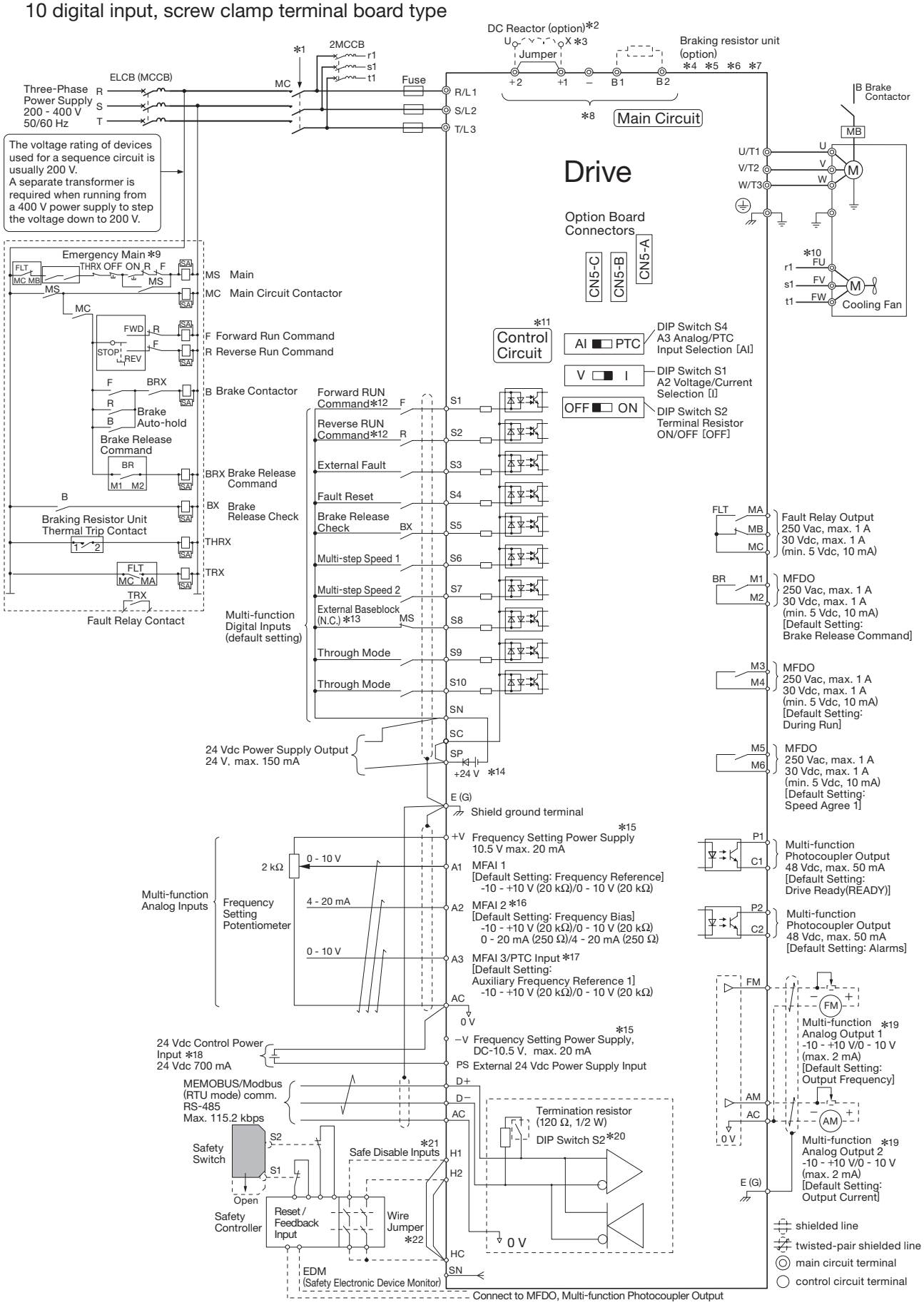
*1: Increase the drive and motor capacities.
*2: 200% is the target value. The value varies depending on the capacity.
*3: Altitudes over 1000 m and up to 4000 m are possible by derating the output current by 1% for every 100 m.
Contact Yaskawa or your nearest sales representative for details.

Note: 1. Perform Rotational Auto-Tuning to achieve specifications listed for Open Loop Vector Control, Close Loop Vector Control and Advanced Open Loop Vector Control.
2. Install the drive in an environment matching the specifications in the table above for optimum performance life.

Standard Connection Diagram

Standard Connection Diagram

10 digital input, screw clamp terminal board type



*1: We recommend that the sequence that de-energizes the power supply be set via the fault relay output for the drive.
*2: Be sure to remove the jumper between terminals +1 and +2 when installing a DC reactor (option).
*3: Catalog codes CR70A2088 to 2415 and 4045 to 4605 have a built-in DC reactor.
*4: Be sure to set L8-55 = 0 [Internal DB Transistor Protection = Disable] when using an optional regenerative converter, regenerative unit, or braking unit. Leaving L8-55 = 1 [Protection Enabled] can cause rF [Braking Resistor Fault].
*5: Set L3-04 = 0 [Disabled] (default setting) when connecting the regenerative converter, regenerative unit, braking unit and braking resistor unit. The drive may not stop within the specified deceleration time if L3-04 is changed to 1 through 5 [Enabled].
*6: Set L8-01 = 1 [3% ERF DB Resistor Protection = Enabled] and set a sequence to de-energize the drive with the fault relay output when using an ERF-type braking resistor.
*7: When connecting a braking unit (CDBR series) or a braking resistor unit (LKEB series) to the catalog code CR70A2088, 2115, and 4091, use wires that are in the range of the applicable gauges for the drive. A junction terminal is required when connecting wires that are less than the applicable gauge to the drive. Contact Yaskawa or your nearest sales representative for details on selection and installation of the junction terminal.
*8: Terminals -, +1, +2, B1 and B2 are the optional connection terminals. Do not connect an AC power supply to terminals -, +1, +2, B1, and B2. Failure to obey can cause damage to the drive and peripheral devices.
*9: Use a sequence that shuts the power OFF by Fault relay output.
*10: Self-cooling motors do not require the wiring for the motors with cooling fans.
*11: Connect a 24 V power supply to terminals PS-AC to operate the control circuit while the main circuit power supply is OFF.
*12: Check that the wiring is set up so that the motor rotates in forward (FOR) when hoisting, and reverse (REV) when lowering in every control method.
*13: The baseblock is released when the external baseblock command is ON.
*14: Use a wire jumper between terminals SC and SP or SC and SN to set the MFDI power supply to SINK Mode, SOURCE Mode, or External power supply. Do not short circuit terminals SP and SN. Failure to obey will cause damage to the drive.
- SINK Mode: Install a jumper between terminals SC and SP. Do not short circuit terminals SC and SN. Failure to obey will cause damage to the drive.
- SOURCE Mode: Install a jumper between terminals SC and SN. Do not short circuit terminals SC and SP. Failure to obey will cause damage to the drive.
- External power supply: No jumper necessary between terminals SC and SN or terminals SC and SP.

*15: The output current capacity of the +V and -V terminals on the control circuit is 20 mA. Do not install a jumper between terminals +V, -V, and AC. Failure to obey can cause damage to the drive.
*16: DIP switch S1 set terminal A2 for voltage or current input. The default setting for S1 is current input ("I" side).
*17: DIP switch S4 sets terminal A3 for analog or PTC input.
*18: Connect the positive lead from an external 24 Vdc power supply to terminal PS and the negative lead to terminal AC. Reversing polarity can cause damage to the drive.
*19: Use multi-function analog monitor outputs with analog frequency meters, ammeters, voltmeters, and wattmeters. Do not use monitor outputs with feedback-type signal devices.
*20: Set DIP switch S2 to "ON" to enable the termination resistor in the last drive in a MEMOBUS/Modbus (RTU mode) network.
*21: Use sourcing mode when using an internal power supply for Safe Disable input.
*22: Disconnect the wire jumper between H1 and HC, and H2 and HC to use the Safe Disable input.

Terminal Specifications

Terminal Functions

Main Circuit Terminals

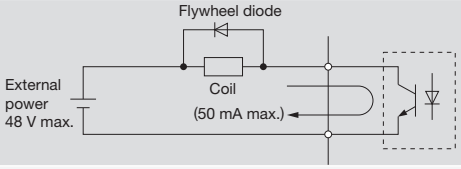
Voltage	200 V Class			400 V Class			
Catalog Code CR70A	2003 to 2075	2088 to 2115	2145 to 2415	4002 to 4039	4045 to 4150	4180 to 4371	4414 to 4605
Max. Applicable Motor Capacity kW	0.4 to 18.5	22, 30	37 to 110	0.4 to 18.5	22 to 75	90 to 200	220 to 315
R/L1, S/L2, T/L3	Main circuit input power supply			Main circuit input power supply			
U/T1, V/T2, W/T3	Drive output			Drive output			
B1, B2	Braking resistor unit connection		–	Braking resistor unit connection		–	–
+2	DC reactor (+1, +2) DC power supply (+1, –)	–	–	DC reactor (+1, +2) DC power supply (+1, –)	–	–	–
+1		DC power supply (+1, –)	DC power supply (+1, –) Braking unit (+3, –)		DC power supply (+1, –)	DC power supply (+1, –) Braking unit (+3, –)	
–							
+3	–	–		–	–		
⏚	Ground terminal (100 Ω or less)			Ground terminal (10 Ω or less)			

Note: 1. Use terminals B1 and - to connect a CDBR braking unit to drive models CR70A2003 to 2115 and CR70A4002 to 4150 with built-in braking transistors.
2. CR70A2180 and CR70A4150 or less are used for European terminals.

Control Circuit Input Terminals (200 V/400 V Class)

Terminal Type	Terminal	Signal Function (default)	Description (Signal Level)
Multi-Function Digital Input	S1	Multi-function input selection 1 (Forward RUN Command)	· Photocoupler · 24 V, 6 mA Note: Use a wire jumper between terminals SC and SP or SC and SN to set the MFDI power supply to SINK Mode, SOURCE Mode, or External power supply. · SINK Mode: Install a jumper between terminals SC and SP. Do not short circuit terminals SC and SN. Failure to obey will cause damage to the drive. · SOURCE Mode: Install a jumper between terminals SC and SN. Do not short circuit terminals SC and SP. Failure to obey will cause damage to the drive. · External power supply: No jumper necessary between terminals SC and SN or terminals SC and SP.
	S2	Multi-function input selection 2 (Reverse RUN Command)	
	S3	Multi-function input selection 3 (External fault, N.O.)	
	S4	Multi-function input selection 4 (Fault reset)	
	S5	Multi-function input selection 5 (Brake Release Check)	
	S6	Multi-function input selection 6 (Multi-step speed reference 1)	
	S7	Multi-function input selection 7 (Multi-step speed reference 2)	
	S8	Multi-function input selection 8 (External Baseblock, N.C.)	
	S9	Multi-function input selection 9 (Through Mode)	
	S10	Multi-function input selection 10 (Through Mode)	
	SN	Digital input power supply 0V 24V transducer power supply 0V	MFDI power supply and sensor power supply, 24 Vdc (max. 150 mA) Note: Do not install a jumper between terminals SP and SN. Failure to comply will damage the drive.
	SC	Multi-functions input common	
	SP	Multi-function input power supply +24 Vdc	
Safety Input	H1	Safety Input 1	Remove the jumper between terminals H1-HC and H2-HC when using the Safe Disable input. · 24 Vdc 6 mA · ON: Normal operation · OFF: Output disabled · Internal impedance 4.7 kΩ · Switching time at least 2 ms
	H2	Safety Input 2	
	HC	Safety input common	Safety input common Note: Do not install a jumper between terminals HC and SN. Failure to comply will damage the drive.
Main Frequency Reference Input	+V	Setting power supply	10.5 V (20 mA max.)
	–V	Setting power supply	–10.5 V (20 mA max.)
	A1	Multi-function analog input 1 (Main frequency reference)	Voltage input H3-01 can be used to set the voltage or current output for terminal A1 (Terminal A1 Signal Level Select.) · –10 to +10 Vdc for –100 to +100% (impedance 20 kΩ) · 0 to 10 Vdc for 0 to 100% (impedance 20 kΩ)
	A2	Multi-function analog input 2 (Frequency reference bias with terminal A1)	Voltage input or current input DIP switch S1 and H3-09 can be used to set the voltage or current output for terminal A2 (Terminal A2 Signal Level Select.) · –10 to +10 Vdc for –100 to +100% (impedance 20 kΩ) · 0 to 10 Vdc for 0 to 100% (impedance 20 kΩ) · 4 to 20 mA for 0 to 100%, 0 to 20 mA for 0 to 100% (impedance 250 Ω)
	A3	Multi-function analog input 3/PTC input (Auxiliary frequency reference)	Voltage input Selected with H3-05 (Terminal A3 Signal Level Select.) · –10 to +10 Vdc for –100 to +100% (impedance 20 kΩ) · 0 to 10 Vdc for 0 to 100% (impedance 20 kΩ) PTC input (For motor overheat protection) Set DIP switch S4 to "PTC" to set terminal A3 for PTC input.
	AC	Frequency reference common	0 V
	E(G)	Shielded cable	–

Control Circuit Input Terminals (200 V/400 V) (continued)

Terminal Type	Terminal	Signal Function (default)	Description (Signal Level)
Fault Relay Output	MA	N.O. output (Fault)	· Relay output · 30 Vdc or less, 10 mA to 1 A · 250 Vac or less, 10 mA to 1 A · Minimum load: 5 Vdc, 10 mA (Values only for reference)
	MB	N.C. output (Fault)	
	MC	Digital output common	
Multi-Function Digital Output	M1	Multi-function digital output (Brake Release Command)	· Relay output · 30 Vdc or less, 10 mA to 1 A · 250 Vac or less, 10 mA to 1 A · Minimum load: 5 Vdc, 10 mA (Values only for reference) Note: Switching life is estimated at 8,000,000 times (assumes 30 mA, inductive load) and 200,000 times (assumes 1 A, resistive load). When an inductive load such as relay coils is switched on and off, connecting the surge absorber parallel to the load is an effective means to protect the contacts.
	M2		
	M3	Multi-function digital output (During run)	
	M4		
	M5	Multi-function digital output (Speed agree 1)	
	M6		
Multi-Function Photocoupler Output	P1	Multi-Function Photocoupler Output (Drive Ready (READY))	· Photocoupler output · 48 Vdc or less, 2 to 50 mA Note: Connect a flywheel diode as shown below when driving a reactive load such as a relay coil. Diode must be rated higher than the circuit voltage. 
	C1		
	P2	Multi-Function Photocoupler Output (Alarms)	
	C2		
Monitor Output	FM	analog monitor (1) (Output frequency)	Voltage output · 0 to 10 Vdc for 0 to 100% · −10 to 10 Vdc for −100 to 100% Note: H4-07 (Terminal FM Signal Level Select.) and H4-08 (Terminal AM Signal Level Select.) to select the signal type for terminals AM and FM.
	AM	analog monitor (2) (Output current)	
	AC	Monitor common	0 V

External Power Supply Input Terminals (200 V/400 V Class)

Type	Terminal	Terminal Name (Default)	Function
External Power Supply Input Terminals	PS	External 24 V power supply input	Supplies backup power to the drive control circuit, keypad, and option card. 21.6 Vdc to 26.4 Vdc, 700 mA
	AC	External 24 V power supply ground	0 V

Serial Communication Terminals (200 V/400 V Class)

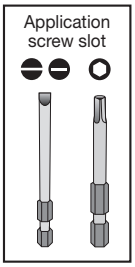
Classification	Terminal	Signal Function	Description(Signal Level)	
MEMOBUS / Modbus (RTU mode) Communications	D+	Communications input (+)	MEMOBUS/Modbus (RTU mode) communications: Use an RS-485 cable to connect the drive. Note: Set DIP switch S2 to ON to enable the termination resistor in the last drive in a MEMOBUS/Modbus (RTU mode) network.	· RS-485 · MEMOBUS/Modbus (RTU mode) communications protocol · Max. 115.2 kbps
	D−	Communications input (−)		
	AC	Shield ground	0 V	

Tools for Wiring European Style Terminal Blocks (Recommended product)

Check the “Terminal size / Wire gauge” on the next page and prepare the tools for wiring.

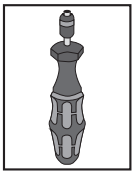
Screw size	Screw type	Recommended Product
M4	Slot ⊖	Prepare the following two tools. · Bit【PHOENIX CONTACT】 Model: SF-BIT-SL 1,0X4,0-70 · Torque screwdriver【PHOENIX CONTACT】 Model: TSD-M 3NM (1.2 to 3 N·m)
M5	Slot ⊖	When wiring drive models CR70A2047 and CR70A4075 or earlier models, be sure to correctly select tools based on the wire gauges. Wiring Gauge: ≤25 mm² or AWG10 · Bit【PHOENIX CONTACT】 Model: SF-BIT-SL 1,2X6,5-70 · Torque screwdriver【PHOENIX CONTACT】 Model: TSD-M 3NM (1.2 to 3 N·m) Wiring Gauge: ≥30 mm² or AWG8 · Torque wrench that includes a torque measurement range of 4.5 N·m · Bit socket holder of 6.35 mm
M6	Hex socket (WAF: 5) ⑤	Prepare the following three tools. · Bit【PHOENIX CONTACT】 Model: SF-BIT-HEX 5-50 · Torque wrench that includes a torque measurement range of 9 N·m · Bit socket holder of 6.35 mm
	Minus ⊖	Prepare the following three tools for the models CR70A2088 to 2115, and CR70A4091. · Bit【PHOENIX CONTACT】 Model: SF-BIT-SL 1,2X6,5-70 · Torque wrench that includes a torque measurement range of 3.5 N·m · Bit socket holder of 6.35 mm
M8	Hex socket (WAF: 6) ⑥	Prepare the following three tools. · Bit【PHOENIX CONTACT】 Model: SF-BIT-HEX 6-50 · Torque wrench that includes a torque measurement range of 12 N·m · Bit socket holder of 6.35 mm
M10	Hex socket (WAF: 8) ⑧	Prepare the following three tools. · Bit【PHOENIX CONTACT】 Model: SF-BIT-HEX 8-50 · Torque wrench that includes a torque measurement range of 14 N·m · Bit socket holder of 6.35 mm

Bit



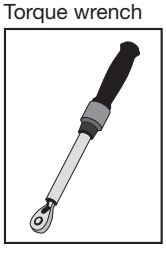
Model	Tip of Bit	Code No.
SF-BIT-SL 1,0X4,0-70	Slot Tip, M4	100-250-491
SF-BIT-SL 1,2X6,5-70	Slot Tip, M5	100-250-492
SF-BIT-HEX 5-50	Hexagon Tip, M6	100-250-488
SF-BIT-HEX 6-50	Hexagon Tip, M8	100-250-489
SF-BIT-HEX 8-50	Hexagon Tip, M10	100-250-490

Torque screwdriver

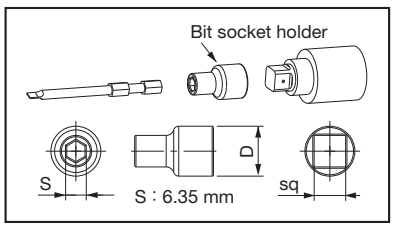


Model	Measurement Range	Code No.
TSD-M 3NM	1.2 to 3 N·m	100-250-493

Torque wrench



Bit socket holder



Terminal Specifications

Terminal Size / Wire Gauge

200 V Class

Symbols indication the shape of the terminal screws:
⊖ : Slot (−), ⊖ : Minus (−), ⑤ : Hex socket (WAF: 5), ⑥ : Hex socket (WAF: 6), ⑧ : Hex socket (WAF: 8)

Catalog code CR70A□	Terminal	Recommended Gauge mm²	Wire Range (IP20 Compatible Gauge) mm²	Wire Stripping Length*1 mm	Terminal Screw		Tightening Torque N·m
					Size	Shape	
2003	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	−, +1, +2	2	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7
2005	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	−, +1, +2	2	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7
2008	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	−, +1, +2	2	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7
2011	R/L1, S/L2, T/L3	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	−, +1, +2	3.5	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7
2014	R/L1, S/L2, T/L3	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	U/T1, V/T2, W/T3	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	−, +1, +2	5.5	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7
2018	R/L1, S/L2, T/L3	8	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	U/T1, V/T2, W/T3	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	−, +1, +2	8	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7
2025	R/L1, S/L2, T/L3	14	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	U/T1, V/T2, W/T3	8	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	−, +1, +2	14	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2
	B1, B2	3.5	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7
2033	R/L1, S/L2, T/L3	14	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	U/T1, V/T2, W/T3	14	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
	−, +1, +2	22	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2
	B1, B2	5.5	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7
2047	R/L1, S/L2, T/L3	22	2 to 22 (8 to 22)	18	M5	⊖	2.3 to 2.5*2
	U/T1, V/T2, W/T3	14	2 to 14 (5.5 to 14)	18	M5	⊖	2.3 to 2.5*2
	−, +1, +2	38	2 to 38 (8 to 38)	20	M6	⑤	5 to 5.5
	B1, B2	14	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
2060	R/L1, S/L2, T/L3	38	2 to 38 (22 to 38)	20	M6	⑤	5 to 5.5
	U/T1, V/T2, W/T3	22	2 to 22 (14 to 22)	20	M6	⑤	5 to 5.5
	−, +1, +2	50	2 to 50 (22 to 50)	20	M6	⑤	5 to 5.5
	B1, B2	14	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
2075	R/L1, S/L2, T/L3	50	2 to 50 (22 to 50)	20	M6	⑤	5 to 5.5
	U/T1, V/T2, W/T3	30	2 to 30 (14 to 30)	20	M6	⑤	5 to 5.5
	−, +1, +2	60	2 to 60 (22 to 60)	20	M6	⑤	5 to 5.5
	B1, B2	14	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
2088	R/L1, S/L2, T/L3	38	22 to 38 (22 to 38)	27	M6	⑤	8 to 9
	U/T1, V/T2, W/T3	38	22 to 38 (22 to 38)	27	M6	⑤	8 to 9
	−, +1	60	30 to 60 (30 to 60)	27	M8	⑤	10 to 12
	B1, B2	22	8 to 22 (8 to 22)	21	M6	⊖	3 to 3.5
2115	R/L1, S/L2, T/L3	60	22 to 60 (38 to 60)	27	M6	⑤	8 to 9
	U/T1, V/T2, W/T3	60	22 to 60 (38 to 60)	27	M6	⑤	8 to 9
	−, +1	80	30 to 80 (50 to 80)	27	M8	⑥	10 to 12
	B1, B2	30	8 to 30 (8 to 30)	21	M6	⊖	3 to 3.5
2145	R/L1, S/L2, T/L3	80	50 to 100 (80 to 100)	37	M10	⑧	12 to 14
	U/T1, V/T2, W/T3	80	50 to 125 (80 to 125)	37	M10	⑧	12 to 14
	−, −, +1, +1*3	38*4	22 to 50 (50)	28	M6	⑤	8 to 9
	+3	60	30 to 80*5 (50 to 80)*5	28	M8	⑥	8 to 9
2180	R/L1, S/L2, T/L3	100	50 to 100 (80 to 100)	37	M10	⑧	12 to 14
	U/T1, V/T2, W/T3	125	50 to 125 (80 to 125)	37	M10	⑧	12 to 14
	−, −, +1, +1*3	50	22 to 50 (50)	28	M6	⑤	8 to 9
	+3	80	30 to 80*5 (50 to 80)*5	28	M8	⑥	8 to 9

*1: Remove the insulator from the tips of wires to the length shown in "Wire Stripping Length."
*2: When using wire with a gauge over 30 mm², tighten to a tightening torque of 4.1 to 4.5 N·m.
*3: Terminals - and + have two screws. Recommended Gauge means the wire gauge of one terminal.
*4: Use cables in the range of applicable gauges to meet the IP20 protective level.
*5: A junction terminal is required when connecting a braking unit (CDBR-series) or a braking resistor unit (LKEB-series).

