

YASKAWA AC Drive

GA700

High Performance Type

200 V Class, 0.4 to 110 kW

400 V Class, 0.4 to 630 kW



Limitless Possibilities

World-class high-performance drive

With the customer's interest always in mind, Yaskawa Electric Corporation leads the industry in developing drives that meet demand with uncompromising quality.

Based on the concepts of versatility, ease of use, and stability, the GA700 new drive series was created to provide the industry's leading and most advanced motor control and ensure continual operation of customer machinery and equipment.

Backed by outstanding performance and total cost reduction, the GA700 helps to improve the added value of our customers' machinery and equipment.



High-performance Motor Control for All Motors

Reduce System Costs
by Incorporating Peripheral Devices

Continuous Operation of Machinery and Equipment
with the Predictive Failure Detection Function in Real-Time










Improve Efficiency of Production Management
with Sensing Technology and IoT Support



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GA700 provides the best value for your application, whether it is development, design, production technology or after-sales service.

Development/ Design

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Production Technology

Maintenance



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

Maximize the Performance of Your Machines

Yaskawa has succeeded in creating a compact motor incorporating its many years of experience in the development of motor control technology. Our products can deliver a performance that exceeds all expectations.

The Industry's Leading and

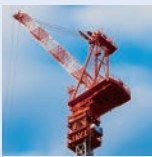
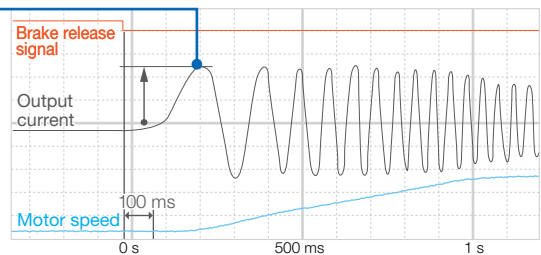
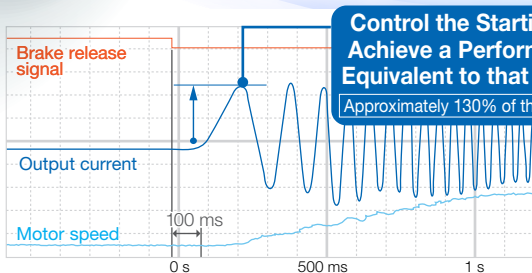


Stable Drive for High-impact Loads

Equipped with high-performance Open Loop Vector control, the GA700 can achieve a control performance that is almost equivalent to that of an encoder.

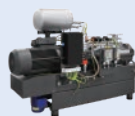
■ GA700 (Advanced Open Loop Vector control)

■ Conventional model (Closed Loop Vector control)



Crane

- Achieve longer service life by controlling the starting current when the brake is released

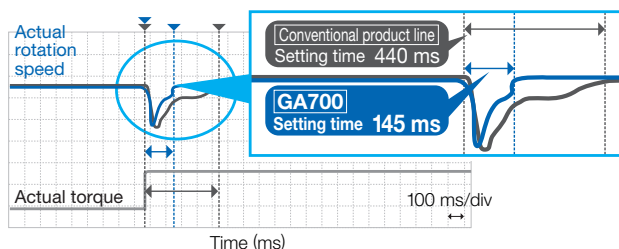
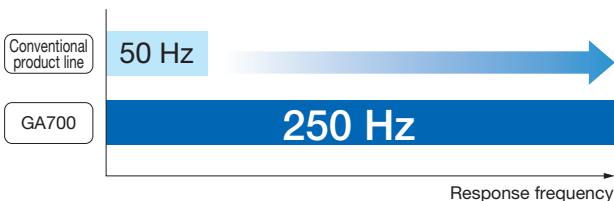


Vacuum Pump

- Stable drive even during atmospheric release

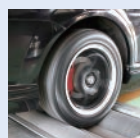
Speed response with an encoder has been significantly improved to 250 Hz, which is five times that of the conventional model, to achieve even more stable operation.

■ Response of PM Closed Loop Vector control and actual rotation speed change with a high-impact load



Compressor (Freezer)

- Stable drive even with residual pressure
- Startup possible with any refrigerants



Test Equipment

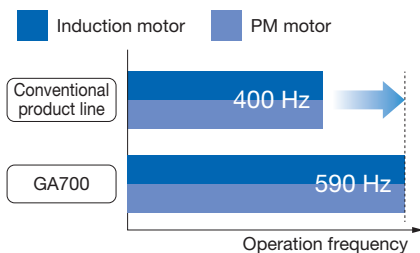
- Achieved high-response and high-precision torque control



Most Advanced Motor Control

Industry-leading 590 Hz!

Achieving high-speed operation with a maximum output frequency of 590Hz* with induction motors and PM motors, machines can be made more compact and efficient as gears and belts do not need to be used with motors.



General Processing Machinery

- High precision drive matched with workpieces
- Reduced number of encoders, gears, and belts

*: Output frequency is 590 Hz after review of Export Control Order.

Drives All Motors

The GA700 can drive both induction motors and PM motors (IMP/SPM motors) with high performance.

Able to Drive Synchronous Reluctance Motor

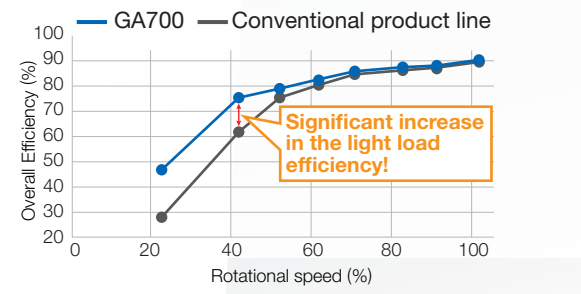
With EZ Open Loop Vector control, it is possible to drive a reluctance motor with high energy savings.

A synchronous reluctance motor uses a magnet-less structure to create a low-cost, highly-efficient motor that does not generate secondary current loss.

Maximize Motor Efficiency

Motor efficiency can be improved with new functions that monitor and control power consumption so that it can be reduced as much as possible.

Overall efficiency of the AC drive and motor

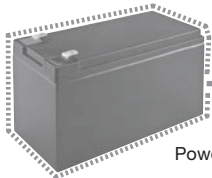


Reduce System Costs by Incorporating Peripheral Devices

To minimize initial investment, the functions of the peripheral devices are incorporated into the GA700. This eliminates the need for these devices, and saves space, wiring, and labor.

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.



Power supply

Sensor

24 Vdc Control Power Input Terminal Standard Equipped

Checks faults and sets parameters without the need for additional options.



Braking Transistor Built-in

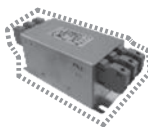
Eliminates the need for a separately mounted braking unit.

Correspondence:
200 V-class up to 37 kW (ND)
400 V-class up to 75 kW (ND)



DC Reactor Built-in

A DC reactor minimizes harmonic distortion.
(Corresponds to 200 V class/400 V class
22 kW (ND) or more)



Internal EMC Filter

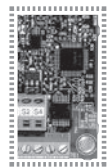
Full capacity, built-in option is available. (EN61800-3)

High Performance Control Without an Encoder



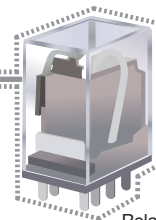
Easy Programming Functions

A control board is not required when a program is created with the support tool DriveWorksEZ.

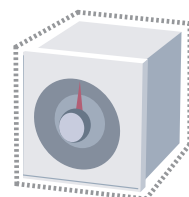


Reduction in the Number of Peripheral Devices

With the enhanced functions of the DriveWorksEZ programming tool, timers and relays are unnecessary.



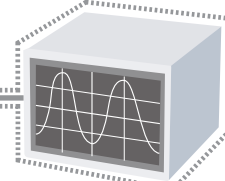
Relay



Timer

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

Voltage/Current Switching Analog Output Conversion Circuit is not required

Conversion circuit is not required for the analog output voltage of 0 to 10 V and electric current of 4 to 20 mA.



Converter

SIL3* Correspondence STO Standard Equipped

Two contactors are no longer needed.

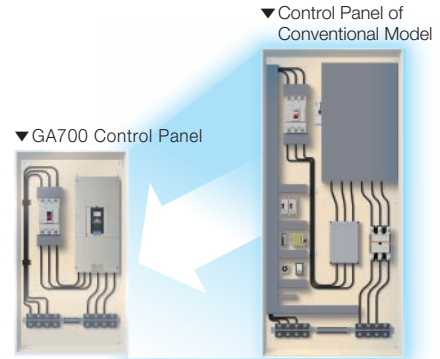
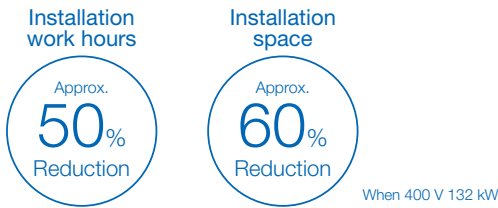
*: Safety performance measurement under IEC/EN61508



Peripheral Device Functions Incorporated into the Drive

Peripheral device functions are incorporated into the drive to minimize work-hours and the installation area of the control panel.

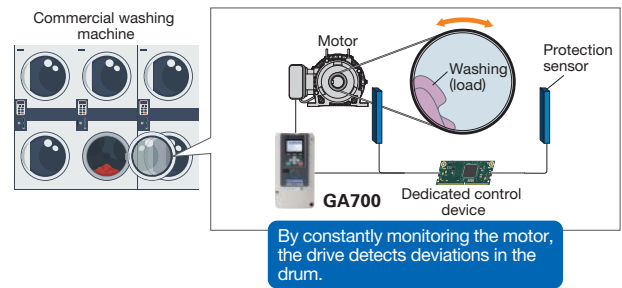
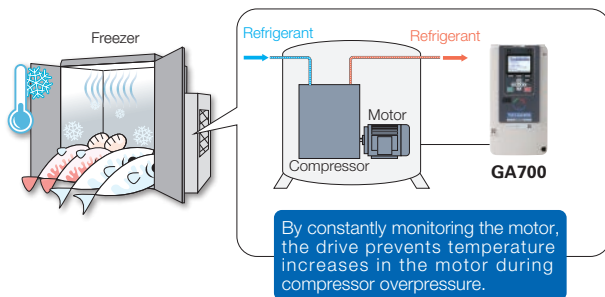
Note: Refer to page 14 for more information.



Sensing Machinery Operation with the Drive

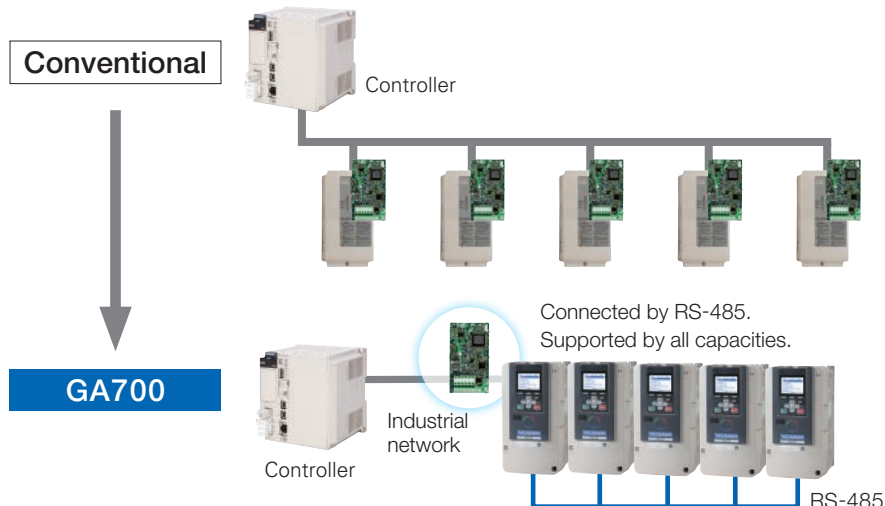
The operation of machinery and equipment can be easily detected by customizing the drive.

Note: The drive must be customized with the visual programming tool DriveWorksEZ.