Note: The recommended wire gauges based on drive continuous current ratings using 75°C 600 V class 2 heat resistant indoor PVC wire.
Assume the following usage conditions:
· Ambient temperature: 40°C or lower
· Wiring distance: 100 m or shorter
· Rated current value

400 V Class

Symbols indication the shape of the terminal screws:
⊖ : Slot (−), ⛔ : Minus (−), ⑤ : Hex socket (WAF: 5), ⑥ : Hex socket (WAF: 6), ⑧ : Hex socket (WAF: 8)

Catalog code CR70A□	Terminal	Recommended Gauge mm²	Wire Range (IP20 Compatible Gauge) mm²	Wire Stripping Length*1 mm	Terminal Screw		Tightening Torque N·m	Catalog code CR70A□	Terminal	Recommended Gauge mm²	Wire Range (IP20 Compatible Gauge) mm²	Wire Stripping Length*1 mm	Terminal Screw		Tightening Torque N·m
					Size	Shape							Size	Shape	
4002	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4031	R/L1, S/L2, T/L3	14	2 to 22 (8 to 22)	18	M5	⊖	2.3 to 2.5*2
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7		U/T1, V/T2, W/T3	14	2 to 14 (5.5 to 14)	18	M5	⊖	2.3 to 2.5*2
	−, +1, +2	2	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		−, +1, +2	22	2 to 38 (8 to 38)	20	M6	⑤	5 to 5.5
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7		B1, B2	5.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
4003	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4039	R/L1, S/L2, T/L3	14	2 to 14 (3.5 to 14)	18	M5	⊖	2.3 to 2.5*2
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7		U/T1, V/T2, W/T3	14	2 to 14 (5.5 to 14)	18	M5	⊖	2.3 to 2.5*2
	−, +1, +2	2	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		−, +1, +2	22	2 to 22 (3.5 to 22)	18	M5	⊖	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7		B1, B2	8	2 to 8 (2 to 8)	10	M4	⊖	1.5 to 1.7
4005	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4045	R/L1, S/L2, T/L3	14	2 to 14 (3.5 to 14)	18	M5	⊖	2.3 to 2.5*2
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7		U/T1, V/T2, W/T3	14	2 to 14 (5.5 to 14)	18	M5	⊖	2.3 to 2.5*2
	−, +1, +2	2	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		−, +1	22	2 to 22 (3.5 to 22)	18	M5	⊖	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7		B1, B2	14	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
4006	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4060	R/L1, S/L2, T/L3	22	2 to 22 (3.5 to 22)	18	M5	⊖	2.3 to 2.5*2
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7		U/T1, V/T2, W/T3	22	2 to 22 (3.5 to 22)	18	M5	⊖	2.3 to 2.5*2
	−, +1, +2	2	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		−, +1	30	2 to 30 (3.5 to 30)	18	M5	⊖	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7		B1, B2	14	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
4007	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4075	R/L1, S/L2, T/L3	30	2 to 30 (5.5 to 30)	18	M5	⊖	2.3 to 2.5*2
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7		U/T1, V/T2, W/T3	30	2 to 30 (5.5 to 30)	18	M5	⊖	2.3 to 2.5*2
	−, +1, +2	2	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		−, +1	38	2 to 38 (22 to 38)	20	M6	⑤	5 to 5.5
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7		B1, B2	22	2 to 22 (3.5 to 22)	18	M5	⊖	2.3 to 2.5*2
4009	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4091	R/L1, S/L2, T/L3	38	22 to 60 (38 to 60)	27	M6	⑤	8 to 9
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7		U/T1, V/T2, W/T3	38	22 to 60 (38 to 60)	27	M6	⑤	8 to 9
	−, +1, +2	3.5	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		−, +1	50	30 to 80 (50 to 80)	27	M8	⑥	10 to 12
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7		B1, B2	30	8 to 30 (8 to 30)	21	M6	⛔	3 to 3.5
4015	R/L1, S/L2, T/L3	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4112	R/L1, S/L2, T/L3	60*4	50 to 100 (80 to 100)	37	M10	⑧	12 to 14
	U/T1, V/T2, W/T3	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7		U/T1, V/T2, W/T3	60*4	50 to 125 (80 to 125)	37	M10	⑧	12 to 14
	−, +1, +2	5.5	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		−, −, +1, +1*3	30*4	22 to 50 (50)	28	M6	⑤	8 to 9
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7		B1, B2	50	30 to 80*5 (50 to 80)*5	28	M8	⑥	8 to 9
4018	R/L1, S/L2, T/L3	8	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4150	R/L1, S/L2, T/L3	80	50 to 100 (80 to 100)	37	M10	⑧	12 to 14
	U/T1, V/T2, W/T3	5.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7		U/T1, V/T2, W/T3	80	50 to 125 (80 to 125)	37	M10	⑧	12 to 14
	−, +1, +2	14	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		−, −, +1, +1*3	38*4	22 to 50 (50)	28	M6	⑤	8 to 9
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7		B1, B2	60	30 to 80*5 (50 to 80)*5	28	M8	⑥	8 to 9
4024	R/L1, S/L2, T/L3	14	2 to 22 (8 to 22)	18	M5	⊖	2.3 to 2.5*2								
	U/T1, V/T2, W/T3	8	2 to 14 (5.5 to 14)	18	M5	⊖	2.3 to 2.5*2								
	−, +1, +2	14	2 to 38 (8 to 38)	20	M6	⑤	5 to 5.5								
	B1, B2	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7								

*1: Remove the insulator from the tips of wires to the length shown in "Wire Stripping Length."
*2: When using wire with a gauge over 30 mm², tighten to a tightening torque of 4.1 to 4.5 N·m.
*3: Terminals - and + have two screws. Recommended Gauge means the wire gauge of one terminal.
*4: Use cables in the range of applicable gauges to meet the IP20 protective level.
*5: A junction terminal is required when connecting a braking unit (CDBR-series) or a braking resistor unit (LKEB-series).

Note: The recommended wire gauges based on drive continuous current ratings using 75°C 600 V class 2 heat resistant indoor PVC wire.
Assume the following usage conditions:
- Ambient temperature: 40°C or lower
- Wiring distance: 100 m or shorter
- Rated current value

Dimensions

Enclosures

200 V Class

Catalog Code CR70A⬚		2003	2005	2008	2011	2014	2018	2025	2033	2047	2060	2075	2088	2115	2145	2180	2215	2283	2346	2415
Max. Applicable Motor Capacity	kW	0.4	0.75	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
IP20/UL Open Type		IP20 supported with standard model																		
IP20/UL Type 1		Option supported (Install UL Type 1 kit on IP20/UL Open Type drive)																		*

400 V Class

Catalog Code CR70A⬚		4002	4003	4005	4006	4007	4009	4015	4018	4024	4031	4039	4045	4060	4075
Max. Applicable Motor Capacity	kW	0.4	0.75	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37
IP20/UL Open Type		IP20 supported with standard model													
IP20/UL Type 1		Option supported (Install UL Type 1 kit on IP20/UL Open Type drive)													

Catalog Code CR70A⬚		4091	4112	4150	4180	4216	4260	4304	4371	4414	4453	4605
Max. Applicable Motor Capacity	kW	45	55	75	90	110	132	160	200	220	250	315
IP20/UL Open Type		IP20 supported with standard model										
IP20/UL Type 1		Option supported (Install UL Type 1 kit on IP20/UL Open Type drive)							*	*	*	*

*: UL Type 1 is not available for this capacity.

■IP20/UL Open Type

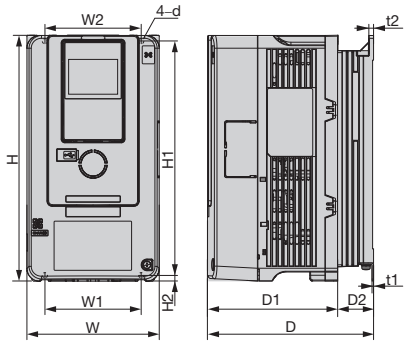


Figure 1

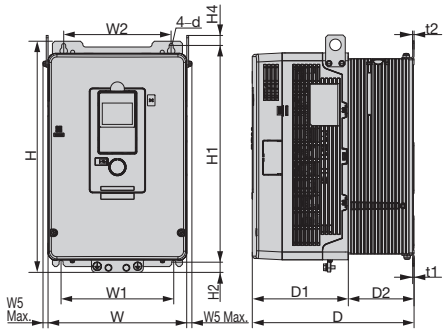


Figure 2

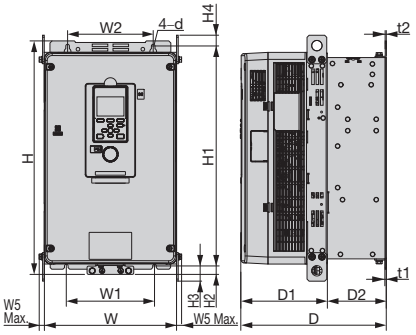


Figure 3

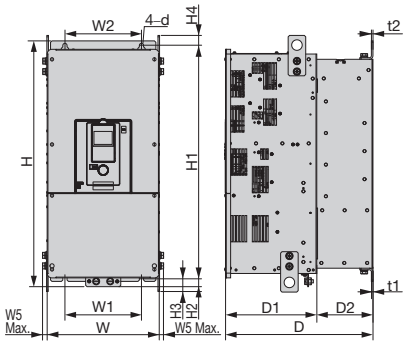


Figure 4

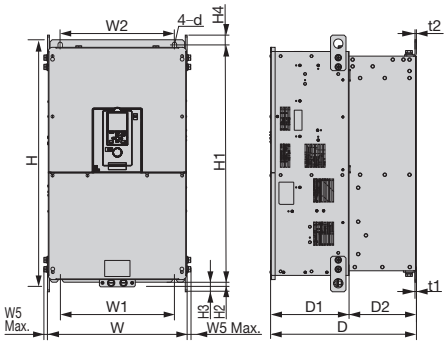


Figure 5

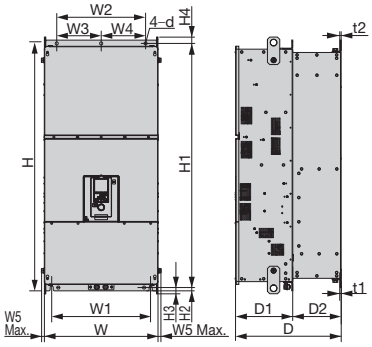


Figure 6

200 V Class

Catalog Code CR70A⬚⬚	Figure	Dimensions mm																	Weight kg
		W	H	D	D1	D2	W1	W2	W3	W4	W5	H1	H2	H3	H4	t1	t2	d	
2003	1	140	260	176	138	38	102	102	—	—	—	248	6	—	—	1.6	5	M5	3.5
2005																			
2008																			
2011																			
2014	1	140	260	211	138	73	102	102	—	—	—	248	6	—	—	1.6	5	M5	3.9
2018																			
2025	1	140	260	211	138	73	102	102	—	—	—	248	6	—	—	1.6	5	M5	4.2
2033																			
2047	1	180	300	202	134	68	140	140	—	—	—	284	8	—	—	1.6	1.6	M5	6.0
2060	1	220	350	227	140	87	192	192	—	—	—	335	8	—	—	2.3	2.3	M6	8.5
2075	1	220	350	227	140	87	192	192	—	—	—	335	8	—	—	2.3	2.3	M6	9
2088	2	240	400	280	166	114	195	186	—	—	12	375	17.5	—	17.5	2.3	2.3	M6	22
2115	3	255	450	280	166	114	170	165	—	—	12	424	16	29	21	2.3	2.3	M6	24
2145	3	264	543	335	186	149	190	182	—	—	12	516	17.5	28.5	20.5	2.3	2.3	M8	39
2180	3	264	543	335	186	149	190	182	—	—	12	516	17.5	28.5	20.5	2.3	2.3	M8	40
2215	4	312	700	420	260	160	218	218	—	—	18	659	28	43.5	28.5	4.5	4.5	M10	67
2283																			
2346	5	440	800	472	254	218	370	370	—	—	20	757	28	44	30	4.5	4.5	M12	104
2415	5	440	800	472	254	218	370	370	—	—	20	757	28	44	30	4.5	4.5	M12	119

400 V Class

Catalog Code CR70A⬚⬚	Figure	Dimensions mm																	Weight kg
		W	H	D	D1	D2	W1	W2	W3	W4	W5	H1	H2	H3	H4	t1	t2	d	
4002	1	140	260	176	138	38	102	102	—	—	—	248	6	—	—	1.6	5	M5	3.5
4003																			
4005																			
4006	1	140	260	211	138	73	102	102	—	—	—	248	6	—	—	1.6	5	M5	3.9
4007																			
4009																			
4015	1	140	260	211	138	73	102	102	—	—	—	248	6	—	—	1.6	5	M5	4.2
4018																			
4024	1	180	300	202	134	68	140	140	—	—	—	284	8	—	—	1.6	1.6	M5	6.0
4031																			
4039	1	220	350	227	140	87	192	192	—	—	—	335	8	—	—	2.3	2.3	M6	7.5
4045	1	220	350	246	140	106	192	192	—	—	—	335	8	—	—	2.3	2.3	M6	12
4060	2	240	400	280	166	114	195	186	—	—	12	375	17.5	—	17.5	2.3	2.3	M6	17
4075	3	255	450	280	166	114	170	165	—	—	12	424	16	29	21	2.3	2.3	M6	22
4091	3	255	450	280	166	114	170	165	—	—	12	424	16	29	21	2.3	2.3	M6	25
4112	3	264	543	335	186	149	190	182	—	—	12	516	17.5	28.5	20.5	2.3	2.3	M8	38
4150	3	264	543	335	186	149	190	182	—	—	12	516	17.5	28.5	20.5	2.3	2.3	M8	39
4180	4	312	700	420	260	160	218	218	—	—	18	659	28	43.5	28.5	4.5	4.5	M10	71
4216																			
4260																			
4304	5	440	800	472	254	218	370	370	—	—	20	757	28	44	30	4.5	4.5	M12	122
4371	5	440	800	472	254	218	370	370	—	—	20	757	28	44	30	4.5	4.5	M12	126
4414	6	510	1136	480	260	220	450	450	225	225	20	1093	25.5	43.5	30.5	4.5	4.5	M12	198
4453																			
4605	6	510	1136	480	260	220	450	450	225	225	20	1093	25.5	43.5	30.5	4.5	4.5	M12	207

Note: External and mounting dimensions are different for standard mounting and panel through mounting.
Please refer to page 39 for panel through mounting.

Dimensions

■IP20/UL Type 1

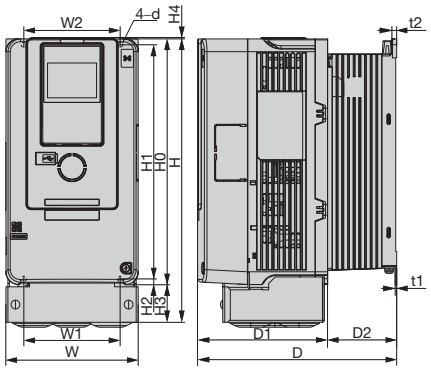


Figure 1

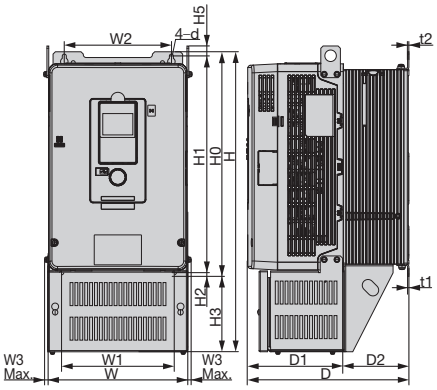


Figure 2

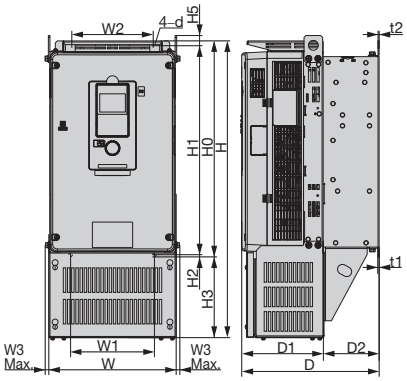


Figure 3

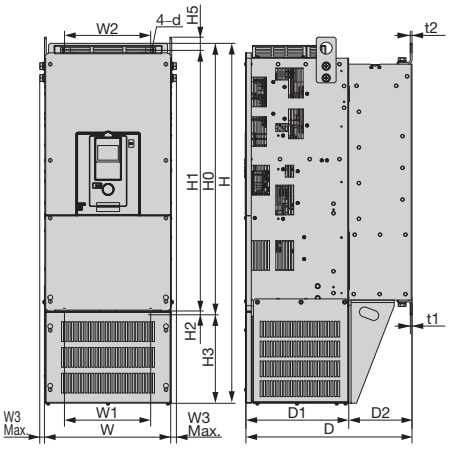


Figure 4

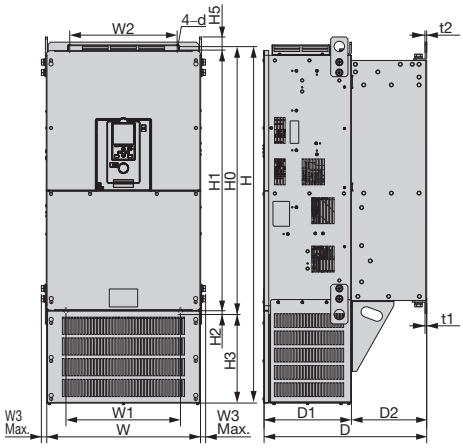


Figure 5

200 V Class: IP20/UL Type 1

Catalog Code CR70A⬚	Figure	Dimensions mm																	Weight kg	UL Type 1 Kit Model (Code No.)
		W	H	D	D1	D2	W1	W2	W3	H0	H1	H2	H3	H4	H5	t1	t2	d		
2003	1	140	300	176	138	38	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.1	900-192-121-001 (100-202-326)
2005																				
2008																				
2011																				
2014	1	140	300	211	138	73	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.5	900-192-121-001 (100-202-326)
2018																				
2025	1	140	300	211	138	73	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.8	900-192-121-001 (100-202-326)
2033																				
2047	1	180	340	202	134	68	140	140	—	300	284	8	40	1.5	—	1.6	1.6	M5	7.0	900-192-121-002 (100-202-327)
2060	1	220	400	227	140	87	192	192	—	350	335	8	50	1.5	—	2.3	2.3	M6	9	900-192-121-003 (100-202-328)
2075	1	220	435	227	140	87	192	192	—	350	335	8	85	1.5	—	2.3	2.3	M6	10	900-192-121-004 (100-202-329)
2088	2	244	500	280	166	114	195	186	10	400	375	17.5	100	—	17.5	2.3	2.3	M6	24	900-192-121-005 (100-202-330)
2115	3	259	580	280	166	114	170	165	10	450	424	16	130	—	21	2.3	2.3	M6	27	900-192-121-006 (100-208-526)
2145	3	268	700	335	186	149	190	182	10	543	516	17.5	157	—	20.5	2.3	2.3	M8	44	900-192-121-007 (100-208-527)
2180	3	268	770	335	186	149	190	182	10	543	516	17.5	227	—	20.5	2.3	2.3	M8	46	900-192-121-008 (100-208-528)
2215	4	316	915	420	260	160	218	218	16	700	659	28	215	—	28.5	4.5	4.5	M10	72	900-192-121-009 (100-208-549)
2283																				
2346	5	444	1045	472	254	218	370	370	18	800	757	28	245	—	30	4.5	4.5	M12	113	900-192-121-010 (100-213-136)

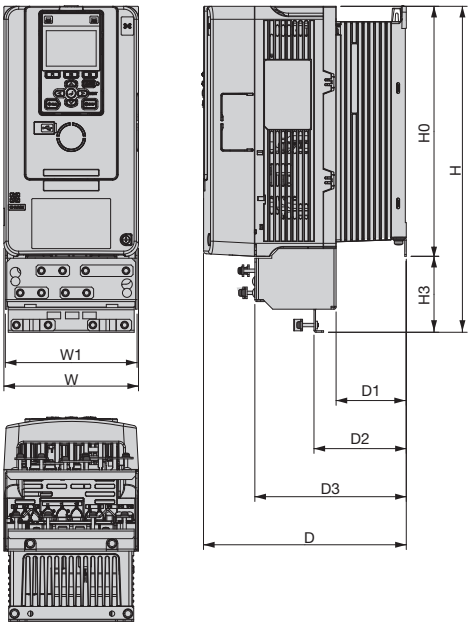
400 V Class: IP20/UL Type 1

Catalog Code CR70A⬚	Figure	Dimensions mm																	Weight kg	UL Type 1 Kit Model (Code No.)
		W	H	D	D1	D2	W1	W2	W3	H0	H1	H2	H3	H4	H5	t1	t2	d		
4002	1	140	300	176	138	38	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.1	900-192-121-001 (100-202-326)
4003																				
4005																				
4006	1	140	300	211	138	73	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.5	900-192-121-001 (100-202-326)
4007																				
4009																				
4015	1	140	300	211	138	73	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.8	900-192-121-001 (100-202-326)
4018																				
4024	1	180	340	202	134	68	140	140	—	300	284	8	40	1.5	—	1.6	1.6	M5	7.0	900-192-121-002 (100-202-327)
4031																				
4039	1	220	400	227	140	87	192	192	—	350	335	8	50	1.5	—	2.3	2.3	M6	8.5	900-192-121-003 (100-202-328)
4045	1	220	400	246	140	106	192	192	—	350	335	8	50	1.5	—	2.3	2.3	M6	13	900-192-121-003 (100-202-328)
4060	2	244	500	280	166	114	195	186	10	400	375	17.5	100	—	17.5	2.3	2.3	M6	20	900-192-121-005 (100-202-330)
4075	3	259	580	280	166	114	170	165	10	450	424	16	130	—	21	2.3	2.3	M6	25	900-192-121-006 (100-208-526)
4091	3	259	580	280	166	114	170	165	10	450	424	16	130	—	21	2.3	2.3	M6	29	900-192-121-006 (100-208-526)
4112	3	268	700	335	186	149	190	182	10	543	516	17.5	157	—	20.5	2.3	2.3	M8	43	900-192-121-007 (100-208-527)
4150	3	268	700	335	186	149	190	182	10	543	516	17.5	157	—	20.5	2.3	2.3	M8	44	900-192-121-007 (100-208-527)
4180	4	316	915	420	260	160	218	218	16	700	659	28	215	—	28.5	4.5	4.5	M10	76	900-192-121-009 (100-208-549)
4216																				
4260																				
4304	5	444	1045	472	254	218	370	370	18	800	757	28	245	—	30	4.5	4.5	M12	130	900-192-121-010 (100-213-136)

Note: UL Type 1 kit (option) is required. The values in the table are the dimensions for the UL Type 1 kit mounted to the IP20/UL Open Type drive.

Dimensions

■ IP20/UL Open Type (Shield Clamp Kit)



200 V Class: IP20/UL Open Type (Shield Clamp Kit)

Catalog Code CR70A⬚⬚	Dimensions mm									Shield Clamp Kit Model (Code No.)
	W	H	D	D1	D2	D3	W1	H0	H3	
2003	140	339	176	38	61	123	137	260	79	900-195-896-001 (100-206-983)
2005										
2008										
2011										
2014	140	339	211	73	96	158	137	260	79	900-195-896-001 (100-206-983)
2018										
2025										
2033										
2047	180	439	202	68	93	148	175	298	141	900-195-896-002 (100-206-984)
2060	220	468	227	87	112	174	220	350	118	900-195-896-003 (100-229-140)
2075	220	468	227	87	112	174	220	350	118	900-195-896-004 (100-229-141)
2088	240	490	280	114	139	217	244	390	100	900-195-896-007 (100-229-144)
2115	255	582	280	114	151	226	259	440	142	900-195-896-009 (100-229-146)
2145	264	697	335	149	189	266	268	533	164	900-195-896-012 (100-233-647)
2180	264	697	335	149	189	266	268	533	164	900-195-896-013 (100-233-700)

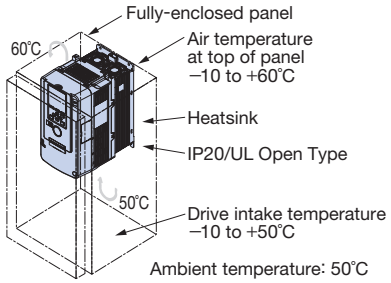
400 V Class: IP20/UL Open Type (Shield Clamp Kit)

Catalog Code CR70A⬚⬚	Dimensions mm									Shield Clamp Kit Model (Code No.)
	W	H	D	D1	D2	D3	W1	H0	H3	
4002	140	339	176	38	61	123	137	260	79	900-195-896-001 (100-206-983)
4003										
4005										
4006	140	339	211	73	96	158	137	260	79	900-195-896-001 (100-206-983)
4007										
4009										
4015										
4018										
4024	180	439	202	68	93	148	175	298	141	900-195-896-002 (100-206-984)
4031										
4039	220	468	227	87	112	174	220	350	118	900-195-896-005 (100-229-142)
4045	220	468	227	87	112	174	220	350	118	900-195-896-006 (100-229-143)
4060	240	490	280	114	139	217	244	390	100	900-195-896-008 (100-229-145)
4075	255	557	280	114	151	226	259	440	117	900-195-896-010 (100-233-645)
4091	255	582	280	114	151	226	259	440	142	900-195-896-011 (100-233-646)
4112	264	697	335	149	189	266	268	533	164	900-195-896-014 (100-233-701)
4150	264	697	335	149	189	266	268	533	164	900-195-896-012 (100-233-647)

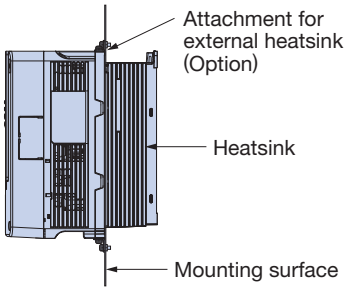
Fully-Enclosed Design and Drive Watt Loss Data

When you install the drive in a control panel, the maximum intake air temperature is 50°C. The heatsink can alternatively be mounted outside the control panel, thus reducing the amount of heat inside the panel and allowing for a more compact set up.

· Cooling Design for Fully-Enclosed Panel

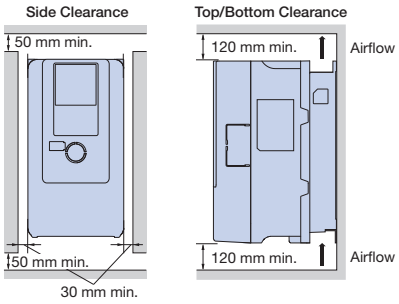


· Mounting the External Heatsink



Intake air temperature for external heatsink
Open chassis side: 50 °C
Heatsink side: 50 °C
Use only an IP20/UL Open Type for the external heatsink.

· Ventilation Space



For installing the drive (IP20/UL Open Type) with capacity of 200 V/400 V class 22 kW and above, be sure to leave enough clearance during installation for main circuit wiring for maintenance.

Drive Watt Loss Data

200 V Class

Catalog Code CR70A2		003	005	008	011	014	018	025	033	047	060	075	088	115	145
Rated Output Current	A	3.2	5	8	11	14	17.5	25	33	47	60	75	88	115	145
Carrier Frequency	kHz	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Watt Loss* W	Internal	5	9	16	21	27	32	36	53	59	110	134	147	209	265
	Heatsink	7	13	27	42	59	74	95	126	155	299	357	467	613	748
	Total Watt Loss	12	22	43	63	86	106	131	179	214	409	491	614	822	1013

Catalog Code CR70A2		180	215	283	346	415
Rated Output Current	A	180	215	283	346	415
Carrier Frequency	kHz	2	2	2	2	2
Watt Loss* W	Internal	297	362	459	520	603
	Heatsink	935	1144	1508	1769	2216
	Total Watt Loss	1232	1506	1967	2289	2819

400 V Class

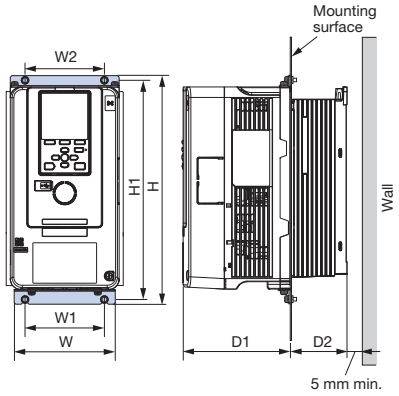
Catalog Code CR70A4		002	003	005	006	007	009	015	018	024	031	039	045	060	075
Rated Output Current	A	1.8	3.4	4.8	5.5	7.2	9.2	14.8	18	24	31	39	45	60	75
Carrier Frequency	kHz	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Watt Loss* W	Internal	13	12	21	28	35	44	55	63	93	121	132	141	188	188
	Heatsink	14	18	32	50	70	86	116	141	206	286	331	365	497	557
	Total Watt Loss	27	30	53	78	105	130	171	204	299	407	463	506	685	745

Catalog Code CR70A4		091	112	150	180	216	260	304	371	414	453	605
Rated Output Current	A	91	112	150	180	216	260	304	371	414	453	605
Carrier Frequency	kHz	2	2	2	2	2	2	2	2	2	2	2
Watt Loss* W	Internal	225	275	385	397	564	573	728	976	1118	1272	1495
	Heatsink	658	804	1012	1279	1484	1709	2075	2778	3133	3559	4500
	Total Watt Loss	883	1079	1397	1676	2048	2282	2803	3754	4251	4831	5995

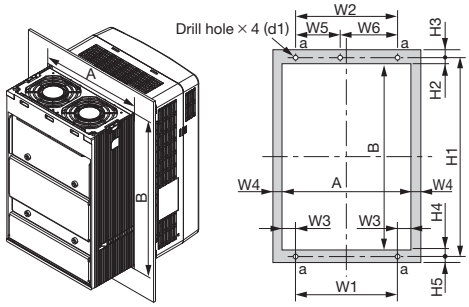
*: Watt loss is calculated in the following conditions:
·200 V class: Input voltage 220 V, power frequency 60 Hz, load ratio 100%
·400 V class: Input voltage 440 V, power frequency 60 Hz, load ratio 100%
Contact your Yaskawa or nearest agent when not calculating watt loss in the above conditions.

Attachment for External Heatsink

When the heatsink is installed outside the drive, additional attachments are required. Additional attachments are not required for models CR70A2088 and above, and CR70A4060 and above because installing a heatsink outside the drive can be performed on these models by replacing their standard mounting feet.
Contact Yaskawa if an instruction manual is needed.



Panel Modification for External Heatsink



Panel cut out dimensions

Note: The shaded area is the size when in installing the gasket. Guarantee a wider and higher gasket width space than the following W and H information.

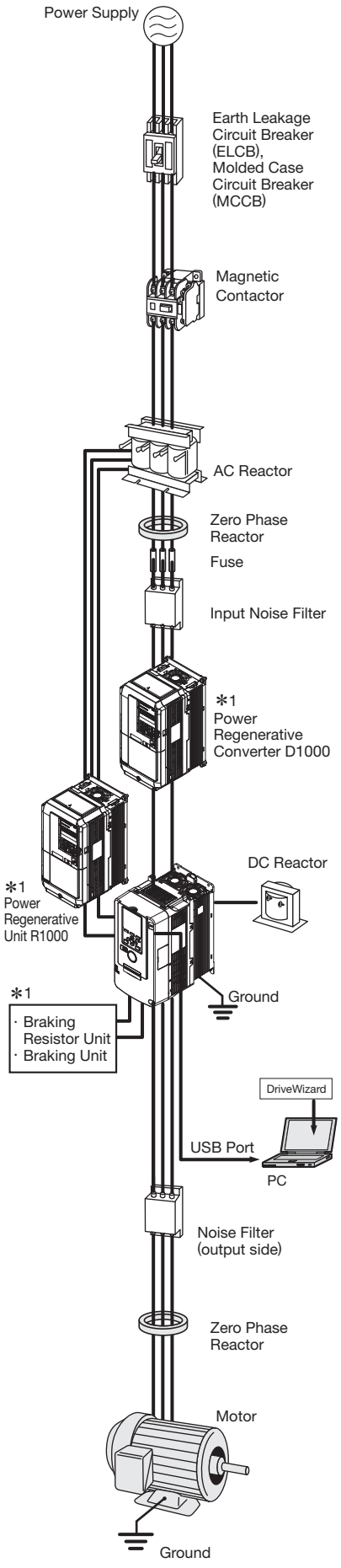
200 V Class

Catalog Code CR70A⬚⬚	Exterior and Mounting Dimensions and Cut-out Dimensions mm																Attachment for External Heatsink Model (Code No.)
	W	H	D1	D2	W1	W2	W3	W4	H1	H2	H3	H4	H5	A	B	d1	
2003	140	294	138	38	102	102	16	3	282	23	6	26	6	134	233	M5	900-193-209-001 (100-203-229)
2005																	
2008																	
2011																	
2014	140	294	138	73	102	102	16	3	282	23	6	26	6	134	233	M5	900-193-209-001 (100-203-229)
2018																	
2025																	
2033																	
2047	180	329	134	68	140	140	17	3	318	23.5	5	24.5	6	174	270	M5	900-193-209-002 (100-203-230)
2060	220	384	140	87	192	192	11	3	371	27	7	25	6	214	319	M6	900-193-209-003 (100-203-231)
2075																	
2088	240	400	166	114	195	204	14.5	8	385	19.5	7.5	19.5	7.5	224	346	M6	—
2115	255	450	166	114	170	210	34.5	8	436	20	8	20	6	239	396	M6	—
2145	264	543	186	149	190	220	29	8	527	19.5	8.5	20.5	7.5	248	487	M8	—
2180																	
2215	312	700	260	160	218	263	39	8	675	33	12	32	13	296	610	M10	—
2283																	
2346	440	800	254	218	370	310	23	12	773	31.5	14	31.5	13	416	710	M12	—
2415																	

400 V Class

Catalog Code CR70A⬚⬚	Exterior and Mounting Dimensions and Cut-out Dimensions mm																		Attachment for External Heatsink Model (Code No.)
	W	H	D1	D2	W1	W2	W3	W4	W5	W6	H1	H2	H3	H4	H5	A	B	d1	
4002	140	294	138	38	102	102	16	3	—	—	282	23	6	26	6	134	233	M5	900-193-209-001 (100-203-229)
4003																			
4005																			
4006	140	294	138	73	102	102	16	3	—	—	282	23	6	26	6	134	233	M5	900-193-209-001 (100-203-229)
4007																			
4009																			
4015																			
4018																			
4024	180	329	134	68	140	140	17	3	—	—	318	23.5	5	24.5	6	174	270	M5	900-193-209-002 (100-203-230)
4031																			
4039	220	384	140	87	192	192	11	3	—	—	371	27	7	25	6	214	319	M6	900-193-209-003 (100-203-231)
4045				106															
4060	240	400	166	114	195	204	14.5	8	—	—	385	19.5	7.5	19.5	7.5	224	346	M6	—
4075	255	450	166	114	170	210	34.5	8	—	—	436	20	8	20	6	239	396	M6	—
4091																			
4112	264	543	186	149	190	220	29	8	—	—	527	19.5	8.5	20.5	7.5	248	487	M8	—
4150																			
4180	312	700	260	160	218	263	39	8	—	—	675	33	12	32	13	296	610	M10	—
4216																			
4260																			
4304	440	800	254	218	370	310	23	12	—	—	773	31.5	14	31.5	13	416	710	M12	—
4371																			
4414	510	1140	260	220	450	404	18	12	179	225	1110	34	15	34	15	486	1042	M12	—
4453																			
4605																			

Peripheral Devices and Options



Name	Purpose	Model, Manufacturer	Page
Power Regenerative Converter D1000	Effectively utilizes regenerative energy as energy for other equipment. Suppresses the power line harmonics ($K_5 = 0$) and satisfies the Guidelines of Harmonics Reduction.	CIMR-DA□□□□	P.53
Power Regenerative Unit R1000	Effectively utilizes regenerative energy as energy for other equipment.	CIMR-RA□□□□	P.53
Earth Leakage Circuit Breaker (ELCB)	Always install an ELCB on the power-supply side to protect the power supply system and to prevent an overload at the occurrence of shortcircuit, and to protect the drive from ground faults that could result in electric shock or fire. Note: When an ELCB is installed for the upper power supply system, an MCCB can be used instead of an ELCB. Choose an ELCB designed to minimize harmonics specifically for AC drives. Use one ELCB per drive, each with a current rating of at least 30 mA.	NV series∗2 by Mitsubishi Electric Corporation	P.42
Molded Case Circuit Breaker (MCCB)	Always install a circuit breaker on the power-supply side to protect the power supply system and to prevent an overload at the occurrence of a short-circuit.	NF series∗2 by Mitsubishi Electric Corporation	P.42
Magnetic Contactor	Interrupts the power supply to the drive. In addition to protecting drive circuitry, a magnetic contactor also prevents damage to a braking resistor if used.	SC series∗2 by Fuji Electric FA Components & Systems Co., Ltd	P.43
AC Reactor	Improve the input power ratio of the drive. The DC reactor is built in for models of catalog codes CR70A2088 and above, and CR70A4045 and above. (The DC reactor is optional for models of catalog codes CR70A2075 and below, and CR70A4039 and below.) · Used for harmonic current suppression and total improving power factor. Should be used if the power supply capacity is larger than 600 kVA. · Suppresses harmonic current · Improves the power factor of the input power supply	UZBA series	P.44
DC Reactor		UZDA series	P.46
Zero Phase Reactor	Reduces noise from the line that enters into the drive input power system. Should be installed as close as possible to the drive. Can be used on both the input and output sides.	F6045GB F11080GB F200160PB by Hitachi Metals, Ltd.	P.47
Fuse / Fuse Holder	Protects internal circuitry in the event of component failure. Fuse should be connected to the input terminal of the drive. Note: Refer to the instruction manual for information on UL approval.	CR/CS series by BUSSMANN	P.48
Input Noise Filter	Reduces noise from the line that enters into the drive input power system. Should be installed as close as possible to the drive. Note: For CE Marking (EMC Directive) compliant models, refer to CR700 Technical Manual.	RTEN seies by TDK-Lambda Corporation B84143B series by EPCOS, Inc. FN series by Schaffner EMC K.K.	P.50
Output Noise Filter	Reduces noise from the line that enters into the drive input power system. Should be installed as close as possible to the drive.	LF series by NEC Tokin Corporation	P.52
External Heatsink Attachment for Braking Unit	Use the external heatsink attachment for installation with the heatsink outside the enclosure.	EZZ021711A	P.59
Braking Resistor Unit	Used to shorten the deceleration time by dissipating regenerative energy through a resistor unit (10% ED). A thermal overload relay is built in (10% ED).	LKEB series	P.54
Braking Unit	Shortened deceleration time results when used with a Braking Resistor Unit.	CDBR series	P.54
PC cable	Connect the drive and PC when using DriveWizard. The cable length must be 3 m or less.	Commercially available USB2.0 A-miniB cable.	P.61
LED Keypad	For easier operation using the LED screen when connecting the optional LED Keypad to the drive. Allows for remote operation. Includes a Copy function for saving drive settings.	JVOP-KPLEA04AAA KPLEA04MAA	P.60
Bluetooth LCD Keypad	Bluetooth connection enables the drive to be operated from a smartphone.	JVOP-KPLCC04ABA KPLCC04MBA	P.60
Keypad Extension Cable	It is used as an extension cable when operating the keypad remotely.	WV001: 1 m WV003: 3 m	P.60
Frequency Meter, Current Meter	Allows the user to set and monitor the frequency, current, and voltage using an external device.	DCF-6A	P.62
Frequency Setting Potentiometer (2 kΩ)		RV30YN	P.62
Frequency Meter Adjusting Potentiometer (20 kΩ)		RV30YN20S	P.62
Control Dial for Frequency Setting Potentiometer		K-2901-M	P.62
Output Voltage Meter		SCF-12NH	P.63
Potential Transformer		UPN-B	P.63
Attachment for External Heatsink	Required for heatsink installation. Current derating may be needed when using a heatsink.	–	P.39

∗1: Select peripheral devices to match how regenerative energy is processed.
∗2: Recommended by Yaskawa. Contact the manufacturer in question for availability and specifications of non-Yaskawa products.

Option Cards

RoHS compliant. Shipment of factory installed option is available. Contact Yaskawa.

Type	Name	Model	Function	Manual No.
Speed Reference Card	Analog Input	AI-A3	Enables high-precision and high-resolution analog speed reference setting. · Input signal level: −10 to +10 Vdc (20 kΩ), 4 to 20 mA (250 Ω) · Input channels: 3 channels, DIP switch for input voltage/input current selection · Input resolution: Input voltage 13 bit signed (1/8192) Input current 1/4096	TOBPC73060078
	Digital Input	DI-A3	Enables 16-bit digital speed reference setting. · Input signal: 16 bit binary, 4 digit BCD +sign signal +set signal · Input voltage: 24 V (isolated) · Input current: 8 mA User-set: 8 bit, 12 bit, 16 bit	TOBPC73060080
Communications Option Card	MECHATROLINK-Ⅱ Interface	SI-T3	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through MECHATROLINK-II communication with the host controller. Note: Use options with software versions of 6108 or later.	TOEPC73060086 SIEPC73060086
	MECHATROLINK-Ⅲ Interface	SI-ET3	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through MECHATROLINK-III communication with the host controller. Note: Use options with software versions of 6202 or later.	TOEPC73060088 SIEPC73060088
	CC-Link Interface	SI-C3*	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through CC-Link communication with the host controller.	TOBPC73060083 SIEPC73060083
	DeviceNet Interface	SI-N3*	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through DeviceNet communication with the host controller. Note: Use options with software versions of 1114 or later.	TOBPC73060084 SIEPC73060084
	LONWORKS Interface	SI-W3*	Used for HVAC control, running or stopping U1000, setting or referencing parameters, and monitoring output current, watt-hours, or similar items through LONWORKS communications with the host controller.	TOEPC73060093 SIJPC73060093
	PROFIBUS-DP Interface	SI-P3*	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through PROFIBUS-DP communication with the host controller.	TOBPC73060082 SIEPC73060082
	CANopen Interface	SI-S3*	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through CANopen communication with the host controller.	TOBPC73060085 SIEPC73060085
	PROFINET Interface	SI-EP3	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through PROFINET communication with the host controller. Note: The drive is compatible with option software versions 4400 and later.	TOEPC73060089 SIEPC73060089
Monitor Option Card	Analog Monitor	AO-A3	Outputs analog signal for monitoring drive output state (output freq., output current etc.). · Output resolution: 11 bit signed (1/2048) · Output voltage: −10 to +10 Vdc (non-isolated) · Terminals: 2 analog outputs	TOBPC73060079
	Digital Output	DO-A3	Outputs isolated type digital signal for monitoring drive run state (alarm signal, zero speed detection, etc.) · Terminals: 6 photocoupler outputs (48 V, 50 mA or less) 2 relay contact outputs (250 Vac, 1 A or less 30 Vdc, 1 A or less)	TOBPC73060081
PG Speed Controller Card	Complimentary Type PG	PG-B3	For control modes requiring a PG encoder for motor feedback. · Phase A, B, and Z pulse (3-phase) inputs (complementary type) · Max. input frequency: 50 kHz · Pulse monitor output: Open collector, 24 V, max. current 30 mA · Power supply output for PG: 12 V, max. current 200 mA	TOBPC73060075
	Line Driver PG	PG-X3	For control modes requiring a PG encoder for motor feedback. · Phase A, B, and Z pulse (differential pulse) inputs (RS-422) · Max. input frequency: 300 kHz · Pulse monitor output: RS-422 · Power supply output for PG: 5 V or 12 V, max. current 200 mA	TOBPC73060076
	Resolver Interface for TS2640N321E64	PG-RT3	For control modes requiring a PG encoder for motor feedback. Can be connected to the TS2640N321E64 resolver made by Tamagawa Seiki Co., Ltd. And electrically compatible resolvers. The representative electrical characteristics of the TS2640N321E64 are as follows. · Input voltage: 7 Vac rms 10 kHz · Transformation ratio: 0.5 ± 5% · maximum input current: 100 mArms · Wiring length: 10 m max.	TOBPC73060087

*: Under development

Note: 1. Each communication option card requires a separate configuration file to link to the network.
2. PG speed controller card is required for PG control.

Peripheral Devices and Options (continued)

Earth Leakage Circuit Breaker (ELCB), Molded Case Circuit Breaker (MCCB)

Device selection is based on the motor capacity.
Make sure that the rated breaking capacity is higher than the shortcircuit current for the power supply. Protect the wiring to withstand the shortcircuit current for the power supply using a combination of fuses if the rated breaking capacity of the ELCB or MCCB is insufficient, such as when the power transformer capacity is large.