Control Multiple Drives with a Single Communication Option Card

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 (gateway connection method). We recommend this system for fans, pumps, and compressors that must control multiple drives and do not require fast communication speeds.



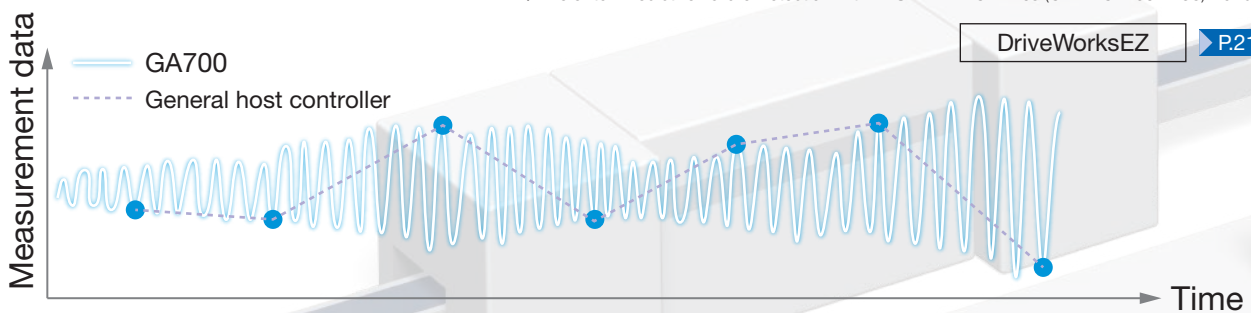
Continuous Operation of Machinery and Equipment

Yaskawa drives contribute to the stable operation and improvement of operating rates with a predictive failure detection by detecting the deterioration of machinery and equipment, as well as a new function that extends service life.

Predictive Failure Detection in Real-Time Using Drives*

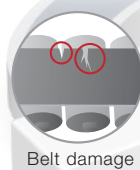
The GA700 helps users build machinery and production lines to ensure continuous operation. The drive detects and informs users about unusual operations in machinery and equipment in real-time.

*: Refer to "Predictive Failure Detection with YASKAWA AC Drives (CHEP C710617 38)" for details.



Transport Conveyor

- Belt break
- Drive chain break
- Roller bearing deterioration



Belt damage



Fan

- Filter clogging
- Wing damage
- Loose pulley belt



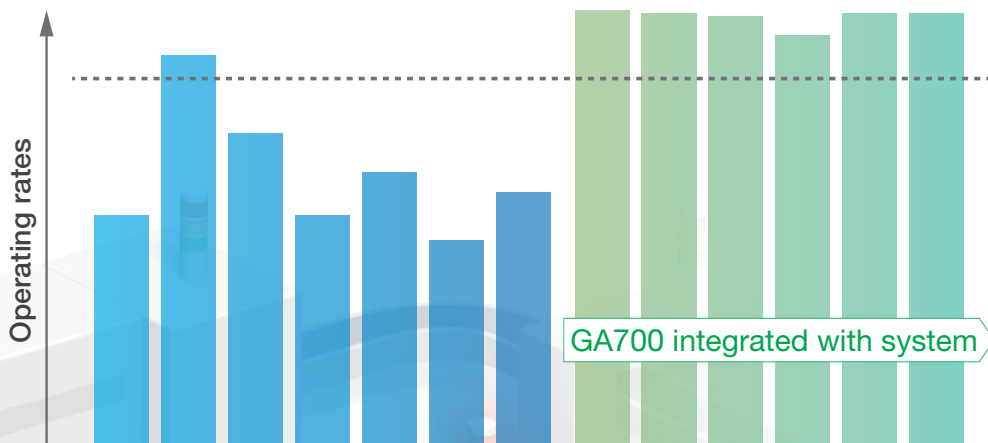
Chiller Compressor

- Liquid return detection, etc.



Pump

- Motor bearings
- Deterioration of bearings

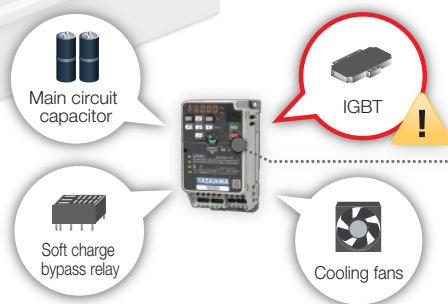


Achieves Stable Operation and Improvement of Operating Rates

Predict Drive Service Life*

The GA700 monitors deterioration of built-in, limited lifetime service parts in real time and notifies users about replacement timing.

*: Refer to "Predictive Failure Detection with YASKAWA AC Drives (CHEP C710617 38)" for details.



Limited lifetime service parts	Replacement
Cooling fan	Replacement of cooling fan (By user)
Main circuit capacitor	Replacement of components (Please send inquiries to a Yaskawa distributor or sales rep.)
Soft charge bypass relay	
IGBT (Power module)	Drive replacement (Please send inquiries to a Yaskawa distributor or sales rep.)

Predicts deterioration of essential parts of drives!

Longer Motor Service Life

The GA700 prevents the phenomenon of a reduction in the magnetic force (irreversible demagnetization), which requires replacement with a PM motor, and helps reduce downtime.



Prevent Demagnetization of PM Motor



Prevent Oscillation of Compressor

Improve Production Management with IoT

Yaskawa drives do more than just drive motors—they also extract data from machines in real time to monitor conditions. They utilize the extracted data to predict potential failures and also connect to the host controllers to share the data so that it improves the efficiency of production management.



Diagnosis

Prevent Major Problems Before They Occur

Yaskawa drives can monitor the status of machinery and equipment via the motor.

In addition to sending monitored data to the host, predictive failure detection can be enabled to detect unusual conditions inside the drive.

DriveWorksEZ

P.21



Visualizes

Monitors machine conditions in real time while the drive is in operation

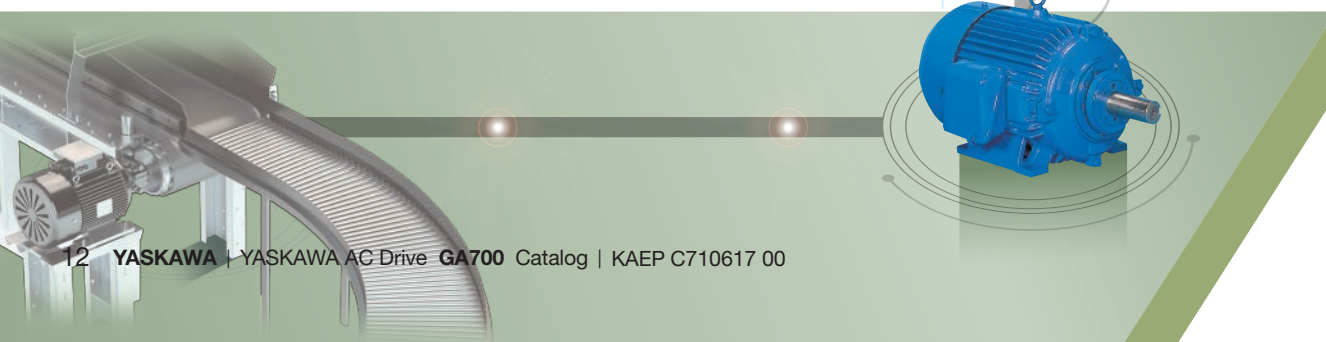
Extracted Data

- Motor speed, Frequency
- Torque
- Power consumption
- Motor voltage
- Load current etc.



Power consumption

Torque



Access Complete Data on Machinery

Monitored data (current, power consumption, torque, etc.) stored in the drive can be collected and analyzed to enhance the efficiency of production management.



*: Software that collects, stores, and analyzes data on facilities and equipment at production sites in real time.

Power consumption

Torque



Connect to Various Host Controllers

The GA700 supports a variety of industrial networks in Japan and around the world, including MECHATROLINK, for connectivity to various host controllers.



Note: Option card is required.

Communication Options ▶ P.53



High-speed Scanning to Analyze Detailed Behavior

Monitored data (current, power consumption, torque, etc.) from the drive can be stored to a microSD card at high speed to be used in for detailed data analysis and investigation of factors when a problem occurs.

DriveWizard ▶ P.20

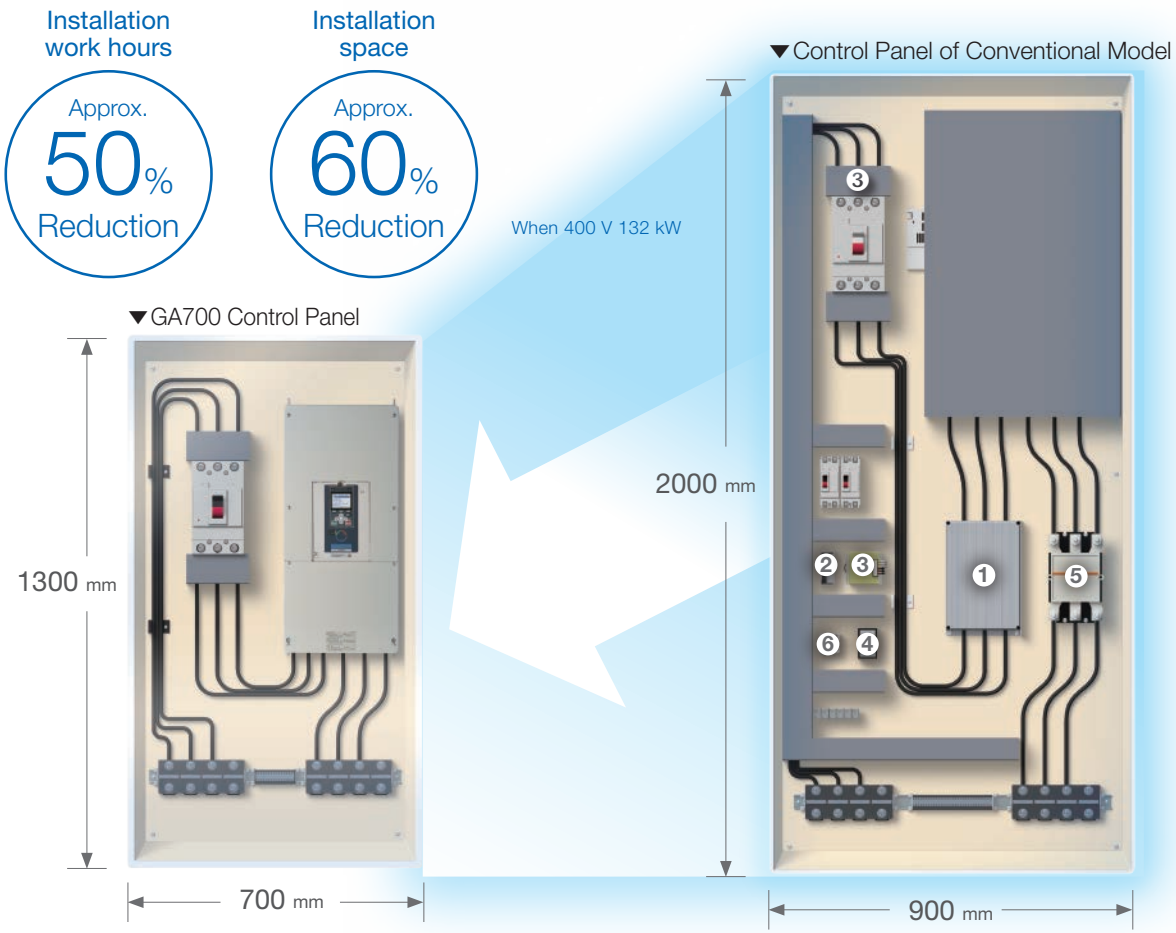


Note: DeviceNet is a trademark of Open DeviceNet Vendor Association, Inc. (ODVA).
 EtherCAT is a trademark of Beckhoff Automation GmbH.
 MECHATROLINK is a trademark of MECHATROLINK Members Association.
 PROFIBUS is a trademark of PROFIBUS Nutzerorganisation e.V.

Reduce Machinery and Control Panel Footprint

The world's top class drive, the GA700, minimizes the installation area of the control panel. By incorporating the functions of peripheral devices, the GA700 achieves the most outstanding results in space savings.

Smaller Control Panel with Integrated Peripheral Device Functions



Braking Transistor/DC Reactor Built-in Models				
200 V	Built-in DC reactor			
	0.4 kW	22 kW	30 kW	110 kW
Built-in braking transistor				
400 V	Built-in DC reactor			
	0.4 kW	22 kW	75 kW	630 kW
Built-in braking transistor				
Lineup expanded up to 75 kW				

- ① EMC Filter
- ② 24Vdc Power Supply
- ③ 24Vdc Power Supply (150mA)
- ④ Analog output conversion circuit (voltage to current)
- ⑤ Safety circuit for safety standard (SIL3)
- ⑥ Timer, relay

Reduced Installation Space

45% reduction in comparison with conventional drives.
 You can design a compact control panel.
 (ex. 400 V class 110 kW)

Note: The size of the reduced installation space will vary depending on capacity.



Installation space
 Approx.
45%
 Reduction

Higher Degree of Freedom in Designing Control Panels

External Heatsink

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



Note: Depending on the capacity, an attachment may be needed. Refer to page 50 for more information.

Side-by-Side Installation

Multiple drives can be installed in close proximity (side-by-side installation). The control panel can be designed compactly.



Compatible Models:
 GA70A2004 to 2082 (200 V class 0.4 to 18.5 kW (HD))
 GA70A4002 to 4044 (400 V class 0.4 to 18.5 kW (HD))
 (ex. 200 V class 0.4 kW)

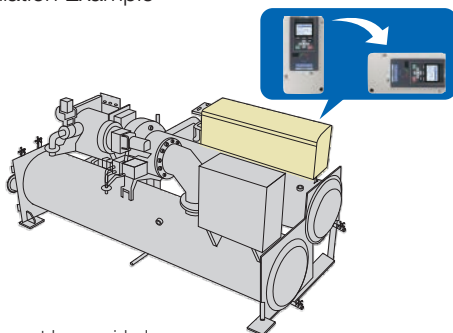
*: At least 30 mm of space is needed if installed near a wall.
 Note: Derating must be considered.

Horizontal Placement

The drive can be installed either vertically or horizontally. The type of installation can be selected depending on the situation, which helps reduce space.

[Applicable up to 18.5 kW (HD) for 200-V class and 30 kW (HD) for 400-V class. Technical documentation is available. Contact a Yaskawa distributor or sales representative for more information.]

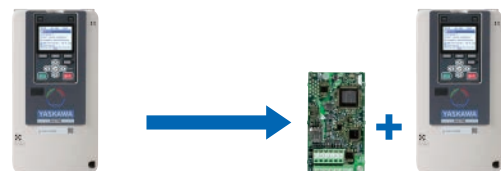
Compressor Installation Example



Note: Adequate airflow must be provided and derating must be considered.

Increase the Degree of I/O Freedom

The DI-A3 input terminal, which is conventionally used as a digital frequency reference card, can also be used as a MFDI terminal. PG option cards and I/O option cards for the 1000 series can also be used.



Input number: **8**

Input number: **24**

Easy Maintenance

This product lineup comes with a variety of functions to help minimize the time and cost of operations from drive selection to troubleshooting.



Significantly Raise Work Efficiency with Support Tools

Setup time can be substantially reduced by connecting the drive to smart phone or PC.

- **Write/Read/Manage parameters without main power supply**
- **Auto-Tuning**
- **Monitor check (current, torque, etc.)**

DriveWizard ▶ P.20

DriveWizard Mobile ▶ P.22-23



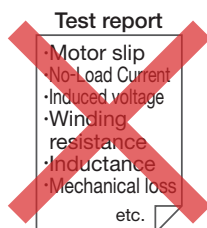
Keypads Store Parameters for a Maximum of 4 Drives

USB connection



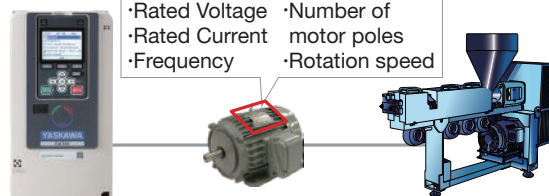
Tuning Possible with Machinery Installed

Easy tuning can be performed even on motors manufactured overseas and motors without information on performance or status with connected machinery to ensure high-performance driving.



Motor nameplate

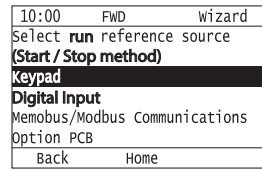
- Rated Voltage
- Rated Current
- Frequency
- Number of motor poles
- Rotation speed



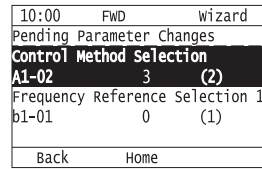
Extruder



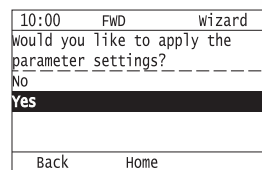
1 Select "Setup Wizard" from the initial setting.



2 Select the item you want to set. Follow the instructions on the keypad.



3 Check the modified parameters and select "Next".



4 Select "Yes" and settings are complete.

- Parameters Set using the Setup Wizard Function
 - Frequency reference source
 - Run command source
 - Motor class
 - Maximum frequency
 - Stopping method
 - Input signal level
 - Duty rating
 - Control mode
 - Input/output setting
 - Acceleration/deceleration time etc.



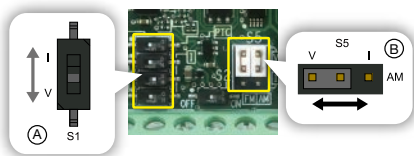
Simply Answer Questions to Set Parameters

The GA700 has been equipped with a Setup Wizard. Even first-time users can easily complete initial settings just by answer the questions displayed on the keypad.

Significant Reduction in Wiring

Easily Switch between Voltage and Current

Analog input Ⓐ : 0 to 10V,
4 to 20mA, 0 to 20mA
Analog output Ⓑ : 0 to 10V

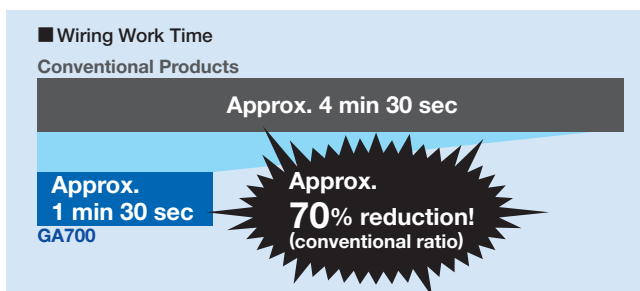


Controllers with 24-V Common Method Supported

You can switch between the Sinking mode (NPN) and Sourcing mode (PNP) on the multifunction digital input terminals and between internal and external power supply.

Wiring Reduction

Virtual I/O function can reduce external wiring. This function virtually wires the I/O terminal of the drive internally without actual wires.



European Terminals

Crimp terminals and crimping operation are no longer required, significantly reducing work hours.

Compatible Models:
GA70A2004 to 2211 (200 V class 45 kW (HD))
GA70A4002 to 4168 (400 V class 75 kW (HD))

Note : For use of the tools, see page 39.

Easy Maintenance

This product lineup comes with a variety of functions to help minimize the time and cost of operations from drive selection to troubleshooting.



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)

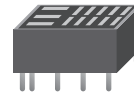
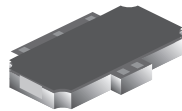
- Intuitive operation keys
- Status display visible from a distance



Monitor Performance Life

▼ Limited lifetime service parts of drive

IGBT	Main circuit capacitors	Soft charge bypass relays	Cooling fans
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Highly-Reliable Design

• Varnish-Coated Printed Circuit Board
(IEC60721-3-3:3C2.3S2)

- Design life of 10 years
- Environment-resistant design (option)
- Resolver Compatible
Note: Option card is required.

Vibration-resistant

Dust-resistant



Moisture-resistant

Gas-resistant

Oil-resistant

Simple Identification of Faults

The drive operating status (current, frequency, torque, etc.) can be recorded on a micro SD card. The oscilloscope function of the DriveWizard in the support tool reproduces the recorded data as a waveform. This function allows users to check the waveforms before and after a fault occurs and helps analyze the causes of failures.



DriveWizard P.20

Quick Response

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

DriveWizard Mobile P.22-23

Method 1: Supply power from 24Vdc external power supply



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



*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 control board to instantly and securely replace the drive. 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

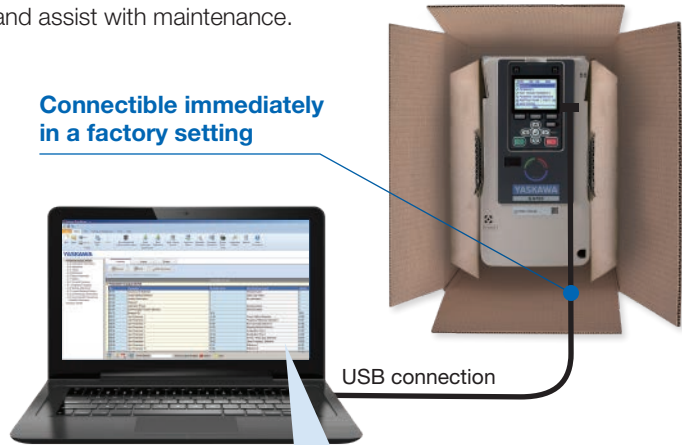
Support Tool DriveWizard

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

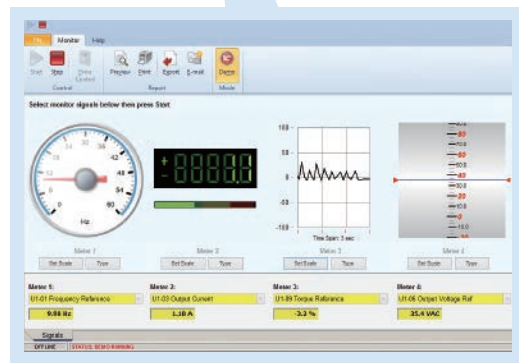
- Connect using a commercially-available USB cable (Mini B to Type A)
- Connect even when no power is supplied to the drive

Connectible immediately in a factory setting



Simple Adjustment

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

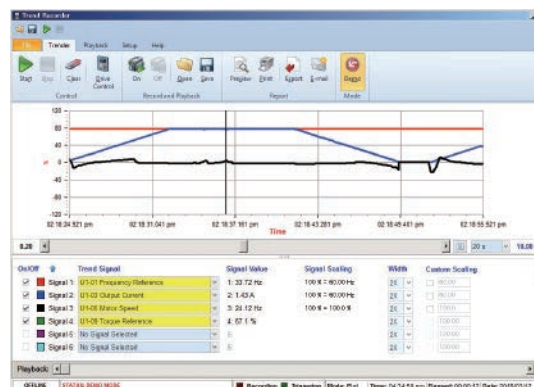


Easy Maintenance

- 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

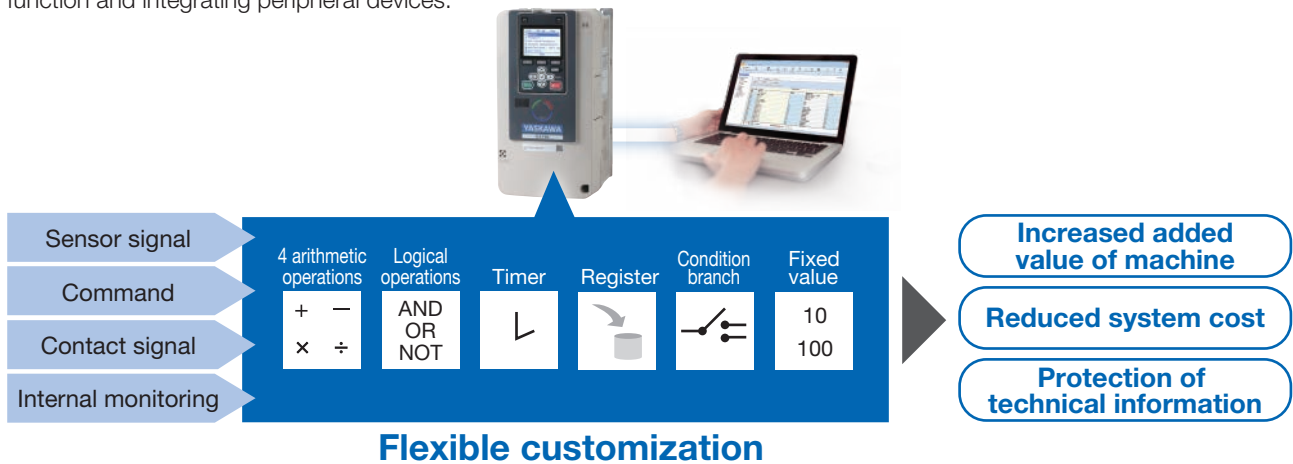
- Displays the saved data on a microSD card as a waveform
- Displays the drive monitor data as a graph
- Displays the I/O terminal status
- Displays the fault history



Customize the Drive to Suit Your Needs

Programming Tool DriveWorksEZ

By combining the sensor signal, drive command, and internal monitor input signal with the arithmetic functions (function block) of the drive, the added value can be improved since costs are reduced as a result of adding a predictive failure detection function and integrating peripheral devices.