Earth Leakage Circuit Breaker
【Mitsubishi Electric Corporation】

Molded Case Circuit Breaker
【Mitsubishi Electric Corporation】

200 V Class

Motor Capacity (kW)	Ground Fault Interrupter						Circuit Breaker					
	Without Reactor*1			With Reactor*1			Without Reactor*1			With Reactor*1		
	Model	Rated Current (A)	Interrupt Capacity (kA) Icu/Ics*2	Model	Rated Current (A)	Interrupt Capacity (kA) Icu/Ics*2	Model	Rated Current (A)	Interrupt Capacity (kA) Icu/Ics*2	Model	Rated Current (A)	Interrupt Capacity (kA) Icu/Ics*2
0.4	NV32-SV	5	10/10	NV32-SV	5	10/10	NF32-SV	5	7.5/7.5	NF32-SV	5	7.5/7.5
0.75	NV32-SV	10	10/10	NV32-SV	10	10/10	NF32-SV	10	7.5/7.5	NF32-SV	10	7.5/7.5
1.5	NV32-SV	15	10/10	NV32-SV	10	10/10	NF32-SV	15	7.5/7.5	NF32-SV	10	7.5/7.5
2.2	NV32-SV	20	10/10	NV32-SV	15	10/10	NF32-SV	20	7.5/7.5	NF32-SV	15	7.5/7.5
3 3.7	NV32-SV	30	10/10	NV32-SV	20	10/10	NF32-SV	30	7.5/7.5	NF32-SV	20	7.5/7.5
5.5	NV63-SV	50	15/15	NV63-SV	40	15/15	NF63-SV	50	15/15	NF63-SV	40	15/15
7.5	NV125-SV	60	50/50	NV63-SV	50	15/15	NF125-SV	60	50/50	NF63-SV	50	15/15
11	NV125-SV	75	50/50	NV125-SV	75	50/50	NF125-SV	75	50/50	NF125-SV	75	50/50
15	NV250-SV	125	85/85	NV125-SV	100	50/50	NF250-SV	125	85/85	NF125-SV	100	50/50
18.5	NV250-SV	150	85/85	NV250-SV	125	85/85	NF250-SV	150	85/85	NF250-SV	125	85/85
22	*3	–	–	NV250-SV	150	85/85	*3	–	–	NF250-SV	150	85/85
30	*3	–	–	NV250-SV	175	85/85	*3	–	–	NF250-SV	175	85/85
37	*3	–	–	NV250-SV	225	85/85	*3	–	–	NF250-SV	225	85/85
45	*3	–	–	NV400-SW	250	85/85	*3	–	–	NF400-CW	250	50/25
55	*3	–	–	NV400-SW	300	85/85	*3	–	–	NF400-CW	300	50/25
75	*3	–	–	NV400-SW	400	85/85	*3	–	–	NF400-CW	400	50/25
90	*3	–	–	NV630-SW	500	85/85	*3	–	–	NF630-CW	500	50/25
110	*3	–	–	NV630-SW	600	85/85	*3	–	–	NF630-CW	600	50/25

*1: The AC or DC reactor is connected to the drive.
*2: Icu: Rated ultimate short-circuit breaking capacity
Ics: Rated service short-circuit breaking capacity
*3: 200 V models 22 kW and above come with a built-in DC reactor that improves the power factor.

400 V Class

Motor Capacity (kW)	Ground Fault Interrupter						Circuit Breaker					
	Without Reactor*1			With Reactor*1			Without Reactor*1			With Reactor*1		
	Model	Rated Current (A)	Interrupt Capacity (kA) Icu/Ics*2	Model	Rated Current (A)	Interrupt Capacity (kA) Icu/Ics*2	Model	Rated Current (A)	Interrupt Capacity (kA) Icu/Ics*2	Model	Rated Current (A)	Interrupt Capacity (kA) Icu/Ics*2
0.4	NV32-SV	5	5/5	NV32-SV	5	5/5	NF32-SV	3	2.5/2.5	NF32-SV	3	2.5/2.5
0.75	NV32-SV	5	5/5	NV32-SV	5	5/5	NF32-SV	5	2.5/2.5	NF32-SV	5	2.5/2.5
1.5	NV32-SV	10	5/5	NV32-SV	10	5/5	NF32-SV	10	2.5/2.5	NF32-SV	10	2.5/2.5
2.2	NV32-SV	15	5/5	NV32-SV	10	5/5	NF32-SV	15	2.5/2.5	NF32-SV	10	2.5/2.5
3 3.7	NV32-SV	20	5/5	NV32-SV	15	5/5	NF32-SV	20	2.5/2.5	NF32-SV	15	2.5/2.5
5.5	NV32-SV	30	5/5	NV32-SV	20	5/5	NF32-SV	30	2.5/2.5	NF32-SV	20	2.5/2.5
7.5	NV32-SV	30	5/5	NV32-SV	30	5/5	NF32-SV	30	2.5/2.5	NF32-SV	30	2.5/2.5
11	NV63-SV	50	7.5/7.5	NV63-SV	40	7.5/7.5	NF63-SV	50	7.5/7.5	NF63-SV	40	7.5/7.5
15	NV125-SV	60	25/25	NV63-SV	50	7.5/7.5	NF125-SV	60	25/25	NF63-SV	50	7.5/7.5
18.5	NV125-SV	75	25/25	NV125-SV	60	25/25	NF125-SV	75	25/25	NF125-SV	60	25/25
22	*3	–	–	NV125-SV	75	25/25	*3	–	–	NF125-SV	75	25/25
30	*3	–	–	NV125-SV	100	25/25	*3	–	–	NF125-SV	100	25/25
37	*3	–	–	NV250-SV	125	36/36	*3	–	–	NF250-SV	125	36/36
45	*3	–	–	NV250-SV	150	36/36	*3	–	–	NF250-SV	150	36/36
55	*3	–	–	NV250-SV	175	36/36	*3	–	–	NF250-SV	175	36/36
75	*3	–	–	NV250-SV	225	36/36	*3	–	–	NF250-SV	225	36/36
90	*3	–	–	NV400-SW	250	42/42	*3	–	–	NF400-CW	250	25/13
110	*3	–	–	NV400-SW	300	42/42	*3	–	–	NF400-CW	300	25/13
132	*3	–	–	NV400-SW	350	42/42	*3	–	–	NF400-CW	350	25/13
160	*3	–	–	NV400-SW	400	42/42	*3	–	–	NF400-CW	400	25/13
200	*3	–	–	NV630-SW	500	42/42	*3	–	–	NF600-CW	630	36/18
220	*3	–	–	NV630-SW	630	42/42	*3	–	–	NF600-CW	630	36/18
250	*3	–	–	NV630-SW	630	42/42	*3	–	–	NF600-CW	630	36/18
315	*3	–	–	NV800-SEW	800	42/42	*3	–	–	NF800-CEW	800	36/18

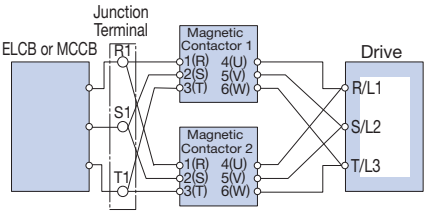
*1: The AC or DC reactor is connected to the drive.
*2: Icu: Rated ultimate short-circuit breaking capacity
Ics: Rated service short-circuit breaking capacity
*3: 400 V models 22 kW and above come with a built-in DC reactor that improves the power factor.

Magnetic Contactor

Base device selection on motor capacity.

Magnetic Contactor
【Fuji Electric FA Components & Systems Co., Ltd】

Wiring a Magnetic Contactor in Parallel



Note: When wiring contactors in parallel, make sure wiring lengths are the same to keep current flow even to the relay terminals.

200 V Class

Motor Capacity (kW)	Without Reactor*1		With Reactor*1	
	Model	Rated Current (A)	Model	Rated Current (A)
0.4	SC-03	11	SC-03	11
0.75	SC-05	13	SC-03	11
1.5	SC-4-0	18	SC-05	13
2.2	SC-N1	26	SC-4-0	18
3	SC-N2	35	SC-N1	26
3.7	SC-N2	35	SC-N1	26
5.5	SC-N2S	50	SC-N2	35
7.5	SC-N3	65	SC-N2S	50
11	SC-N4	80	SC-N4	80
15	SC-N5A	93	SC-N4	80
18.5	SC-N5	93	SC-N5	93
22	*2	–	SC-N6	125
30	*2	–	SC-N7	152
37	*2	–	SC-N8	180
45	*2	–	SC-N10	220
55	*2	–	SC-N11	300
75	*2	–	SC-N12	400
90	*2	–	SC-N12	400
110	*2	–	SC-N14	600

*1: Indicates whether an AC reactor or DC reactor is connected to the drive.
*2: 200 V models 22 kW and above come with a built-in DC reactor that improves the power factor.

400 V Class

Motor Capacity (kW)	Without Reactor*1		With Reactor*1	
	Model	Rated Current (A)	Model	Rated Current (A)
0.4	SC-03	7	SC-03	7
0.75	SC-03	7	SC-03	7
1.5	SC-05	9	SC-05	9
2.2	SC-4-0	13	SC-4-0	13
3	SC-4-1	17	SC-4-1	17
3.7	SC-4-1	17	SC-4-1	17
5.5	SC-N2	32	SC-N1	25
7.5	SC-N2S	48	SC-N2	32
11	SC-N2S	48	SC-N2S	48
15	SC-N3	65	SC-N2S	48
18.5	SC-N3	65	SC-N3	65
22	*2	–	SC-N4	80
30	*2	–	SC-N4	80
37	*2	–	SC-N5	90
45	*2	–	SC-N6	110
55	*2	–	SC-N7	150
75	*2	–	SC-N8	180
90	*2	–	SC-N10	220
110	*2	–	SC-N11	300
132	*2	–	SC-N11	300
160	*2	–	SC-N12	400
200	*2	–	SC-N12	400
220	*2	–	SC-N14	600
250	*2	–	SC-N14	600
315	*2	–	SC-N16	800

*1: The AC or DC reactor is connected to the drive.
*2: 400 V models 22 kW and above come with a built-in DC reactor that improves the power factor.

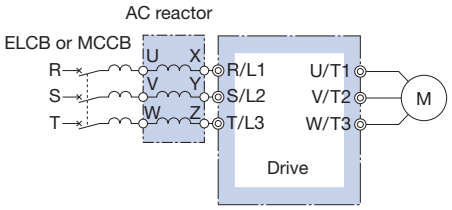
Peripheral Devices and Options (continued)

AC Reactor (UZBA-B for 50/60 Hz Input)

Base device selection on motor capacity.

Lead Wire Type

Connection Diagram



Note: When using low noise type drives (high-carrier frequency of 2.5 kHz or more), do not connect an AC reactor to the output side (U, V, W) of the drive.

Dimensions (mm)

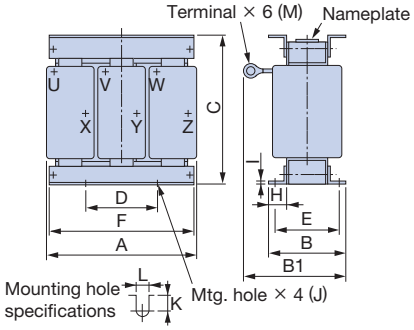


Figure 1

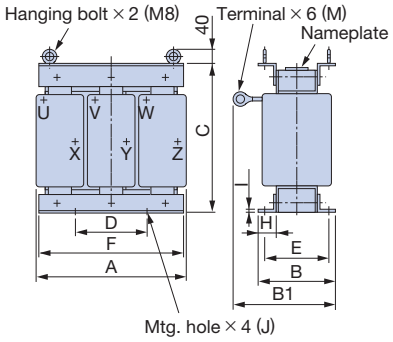
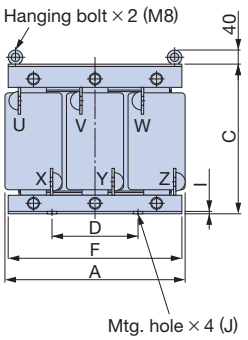


Figure 2



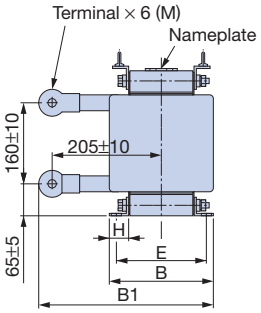


Figure 3

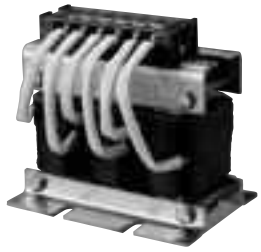
200 V Class

Motor Capacity (kW)	Current (A)	Inductance (mH)	Code No.	Figure	Dimensions (mm)													Weight (kg)	Watt Loss (W)
					A	B	B1	C	D	E	F	H	I	J	K	L	M		
3	20	0.53	100-250-562	1	130	88	114	105	50	70	130	22	3.2	M6	11.5	7	M5	3	35
3.7																			
5.5	30	0.35	100-250-578	1	130	88	119	105	50	70	130	22	3.2	M6	9	7	M5	3	45
7.5	40	0.265	100-250-584	1	130	98	139	105	50	80	130	22	3.2	M6	11.5	7	M6	4	50
11	60	0.18	100-250-594	1	160	105	147.5	130	75	85	160	25	2.3	M6	10	7	M6	6	65
15	80	0.13	100-250-599	1	180	100	155	150	75	80	180	25	2.3	M6	10	7	M8	8	75
18.5	90	0.12	100-250-602	1	180	100	150	150	75	80	180	25	2.3	M6	10	7	M8	8	90
22	120	0.09	100-250-552	1	180	100	155	150	75	80	180	25	2.3	M6	10	7	M10	8	90
30	160	0.07	100-250-557	1	210	100	170	175	75	80	205	25	3.2	M6	10	7	M10	12	100
37	200	0.05	100-250-560	1	210	115	182.5	175	75	95	205	25	3.2	M6	10	7	M10	15	110
45	240	0.044	100-250-574	1	240	126	218	215	150	110	240	25	3.2	M8	8	7	M10	23	125
55	280	0.039	100-250-576	1	240	126	218	215	150	110	240	25	3.2	M8	8	10	M12	23	130
75	360	0.026	100-250-583	1	270	162	241	230	150	130	260	40	5	M8	16	10	M12	32	145
90	500	0.02	100-250-589	2	330	162	281	270	150	130	320	40	4.5	M10	16	10	M12	55	200
110																			

400 V Class

Motor Capacity (kW)	Current (A)	Inductance (mH)	Code No.	Figure	Dimensions (mm)													Weight (kg)	Watt Loss (W)
					A	B	B1	C	D	E	F	H	I	J	K	L	M		
7.5	20	1.06	100-250-564	1	160	90	115	130	75	70	160	25	2.3	M6	10	7	M5	5	50
11	30	0.7	100-250-580	1	160	105	132.5	130	75	85	160	25	2.3	M6	10	7	M5	6	65
15	40	0.53	100-250-586	1	180	100	140	150	75	80	180	25	2.3	M6	10	7	M6	8	90
18.5	50	0.42	100-250-590	1	180	100	145	150	75	80	180	25	2.3	M6	10	7	M6	8	90
22	60	0.36	100-250-596	1	180	100	150	150	75	80	180	25	2.3	M6	10	7	M6	8.5	90
30	80	0.26	100-250-601	1	210	100	150	175	75	80	205	25	3.2	M6	10	7	M8	12	95
37	90	0.24	100-250-604	1	210	115	177.5	175	75	95	205	25	3.2	M6	10	7	M8	15	110
45	120	0.18	100-250-553	1	240	126	193	205	150	110	240	25	3.2	M8	8	10	M10	23	130
55	150	0.15	100-250-554	1	240	126	198	205	150	110	240	25	3.2	M8	8	10	M10	23	150
75	200	0.11	100-250-561	1	270	162	231	230	150	130	260	40	5	M8	16	10	M10	32	135
90	250	0.09	100-250-575	1	270	162	246	230	150	130	260	40	5	M8	16	10	M12	32	135
110																			
132	330	0.06	100-250-582	2	320	165	253	275	150	130	320	40	4.5	M10	17.5	12	M12	55	200
160																			
200	490	0.04	100-250-588	2	330	176	293	275	150	150	320	40	4.5	M10	13	12	M12	60	340
220																			
250																			
315	660	0.03	100-250-597	3	330	216	353	285	150	185	320	40	4.5	M10	22	12	M16	80	300

Terminal Type



Dimensions (mm)

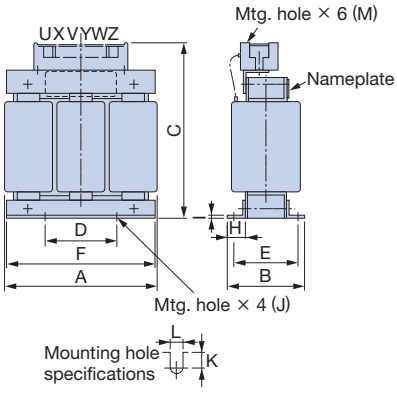


Figure 1

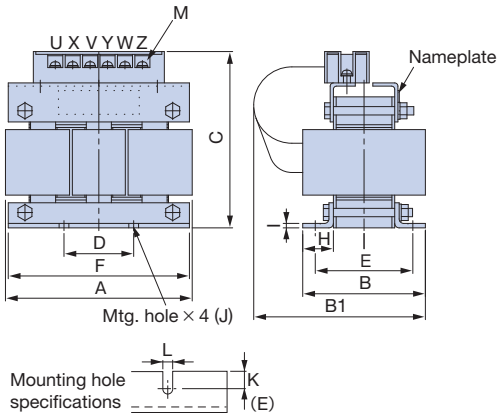


Figure 2

200 V Class

Motor Capacity (kW)	Current (A)	Inductance (mH)	Code No.	Figure	Dimensions (mm)													Weight (kg)	Watt Loss (W)
					A	B	B1	C	D	E	F	H	I	J	K	L	M		
0.4	2.5	4.2	100-250-558	1	120	71	–	120	40	50	105	20	2.3	M6	10.5	7	M4	2.5	15
0.75	5	2.1	100-250-592	1	120	71	–	120	40	50	105	20	2.3	M6	10.5	7	M4	2.5	15
1.5	10	1.1	100-250-550	1	130	88	–	130	50	70	130	22	3.2	M6	9	7	M4	3	25
2.2	15	0.71	100-250-555	1	130	88	–	130	50	70	130	22	3.2	M6	9	7	M4	3	30
3 3.7	20	0.53	100-250-563	2	135	88	140	130	50	70	130	22	3.2	M6	9	7	M4	3	35
5.5	30	0.35	100-250-579	2	135	88	150	130	50	70	130	22	3.2	M6	9	7	M4	3	45
7.5	40	0.265	100-250-585	2	135	98	160	140	50	80	130	22	3.2	M6	9	7	M5	4	50
11	60	0.18	100-250-595	2	165	105	185	170	75	85	160	25	2.3	M6	10	7	M6	6	65
15	80	0.13	100-250-600	2	185	100	180	195	75	80	180	25	2.3	M6	10	7	M6	8	75
18.5	90	0.12	100-250-603	2	185	100	180	195	75	80	180	25	2.3	M6	10	7	M6	8	90

400 V Class

Motor Capacity (kW)	Current (A)	Inductance (mH)	Code No.	Figure	Dimensions (mm)													Weight (kg)	Watt Loss (W)
					A	B	B1	C	D	E	F	H	I	J	K	L	M		
0.4	1.3	18	100-250-549	1	120	71	–	120	40	50	105	20	2.3	M6	10.5	7	M4	2.5	15
0.75	2.5	8.4	100-250-559	1	120	71	–	120	40	50	105	20	2.3	M6	10.5	7	M4	2.5	15
1.5	5	4.2	100-250-593	1	130	88	–	130	50	70	130	22	3.2	M6	9	7	M4	3	25
2.2	7.5	3.6	100-250-598	1	130	88	–	130	50	70	130	22	3.2	M6	9	7	M4	3	25
3 3.7	10	2.2	100-250-551	1	130	88	–	130	50	70	130	22	3.2	M6	9	7	M4	3	40
5.5	15	1.42	100-250-556	1	130	98	–	130	50	80	130	22	3.2	M6	9	7	M4	4	50
7.5	20	1.06	100-250-565	2	165	90	160	155	75	70	160	25	2.3	M6	10	7	M4	5	50
11	30	0.7	100-250-581	2	165	105	175	155	75	85	160	25	2.3	M6	10	7	M4	6	65
15	40	0.53	100-250-587	2	185	100	170	185	75	80	180	25	2.3	M6	10	7	M5	8	90
18.5	50	0.42	100-250-591	2	185	100	170	185	75	80	180	25	2.3	M6	10	7	M5	8	90

Peripheral Devices and Options (continued)

DC Reactor (UZDA-B for DC circuit)

Base device selection on motor capacity.

Terminal Type

Dimensions (mm)

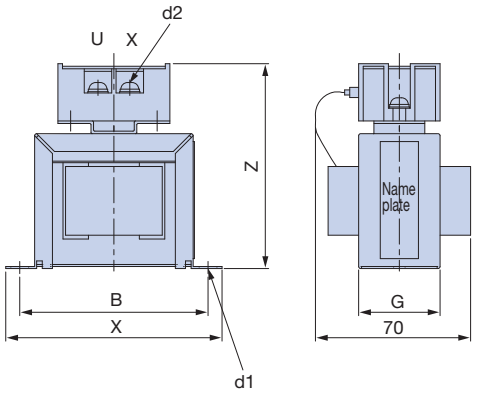


Figure 1

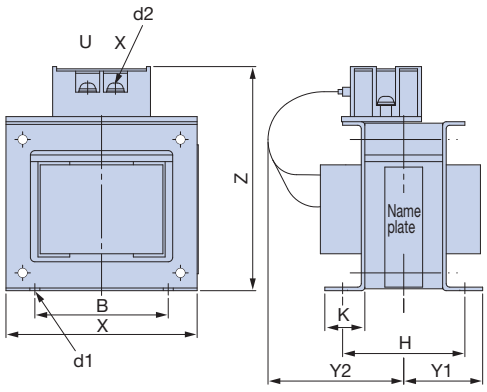


Figure 2

200 V Class

Motor Capacity (kW)	Current (A)	Inductance (mH)	Code No.	Figure	Dimensions (mm)										Weight (kg)	Watt Loss (W)
					X	Y2	Y1	Z	B	H	K	G	d1	d2		
0.4	5.4	8	100-250-673	1	85	–	–	81	74	–	–	32	M4	M4	0.8	8
0.75																
1.5	18	3	100-250-661	2	86	84	36	101	60	55	18	–	M4	M4	2	18
2.2																
3																
3.7																
5.5	36	1	100-250-669	2	105	94	46	129	64	80	26	–	M6	M4	3.2	22
7.5																
11	72	0.5	100-250-678	2	105	124	56	135	64	100	26	–	M6	M6	4.9	29
15																
18.5	90	0.4	100-250-680	2	133	147.5	52.5	160	86	80	25	–	M6	M6	6.5	44
22 ~ 110	Built-in															

400 V Class

Motor Capacity (kW)	Current (A)	Inductance (mH)	Code No.	Figure	Dimensions (mm)										Weight (kg)	Watt Loss (W)
					X	Y2	Y1	Z	B	H	K	G	d1	d2		
0.4	3.2	28	100-250-665	1	85	–	–	81	74	–	–	32	M4	M4	0.8	9
0.75																
1.5	5.7	11	100-250-675	1	90	–	–	88	80	–	–	32	M4	M4	1	11
2.2																
3	12	6.3	100-250-659	2	86	84	36	101	60	55	18	–	M4	M4	2	16
3.7																
5.5	23	3.6	100-250-663	2	105	104	46	118	64	80	26	–	M6	M4	3.2	27
7.5																
11	33	1.9	100-250-667	2	105	109	51	129	64	90	26	–	M6	M4	4	26
15																
18.5	47	1.3	100-250-671	2	115	142.5	57.5	136	72	90	25	–	M6	M5	6	42
22 ~ 315	Built-in															

Zero Phase Reactor

Zero-phase reactor should match wire gauge.*

*: Current values for wire gauges may vary based on electrical codes.
The table below lists selections based on Japanese electrical standards rating.
Contact Yaskawa for questions regarding UL.
Pass each wire (U/T1, V/T2, W/T3) through the core 4 times. Noise will be more effectively reduced when more wire is wrapped.
If the wire is thick and cannot be wrapped around the core, pass it through in series of no less than 4 cores.