Other Features

- Easy program copying: Use the LCD keypad to copy the program and write data to another GA700.
- Simulation function: Check program operations even without using a drive.

Application Examples

Detect machine failure or deterioration

- Belt damage on conveyor
- Filter clogging of fan
- Liquid return in compressor
- Air entrainment in pump

Use the AC Drive's functions instead of sensor signals to enhance the functions of the machine

- Constant pressure control of pump
- Constant air flow control of fan
- Optimum temperature control
- Multiple pump control
- Dancer tension control

Significantly reduce the number of peripheral devices and sensors

- Impact stop function
- Repetitive starts and stops
- Forward/reverse run
- Simple positioning control
- Load unbalance detection

Contact Yaskawa for details on other solutions.

Use a Smartphone to Adjust the Drive and Perform Maintenance

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.

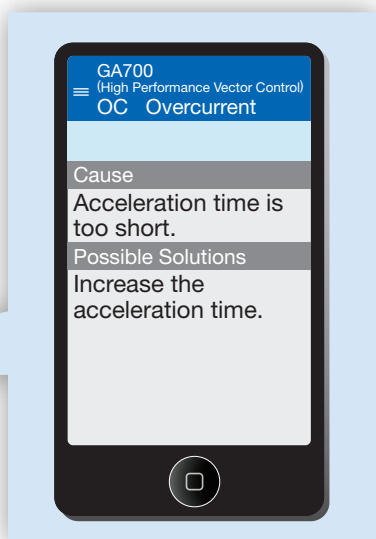
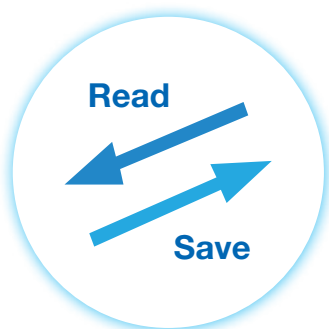
Edit parameters, perform operations and check monitored data in real-time.

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



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.



Troubleshooting Screen When an Error Occurs

Users can check details on errors and information on troubleshooting on the screen and quickly recover the drive without using a manual.



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 (<https://www.e-mechatronics.com>) to access the App Store and Google Play.

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Google Play and the Google Play logo are trademarks of Google LLC.

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QR Code is a registered trademark of DENSO WAVE INCORPORATED.

Bluetooth is a registered trademark of Bluetooth SIG, Inc.

Product Lineup

Motor Capacity kW	Three-Phase 200 V Class				Three-Phase 400 V Class			
	Heavy Duty		Normal Duty		Heavy Duty		Normal Duty	
	Catalog Code GA70A:□	Rated Output	Catalog Code GA70A:□	Rated Output	Catalog Code GA70A:□	Rated Output	Catalog Code GA70A:□	Rated Output
0.4	2004	3.2 A			4002	1.8 A		
0.75	2006	5 A	2004	3.5 A	4004	3.4 A	4002	2.1 A
1.1	2008	6.9 A	2006	6 A				
1.5	2010	8 A	2008	8 A	4005	4.8 A	4004	4.1 A
2.2	2012	11 A	2010	9.6 A	4007	5.5 A	4005	5.4 A
3	2018	14 A	2012	12.2 A	4009	7.2 A	4007	7.1 A
3.7	2021	17.5 A	2018	17.5 A	4012	9.2 A	4009	8.9 A
5.5	2030	25 A	2021	21 A	4018	14.8 A	4012	11.9 A
7.5	2042	33 A	2030	30 A	4023	18 A	4018	17.5 A
11	2056	47 A	2042	42 A	4031	24 A	4023	23.4 A
15	2070	60 A	2056	56 A	4038	31 A	4031	31 A
18.5	2082	75 A	2070	70 A	4044	39 A	4038	38 A
22	2110	88 A	2082	82 A	4060	45 A	4044	44 A
30	2138	115 A	2110	110 A	4075	60 A	4060	59.6 A
37	2169	145 A	2138	138 A	4089	75 A	4075	74.9 A
45	2211	180 A	2169	169 A	4103	91 A	4089	89.2 A
55	2257	215 A	2211	211 A	4140	112 A	4103	103 A
75	2313	283 A	2257	257 A	4168	150 A	4140	140 A
90	2360	346 A	2313	313 A	4208	180 A	4168	168 A
110	2415	415 A	2360	360 A	4250	216 A	4208	208 A
132					4296	260 A	4250	250 A
160					4371	304 A	4296	296 A
200					4389	371 A	4371	371 A
220					4453	414 A	4389	389 A
250					4568	453 A	4453	453 A
315					4675	605 A	4568	568 A
355							4675	675 A
400					4810	720 A		
450					4930	810 A	4810	810 A
500					4H11	930 A	4930	930 A
560					4H12	1090 A	4H11	1090 A
630							4H12	1200 A

Model Number

Drives can be customized according to your specifications.



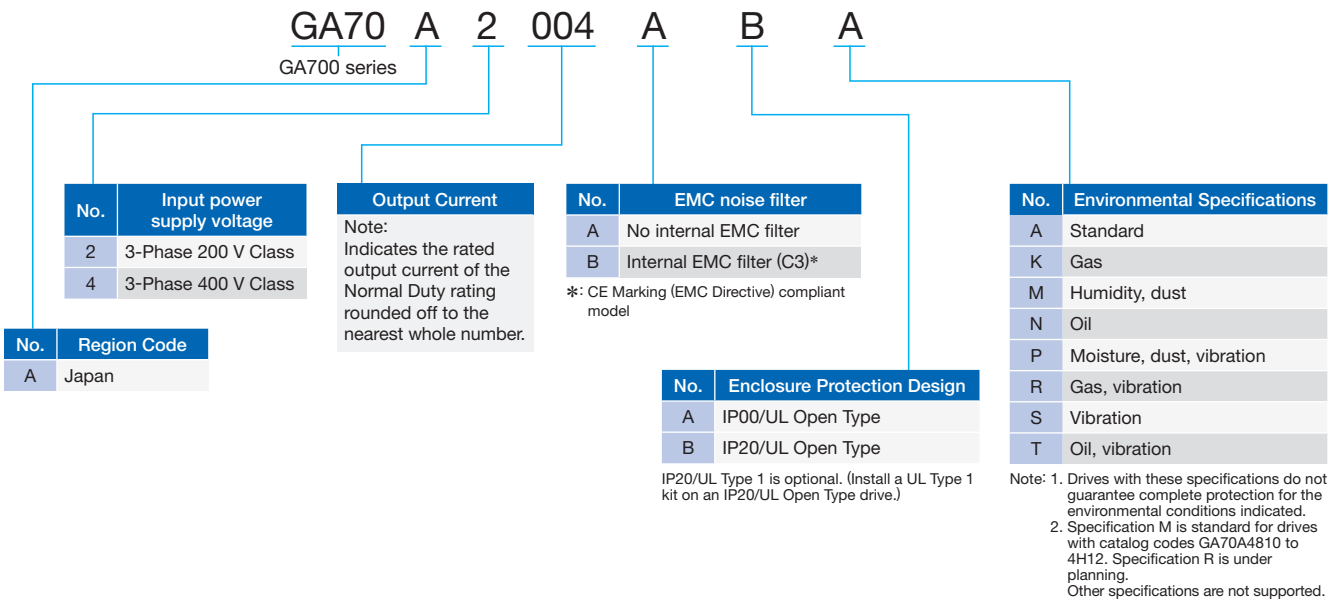
Note: CAAAAA is the standard for model numbers 9 to 14. Contact us for other combinations.

No	Description
1	Product series · GA700 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
6	Enclosure Protection Design · A: IP00/UL Open Type · B: IP20/UL Open Type IP20/UL Type 1 is optional. (Install a UL Type 1 kit on an IP20/UL Open Type drive.)
7	Environmental specifications*2 · 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. · Specification M is standard for drives with catalog codes GA70A4810 to 4H12. Specification R is under planning. Other specifications are not supported.

No	Description
8	Design revision order
9	Control circuit terminal board · A: Relay output/screw clamp terminal board type · C: Photocoupler output/screw clamp terminal board type (Standard)
10	Option card (connector CN5-A) · A: No option card (Standard)
11	Option card (connector CN5-B) · A: No option card (Standard)
12	Option card (connector CN5-C) · A: No option card (Standard)
13	Keypad · A: LCD keypad (Standard)*3 · B: LCD keypad (humidity-resistant and dust-resistant)*3 · D: Bluetooth LCD Keypad*3 · E: Bluetooth LCD Keypad (humidity-resistant and dust-resistant)*3 · F: LED keypad*3 · G: LED keypad (humidity-resistant and dust-resistant)*3 · L: Blank cover
14	Special applications · A: Standard · B: High frequency*4

- *1: Indicates the rated output current of the Normal Duty rating rounded off to the nearest whole number. Refer to Rated Output Current column on page 24 for detailed values.
- *2: The keypad is attached according to the environmental specifications of the drive.
- *3: A separate cable must be purchased to connect the drive and the keypad. Refer to Keypad Extension Cable on page 72 for more details.
- *4: This model is subject to export regulations. Contact Yaskawa for more information.

Catalog Code



Basic Instructions

Outstanding operability and quick setup

Keypad Names and Functions

① RUN LED

Lit while the drive is operating the motor.

⑤ ALM LED

The drive lights up if a fault is detected.

Flashes when minor faults, tuning errors and operational errors occur.

⑦ LO/RE LED

Lit: When the keypad is selected for Run command and frequency reference control (LOCAL).

Off: When a device other than the keypad is selected for Run command and frequency reference control (REMOTE).

⑩ LED Status Ring

The corresponding lamp lights depending on the operation status.

④ RUN Key

Starts the drive in LOCAL mode.

⑥ LO/RE Selection Key

Switches drive control between the keypad (LOCAL) and an external source (REMOTE) for the Run command and frequency reference.

⑧ STOP Key

Stops drive operation.

⑨ Com port

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

⑪ QR code

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



② 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.

③ 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

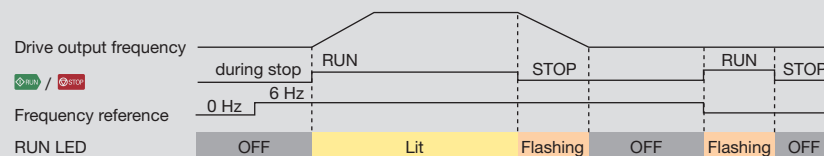
- Inputs parameter numbers and setting values. Press to enter values, edit parameters and set the control mode.
- Switches between displays with selection of menu items.

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

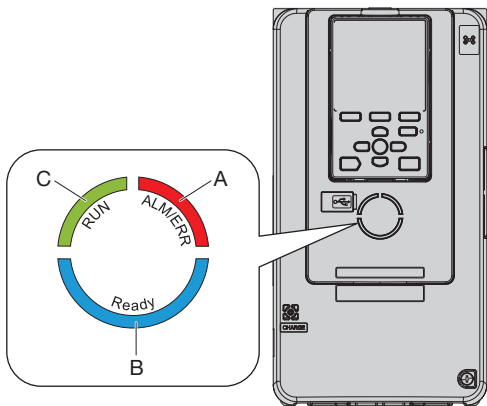
Keypad LED

Indicator LED	Lit	Flashing	Flashing Quickly	OFF
	Motor running.	<ul style="list-style-type: none"> • The motor is performing ramp to stop. • The Run command was inputted when the frequency reference was 0 Hz 	<ul style="list-style-type: none"> • 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.
	A fault was detected.	<ul style="list-style-type: none"> • Minor fault was detected. • Operation error was detected. • Auto-Tuning was detected. 	—	Normal operation
	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:



LED Status Ring



LED Status Ring	State	Content
A 	Lit	The drive detected a fault.
	Flashing	The drive has detected: <ul style="list-style-type: none"> • 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 or faults present.
B 	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	<ul style="list-style-type: none"> • 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 	Lit	The drive is in regular operation.
	Flashing	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 drive output stops.

- Product Lineup
- Model Number / Catalog Code
- Basic Instructions
- Model Selection
- Standard Specifications
- Standard Connection Diagram
- Terminal Specifications
- Dimensions
- Fully-Enclosed Design and Drive Watt Loss Data
- Peripheral Devices and Options
- Application Notes
- Warranty
- Global Service Network

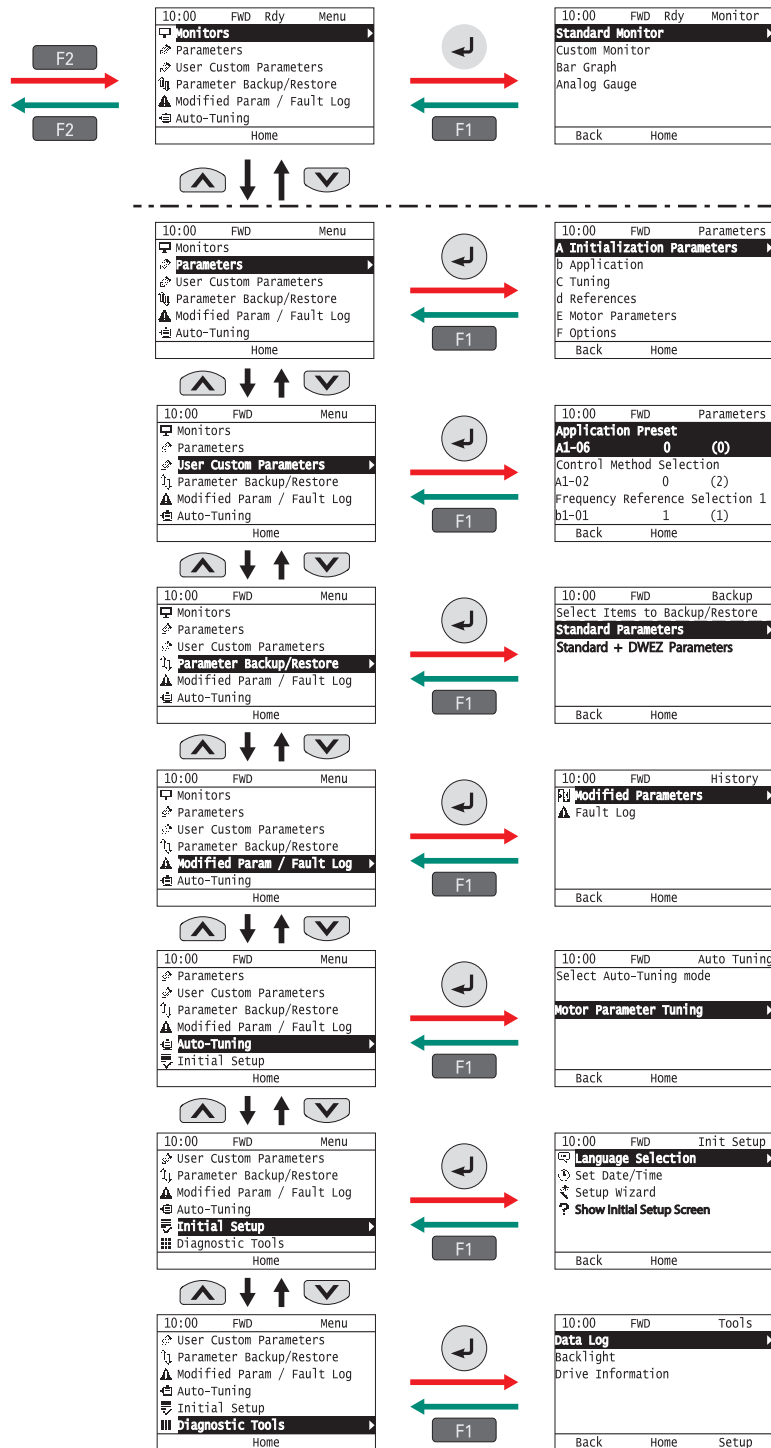
Basic Instructions (continued)

Keypad Example

Turn the power on

10:00	FWD	Rdy	Home
Freq Reference (AI)			0.00
U1-01 Hz			0.00
Output Frequency			0.00
U1-02 Hz			0.00
Output Current			0.00
U1-03 A			0.00
Jog	Menu	FWD/REV	

Home



Drive Mode

Program Mode

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.

- The drive will not accept a Run command while in Programming Mode.
Set b1-08 [Run Command Select in PRG Mode] to accept or reject a Run command from an external source while in Programming Mode.
–Set b1-08 = 0 [Do not accept RUN at Programming] (default) to reject the Run command from an external source while in Programming Mode.
–Set b1-08 = 1 [Accept RUN while Programming] to accept the Run command from an external source while in Programming Mode.
–Set b1-08 = 2 [Allow Programming only at Stop] to block changes from Drive Mode to Programming Mode while the drive is in operation.

Model Selection

Optimizing Control for Each Application

GA700 offers two separate performance ratings: Heavy Duty and Normal Duty.

Heavy Duty is capable of creating more powerful torque, while Normal Duty allows the drive to operate a larger motor.

Difference between load ratings:

	Heavy Duty Rating	Normal Duty Rating
Parameter settings	C6-01=0 (default)	C6-01=1
Overload tolerance	150% 60s	110% 60s
Carrier frequency	Low carrier frequency	Low carrier frequency (SwingPWM) *

*: Use Swing PWM to quiet undesirable motor noise generated when operating with a low carrier frequency. Available for models less than 450 kW.

Heavy Duty Applications

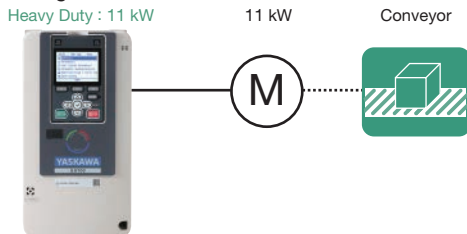
● Applications



● Selecting a Drive

For a conveyor application using an 11 kW motor, select GA70A2056 and set it for Heavy Duty performance (C6-01=0: default).

Catalog code: GA70A2056



Normal Duty Applications

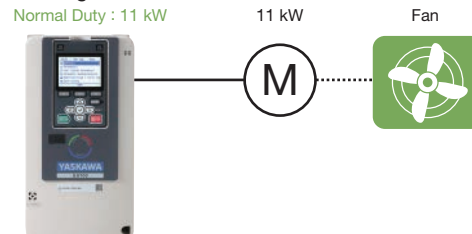
● Applications



● Selecting a Drive

For a fan application using a 11 kW motor, select GA70A2042 and set it for Normal Duty performance (C6-01=1).

Catalog code: GA70A2042



- Product Lineup
- Model Number / Catalog Code
- Basic Instructions
- Model Selection
- Standard Specifications
- Standard Connection Diagram
- Terminal Specifications
- Dimensions
- Fully-Enclosed Design and Drive Watt Loss Data
- Peripheral Devices and Options
- Application Notes
- Warranty
- Global Service Network

Standard Specifications

Parameter C6-01 sets the drive for Heavy Duty (default) or Normal Duty performance.

200 V Class

HD: Heavy Duty, ND: Normal Duty

Catalog Code GA70A2:...			004	006	008	010	012	018	021	030	042	056	070	082	110	138	169	211	257	313	360	415	
Max. Applicable Motor Capacity*1	kW	HD	0.4	0.75	1.1	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	
		ND	0.75	1.1	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	HD	3.6	4.8	6.7	8.9	12.7	17	20.7	30	40.3	58.2	78.4	96	82	111	136	164	200	271	324	394
			ND	4.8	6.7	8.9	12.7	17	20.7	30	40.3	52	78.4	96	114	111	136	164	200	271	324	394	—
Output	Rated Output Current	A	HD	3.2	5	6.9	8	11	14	17.5	25	33	47	60	75	88	115	145	180	215	283	346	415
			ND	3.5	6	8	9.6	12.2	17.5	21	30	42	56	70	82	110	138	169	211	257	313	360	—
	Overload Tolerance	· HD Rating: 150% of rated output current for 60 s · ND Rating: 110% 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 for an ND rating of 2 kHz and an HD rating up to 8 kHz.)																Derating the output current enables a maximum of 10 kHz to be set. (Derating the output current is not necessary for an ND rating of 2 kHz and an HD rating 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 capacity*2	HD	1.5	2.0	2.8	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	
	ND	2.0	2.8	3.7	5.3	7.1	8.6	12.5	16.8	21.6	32.6	39.9	47.4	46.1	56.5	68.2	83.1	113	135	164	—		

*1: The rated output current of the drive output amps should be equal to or greater than the motor rated current.

*2: Power supply capacity is calculated with a power line voltage of 240 V.

400 V Class

HD: Heavy Duty, ND: Normal Duty

Catalog Code GA70A4...			002	004	005	007	009	012	018	023	031	038	044	060	075	089	103		
Max. Applicable Motor Capacity*1	kW	HD	0.4	0.75	1.5	2.2	3.0	3.7	5.5	7.5	11	15	18.5	22	30	37	45		
		ND	0.75	1.5	2.2	3.0	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55		
Input	Rated Input Current	A	HD	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	
		ND	2.5	4.7	6.7	8.9	11.7	15.8	21.2	30.6	41.3	50.5	59.7	58.3	71.5	86.5	105		
Output	Rated Output Current	A	HD	1.8	3.4	4.8	5.5	7.2	9.2	14.8	18	24	31	39	45	60	75	91	
		ND	2.1	4.1	5.4	7.1	8.9	11.9	17.5	23.4	31	38	44	59.6	74.9	89.2	103		
Output	Overload Tolerance		· HD Rating: 150% of rated output current for 60 s · ND Rating: 110% 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 for an ND rating of 2 kHz and an HD rating 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 capacity*2	kVA	HD	1.5	2.8	3.7	5.3	7.1	9.3	13	17	24	33	40	34	46	57	69	
ND			2.0	3.7	5.3	7.1	9.3	13	17	24	33	40	48	46	57	69	84		

Catalog Code GA70A4...			140	168	208	250	296	371	389	453	568	675	810	930	H11	H12	
Max. Applicable Motor Capacity*1	kW	HD	55	75	90	110	132	160	200	220	250	315	400	450	500	560	
		ND	75	90	110	132	160	200	220	250	315	355	450	500	560	630	
Input	Rated Input Current	A	HD	105	142	170	207	248	300	373	410	465	584	783	830	976	1031
		ND	142	170	207	248	300	373	410	465	584	657	879	922	1091	1158	
Output	Rated Output Current	A	HD	112	150	180	216	260	304	371	414	453	605	720	810	930	1090
		ND	140	168	208	250	296	371	389	453	568	675	810	930	1090	1200	
Output	Overload Tolerance		· HD Rating: 150% of rated output current for 60 s · ND Rating: 110% 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 for an ND rating of 2 kHz and an HD rating up to 5 kHz.)										Derating the output current enables a maximum of 5 kHz to be set. (Derating the output current is unnecessary for ND/HD rating 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 capacity*2	kVA	HD	84	113	136	165	198	239	297	327	370	465	624	662	777	821
ND			113	136	165	198	239	297	327	370	465	523	701	734	870	923	

*1: The rated output current of the drive output amps should be equal to or greater than the motor rated current.