FINEMET Zero-Phase Reactor to Reduce Radio Noise

【Hitachi Metals, Ltd.】

Note: FINEMET is a trademark of Hitachi Metals, Ltd.

Connection Diagram

Compatible with the input and output side of the drive.

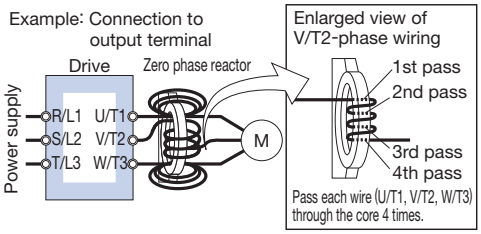
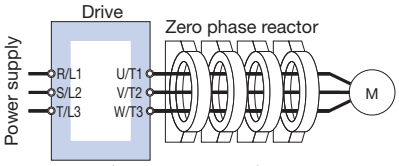
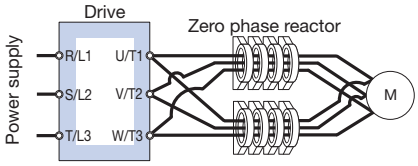


Diagram a



All wires (U/T1, V/T2, W/T3) should pass through the four cores of the reactor in series without winding.

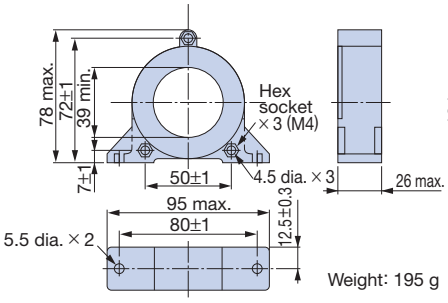
Diagram b



Separate each terminal lead for U/T1, V/T2, and W/T3 in half, passing one half of the wires through a set of four cores and the other half through the other set of four cores as shown.

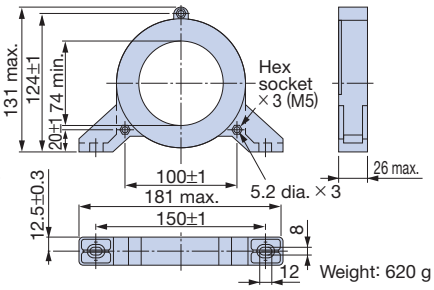
Diagram c

Dimensions (mm)



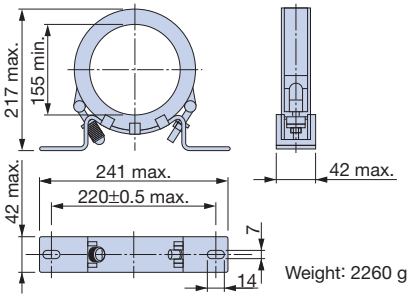
Weight: 195 g

Model F6045GB



Weight: 620 g

Model F11080GB



Weight: 2260 g

Model F200160PB

200 V Class

Motor Capacity (kW)	CR700 Recommended Gauge (mm²)		Zero Phase Reactor							
			Input Side				Output Side			
	Input Side	Output Side	Model	Code No.	Qty.	Diagram	Model	Code No.	Qty.	Diagram
0.4	2	2	F6045GB	100-250-745	1	a	F6045GB	100-250-745	1	a
0.75										
1.5										
2.2										
3	3.5	2	F6045GB	100-250-745	1	a	F6045GB	100-250-745	1	a
3.7	3.5	3.5								
5.5	8	3.5	F11080GB	100-250-743	1	a	F6045GB	100-250-745	1	a
7.5	14	8	F6045GB	100-250-745	4	b	F11080GB	100-250-743	1	a
11	14	14	F6045GB	100-250-745	4	b	F6045GB	100-250-745	4	b
15	22	14								
18.5	38	22								
22	50	30	F11080GB	100-250-743	4	b	F6045GB	100-250-745	4	b
30	38	38	F6045GB	100-250-745	4	b	F6045GB	100-250-745	4	b
37	60	60	F11080GB	100-250-743	4	b	F11080GB	100-250-743	4	b
45	80	80								
55	100	125								
75	60×2P	50×2P	F200160PB	100-250-744	4	b	F11080GB	100-250-743	4	b
90	80×2P	80×2P	F200160PB	100-250-744	4	b	F200160PB	100-250-744	4	b
110	125×2P	125×2P								

Depending on the loading conditions of the motor, when a wire is selected that is not of the recommended gauge, select a zero-phase reactor using the table below.

Wiring Gauge Guide mm²	Model	Code No.	Qty.	Diagram
2 to 5.5 or less	F6045GB	100-250-745	1	a
More than 5.5 to 8	F11080GB	100-250-743	1	a
More than 8 to 38	F6045GB	100-250-745	4*	b
More than 38×2P to 50×2P	F11080GB	100-250-743	4*	b
More than 200 to 250, more than 50×2P to 150×4P	F200160PB	100-250-744	4*	b
More than 150×4P to 150×8P	F200160PB	100-250-744	8*	c

400 V Class

Motor Capacity (kW)	CR700 Recommended Gauge (mm²)		Zero Phase Reactor							
			Input Side				Output Side			
	Input Side	Output Side	Model	Code No.	Qty.	Diagram	Model	Code No.	Qty.	Diagram
0.4	2	2	F6045GB	100-250-745	1	a	F6045GB	100-250-745	1	a
0.75										
1.5										
2.2										
3										
3.7										
5.5										
7.5	3.5	3.5	F6045GB	100-250-745	1	a	F6045GB	100-250-745	1	a
11	8	5.5	F11080GB	100-250-743	1	a	F6045GB	100-250-745	1	a
15	14	8	F6045GB	100-250-745	4	b	F11080GB	100-250-743	1	a
18.5	14	14	F6045GB	100-250-745	4	b	F6045GB	100-250-745	4	b
22										
30										
37	22	22	F6045GB	100-250-745	4	b	F6045GB	100-250-745	4	b
45	30	30								
55	38	38								
75	60	60	F11080GB	100-250-743	4	b	F11080GB	100-250-743	4	b
90	80	80								
110	50×2P	50×2P	F11080GB	100-250-743	4	b	F11080GB	100-250-743	4	b
132										
160	80×2P	80×2P	F200160PB	100-250-744	4	b	F200160PB	100-250-744	4	b
200	125×2P	125×2P	F200160PB	100-250-744	4	b	F200160PB	100-250-744	4	b
220										
250	125×4P	100×4P	F200160PB	100-250-744	4	b	F200160PB	100-250-744	4	b
315										

*: The selection of 4 or more zero-phase reactors assumes that the wires are thick and cannot be wrapped.
When the wires can be wrapped, you can reduce the number of reactors used.

Peripheral Devices and Options (continued)

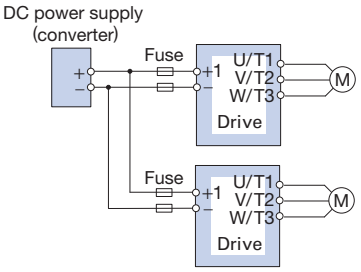
Fuse and Fuse Holder

Install a fuse to the drive input terminals to prevent damage in case a fault occurs.
Refer to the instruction manual for information on UL-approved components.

【BUSSMANN】

Connection Diagram

This example shows a DC power supply (two drives connected in series). For an AC power supply, see the connection diagram on page 26.



Note: When connecting multiple drives together, make sure that each drive has its own fuse. If any one fuse blows, all fuses should be replaced.

200 V Class

Catalog Code CR70A⬚	AC Power Supply Input					DC Power Supply Input				
	Fuse			Fuse Holder		Fuse			Fuse Holder	
	Model	Rated Shortcircuit Breaking Current (kA)	Qty.	Model	Qty.	Model	Rated Shortcircuit Breaking Current (kA)	Qty.	Model	Qty.
2003	FWH-45B	200	3	1BS101	6	FWH-45B	200	2	1BS101	4
2005										
2008										
2011	FWH-50B	200	3	1BS101	6	FWH-50B	200	2	1BS101	4
2014	FWH-80B	200	3	1BS101	6	FWH-80B	200	2	1BS101	4
2018										
2025	FWH-125B	200	3	1BS102	6	FWH-125B	200	2	1BS102	4
2033	FWH-150B	200	3	1BS102	6	FWH-150B	200	2	1BS102	4
2047	FWH-200B	200	3	1BS102	6	FWH-200B	200	2	1BS102	4
2060	FWH-225A	200	3	1BS103	6	FWH-250A	200	2	1BS103	4
2075	FWH-225A FWH-250A*1	200	3	1BS103	6	FWH-250A FWH-300A*1	200	2	1BS103	4
2088	FWH-225A FWH-250A*1	200	3	1BS103	6	FWH-250A FWH-275A*1	200	2	1BS103	4
2115	FWH-275A FWH-300A*1	200	3	1BS103	6	FWH-300A FWH-350A*1	200	2	1BS103	4
2145	FWH-275A FWH-350A*1	200	3	1BS103	6	FWH-350A FWH-450A*1	200	2	1BS103 1BS104	4
2180	FWH-325A FWH-450A*1	200 200	3 3	1BS103 1BS104	6 6	FWH-450A FWH-600A*1	200	2	1BS104	4
2215	FWH-600A	200	3	1BS104	6	FWH-600A FWH-700A*1	200	2	1BS104 *2	4
2283	FWH-800A	200	3	*2		FWH-800A FWH-1000A*1	200	2	*2	
2346	FWH-1000A	200	3	*2		FWH-1000A	200	2	*2	
2415										

*1: For applications in which a high current that is 150% or more of the drive rated current repeatedly flows, Yaskawa suggests that you select a lower tier fuse.
*2: Manufacturer does not recommend a specific fuse holder for this fuse.

400 V Class

Catalog Code CR70A⬚	AC Power Supply Input					DC Power Supply Input				
	Fuse			Fuse Holder		Fuse			Fuse Holder	
	Model	Rated Shortcircuit Breaking Current (kA)	Qty.	Model	Qty.	Model	Rated Shortcircuit Breaking Current (kA)	Qty.	Model	Qty.
4002	FWH-50B	200	3	1BS101	6	FWH-50B	200	2	1BS101	4
4003	FWH-50B	200	3	1BS101	6	FWH-50B	200	2	1BS101	4
4005										
4006	FWH-60B	200	3	1BS101	6	FWH-60B	200	2	1BS101	4
4007										
4009										
4015	FWH-80B	200	3	1BS101	6	FWH-80B	200	2	1BS101	4
4018	FWH-90B	200	3	1BS101	6	FWH-90B	200	2	1BS101	4
4024	FWH-150B	200	3	1BS102	6	FWH-150B	200	2	1BS102	4
4031	FWH-200B	200	3	1BS102	6	FWH-200B	200	2	1BS102	4
4039										
4045	FWH-225A	200	3	1BS103	6	FWH-225A	200	2	1BS103	4
4060	FWH-250A	200	3	1BS103	6	FWH-250A	200	2	1BS103	4
4075	FWH-275A	200	3	1BS103	6	FWH-275A	200	2	1BS103	4
4091										
4112	FWH-300A	200	3	1BS103	6	FWH-300A FWH-325A*1	200	2	1BS103	4
4150	FWH-325A FWH-400A*1	200	3	1BS103	6	FWH-400A FWH-450A*1	200	2	1BS103 1BS104	4
4180	FWH-500A	200	3	1BS104	6	FWH-500A FWH-600A*1	200	2	1BS104	4
4216	FWH-600A	200	3	1BS104	6	FWH-600A	200	2	1BS104	4
						FWH-700A*1	200	2	*2	
4260	FWH-700A	200	3	*2		FWH-700A FWH-800A*1	200	2	*2	
4304	FWH-800A	200	3	*2		FWH-800A FWH-1000A*1	200	2	*2	
4371	FWH-1000A	200	3	*2		FWH-1000A FWH-1200A*1	200	2	*2	
4414	FWH-1200A	200	3	*2		FWH-1200A FWH-1400A*1	200	2	*2	
4453	FWH-1200A	200	3	*2		FWH-1200A FWH-1600A*1	200	2	*2	
4605	FWH-1400A FWH-1600A*1	200	3	*2		FWH-1600A	200	2	*2	

∗1: For applications in which a high current that is 150% or more of the drive rated current repeatedly flows, Yaskawa suggests that you select a lower tier fuse.
∗2: Manufacturer does not recommend a specific fuse holder for this fuse.

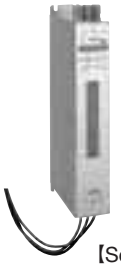
Peripheral Devices and Options (continued)

Input Noise Filter

Base device selection on motor capacity.

Noise Filter without Case

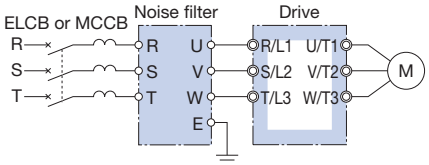
Noise Filter with Case



Noise Filter
【Schaffner EMC K.K.】

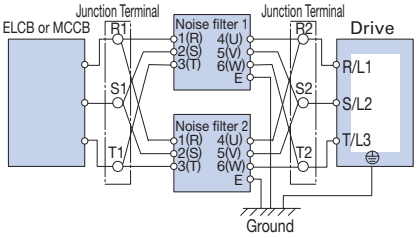
Note: Select the internal EMC filter type for CE Marking (EMC Directive) compliant model. Refer to the instruction manual for more information.

Connection Diagram



Note: Do not connect the input noise filter to the drive output terminals (U, V, W). Connect in parallel when using two filters.

Connecting Noise Filters in Parallel to the Input or Output Side (examples shows two filters in parallel)



Note: When wiring contactors in parallel, make sure wiring lengths are the same to keep current flow even to the relay terminals. Noise filters and grounding wire should be as heavy and as short as possible.

200 V Class

Motor Capacity (kW)	Noise Filter without Case				Noise Filter with Case				Noise Filter by Schaffner EMC K.K.			
	Model	Code No.	Qty.	Rated Current (A)	Model	Code No.	Qty.	Rated Current (A)	Model	Code No.	Qty.	Rated Current (A)
0.4												
0.75	LNFD-2103DY	100-250-524	1	10	LNFD-2103HY	100-250-525	1	10	–	–	–	–
1.5												
2.2	LNFD-2153DY	100-250-526	1	15	LNFD-2153HY	100-250-527	1	15	–	–	–	–
3	LNFD-2303DY	100-250-530	1	30	LNFD-2303HY	100-250-531	1	30	–	–	–	–
3.7												
5.5	LNFD-2203DY	100-250-528	2	40	LNFD-2203HY	100-250-529	2	40	FN258L-42-07	100-250-467	1	42
7.5	LNFD-2303DY	100-250-530	2	60	LNFD-2303HY	100-250-531	2	60	FN258L-55-07	100-250-468	1	55
11	LNFD-2303DY	100-250-530	3	90	LNFD-2303HY	100-250-531	3	90	FN258L-75-34	100-250-470	1	75
15	LNFD-2303DY	100-250-530	3	90	LNFD-2303HY	100-250-531	3	90	FN258L-100-35	100-250-462	1	100
18.5	LNFD-2303DY	100-250-530	4	120	LNFD-2303HY	100-250-531	4	120	FN258L-100-35	100-250-462	1	100
22	LNFD-2303DY	100-250-530	4	120	LNFD-2303HY	100-250-531	4	120	FN258L-130-35	100-250-463	1	130
30	–	–	–	–	–	–	–	–	FN258L-130-35	100-250-463	1	130
37	–	–	–	–	–	–	–	–	FN258L-180-07	100-250-465	1	180
45												
55	–	–	–	–	–	–	–	–	FN359P-250-99	100-250-471	1	250
75	–	–	–	–	–	–	–	–	FN359P-400-99	100-250-473	1	400
90	–	–	–	–	–	–	–	–	FN359P-500-99	100-250-474	1	500
110	–	–	–	–	–	–	–	–	FN359P-600-99	100-250-475	1	600

400 V Class

Motor Capacity (kW)	Noise Filter without Case				Noise Filter with Case				Noise Filter by Schaffner EMC K.K.			
	Model	Code No.	Qty.	Rated Current (A)	Model	Code No.	Qty.	Rated Current (A)	Model	Code No.	Qty.	Rated Current (A)
0.4	LNFD-4053DY	100-250-532	1	5	LNFD-4053HY	100-250-533	1	5	–	–	–	–
0.75												
1.5	LNFD-4103DY	100-250-534	1	10	LNFD-4103HY	100-250-535	1	10	–	–	–	–
2.2												
3	LNFD-4153DY	100-250-536	1	15	LNFD-4153HY	100-250-537	1	15	–	–	–	–
3.7												
5.5	LNFD-4203DY	100-250-538	1	20	LNFD-4203HY	100-250-539	1	20	–	–	–	–
7.5	LNFD-4303DY	100-250-540	1	30	LNFD-4303HY	100-250-541	1	30	–	–	–	–
11	LNFD-4203DY	100-250-538	2	40	LNFD-4203HY	100-250-539	2	40	FN258L-42-07	100-250-467	1	42
15	LNFD-4303DY	100-250-540	2	60	LNFD-4303HY	100-250-541	2	60	FN258L-55-07	100-250-468	1	55
18.5												
22	LNFD-4303DY	100-250-540	3	90	LNFD-4303HY	100-250-541	3	90	FN258L-75-34	100-250-470	1	75
30												
37	LNFD-4303DY	100-250-540	3	90	LNFD-4303HY	100-250-541	3	90	FN258L-100-35	100-250-462	1	100
45	LNFD-4303DY	100-250-540	4	120	LNFD-4303HY	100-250-541	4	120	FN258L-100-35	100-250-462	1	100
55	–	–	–	–	–	–	–	–	FN258L-130-35	100-250-463	1	130
75	–	–	–	–	–	–	–	–	FN258L-180-07	100-250-465	1	180
90												
110	–	–	–	–	–	–	–	–	FN359P-300-99	100-250-472	1	300
132	–	–	–	–	–	–	–	–	FN359P-400-99	100-250-473	1	400
160												
200	–	–	–	–	–	–	–	–	FN359P-500-99	100-250-474	1	500
220	–	–	–	–	–	–	–	–	FN359P-600-99	100-250-475	1	600
250												
315	–	–	–	–	–	–	–	–	FN359P-900-99	100-250-476	1	900

Without Case

Dimensions (mm)

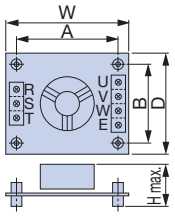


Figure 1

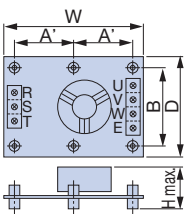
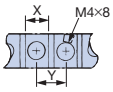


Figure 2

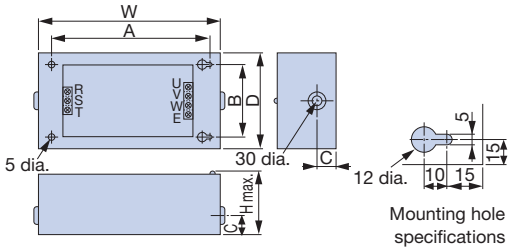
Model LNFD-	Code No.	Figure	Dimensions (mm)							Terminal (mm)		Mounting Screw	Weight (kg)
			W	D	H	A	A'	B	M	X	Y		
2103DY	100-250-524	1	120	80	55	108	–	68	20	9	11	M4×4, 20 mm	0.2
2153DY	100-250-526	1	120	80	55	108	–	68	20	9	11	M4×4, 20 mm	0.2
2203DY	100-250-528	1	170	90	70	158	–	78	20	9	11	M4×4, 20 mm	0.4
2303DY	100-250-530	2	170	110	70	–	79	98	20	10	13	M4×6, 20 mm	0.5
4053DY	100-250-532	2	170	130	75	–	79	118	30	9	11	M4×6, 30 mm	0.3
4103DY	100-250-534	2	170	130	95	–	79	118	30	9	11	M4×6, 30 mm	0.4
4153DY	100-250-536	2	170	130	95	–	79	118	30	9	11	M4×6, 30 mm	0.4
4203DY	100-250-538	2	200	145	100	–	94	133	30	9	11	M4×4, 30 mm	0.5
4303DY	100-250-540	2	200	145	100	–	94	133	30	10	13	M4×4, 30 mm	0.6

Terminal close-up



With Case

Dimensions (mm)

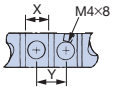


Mounting hole specifications

The figure shows an example of three-phase input.

Model LNFD-	Code No.	Dimensions (mm)						Terminal (mm)		Weight (kg)
		W	D	H	A	B	C	X	Y	
2103HY	100-250-525	185	95	85	155	65	33	9	11	0.9
2153HY	100-250-527	185	95	85	155	65	33	9	11	0.9
2203HY	100-250-529	240	125	100	210	95	33	9	11	1.5
2303HY	100-250-531	240	125	100	210	95	33	10	13	1.6
4053HY	100-250-533	235	140	120	205	110	43	9	11	1.6
4103HY	100-250-535	235	140	120	205	110	43	9	11	1.7
4153HY	100-250-537	235	140	120	205	110	43	9	11	1.7
4203HY	100-250-539	270	155	125	240	125	43	9	11	2.2
4303HY	100-250-541	270	155	125	240	125	43	10	13	2.2

Terminal close-up



Manufactured by Schaffner EMC K.K.

Dimensions (mm)

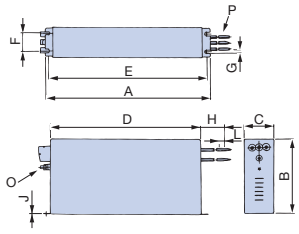


Figure 1

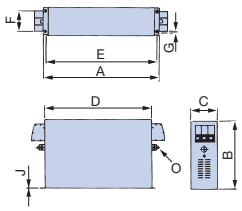


Figure 2

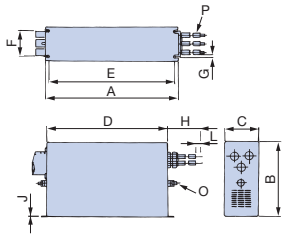


Figure 3

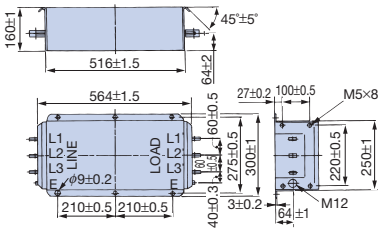


Figure 4

Model	Weight (kg)
FN359P-250-99	16
FN359P-300-99	16
FN359P-400-99	18.5
FN359P-500-99	19.5
FN359P-600-99	20.5
FN359P-900-99	33

Model	Figure	Dimensions (mm)											Wire Gauge	Weight (kg)
		A	B	C	D	E	F	G	H	J	L	O	P	
FN258L-42-07	1	329	185±1	70	300	314	45	6.5	500	1.5	12	M6	AWG8	2.8
FN258L-55-07	1	329	185±1	80	300	314	55	6.5	500	1.5	12	M6	AWG6	3.1
FN258L-75-34	1	329	220	80	300	314	55	6.5	–	1.5	–	M6	–	4
FN258L-100-35	2	379±1.5	220	90±0.8	350±1.2	364	65	6.5	–	1.5	–	M10	–	5.5
FN258L-130-35	2	438±1.5	240	110±0.8	400±1.2	414	80	6.5	–	3	–	M10	–	7.5
FN-258L-180-07	3	438±1.5	240	110±0.8	400±1.2	413	80	6.5	500	4	15	M10	50 mm²	11
FN359P-	4	The dimensions are shown in Figure 4.												See above.

Note: For CE Marking (EMC Directive) compliant models, contact us for inquiry.

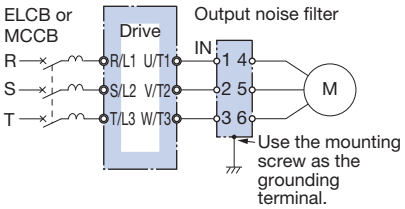
Peripheral Devices and Options (continued)

Output Noise Filter

Base device selection on motor capacity.

【NEC Tokin Corporation】

Connection Diagram



Dimensions (mm)

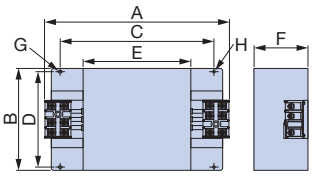


Figure 1

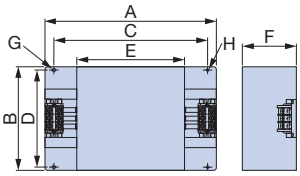


Figure 2

200 V Class

Motor Capacity (kW)	Model	Code No.	Qty.*1	Rated Current (A)	Figure	Dimensions (mm)								Terminal Block		Weight*2 (kg)
						A	B	C	D	E	F	G	H	Model	Screw Size	
0.4	LF-310KA	100-261-505	1	10	1	150	100	100	90	70	45	7×4.5 dia.	4.5 dia.	OTB-203	M4	0.5
0.75																
1.1																
1.5																
2.2	LF-320KA	100-261-506	1	20	1	150	100	100	90	70	45	7×4.5 dia.	4.5 dia.	OTB-203	M4	0.6
3																
3.7																
5.5	LF-350KA	100-261-510	1	50	2	260	180	180	160	120	65	7×4.5 dia.	4.5 dia.	CTKC-65S	M6	2.0
7.5																
11	LF-350KA	100-261-510	2	100	2	260	180	180	160	120	65	7×4.5 dia.	4.5 dia.	CTKC-65S	M6	2.0
15																
18.5																
22	LF-350KA*3	100-261-510	3	150	2	260	180	180	160	120	65	7×4.5 dia.	4.5 dia.	CTKC-65S	M6	2.0
	LF-3110KB*3	100-261-513	1	110	2	540	340	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5
30	LF-350KA*3	100-261-510	3	150	2	260	180	180	160	120	65	7×4.5 dia.	4.5 dia.	CTKC-65S	M6	2.0
	LF-375KB*3	100-261-512	2	150	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-65S	M6	12.0
37	LF-3110KB	100-261-513	2	220	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5
45																
55																
75	LF-3110KB	100-261-513	3	330	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5
90	LF-3110KB	100-261-513	4	440	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5
110	LF-3110KB	100-261-513	5	550	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5

*1: Connect in parallel when using more than one filter. Refer to the Connecting Noise Filters in Parallel to the Input or Output Side on page 58.
*2: Weight of one filter.
*3: Either noise filter model can be used.

400 V Class

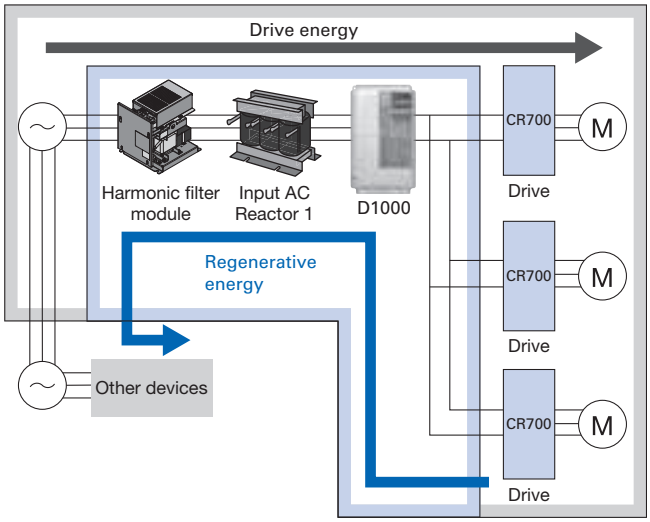
Motor Capacity (kW)	Model	Code No.	Qty.*1	Rated Current (A)	Figure	Dimensions (mm)								Terminal Block		Weight*2 (kg)
						A	B	C	D	E	F	G	H	Model	Screw Size	
0.4	LF-310KB	100-261-507	1	10	1	150	100	100	90	70	45	7×4.5 dia.	4.5 dia.	OTB-203	M4	0.5
0.75																
1.5																
2.2																
3																
3.7																
5.5	LF-320KB	100-261-508	1	20	1	150	100	100	90	70	45	7×4.5 dia.	4.5 dia.	OTB-203	M4	0.6
7.5																
11	LF-335KB	100-261-509	1	35	1	150	100	100	90	70	45	7×4.5 dia.	4.5 dia.	OTB-203	M4	0.8
15																
18.5	LF-345KB	100-261-511	1	45	2	260	180	180	160	120	65	7×4.5 dia.	4.5 dia.	CTKC-65S	M6	2.0
22	LF-375KB	100-261-512	1	75	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-65S	M6	12.0
30																
37	LF-3110KB	100-261-513	1	110	2	540	340	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5
45																
55	LF-375KB	100-261-512	2	150	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-65S	M6	12.0
75	LF-3110KB	100-261-513	2	220	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5
90																
110	LF-3110KB	100-261-513	3	330	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5
132																
160	LF-3110KB	100-261-513	4	440	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5
200																
220	LF-3110KB	100-261-513	5	550	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5
250	LF-3110KB	100-261-513	6	660	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5
315	LF-3110KB	100-261-513	7	770	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5
355	LF-3110KB	100-261-513	8	880	2	540	320	480	300	340	240	9×6.5 dia.	6.5 dia.	CTKC-100	M8	19.5

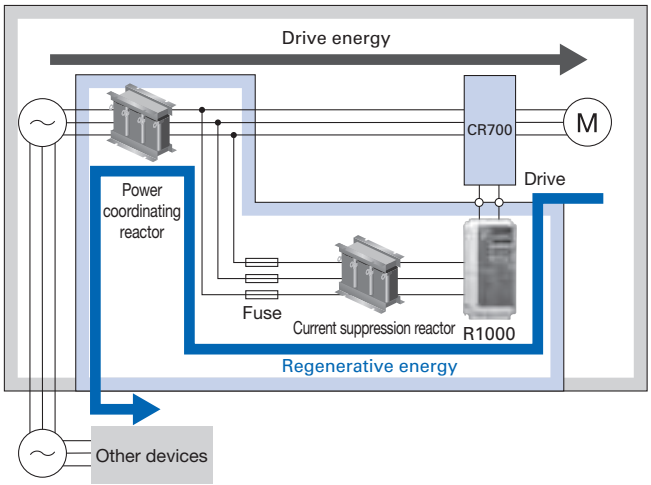
*1: Connect in parallel when using more than one filter. Refer to the Connecting Noise Filters in Parallel to the Input or Output Side on page 58.
*2: Weight of one filter.

Power Regenerative Converter, Power Regenerative Unit

Power Regenerative Converter
D1000

Power Regenerative Unit
R1000





D1000 / R1000 selecting

Select D1000 and R1000 according to motor capacity. For details, refer to the product catalogs.

200 V Class

Max. Applicable Motor Capacity kW	0.4	0.75	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
D1000 Model: CIMR-DA2A□	0005	0005	0005	0005	0005	0005	0010	0010	0020	0020	0030	0030	0050	0050	0065	0065	0090	0130	0130
R1000 Model: CIMR-RA2A□	03P5	03P5	03P5	03P5	03P5	03P5	0005	0007	0010	0014	0017	0020	0028	0035	0053	0053	0073	0105	0105

400 V Class

Max. Applicable Motor Capacity kW	0.4	0.75	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
D1000 Model: CIMR-DA4A□	0005	0005	0005	0005	0005	0005	0010	0010	0020	0020	0030	0030	0040	0060	0060	0100	0100	0130	0130
R1000 Model: CIMR-RA4A□	03P5	03P5	03P5	03P5	03P5	03P5	0005	0007	0010	0014	0017	0020	0028	0035	0043	0053	0073	0105	0105

Max. Applicable Motor Capacity kW	132	160	200	220	250	315
D1000 Model: CIMR-DA4A□	0185	0185	0270	0270	0370	0370
R1000 Model: CIMR-RA4A□	0150	0150	0210	0210	0300	0300

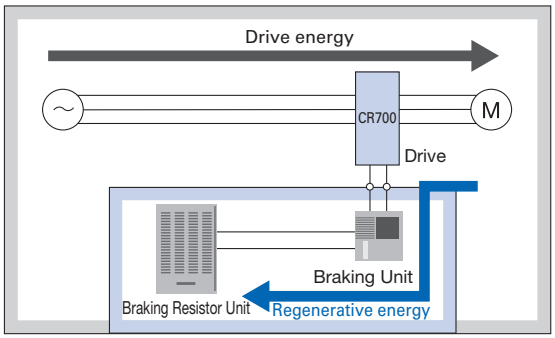
Peripheral Devices and Options (continued)

Braking Unit, Braking Resistor Unit

Select the braking unit / braking resistor unit from the following table.
However, the braking unit for drives with catalog codes CR70A2003 through 2115 and CR70A4002 through 4150 is not required since these drives have built-in braking transistors. If the application requires a braking resistor or braking unit, choose from built-in and stand-alone types in accordance with motor capacity.
When connecting a braking unit or a braking resistor unit with the catalog codes CR70A2145, CR70A2180, CR70A4112, and CR70A4150, a junction terminal is required.
Yaskawa recommends Mibu Denki Industrial Co., Ltd. as a manufacturer of the junction terminal.

Braking Unit
CDBR-□D series

Braking Resistor Unit
LKEB series



Specification

200 V Class

Max. Applicable Motor Capacity (kW)	CR700	Braking Unit				Braking Resistor Unit (Duty Factor: 10% ED, 10 s max.)*1					Min.*2 Connectable Resistance (Ω)
	Catalog Code CR70A□□□□	Model CDBR-□□□□	Maximum discharge current A/10% ED (10 s max.)	Rated discharge current A/continuous	Qty.	Model LKEB-□□□□	Resistor Specifications (per unit)	Qty.	Diagram	Braking Torque*3 (%)	
0.4	2003	Built-in				20P7	70 W 200 Ω	1	A	220	48
0.75	2005					20P7	70 W 200 Ω	1	A	125	48
1.5	2008					21P5	260 W 100 Ω	1	A	125	48
2.2	2011					22P2	260 W 70 Ω	1	A	120	16
3	2014					23P7	390 W 40 Ω	1	A	150	16
3.7	2018					23P7	390 W 40 Ω	1	A	125	16
5.5	2025					25P5	520 W 30 Ω	1	A	115	16
7.5	2033					27P5	780 W 20 Ω	1	A	125	9.6
11	2047					2011	2400 W 13.6 Ω	1	A	125	9.6
15	2060					2015	3000 W 10 Ω	1	A	125	9.6
18.5	2075					2015	3000 W 10 Ω	1	A	100	9.6
22	2088					2022	4800 W 6.8 Ω	1	A	125	6.4
30	2115					2022	4800 W 6.8 Ω	1	A	90	6.4
37	2145*5	2037D	80	24	1	2015	3000 W 10 Ω	2	E	100	5.0
45	2180*5	2022D	60	20	2	2022	4800 W 6.8 Ω	2	F	120	6.4
55	2215	2022D	60	20	2	2022	4800 W 6.8 Ω	2	B	100	6.4
75	2283	2110D	250	80	1	2022	4800 W 6.8 Ω	3	C	110	1.6
90	2346	2110D	250	80	1	2022	4800 W 6.8 Ω	4	C	120	1.6
110	2415	2110D	250	80	1	2018	4800 W 8 Ω	5	C	100	1.6

∗1: Refers to a motor coasting to stop with a constant torque load. Constant output and regenerative braking will reduce the duty factor.
∗2: Assumes the use of a single braking unit. The braking unit should have a resistance higher than the minimum connectable resistance value and be able to generate enough braking torque to stop the motor.
∗3: Applications with a relatively large amount of regenerative power may require more braking power than is possible with only the standard braking unit and braking resistor unit.
If the braking torque exceeds the value shown in the table, the capacity of the braking resistor unit must be increased.
∗4: When using multiple braking resistor units, connect them in parallel.
∗5: When connecting a braking unit or a braking resistor unit with the catalog codes CR70A2145, CR70A2180, a junction terminal is required. See the connectiondiagram on page 56 and 57.

Note: 1. Use the retrofit attachment when replacing an older model CDBR braking unit (CDBR-□B, CDBR-□C). Refer to TOBP C720600 01 CR700 Option CDBR, LKEB Installation Manual for more details.
2. Use the External Heatsink Attachment for installation with the heatsink outside the enclosure. Refer to page 59 for details.

Specification

400 V Class

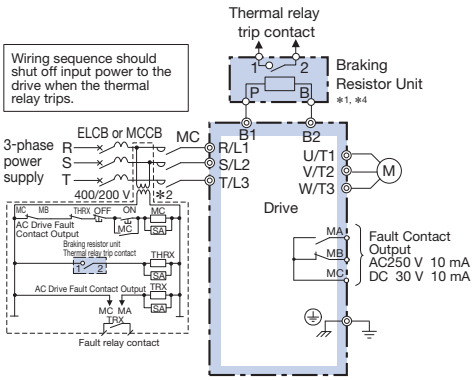
Max. Applicable Motor Capacity (kW)	CR700	Braking Unit				Braking Resistor Unit (Duty Factor: 10% ED, 10 s max.)*1					Min.*2 Connectable Resistance (Ω)
	Catalog Code CR70A□□□□	Model CDBR-□□□□	Maximum discharge current A/10% ED (10 s max.)	Rated discharge current A/continuous	Qty.	Model LKEB-□□□□	Resistor Specifications (per unit)	Qty.	Diagram	Braking Torque*3 (%)	
0.4	4002					40P7	70 W 750 Ω	1	A	230	165
0.75	4003					40P7	70 W 750 Ω	1	A	130	165
1.5	4005					41P5	260 W 400 Ω	1	A	125	110
2.2	4006					42P2	260 W 250 Ω	1	A	135	110
3	4007					43P7	390 W 150 Ω	1	A	150	55
3.7	4009					43P7	390 W 150 Ω	1	A	135	55
5.5	4015					45P5	520 W 100 Ω	1	A	135	32
7.5	4018					47P5	780 W 75 Ω	1	A	130	32
11	4024		Built-in			4011	1040 W 50 Ω	1	A	135	20
15	4031					4015	1560 W 40 Ω	1	A	125	20
18.5	4039					4018	4800 W 32 Ω	1	A	125	19.2
22	4045					4022	4800 W 27.2 Ω	1	A	125	19.2
30	4060					4030	6000 W 20 Ω	1	A	125	19.2
37	4075					4037	9600 W 16 Ω	1	A	125	10.6
45	4091					4045	9600 W 13.6 Ω	1	A	125	8.7
55	4112*5					4030	6000 W 20 Ω	2	G	135	7.2
75	4150*5					4045	9600 W 13.6 Ω	2	G*4	145	5.2
90	4180	4045D	60	18	2	4045	9600W 13.6 Ω	2	B	100	12.8
110	4216	4220D	250	80	1	4030	6000 W 20 Ω	3	C	100	3.2
132	4260	4220D	250	80	1	4045	9600 W 13.6 Ω	4	C	140	3.2
160	4304	4220D	250	80	1	4045	9600 W 13.6 Ω	4	C	140	3.2
200	4371	4220D	250	80	1	4045	9600 W 13.6 Ω	4	C	120	3.2
220	4414	4220D	250	80	1	4037	9600 W 16 Ω	5	C	110	3.2
250	4453	4220D	250	80	1	4037	9600 W 16 Ω	5	C	90	3.2
315	4605	4220D	250	80	2	4045	9600 W 13.6 Ω	6	D	100	3.2

∗1: Refers to a motor coasting to stop with a constant torque load. Constant output and regenerative braking will reduce the duty factor.
∗2: Assumes the use of a single braking unit. The braking unit should have a resistance higher than the minimum connectable resistance value and be able to generate enough braking torque to stop the motor.
∗3: Applications with a relatively large amount of regenerative power may require more braking power than is possible with only the standard braking unit and braking resistor unit.
If the braking torque exceeds the value shown in the table, the capacity of the braking resistor unit must be increased.
∗4: When using multiple braking resistor units, connect them in parallel.
∗5: When connecting a braking unit or a braking resistor unit with the catalog codes CR70A4112, CR70A4150, a junction terminal is required. See the connectiondiagram on page 56 and 57.

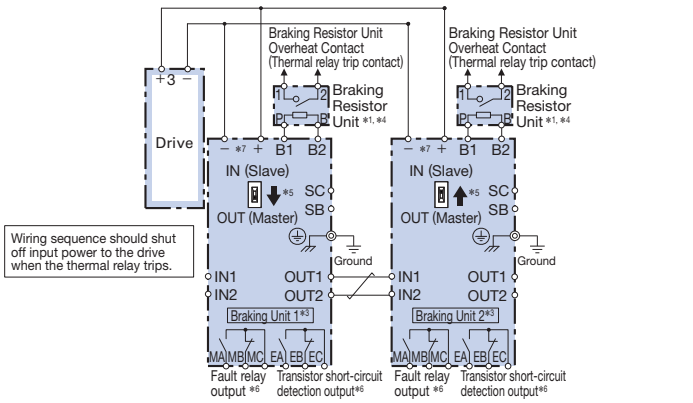
Note: 1. Use the retrofit attachment when replacing an older model CDBR braking unit (CDBR-□B, CDBR-□C). Refer to TOBP C720600 01 CR700 Option CDBR, LKEB Installation Manual for more details.
2. Use the External Heatsink Attachment for installation with the heatsink outside the enclosure. Refer to page 59 for details.

Peripheral Devices and Options (continued)

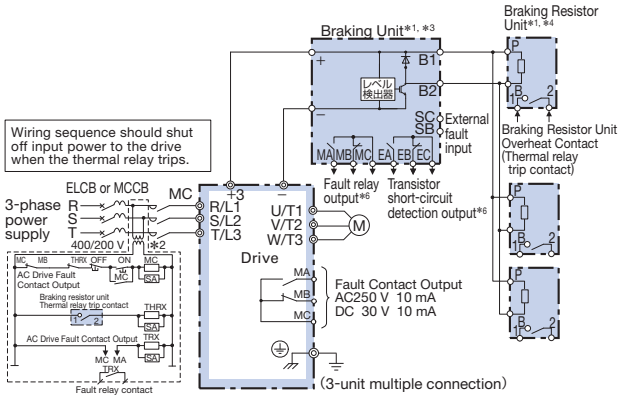
Connection Diagram A to D (E to G are described on the next page)



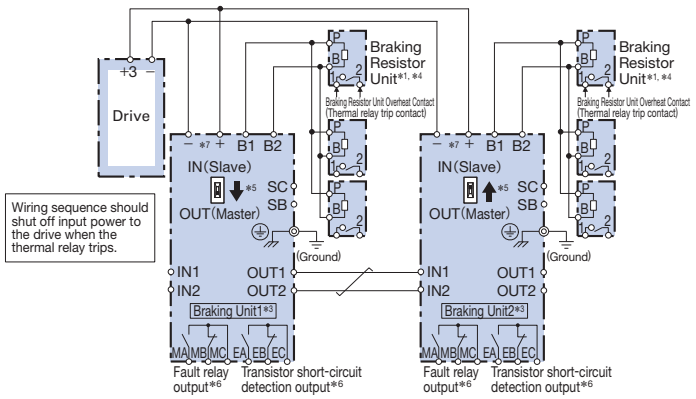
Connection Diagram A



Connection Diagram B



Connection Diagram C



Connection Diagram D

∗1: Set L3-04 = 0 [Disabled] (default setting) when connecting the regenerative converter, regenerative unit, braking unit and braking resistor unit. The drive may not stop within the specified deceleration time if L3-04 is changed to 1 through 5 [Enabled].

∗2: 200 V class drives do not require a control circuit transformer.

∗3: Set L8-55 to 0 to disable the protection function for the built-in braking transistor when using a regenerative unit or another type of braking option in lieu of the built-in braking transistor. If the protection function is enabled under these conditions, it may cause a braking resistor fault (rF).
When connecting a separately-installed type braking resistor unit (model CDBR) to drives with a built-in braking transistor (catalog codes CR70A2003 to 2115, and CR70A4002 to 4150), connect the B1 terminal of the drive to the positive terminal of the braking resistor unit and connect the negative terminal of the drive to the negative terminal of the braking resistor unit. The B2 terminal is not used in this case.

∗4: Be sure to protect non-Yaskawa braking resistors by thermal overload relay.

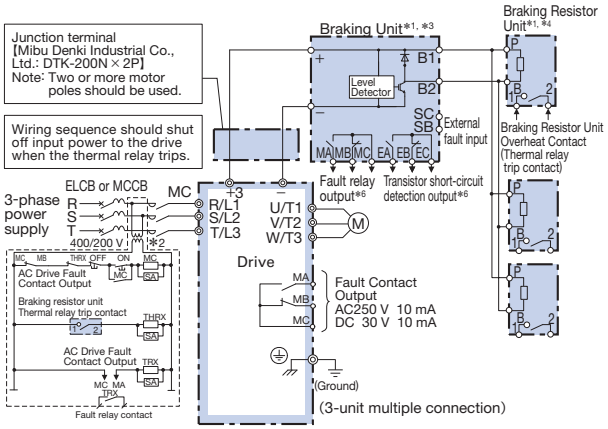
∗5: When using more than one braking unit connected in parallel, set one of the braking units as the master, and set the others as slaves.

∗6: Connect fault relay output to multi-function digital input S⬚ (External Fault). Connect the CDBR transistor short-circuit detection output to disconnect main input power to the drive.

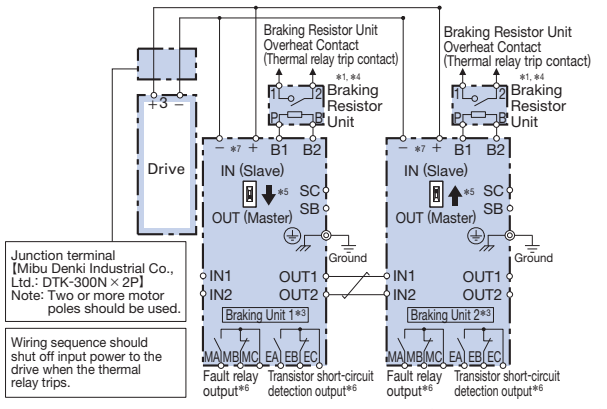
∗7: Connect directly to the drive terminal or install a terminal block.