*2: Power supply capacity is calculated with a power line voltage of 460 V.

Standard Specifications

Common Specifications

Item	Specifications
Control Method	The following controls are selected by parameters. <ul style="list-style-type: none"> • V/f Control • Closed Loop V/f Control • Open Loop Vector Control • Closed Loop Vector Control • Advanced Open Loop Vector Control • Open Loop Vector Control for PM • Advanced Open Loop Vector Control for PM • Closed Loop Vector Control for PM • EZ Open Loop Vector Control
Maximum Output Frequency	<ul style="list-style-type: none"> • Advanced Open Loop Vector Control, EZ Open Loop Vector Control: 120 Hz • Closed Loop V/f Control, Closed Loop Vector Control, Advanced Open Loop Vector Control for PM, Closed Loop Vector Control for PM: 400 Hz • V/f Control, Open Loop Vector Control, Open Loop Vector Control for PM: 590 Hz
Frequency Accuracy (Temperature Fluctuation)	Digital reference: within $\pm 0.01\%$ of the max. output frequency (-10°C to +40°C) Analog reference: within $\pm 0.1\%$ of the max. output frequency (25°C \pm 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 Resolution	Main frequency reference: -10 to +10 Vdc, 0 to 10 Vdc (20 k Ω), 4 to 20 mA (250 Ω), 0 to 20 mA (250 Ω) Main speed reference : Pulse train input (max. 32 kHz)
Starting Torque	<ul style="list-style-type: none"> • 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 • Open Loop Vector Control for PM: 100%/5% speed • Advanced Open Loop Vector Control for PM: 200%/0 min⁻¹*1 • Closed Loop Vector Control for PM: 200%/0 min⁻¹*1 • EZ Open Loop Vector Control: 100%/1% speed <p>Note: To achieve specifications listed for Advanced Open Loop Vector Control for PM; Set n8-57 to 1 (High frequency injection is enabled), and perform Rotational Auto-Tuning to drive a non-Yaskawa PM motor.</p>
Speed Control Range*2	<ul style="list-style-type: none"> • 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 • Open Loop Vector Control for PM 1:20 • Advanced Open Loop Vector Control for PM 1:100 • Closed Loop Vector Control for PM 1:1500 • EZ Open Loop Vector Control 1:100 <p>Note: 1. To achieve specifications listed for Advanced Open Loop Vector Control for PM; Set n8-57 to 1 (High frequency injection is enabled), and perform Rotational Auto-Tuning to drive a non-Yaskawa PM motor. 2. Advanced Open Loop Vector Control for PM 1:100 is valid in the momentary operation region. When using the motor continuously, it is necessary to consider the capacity of the GA700 and the motor.</p>
Zero Speed Control	Possible in Closed Loop Vector Control, Advanced Open Loop Vector Control for PM, and Closed Loop Vector Control for PM.
Torque Limit	Parameter settings allow separate limits in four quadrants in Open Loop Vector Control, Closed Loop Vector Control, Advanced Open Loop Vector Control, Advanced Open Loop Vector Control for PM, Closed Loop Vector Control for PM, and EZ 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 <ul style="list-style-type: none"> • 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 / High Slip Braking allow for approx. 40% • Continuous regenerative torque: Approx. 20%. Dynamic braking option allows for approx. 125%, 10% ED, 10 s <p>Note: 1. Catalog codes GA700□2004 to 2138 and 4002 to 4168 have a built-in braking transistor. 2. Set L3-04 = 0 [Stall Prevention during Decel = Disabled] when using a regenerative converter, regenerative unit, braking unit, braking resistor, or braking resistor unit. The drive could possibly not stop within the specified deceleration time when L3-04 = 1 [General Purpose](default). 3. 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. 4. Continuous regenerative torque and short-time deceleration torque for motors 2.2 kW and larger vary depending on motor characteristics.</p>
V/f Characteristics	Select from 15 predefined V/f patterns, or a user-set V/f pattern.
Main Control Functions	Torque Control, Droop Control, Speed/Torque Control switch, Feed Forward Control, Zero Servo Control, Momentary Power Loss Ride-Thru, Speed Search, Overtorque detection, torque limit, 17 Step Speed (max.), accel/decel switch, S-curve accel/decel, 3-wire sequence, Auto-Tuning (rotational, stationary), Dwell, cooling fan on/off switch, slip compensation, torque compensation, Frequency Jump, Upper/lower limits for frequency reference, DC Injection Braking at start and stop, Overexcitation Deceleration, High Slip Braking, PID control (with Sleep function), Energy Saving Control, MEMOBUS/Modbus (RTU mode) Communications (RS-485/422, max. 115.2 kbps), Fault Restart, Application Presets, DriveWorksEZ (customized functions), Parameter Backup Function, Online Tuning, KEB, Overexcitation Deceleration, Inertia Tuning and ASR Tuning, Overvoltage Suppression, High Frequency Injection, etc.

Item		Specifications
Protection Function	Motor Protection	Motor overheat protection based on output current
	Momentary Overcurrent Protection	Drive stops when output current exceeds 200%*3 of the HD output current.
	Overload Protection	Drive stops after 60 s at 150% of rated HD output current and at 110% of rated ND 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
	Momentary Power Loss Ride-Thru	Stops when power loss is longer than approximately 15 ms (default setting). Continues operation if power loss is shorter than 2 s (depending on parameter settings). Note: 1. Stop time may be shortened depending on the load and motor speed. 2. Continuous operation time varies by drive capacity. Catalog codes 2004 to 2056 and 4002 to 4031 require a Momentary Power Loss Recovery Unit to continue operation through a 2 s power loss.
	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.
Environment	Charge LED	Charge LED remains lit until DC bus has fallen below approx. 50 V
	Area of Use	Indoors · Chemical gas: IEC60721-3-3: 3 C2 · Solid particle: IEC60721-3-3: 3 S2
	Power Supply	Overcurrent Category III
	Ambient Temperature	IP00/UL Open Type: -10°C to +50°C IP20/UL Open Type: -10°C to +50°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. · IP00/UL Open Type and IP20/UL Open Type drives can be used up to an ambient temperature of 60°C by derating the output current. · IP20/UL Type 1 is optional. (Install a UL Type 1 kit on an IP20/UL Open Type drive.) : -10°C to +40°C, IP20/UL Type 1 drives can be used up to an ambient temperature of 50°C by derating 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*4
	Vibration	· 10 Hz to 20 Hz, Catalog code GA70A2004 to 2415, 4002 to 4675: 1 G (9.8 m/s ²), Catalog code GA70A4810 to 4H12: 0.6 G (5.9 m/s ²) · 20 Hz to 55 Hz, Catalog code GA70A2004 to 2211, 4002 to 4168: 0.6 G (5.9 m/s ²), Catalog code GA70A2257 to 2415, 4208 to 4H12: 0.2 G (2.0 m/s ²) Note: This drive passed the vibration test with a logarithmic sweep as specified by EN 60068-2-6 and JIS C60068-2-6. If the internal components of the drive vibrate too much, it can cause damage to the drive even when the vibration frequency is in the specification. If the drive components vibrate, improve the installation environment to decrease vibration. · Put the drive on a rubber pad to decrease vibration. · Reinforce the structure of the installation.
	Standards Compliance	UL standards
European standards		· Electromagnetic Compatibility Directive (EMC) (Harmonized standards): EN61800-3 · Low Voltage Directive (LVD) (Harmonized standards): IEC/EN61800-5-1 · Machine Directive (MD) (Harmonized standards): EN ISO 13849-1 (Cat.3 PL _e), IEC 62061 (SIL CL3), EN 62061 (SIL CL3), IEC/EN 61800-5-2 (Two safe disable inputs and 1 EDM output*) *: Used by setting functions to multi-function digital output terminals.
Enclosure Protection Design		· Catalog code GA70A2004 to 2415, 4002 to 4675: 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 an IP20/UL Type 1. · Catalog code GA70A4810 to 4H12: IP00/UL Open Type

*1: Increase the drive and motor capacities.

*2: For high-torque and long-time/continuous operation at low frequency (less than 6 Hz), take one of the following measures: reduce the load, increase the speed, or increase the drive capacity, with a target of 75% at 3 Hz output frequency and 50% at 0 Hz. No these measures are required if the drive is operated at low frequency for a short duration of only a few seconds, or is in the acceleration or deceleration range.

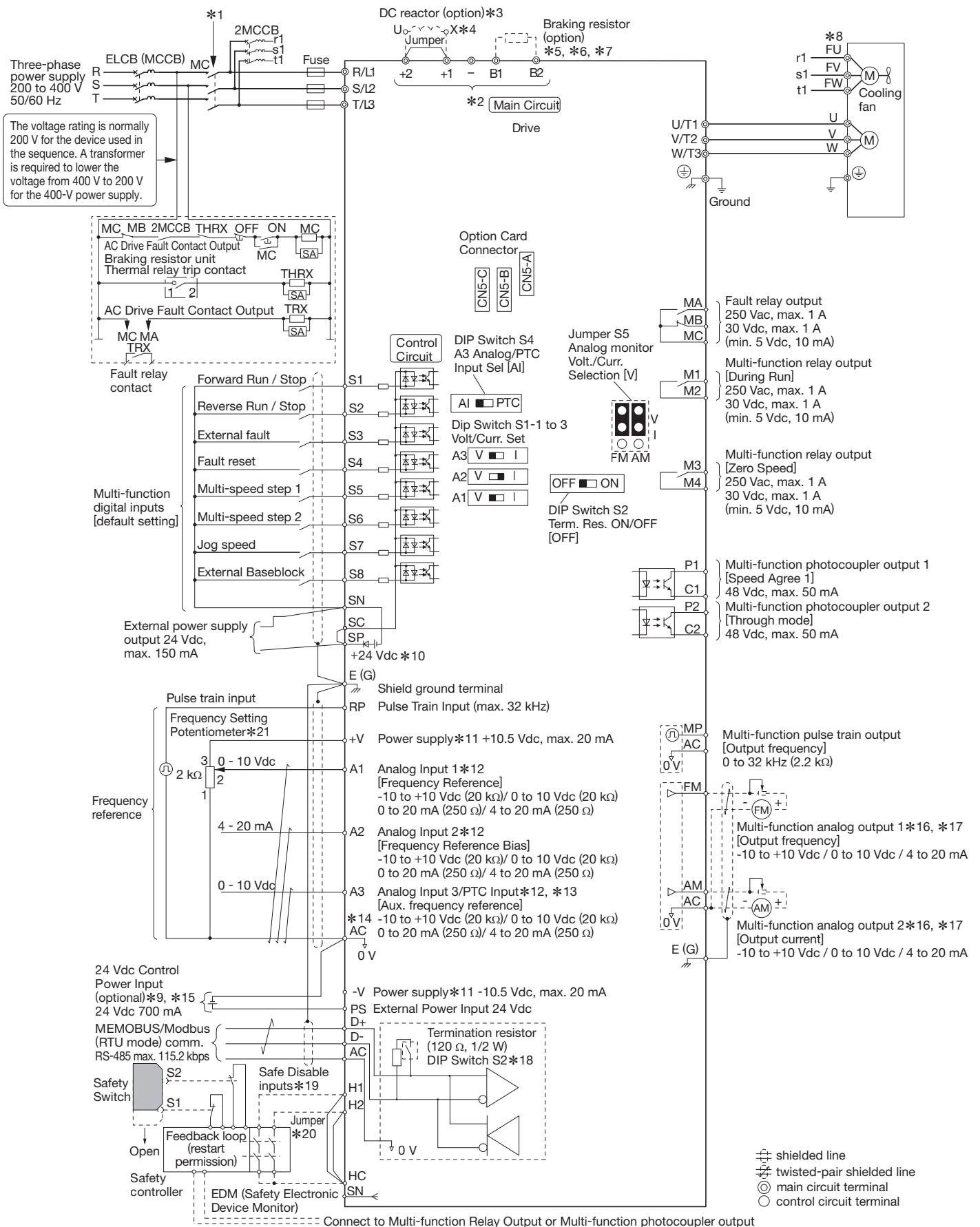
*3: 200% is the target value. The value varies depending on the capacity.