∗8: Contact your Yaskawa or nearest sales representative for a replacement manual when connecting braking units CDBR-⬚B, CDBR-⬚C, and CDBR-⬚D in parallel.

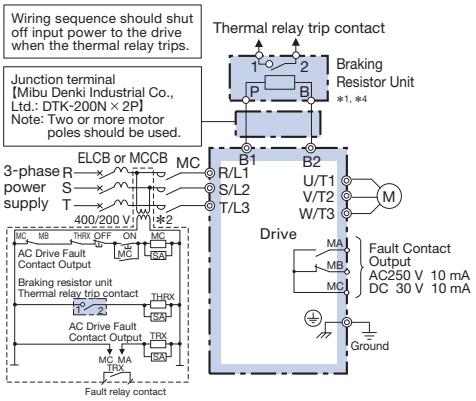
Connection Diagram E to G



Connection Diagram E



Connection Diagram F



Connection Diagram G

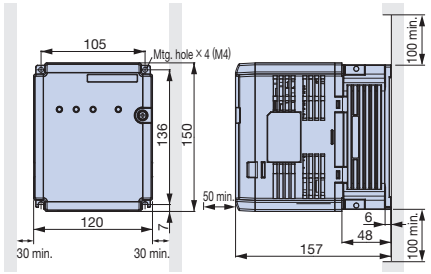
*1: Set L3-04 = 0 [Disabled] (default setting) when connecting the regenerative converter, regenerative unit, braking unit and braking resistor unit. The drive may not stop within the specified deceleration time if L3-04 is changed to 1 through 5 [Enabled].
*2: 200 V class drives do not require a control circuit transformer.
*3: Set L8-55 to 0 to disable the protection function for the built-in braking transistor when using a regenerative unit or another type of braking option in lieu of the built-in braking transistor. If the protection function is enabled under these conditions, it may cause a braking resistor fault (rF).
When connecting a separately-installed type braking resistor unit (model CDBR) to drives with a built-in braking transistor (catalog codes CR70A2003 to 2115, and CR70A4002 to 4150), connect the B1 terminal of the drive to the positive terminal of the braking resistor unit and connect the negative terminal of the drive to the negative terminal of the braking resistor unit. The B2 terminal is not used in this case.
*4: Be sure to protect non-Yaskawa braking resistors by thermal overload relay.
*5: When using more than one braking unit connected in parallel, set one of the braking units as the master, and set the others as slaves.
*6: Connect fault relay output to multi-function digital input S□ (External Fault). Connect the CDBR transistor short-circuit detection output to disconnect main input power to the drive.
*7: Connect directly to the drive terminal or install a terminal block.
*8: Contact your Yaskawa or nearest sales representative for a replacement manual when connecting braking units CDBR-□B, CDBR-□C, and CDBR-□D in parallel.

Peripheral Devices and Options (continued)

Dimensions (mm)
Braking Unit

Open Chassis【IP20】

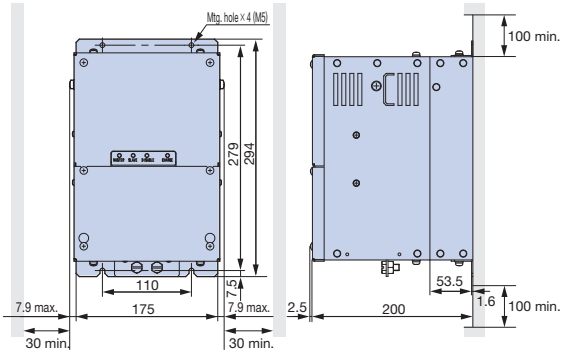
CDBR-2022D, -2037D, -4045D



Weight: 2 kg

Open Chassis【IP00】

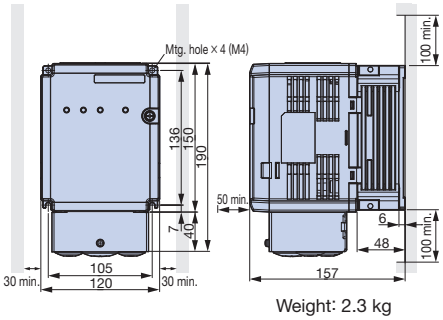
CDBR-2110D, -4220D



Weight: 7.5 kg

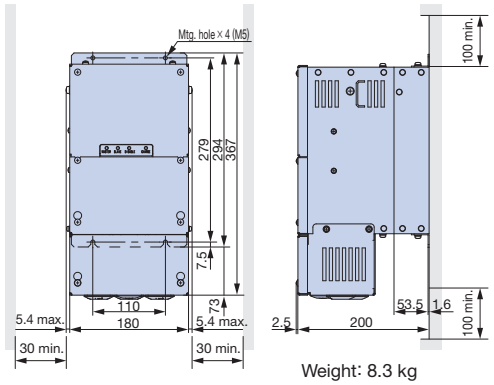
Enclosure Wall-Mounted【UL Type 1】

CDBR-2022D, -2037D, -4045D



Weight: 2.3 kg

CDBR-2110D, -4220D



Weight: 8.3 kg

Braking Resistor Unit (stand-alone)

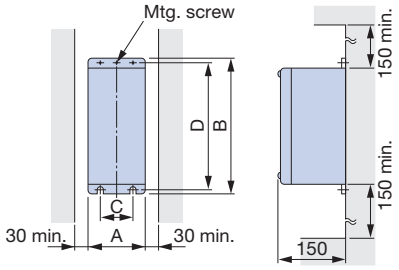


Figure 1

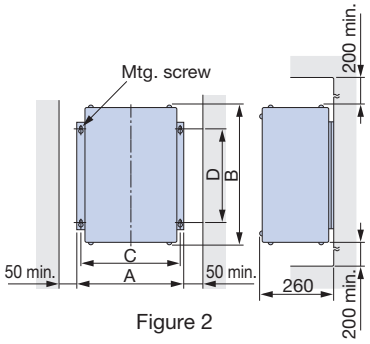


Figure 2

Applicable Voltage Class	Braking Resistor Unit Model LKEB-	Figure	Dimensions (mm) A	B	C	D	MTG Screw	Weight (kg)	Allowable Average Power Consumption (W)
200 V Class	20P7	1	105	275	50	260	M5×3	3.0	30
	21P5	1	130	350	75	335	M5×4	4.5	60
	22P2	1	130	350	75	335	M5×4	4.5	89
	23P7	1	130	350	75	335	M5×4	5.0	150
	25P5	1	250	350	200	335	M6×4	7.5	220
	27P5	1	250	350	200	335	M6×4	8.5	300
	2011	2	266	543	246	340	M8×4	10	440
	2015	2	356	543	336	340	M8×4	15	600
	2018	2	446	543	426	340	M8×4	19	740
	2022	2	446	543	426	340	M8×4	19	880

Applicable Voltage Class	Braking Resistor Unit Model LKEB-	Figure	Dimensions (mm) A	B	C	D	MTG Screw	Weight (kg)	Allowable Average Power Consumption (W)
400 V Class	40P7	1	105	275	50	260	M5×3	3.0	30
	41P5	1	130	350	75	335	M5×4	4.5	60
	42P2	1	130	350	75	335	M5×4	4.5	89
	43P7	1	130	350	75	335	M5×4	5.0	150
	45P5	1	250	350	200	335	M6×4	7.5	220
	47P5	1	250	350	200	335	M6×4	8.5	300
	4011	2	350	412	330	325	M6×4	16	440
	4015	2	350	412	330	325	M6×4	18	600
	4018	2	446	543	426	340	M8×4	19	740
	4022	2	446	543	426	340	M8×4	19	880
	4030	2	356	956	336	740	M8×4	25	1200
	4037	2	446	956	426	740	M8×4	33	1500
	4045	2	446	956	426	740	M8×4	33	1800

Model, Code No.
Braking Unit

200 V Class

Model CDBR-□□□□□	Protection Design	Code No.
2022D	IP20	100-091-707
	UL Type1	100-091-754
2037D	IP20	100-091-712
	UL Type1	100-091-759
2110D	IP00	100-091-524
	UL Type1	100-091-530

400 V Class

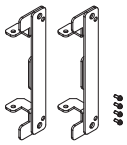
Model CDBR-□□□□□	Protection Design	Code No.
4045D	IP20	100-091-722
	UL Type1	100-091-769
4220D	IP00	100-091-526
	UL Type1	100-091-532

Watt Loss

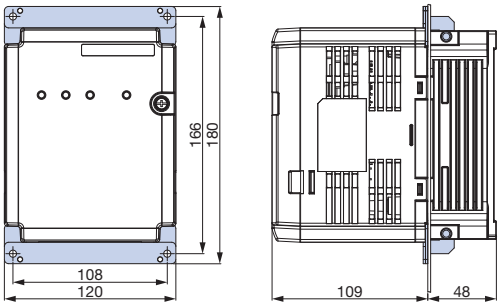
Model CDBR-⬚⬚⬚⬚	Watt Loss (W)
2022D	27
2037D	38
2110D	152
4045D	36
4220D	152

Braking Unit External Heatsink Attachment

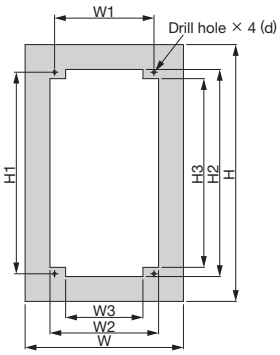
Use the external heatsink attachment for installation with the heatsink outside the enclosure.

Attachment	Model CDBR-⬚⬚⬚⬚	Model (Code No.)
	2022D	EZZ021711A (100-066-355)
	2037D	
	4045D	

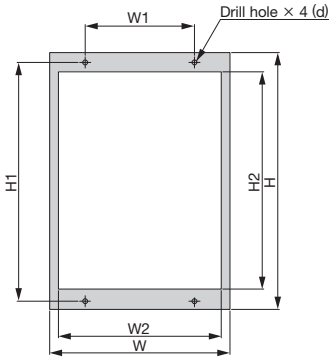
Dimensions (mm)



Braking Unit Panel Cutout Dimensions



Modification Figure 1



Modification Figure 2

Model CDBR-⬚⬚⬚⬚	Modification Figure	Dimensions (mm)								
		W*	H*	W1	W2	W3	H1	H2	H3	d
2022D	1	172	226	108	118	84	166	172	152	M4
2037D	1	172	226	108	118	84	166	172	152	M4
2110D	2	175	294	110	159	–	279	257.8	–	M5
4045D	1	172	226	108	118	84	166	172	152	M4
4220D	2	175	294	110	159	–	279	257.8	–	M5

✻ The following W, H information is the size when in installing the gasket.

Peripheral Devices and Options (continued)

Bluetooth LCD Keypad

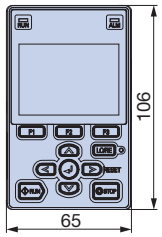
A Bluetooth communications interface is built into the LCD keypad.
The drive can be connected to DriveWizard Mobile through a wireless connection.

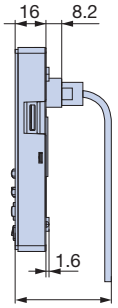
Specification	Model	Code No.
Standard	JVOP-KPLCC04ABA	100-225-008
Humidity, dust	JVOP-KPLCC04MBA	100-225-009

Note: 1. Certified international standards:
CE, FCC, IC (Industry Canada), CMIIT, KC, MIC
2. This keypad is equipped with a wireless device. The usage of wireless devices may be restricted in accordance with the Radio Law in each country. Check relevant laws and regulations in each country before using the product.

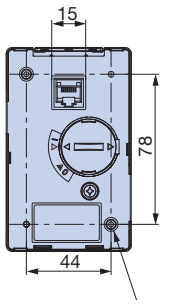
Dimensions (mm)

Bluetooth
LCD keypad





Bending radius
53.8 min.



Mtg. holes, M3 × 2
screws (depth 6)
(for mounting on
control panel)

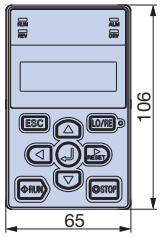
LED Keypad

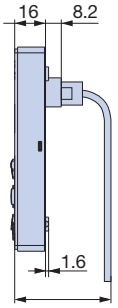
The LED keypad offers a five-digit LED display.
Shipment of LED keypad as standard prepared is available. Contact Yaskawa.

Specification	Model	Code No.
Standard	JVOP-KPLEA04AAA	100-206-377
Humidity, dust	JVOP-KPLEA04MAA	100-206-378

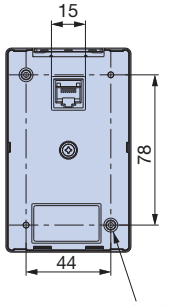
Dimensions (mm)

LED keypad





Bending radius
53.8 min.



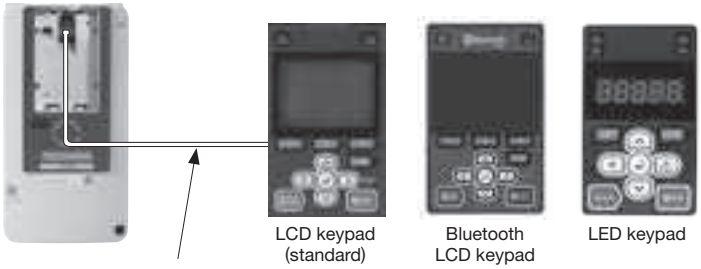
Mtg. holes, M3 × 2
screws (depth 6)
(for mounting on
control panel)

Keypad Extension Cable

Enables remote operation.

Model	Code No.	Remarks
WV001 (1 m)	WV001	· RJ-45, 8-pin straight-through · UTP CAT5e cable (1 m/3 m)
WV003 (3 m)	WV003	Note: Use straight-through cable. Other cables will cause drive failure.

Note: 1. Never use this cable for connecting the drive to a PC. Doing so may damage the PC.
2. You can also use a commercially available LAN cable (straight-through) for the operator extension cable.



Keypad extension cable

LCD keypad
(standard)

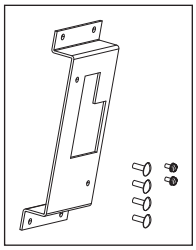
Bluetooth
LCD keypad

LED keypad

Keypad Mounting Bracket

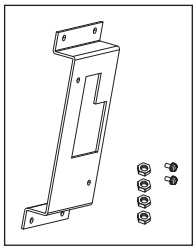
This bracket is required to mount the LCD, Bluetooth LCD Keypad, or LED keypad on the control panel.

Installation Support Set A



Model	Code No.	Notes
900-192-933-001	100-203-008	For use with holes through the panel

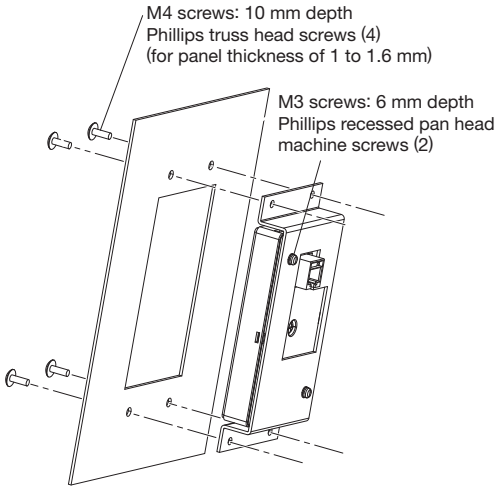
Installation Support Set B



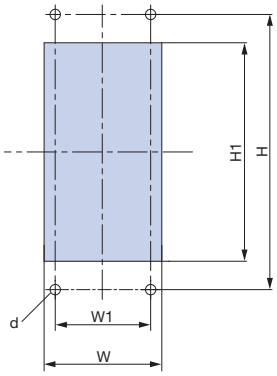
Model	Code No.	Notes
900-192-933-002	100-203-009	For nut fixing

Note: If there are weld studs on the interior of the control panel, use the installation support set B (nut clamp).

Installation using Set A



Panel Modification for Keypad Mounting Bracket

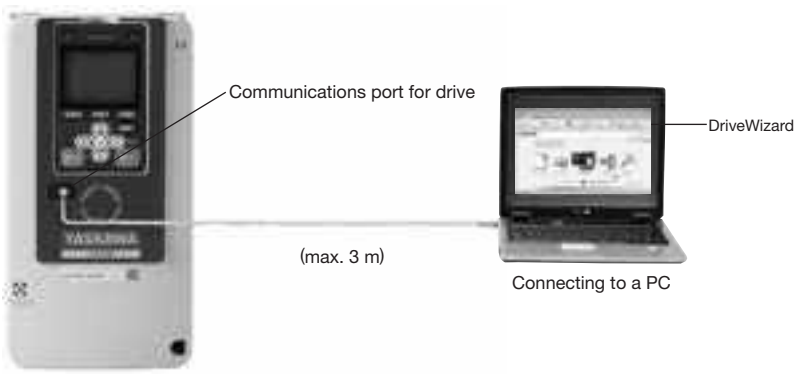


Dimensions (mm)				
W	H	W1	H1	d
64+0.5 (2.52+0.02)	130 (5.12)	45 (1.77)	105+0.5 (4.13+0.02)	M4

PC Cable

Cable to connect the drive to a PC with DriveWizard installed.
Use a commercially available USB 2.0 cable (A-miniB connectors, max. 3 m).

Connection



Note: DriveWizard is a PC software package for managing parameters and functions in Yaskawa drives.

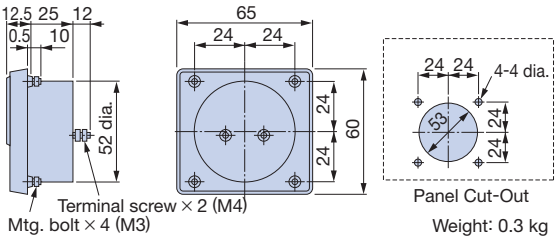
Peripheral Devices and Options (continued)

Frequency Meter/Current Meter

Model	Code No.
Scale-75 Hz full-scale: DCF-6A	100-250-730
Scale-60/130 Hz full-scale: DCF-6A	100-250-728
Scale-5 A full-scale: DCF-6A	100-252-699
Scale-10 A full-scale: DCF-6A	100-252-695
Scale-20 A full-scale: DCF-6A	100-252-696
Scale-30 A full-scale: DCF-6A	100-252-697
Scale-50 A full-scale: DCF-6A	100-252-698

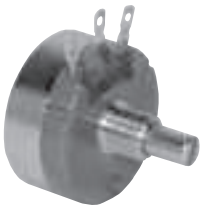
Note: DCF-6A specifications are 3 V, 1 mA, and 3 kΩ inner impedance. Because the CR700 multifunction analog monitor output default setting is 0 to 10 V, set frequency meter adjusting potentiometer (20 k Ω) or parameter H4-02 (analog monitor output gain) within the range of 0 to 3 V.

Dimensions (mm)



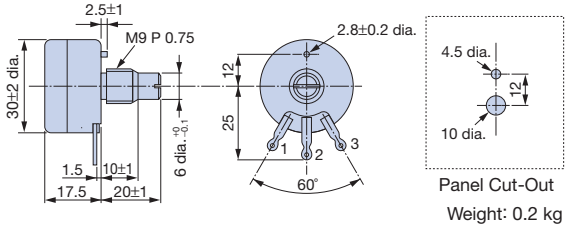
Weight: 0.3 kg

Frequency Setting Potentiometer/Frequency Meter Adjusting Potentiometer



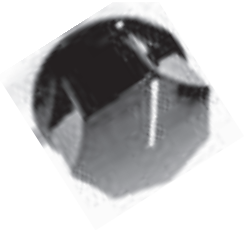
Model	Code No.
2 kΩ : RV30YN	100-250-722
20 kΩ : RV30YN20S	100-250-723

Dimensions (mm)



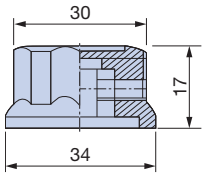
Weight: 0.2 kg

Control Dial for Frequency Setting Potentiometer/ Frequency Meter Adjusting Potentiometer



Model	Code No.
K-2901-M	100-250-544

Dimensions (mm)



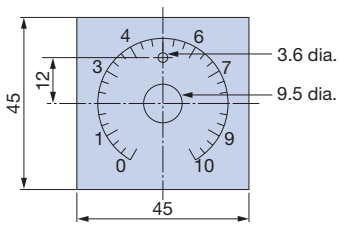
Applicable shaft diameter 6 mm

Mounting screw × 1 (M4)

Meter Plate for Frequency Setting Potentiometer/ Frequency Meter Adjusting Potentiometer

Model	Code No.
NPJT41561-1	100-250-701

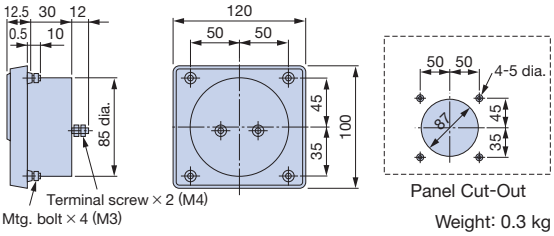
Dimensions (mm)



Output Voltage Meter

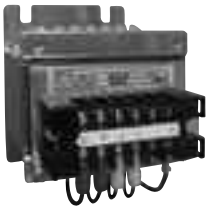
Model	Code No.
Scale-300 V full-scale (Rectification Type Class 2.5: SCF-12NH)	100-250-739
Scale-600 V full-scale (Rectification Type Class 2.5: SCF-12NH)	100-250-740

Dimensions (mm)



Weight: 0.3 kg

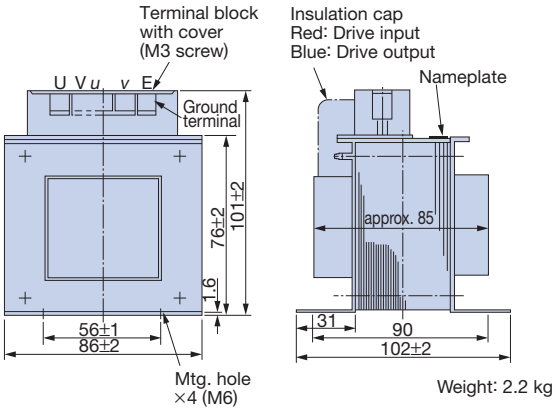
Potential Transformer



Model	Code No.
600 V meter for voltage transformer UPN-B 440/110 V (400/100 V)	100-250-548

Note: For use with a standard voltage regulator. A standard voltage regulator may not match the drive output voltage. Select a regulator specifically designed for the drive output (100-250-548), or a voltmeter that does not use a transformer and offers direct read out.

Dimensions (mm)



Weight: 2.2 kg

Application Notes

Selection

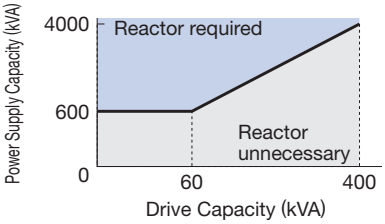
■ Installing a Reactor

An AC or DC reactor can be used for the following situations:

- when the power supply is 600 kVA or more.
- to smooth peak current that results from switching a phase advance capacitor.
- to improve the power supply power factor.

The DC reactor is built in for models of catalog codes CR70A2088 and above, CR70A4045 and above.