*4: Altitudes over 1000 m and up to 4000 m are possible by derating the output current by 1% for every 100 m. Contact a Yaskawa representative or salesperson for more information.

Note: 1. Perform Rotational Auto-Tuning to achieve specifications listed for Open 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 Multi-Function Photocoupler Output Type C (Standard)

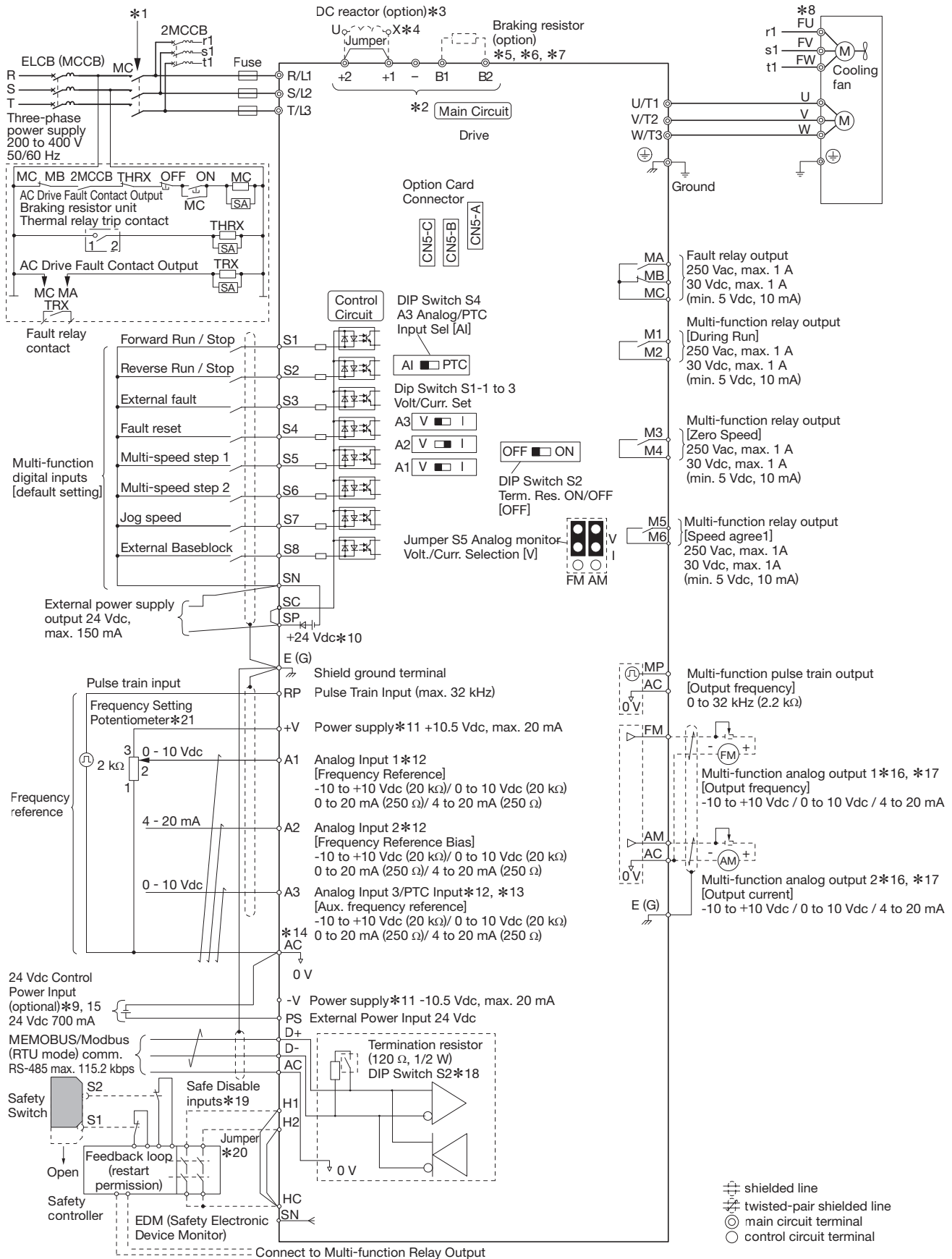


- *1: We recommend that the sequence that de-energizes the power supply be set via the fault relay output for the drive. When using the Fault Restart function, if L5-02 = 1 [Fault Contact at Restart Select = Always Active], the fault signal is output during Restart Enabled and the power supply will turn OFF. Be careful when using a cut-off sequence. The default setting for L5-02 is 0 [Active Only when Not Restarting].
- *2: 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.
- *3: Be sure to remove the jumper between terminals +1 and +2 when installing a DC reactor (option).
- *4: Catalog codes GA70A2110 to 2415 and 4060 to 4H12 have a built-in DC reactor.
- *5: 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].
- *6: Set L3-04 = 0 [Stall Prevention during Decel = Disabled] when connecting a regenerative converter, regenerative unit, braking unit, braking resistor, or braking resistor unit. If L3-04 = 1 [Enabled] (default setting), the drive may not stop within the designated deceleration time.
- *7: When using a braking resistor (ERF type), set L8-01 = 1 [3% ERF DB Resistor Protection = Enabled] and be sure to use a sequence that shuts the power off by using the fault relay output for the drive.
- *8: Self-cooling motors do not require the wiring for the motors with cooling fans.
- *9: When 24 V power is supplied to terminal PS-AC, power is supplied to the keypad, option board, and other components required to check faults and set parameters.
- *10: Use a wire jumper between terminals SC and SP or SC and SN to set the multi-function digital input 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: Remove the jumper between terminals SC-SN and terminals SC-SP.
- *11: 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.
- *12: DIP switches S1-1 to S1-3 set terminals A1 to A3 for voltage or current input. The default setting for S1-1 and S1-3 is voltage input ("V" side). The default setting for S1-2 is current input ("I" side).
- *13: DIP switch S4 sets terminal A3 for analog or PTC input. Set DIP switch S1-3 to the "V" side, and set H3-05 = 0 [Terminal A3 Signal Level Select = 0 to 10 V (Lower Limit at 0)] to set terminal A3 for PTC input with DIP switch S4.
- *14: Do not ground the control circuit terminals AC or connect them to the drive. Failure to comply may cause malfunction or failure.
- *15: Connect the 24 V line of the 24 V control power supply input to terminal PS, and the 0 V line to terminal AC. Do not connect reverse terminals PS and AC. Failure to obey will cause damage to the drive.
- *16: Use multi-function analog monitor outputs with analog frequency meters, ammeters, voltmeters, and wattmeters. Do not use monitor outputs with feedback-type signal devices.
- *17: Jumper switch S5 sets terminal FM and AM for voltage or current output. The default setting is voltage output ("V" side).
- *18: Set DIP switch S2 to "ON" to enable the termination resistor in the last drive in a MEMOBUS/Modbus (RTU mode) network.
- *19: Use only SOURCE Mode for Safe Disable input.
- *20: Disconnect the wire jumper between H1 and HC, and H2 and HC to use the Safe Disable input.
- *21: A frequency setting potentiometer is connected with model RV30YN (2 kΩ).

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Standard Connection Diagram

Standard Connection Diagram Multi-Function Digital Output Type A (Factory Option)



- *1: We recommend that the sequence that de-energizes the power supply be set via the fault relay output for the drive. When using the Fault Restart function, if L5-02 = 1 [Fault Contact at Restart Select = Always Active], the fault signal is output during Restart Enabled and the power supply will turn OFF. Be careful when using a cut-off sequence. The default setting for L5-02 is 0 [Active Only when Not Restarting].
- *2: 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.
- *3: Be sure to remove the jumper between terminals +1 and +2 when installing a DC reactor (option).
- *4: Catalog codes GA70A2110 to 2415 and 4060 to 4H12 have a built-in DC reactor.
- *5: 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].
- *6: Set L3-04 = 0 [Stall Prevention during Decel = Disabled] when connecting a regenerative converter, regenerative unit, braking unit, braking resistor, or braking resistor unit. If L3-04 = 1 [Enabled] (default setting), the drive may not stop within the designated deceleration time.
- *7: When using a braking resistor (ERF type), set L8-01 = 1 [3% ERF DB Resistor Protection = Enabled] and be sure to use a sequence that shuts the power off by using the fault relay output for the drive.
- *8: Self-cooling motors do not require the wiring for the motors with cooling fans.
- *9: When 24 V power is supplied to terminal PS-AC, power is supplied to the keypad, option board, and other components required to check faults and set parameters.
- *10: Use a wire jumper between terminals SC and SP or SC and SN to set the multi-function digital input 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: Remove the jumper between terminals SC-SN and terminals SC-SP.
- *11: 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.
- *12: DIP switches S1-1 to S1-3 set terminals A1 to A3 for voltage or current input. The default setting for S1-1 and S1-3 is voltage input ("V" side). The default setting for S1-2 is current input ("I" side).
- *13: DIP switch S4 sets terminal A3 for analog or PTC input. Set DIP switch S1-3 to the "V" side, and set H3-05 = 0 [Terminal A3 Signal Level Select = 0 to 10 V (Lower Limit at 0)] to set terminal A3 for PTC input with DIP switch S4.
- *14: Do not ground the control circuit terminals AC or connect them to the drive. Failure to comply may cause malfunction or failure.
- *15: Connect the 24 V line of the 24 V control power supply input to terminal PS, and the 0 V line to terminal AC. Do not connect reverse terminals PS and AC. Failure to obey will cause damage to the drive.
- *16: Use multi-function analog monitor outputs with analog frequency meters, ammeters, voltmeters, and wattmeters. Do not use monitor outputs with feedback-type signal devices.
- *17: Jumper switch S5 sets terminal FM and AM for voltage or current output. The default setting is voltage output ("V" side).
- *18: Set DIP switch S2 to "ON" to enable the termination resistor in the last drive in a MEMOBUS/Modbus (RTU mode) network.
- *19: Use only SOURCE Mode for Safe Disable input.
- *20: Disconnect the wire jumper between H1 and HC, and H2 and HC to use the Safe Disable input.
- *21: A frequency setting potentiometer is connected with model RV30YN (2 kΩ).

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Terminal Specifications

Terminal Functions

Main Circuit Terminals

Max. Applicable Motor Capacity indicates Heavy Duty

Voltage	200 V Class			400 V Class			
Catalog Code GA70A	2004 to 2082	2110 to 2138	2169 to 2415	4002 to 4044	4060 to 4168	4208 to 4389	4453 to 4H12
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 220	260 to 560
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			Braking resistor unit			
+2	DC reactor (+1, +2)	-	-	DC reactor (+1, +2)	-	-	-
+1	DC power supply (+1, -)	DC power supply (+1, -)	DC power supply (+1, -)	DC power supply (+1, -)	DC power supply (+1, -)	DC power supply (+1, -)	
-			Braking unit (+3, -)			Braking unit (+3, -)	
+3	-	-	-	-	-	-	
⊕	Ground terminal (100 Ω or less)			Ground terminal (10 Ω or less)			

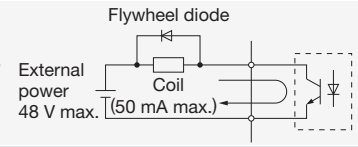
Note: Use terminals B1 and - to connect a CDBR braking unit to drive models 2004 to 2138 and 4002 to 4168 with built-in braking transistors.