Use an AC reactor when also connecting a thyristor converter to the same power supply system, regardless of the conditions of the power supply.



■ Emergency Stop

When the drive faults out, a protective circuit is activated and drive output is shut off. This, however, does not stop the motor immediately. Some type of mechanical brake may be needed if it is necessary to halt the motor faster than the Fast Stop function is able to.

■ Options

The B1, B2, −, +1, +2 and +3 terminals are used to connect optional devices. Connect only CR700-compatible devices.

■ Repetitive Starting/Stopping

Using the drive with frequent starts and stops often exceed 150% of the drive rated current values. Heat stress generated from repetitive high current can shorten the lifespan of the IGBTs. The expected lifespan for the IGBTs is about 8 million start and stop cycles with a 2 kHz carrier frequency and a 150% peak current.

Yaskawa recommends lowering the carrier frequency, particularly when audible noise is not a concern. The user can also choose to reduce the load, increase the acceleration and deceleration times, or switch to a larger drive. This will help keep peak current levels under 150%.

Be sure to check the peak current levels when starting and stopping repeatedly during the initial test run, and make adjustments accordingly.

For using the inching function in which the drives starts and stops the motor repeatedly, Yaskawa recommends the following steps to ensure torque levels:

- Select a large enough drive so that peak current levels remain below 150%.
- The drive should be one frame size larger than the motor.

■ As the carrier frequency of the drive is increased above the factory default setting, the drive's rated output current must be derated. Refer to the instruction manual of the drive for details on this function.

Installation

■ Enclosure Panels

Keep the drive in a clean environment by either selecting an area free of airborne dust, lint, oil mist, corrosive gas, and flammable gas, or install the drive in an enclosure panel. Leave the required space between the drives to provide for cooling, and take steps to ensure that the ambient temperature remains within allowable limits. Keep flammable materials away from the drive. If the drive must be used in an area where it is subjected to oil mist and excessive vibration, protective designs are available. Contact Yaskawa for details.

■ Installation Direction

The drive should be installed upright as specified in the manual.

Settings

■ Use V/f Control when running multiple induction motors at the same time.

■ Upper Limits

Because the drive is capable of running the motor at up to 590 Hz, be sure to set the upper limit for the frequency to control the maximum speed. The default setting for the maximum output frequency is 60 Hz.

■ Pay attention to the following points when using the Virtual I/O function.

This function virtually wires the I/O terminal of the drive internally.

Consequently, the behavior of the drive may differ from its defaults, even if there is no wiring in the I/O terminal.

Before conducting a test operation, always check the setting values for the parameter of the Virtual I/O function.

Failure to check may result in death or serious injury.

■ DC Injection Braking

Motor overheat can result if there is too much current used during DC Injection Braking, or if the time for DC Injection Braking is too long.

■ Acceleration/Deceleration Times

Acceleration and deceleration times are affected by how much torque the motor generates, the load torque, and the inertia moment ($GD^2/4$). Set a longer accel/decel time when Stall Prevention is enabled. The accel/decel times are lengthened for as long as the Stall Prevention function is operating. For faster acceleration, increase the capacity of both the motor and the drive. For faster deceleration, use a dynamic braking option or a power regenerative unit.

General Handling

■ Electrical Shock Hazard

Failure to comply may result in death or serious injury.
Do not allow unqualified personnel to perform work on the drive. Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of AC drives.

■ Wiring Check

Never short the drive output terminals or apply voltage to output terminals (U/T1, V/T2, W/T3), as this can cause serious damage to the drive. Doing so will destroy the drive. Be sure to perform a final check of all sequence wiring and other connections before turning the power on. Make sure there are no short circuits on the control terminals (+V, AC, etc.), as this could damage the drive. Retighten the screws for the wiring terminals periodically.

■ European Terminal

- For European terminals, do not shake the wires excessively or pull on the wires too much.
- When connecting uninsulated wire and when crimping wire to the solderless terminal, do not let the wire protrude past the conductor section. Pay close attention to this because it could cause a short circuit.
- Check for any unsuitable wire size connections.
- Righten at the specified torque.

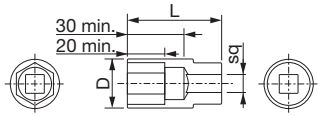
■ European Terminal Wiring Work

Heed the following points. Follow the procedure in the manual concerning all points except the following.

- Use the torque driver or a torque wrench and ratchet. The tip of a straight-edge screwdriver or a hex socket tool is required for wiring the European terminal.
- Wiring tools can be purchased from Yaskawa. Contact Yaskawa. The torque wrench should be supplied by the customer.
- To replace a previous model, the wires that are used may be partially out of connection range. Contact Yaskawa beforehand about the available wire gauges.

■ Wiring Using Closed-loop Crimp Terminals

Wrench-type or closed-wrench type tools cannot be used with drives with catalog codes of CR70A2215 and above or 4180 and above. Make sure to always use socket-type tools. Use only sockets with a depth of 30 mm or more.



Socket Dimensions (for crimp terminals)

■ Magnetic Contactor Installation

Avoid switching a magnetic contactor on the power supply side more frequently than once every 30 minutes. Frequent switching can cause damage to the drive.

■ Keypad

[microSD card]

- The SD card supports microSD, and microSD HC with a capacity of up to 32 GB.
- Plug in and remove the microSD card after turning off the power supply for the drive. Do not remove the microSD card or de-energize the keypad when accessing the microSD card. This may cause data loss and failure.
- If there are many files and folders on the SD card or if the free space on the microSD card is low, the SD card may not run properly.

[Connection via USB]

- Use a miniUSB cable. The USB connection between the PC and keypad is not possible while the drive and keypad are connected. First remove the keypad from the drive and then connect with the PC.
- While connected to the USB, it is not possible from a PC to access the files on a microSD card that is inserted.

■ Inspection and Maintenance

After shutting off the drive, make sure the CHARGE light has gone out completely before preforming any inspection or maintenance. Residual voltage in drive capacitors can cause serious electric shock.
The heatsink can become quite hot during operation, and proper precautions should be taken to prevent burns.
When replacing the cooling fan, shut off the power and wait at least 15 minutes to be sure that the heatsink has cooled down.

Application Notes (continued)

■ Wiring on UL- and cUL-certified drives

When performing wiring work on UL/cUL-certified drives, wire the drives at their recommended tightening torques using UL/cUL-compliant wires. For drives that require connection with closed-loop crimp terminals, use closed-loop crimp terminals and perform closed-loop crimping work using the crimping tools specified by the terminal manufacturer.

■ Replacing an existing model

- Wires used in existing models may be out of connection range. Contact Yaskawa beforehand for the available wire gauges.
- If replacing an existing model with drives with catalog codes of CR70A2180 and lower or 4150 and lower, the wire connection method should be changed. Cut off the crimp terminal and remove the covering to expose the wires. If an uninsulated wire is already connected to it, check the condition of the tip of the wire. After peeling of the dressing as necessary, wire again.

■ Transporting the Drive

Never steam clean the drive. During transport, keep the drive from coming into contact with salts, fluorine, bromine and other such harmful chemicals.

Storage

The drive contains electrolytic capacitors and fine electronic components that undergo chemical changes. Observe the following precautions to help maintain the expected performance life and reliability during long-term storage.

■ Storage Location

- Temperature and humidity

  Storage temperatures between -20 to +70°C are allowed when storing the drive for approximately one month. During transport, store and pack the drive so that it is isolated from as much vibration and shock as possible. Store the drive in a location with a relative humidity of 95% or less. Do not store the drive in direct sunlight or where condensation or ice will form.
- Dust and oil mist

  Do not store the drive in dusty locations or locations that are susceptible to oil mist, such as the site of a cement factory or cotton mill.
- Corrosive gas

  Do not store the drive in an area that may contain corrosive gas or in a location like a chemical plant, refinery, or sewage facility.
- Salt-air damage

  Do not store the drive in locations that are subject to salt damage, such as near the ocean, and salt damage-designated zones, in particular.

Do not store the drive in adverse environments. Store all drives in storage rooms that are not subjected to adverse environmental elements.

■ Periodic Power Application

Try to apply power to the drive once per year for at least 30 minutes to prevent the capacitors from deteriorating. When applying power after power has not been applied for more than two years, Yaskawa recommends using a variable power source and gradually increasing the power over a period of 2 to 3 minutes. Apply power for at least 1 hour with no load to age the main circuit electrolytic capacitor.

Wire the drive normally and check for drive faults, overcurrents, motor vibration, speed fluctuations, and other abnormalities during operation after performing the above procedure.

■ Environmental Specifications

The drive must not be used in the above mentioned environments. However, if it is difficult to avoid running the drive in these environments, Yaskawa offers special drives that are resistant to moisture, gas, vibrations, and salt. Contact Yaskawa for details.

Be aware that drives with these specifications do not guarantee complete protection for the environmental conditions indicated.

■ Contact Yaskawa when running an isolation test with a drive.

Peripheral Devices

Installing a Ground Fault Interrupter or an MCCB

- Be sure to install an MCCB or an ELCB that is recommended by Yaskawa at the power supply side of the drive to protect internal circuitry.
- The type of MCCB is selected depending on the power supply power factor (power supply voltage, output frequency, load characteristics, etc.). Sometimes a fairly large MCCB may be required due to the affects of harmonic current on operating characteristics. If you do not use a recommended ELCB, use one fitted for harmonic suppression measures and designed specifically for drives. A malfunction may occur due to high-frequency leakage current, so the rated current of the ELCB must be 30 mA or higher per drive unit. If a malfunction occurs in an ELCB without any countermeasures, reduce the carrier frequency of the drive, replace the ELCB with one that has countermeasures against high frequency, or use an ELCB which has a rated current of 200 mA or higher per drive unit.
  Select an MCCB or an ELCB with a rated capacity greater than the short-circuit current for the power supply. For a fairly large power supply transformer, a fuse can be added to the ELCB or MCCB in order to handle the short-circuit current level.

Magnetic Contactor for Input Power

Use a magnetic contactor (MC) to ensure that power to the drive can be completely shut off when necessary. The MC should be wired so that it opens when a fault output terminal is triggered.
Even though an MC is designed to switch to a momentary power loss, frequent MC use can damage other components.
Avoid switching the MC more than once every 30 minutes. The MC will not be activated after a momentary power loss if using the LCD keypad to run the drive. This is because the drive is unable to restart automatically when set for LOCAL.
Although the drive can be stopped by using an MC installed on the power supply side, the drive cannot stop the motor in a controlled fashion, and it will simply coast to stop. If a braking resistor or dynamic braking unit has been installed, be sure to set up a sequence that opens the MC with a thermal protector switch connected to the braking resistor device.

Magnetic Contactor for Motor

As a general principle, the user should avoid opening and closing the magnetic contactor between the motor and the drive during run. Doing so can cause high peak currents and overcurrent faults. If magnetic contactors are used to bypass the drive by connecting the motor to the power supply directly, make sure to close the bypass only after the drive is stopped and fully disconnected from the motor.

Motor Thermal Over Load Relay Installation

Although the drive comes with built in electrothermal protection to prevent damage from overheat, a thermal relay should be connected between the drive and each motor if running several motors from the same drive.
For a multi-pole motor or some other type of nonstandard motor, Yaskawa recommends using an external thermal relay appropriate for the motor. Be sure to disable the motor protection selection parameter (L1-01 = 0), and set the thermal relay or thermal protection value to 1.1 times the motor rated current listed on the motor nameplate.
When long motor cables and high carrier frequency are used, nuisance tripping of the thermal relay may occur due to increased leakage current. Therefore, reduce the carrier frequency or increase the tripping level of the thermal overload relay.

Improving the Power Factor

Install a DC reactor, AC reactor, or Power Regenerative Converter D1000 to the drive input side to improve the power factor. The DC reactor is built in for models of catalog codes CR70A2088 and above, CR70A4045 and above.
Refrain from using a capacitor or surge absorber on the output side as a way of improving the power factor, because high-frequency contents on the output side can lead to damage from overheat. This can also lead to problems with overcurrent.

Radio Frequency Interference

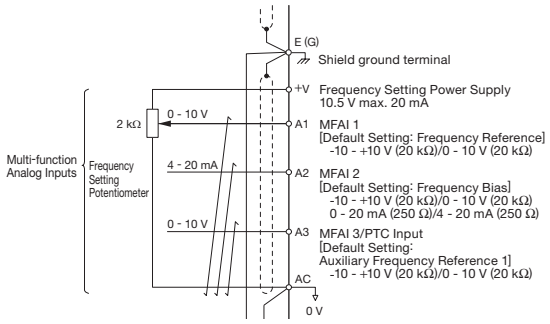
Drive output contains high-frequency contents that can affect the performance of surrounding electronic instruments such as an AM radio. These problems can be prevented by installing a noise filter, as well as by using a properly grounded metal conduit to separate wiring between the drive and motor.

Application Notes (continued)

■ Wire Gauges and Wiring Distance

Motor torque can suffer as a result of voltage loss across a long cable running between the drive and motor, especially when there is low frequency output. Make sure that a large enough wire gauge is used.

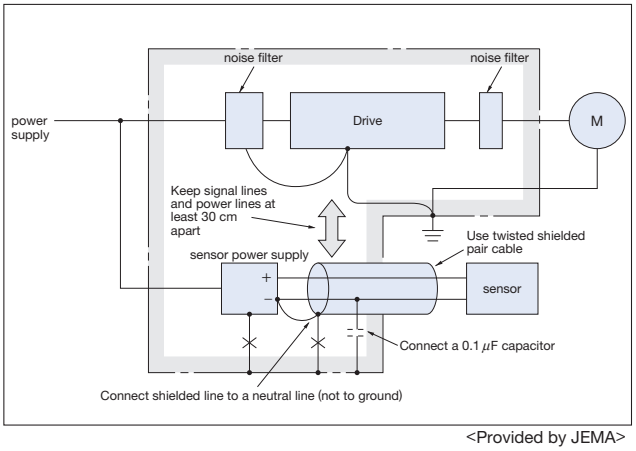
The LCD keypad requires an extensional cable for remote operation. If an analog signal is used to operate the drive via the input terminals, make sure that the wire between the analog operator and the drive is no longer than 50 m, and that it is properly separated from the main circuit wiring. Use reinforced circuitry (main circuit and relay sequence circuitry) to prevent inductance from surrounding devices. To run the drive with a frequency potentiometer via the external terminals, use twisted shielded pair cables and ground the shield.



■ Counteracting Noise

Because CR700 is designed with PWM control, a low carrier frequency tends to create more motor flux noise than using a higher carrier frequency. Keep the following points in mind when considering how to reduce motor noise:

- Lowering the carrier frequency (C6-02) minimizes the effects of noise.
- A line noise filter can reduce the affects on AM radio frequencies and poor sensor performance. See “Options and Peripheral Devices” on page 40.
- Make sure the distance between signal and power lines is at least 10 cm (up to 30 cm is preferable), and use twisted pair cable to prevent induction noise from the drive power lines.



<Provided by JEMA>

■ Leakage Current

High-frequency leakage current passes through stray capacitance that exists between the power lines to the drive, ground, and the motor lines. Consider using the following peripheral devices to prevent problems with leakage current.

	Problem	Solution
Ground Leakage Current	MCCB is mistakenly triggered	· Lower the carrier frequency set to parameter C6-02. · Try using a component designed to minimize harmonic distortion for the MCCB such as the NV series by Mitsubishi.
Current Leakage Between Lines	Thermal relay connected to the external terminals is mistakenly triggered by harmonics in the leakage current	· Lower the carrier frequency set to parameter C6-02. · Use the drive's built-in thermal motor protection function.

The following table shows the guidelines for the set value of the carrier frequency relative to the wiring distance between the drive and the motor when using V/f control.

Wiring Distance*	50 m or less	100 m or less	100 m or more
C6-02: Carrier Frequency Selection	1 to 6 (15 kHz or less)	1, 2 (5 kHz or less)	1 (2 kHz or less)

*: When a single drive is used to run multiple motors, the length of the motor cable should be calculated as the total distance between the drive and each motor.

When the wiring distance exceeds 100 m, use the control mode in V/f Control (A1-02 = 0).

Notes on Motor Operation

■ Motor Bearing Life

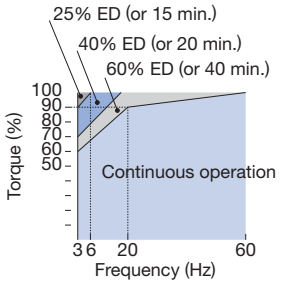
In applications involving constant speed over long periods, the life of the motor bearing may be shortened. This is called bearing electrolytic corrosion.

The installation of a zero-phase reactor between the drive and motor, and the utilization of a motor with insulated bearings are effective countermeasures. Details can be found in the technical documentation. Contact your Yaskawa or nearest sales representative for more information.

Using a Standard Motor

■ Low Speed Range

There is a greater amount of loss when operating a motor using an drive than when running directly from line power. With a drive, the motor can become quite hot due to the poor ability to cool the motor at low speeds. The load torque should be reduced accordingly at low speeds.



Allowable Load Characteristics for a Yaskawa Motor

The figure above shows the allowable load characteristics for a Yaskawa standard motor. A motor designed specifically for operation with a drive should be used when 100% continuous torque is needed at low speeds.

■ Insulation Tolerance

Consider voltage tolerance levels and insulation in applications with an input voltage of over 440 V or particularly long wiring distances. Use a drive motor that has been equipped with isolation countermeasures.

■ High Speed Operation

Problems may occur with the motor bearings and dynamic balance in applications operating at over 60 Hz. Contact Yaskawa for consultation.

■ Torque Characteristics

Torque characteristics differ when operating directly from line power. The user should have a full understanding of the load torque characteristics for the application.

■ Vibration and Shock

The motor may generate vibrations in the following circumstances.

(1) Resonance

Take particular caution when using a variable speed drive for an application that is conventionally run from line power at a constant speed. Shock-absorbing rubber should be installed around the base of the motor and the Jump Frequency selection should be enabled to prevent resonance.

(2) Any imperfection on a rotating body increases vibration with speed.

Caution should be taken when operating above the motor rated speed.

(3) Subsynchronous Resonance

Subsynchronous resonance may occur in applications with high load inertia, as well as in motors with a relatively long shaft. Yaskawa recommends using Closed Loop Vector Control for such applications.

■ Audible Noise

Noise created during run varies by the carrier frequency setting. Using a high carrier frequency creates about as much noise as running from line power. Operating above the rated speed (i.e., above 60 Hz), however, can create unpleasant motor noise.

Using a Highly Efficient Motor

■ IE3 Motor

The IE3 motor has superior features compared to the standard IE1 motors. Contact Yaskawa for technical documents.

Application Notes (continued)

Applications with Specialized Motors

Multi-Pole Motor

Because the rated current will differ from a standard motor, be sure to check the maximum current when selecting a drive. Always stop the motor before switching between the number of motor poles. If a regenerative overvoltage fault occurs or if overcurrent protection is triggered, the motor will coast to stop.

Explosion-Proof Motor

Both the motor and drive need to be tested together to be certified as explosion-proof. The drive is not for explosion proof areas.

An explosion-proof pulse generators (PG) is used for an explosion-proof with voltage tolerance. Use a specially designed pulse coupler between the drive and the PG when wiring.

Geared Motor

Continuous operation specifications differ by the manufacturer of the lubricant. Due to potential problems of gear damage when operating at low speeds, be sure to select the proper lubricant. Consult with the manufacturer for applications that require frequencies in excess of the rated frequency.

Single-Phase Motor

Variable speed drives are not designed for operating single phase motors. Using a capacitor to start the motor causes high-frequency current to flow into the capacitors, potentially causing damage. A split-phase start or a repulsion start can end up burning out the starter coils because the internal centrifugal switch is not activated. CR700 is for use only with 3-phase motors.

Motor with Brake

Caution should be taken when using a drive to operate a motor with a built-in holding brake. If the brake is connected to the output side of the drive, it may not release at start due to low voltage levels. A separate power supply should be installed for the motor brake. Motors with a built-in brake tend to generate a fair amount of noise when running at low speeds.

Power Driven Machinery

Continuous operation at low speeds wears on the lubricating material used in gear box type systems to accelerate and decelerate power driven machinery. Note also that operation at a frequency exceeding the rated frequency can cause problems with the power transmission mechanism, including audible noise, performance life, and durability due to centrifugal force.

Warranty

Warranty Information

Warranty Period

The period is 12 months from the date the product is first used by the buyer, or 18 months from the date of shipment, whichever occurs first.

Post-Warranty Repair Period

The post-warranty repair period applies to products that are not in the standard warranty period.
During the post-warranty repair period, Yaskawa will repair or replace damaged parts for a fee.
There is a limit to the period during which Yaskawa will repair or replace damaged parts.
Contact Yaskawa or your nearest sales representative for more information.

Warranty Scope

Failure diagnosis

The primary failure diagnosis shall be performed by your company as a rule.
By your company's request, however, we or our service sector can execute the work for your company for pay.
In such a case, if the cause of the failure is in our side, the work is free.

Repair

When a failure occurred, repairs, replacement, and trip to the site for repairing the product shall be free of charge. However, the following cases have to be paid.

- Cases of failure caused by inappropriate storing, handling, careless negligence, or system design errors performed by you or your customers.
- Cases of failure caused by a modification performed by your company without our approval.
- Cases of failure caused by using the product beyond the specification range.
- Cases of failure caused by force majeure such as natural disaster and fire.
- Cases in which the warranty period has expired.
- Cases of replacement of consumables and other parts with limited service life.
- Cases of product defects caused by packaging or fumigation processing.
- Other failures caused by reasons for which Yaskawa is not liable.

The services described above are available in Japan only. Please understand that failure diagnosis is not available outside of Japan. If overseas after-sales service is desired, consider registering for the optional overseas after-sales service contract.

Exception of Guaranteed Duty

Lost business opportunities and damage to your property, including your customers and other compensation for work, is not covered by the warranty regardless of warranty eligibility, except when caused by product failure of Yaskawa products.
This product does not guarantee the safety of the entire crane system. Implement crane safety measures on the host system.

Definition of Delivery

For standard products that are not set or adjusted for a specified application, Yaskawa considers the product delivered when it arrives at your company and Yaskawa is not responsible for on-site adjustments or test runs.

General Safety

Exclusion of Liability

- This product has been manufactured for variable speed applications of three-phase AC motors for general industry.
- Contact a Yaskawa representative or your Yaskawa sales representative if you are considering the application of this product for special purposes where its failure or malfunction could cause a loss of human life or physical injury, such as machines or systems used for nuclear power, airplanes and aerospace, traffic, medicine, or safety devices.
- Yaskawa has manufactured this product with strict quality-control guidelines. Install applicable safety devices to minimize the risk of accidents when you install the product where its failure could cause a loss of human life, physical injury, or a serious accident.
- Only approved personnel should install, wire, maintain, inspect, replace parts, and repair the drive.
- Use this product only for loads with three-phase AC motors.

Export Controls

In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

Global Service Network

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South America	Brazil	São Paulo	❸YASKAWA ELÉTRICO DO BRASIL LTDA.	☎ +55-11-3585-1100 FAX +55-11-3585-1187
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Certified for ISO9001 and ISO14001

JQA-QMA14913 JQA-EM0202

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LITERATURE NO. KAEP C710617 24B <1>-0
Published in Japan September 2020
V1-02-19-08