Control Circuit Terminals (200 V/400 V Class)

Terminal Type	Terminal	Signal Function (default)	Description (Signal Level)
Multi-Function Digital Input (MFDI)	S1	MFDI selection 1 (ON: Forward run OFF: Stop)	· Photocoupler · 24 V, 6 mA
	S2	MFDI selection 2 (ON: Reverse run OFF: Stop)	Note: Install the wire jumpers between terminals SC-SP and SC-SN to set the MFDI power supply (sinking/sourcing mode or internal/external power supply).
	S3	MFDI selection 3 (External fault, N.O.)	
	S4	MFDI selection 4 (Fault reset)	· Sinking Mode: Install a jumper between terminals SC and SP. NOTICE: Do not close the circuit between terminals SC and SN. A closed circuit between these terminals will cause damage to the drive.
	S5	MFDI selection 5 (Multi-step speed reference 1)	
	S6	MFDI selection 6 (Multi-step speed reference 2)	· Sourcing Mode: Install a jumper between terminals SC and SN. NOTICE: Do not close the circuit between terminals SC and SP. A closed circuit between these terminals will cause damage to the drive.
	S7	MFDI selection 7 (Jog command)	
	S8	MFDI selection 8 (Baseblock, N.O.)	· External power supply: No jumper necessary between terminals SC-SN and terminals SC-SP.
	SN	MFDI power supply 0V	MFDI power supply, 24 V (maximum 150 mA)
	SC	MFDI selection common	NOTICE: Do not close the circuit between terminals SP and SN. Failure to obey will cause damage to the drive.
SP	MFDI power supply +24 Vdc		
Safe Disable Input	H1	Safe Disable input 1	Remove the jumper between terminals H1-HC and H2-HC to use the Safe Disable input. · 24 V, 6 mA
	H2	Safe Disable input 2	· ON: Normal operation · OFF: Coasting motor · Internal impedance 4.7 kΩ · OFF Minimum OFF time of 2 ms.
	HC	Safe Disable function common	Safe Disable function common NOTICE: Do not close the circuit between terminals HC and SN. A closed circuit between these terminals will cause damage to the drive.
Master Frequency Reference	RP	Master frequency reference pulse train input (Master frequency reference)	· Response frequency: 0 Hz to 32 kHz · H level duty: 30% to 70% · H level voltage: 3.5 V to 13.2 V · L level voltage: 0.0 V to 0.8 V · Input impedance: 3 kΩ
	+V	Power supply for frequency setting	10.5 V (allowable current 20 mA max.)
	-V	Power supply for frequency setting	-10.5 V (allowable current 20 mA max.)
	A1	Multi-function analog input 1 (Master frequency reference)	Voltage input or current input Select terminal A1 with DIP switch S1-1 and H3-01 [Terminal A1 Signal Level Select]. Select terminal A2 with DIP switch S1-2 and H3-09 [Terminal A2 Signal Level Select].
	A2	Multi-function analog input 2 (Combined to terminal A1)	· -10 V to +10 V/-100% to +100% (input impedance: 20 kΩ) · 0 V to 10 V/100% (input impedance: 20 kΩ) · 4 mA to 20 mA/100%, 0 mA to 20 mA/100% (input impedance: 250 Ω)
	A3	Multi-function analog input 3/PTC input (Auxiliary frequency reference)	Voltage input or current input Select using DIP switch S1-3 and H3-05 [Terminal A3 Signal Level Select]. · -10 V to +10 V/-100% to +100% (input impedance: 20 kΩ) · 0 V to 10 V/100% (input impedance: 20 kΩ) · 4 mA to 20 mA/100%, 0 mA to 20 mA/100% (input impedance: 250 Ω)
	AC	Frequency reference common	PTC input (Motor Overheat Protection) Set DIP switch S4 to "PTC" and set DIP switch S1-3 to "V" to set terminal A3 for PTC input. 0 V
Fault Relay Output	MA	N.O. output (Fault)	· Relay output
	MB	N.C. output (Fault)	· 30 Vdc, 10 mA to 1 A · 250 Vac, 10 mA to 1 A
	MC	Digital output common	· Minimum load: 5 Vdc, 10 mA (Reference value)
Multi-Function Digital Output (MFDO)	M1	MFDO (During run)	· Relay output
	M2		· 30 Vdc, 10 mA to 1 A
	M3	MFDO (Zero speed)	· 250 Vac, 10 mA to 1 A
	M4		· Minimum load: 5 V, 10 mA (Reference value)
	M5*1		NOTICE: Do not set functions that frequently switch ON/OFF to MFDO (M1 to M6) because this will decrease the performance life of the relay contacts.
	M6*1	MFDO (Speed agree1)	Yaskawa estimates switching life at 200,000 times (assumes 1 A, resistive load).

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

Terminal Type	Terminal	Signal Function (default)	Description (Signal Level)
Multi-Function Photocoupler Output*2	P1	Multi-function photocoupler output (Speed agree1)	<ul style="list-style-type: none"> Photocoupler output 48 Vdc or less, 2 to 50 mA Note: Connect a flywheel diode as shown in the figure when driving a reactive load such as a relay coil. Make sure that the diode rating is larger than the circuit voltage.
	C1		
	P2	Multi-function photocoupler output (Through mode)	
	C2		
Monitor Output	MP	Pulse train input (Output frequency)	32 kHz (maximum)
	FM	Analog monitor output 1 (Output frequency)	Select voltage or current output. <ul style="list-style-type: none"> 0 V to 10 V/0% to 100% -10 V to +10 V/-100% to +100% 4 mA to 20 mA (receiver recommended impedance: 250 Ω) Note: Select with jumper switch S5 and H4-07 [Terminal FM Signal Level Select] or H4-08 [Terminal AM Signal Level Select].
	AM	Analog monitor output 2 (Output current)	
	AC	Monitor common	0 V



*1: Multi-function digital output type A is compatible.
 *2: Multi-function photocoupler output type C (standard) is compatible.

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 power to the keypad, option board, and other components required to check faults and set parameters. 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)

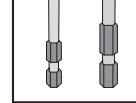
Classification	Terminal	Signal Function	Description (Signal Level)
MEMOBUS / Modbus (RTU mode) Communications	D+	Communications input (+)	MEMOBUS/Modbus (RTU mode) communications: <ul style="list-style-type: none"> Use an RS-485 cable to connect the drive. Set DIP switch S2 to ON to enable the termination 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 Terminal Blocks (Recommended product)

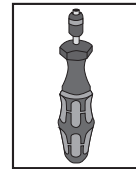
Check the "Terminal size / Wire gauge" on the next page and prepare the tools for wiring.

Screw size	Screw type	Recommended Product
M4	Slot	Prepare the following two tools. <ul style="list-style-type: none"> 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 GA70A2056 and GA70A4089 or earlier models, be sure to correctly select tools based on the wire gauges. <p>Wiring Gauge: ≤25 mm² or AWG10</p> <ul style="list-style-type: none"> 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) <p>Wiring Gauge: ≥30 mm² or AWG8</p> <ul style="list-style-type: none"> 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)	Prepare the following three tools. <ul style="list-style-type: none"> 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 GA70A2110 to 2138, and GA70A4103. <ul style="list-style-type: none"> 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)	Prepare the following three tools. <ul style="list-style-type: none"> 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)	Prepare the following three tools. <ul style="list-style-type: none"> 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

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

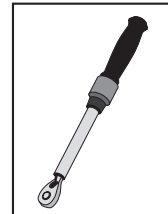


Torque screwdriver

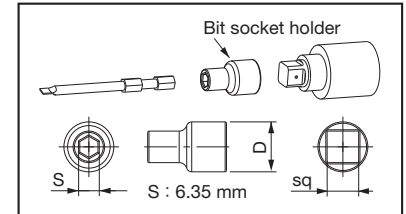


Model	Measurement Range	Code No.
TSD-M 3NM	1.2 to 3 N·m	100-250-493

Torque wrench



Bit socket holder



Terminal Specifications

Main Circuit Terminal Type

Voltage	200 V Class		400 V Class	
Catalog Code GA70A	2004 to 2211	2257 to 2415	4002 to 4168	4208 to 4H12
Terminal Type	European Terminal*	Conventional Products	European Terminal*	Conventional Products

*: The ground terminal is a screw terminal.

Terminal Size / Wire Gauge Symbols

Symbols indication the shape of the terminal screws:

200 V Class

⊖ : Slot (-), ⊖ : Minus (-), ⑤ : Hex socket (WAF: 5), ⑥ : Hex socket (WAF: 6), ⑧ : Hex socket (WAF: 8), ⑨ : Hex self-locking nut

Catalog code GA70A	Terminal	Recommended Gauge mm ²	Wire Range (IP20 Compatible Gauge) mm ²	Wire Stripping Length ¹ mm	Terminal Screw		Tightening Torque N·m	Catalog code GA70A	Terminal	Recommended Gauge mm ²	Wire Range (IP20 Compatible Gauge) mm ²	Wire Stripping Length ¹ mm	Terminal Screw		Tightening Torque N·m
					Size	Shape							Size	Shape	
2004	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	2021	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	2	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	2	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		-, +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		B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7
2006	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	2030	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	2	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	2	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		-, +1, +2	14	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		B1, B2	3.5	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	2042	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	2	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	2	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		-, +1, +2	22	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		B1, B2	5.5	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7
2010	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	2056	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	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	38	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	14	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
2012	R/L1, S/L2, T/L3	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	2070	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	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7		U/T1, V/T2, W/T3	22	2 to 22 (14 to 22)	20	M6	⑤	5 to 5.5
	-, +1, +2	3.5	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		-, +1, +2	50	2 to 50 (22 to 50)	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	14	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7
2018	R/L1, S/L2, T/L3	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	2082	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	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7		U/T1, V/T2, W/T3	30	2 to 30 (14 to 30)	20	M6	⑤	5 to 5.5
	-, +1, +2	5.5	2 to 22 (2 to 22)	18	M5	⊖	2.3 to 2.5*2		-, +1, +2	60	2 to 60 (22 to 60)	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	14	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7

(Continue)

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), ⊞ : Hex self-locking nut

Catalog code GA70A □	Terminal	Recommended Gauge mm ²	Wire Range (IP20 Compatible Gauge) mm ²	Wire Stripping Length ¹⁾ mm	Terminal Screw		Tightening Torque N·m	Catalog code GA70A □	Terminal	Recommended Gauge mm ²	Wire Range (IP20 Compatible Gauge) mm ²	Wire Stripping Length ¹⁾ mm	Terminal Screw		Tightening Torque N·m
					Size	Shape							Size	Shape	
2110	R/L1, S/L2, T/L3	38	22 to 38 (22 to 38)	27	M6	⑤	8 to 9	2257	R/L1, S/L2, T/L3	60 × 2P	22 to 100 × 2P (80 to 100 × 2P)	-	M10	⊞	20 (177)
	U/T1, V/T2, W/T3	38	22 to 38 (22 to 38)	27	M6	⑤	8 to 9		U/T1, V/T2, W/T3	50 × 2P	22 to 100 × 2P (80 to 100 × 2P)	-	M10	⊞	20 (177)
	- , +1	60	30 to 60 (30 to 60)	27	M8	⑥	10 to 12		- , +1	80 × 2P	30 to 125 × 2P (100 to 125 × 2P)	-	M10	⊞	20 (177)
	B1, B2	22	8 to 22 (8 to 22)	21	M6	⊖	3 to 3.5		+3	50 × 2P	22 to 60 × 2P (50 to 60 × 2P)	-	M10	⊞	20 (177)
2138	R/L1, S/L2, T/L3	60	22 to 60 (38 to 60)	27	M6	⑤	8 to 9	2313	R/L1, S/L2, T/L3	80 × 2P	22 to 100 × 2P (80 to 100 × 2P)	-	M10	⊞	20 (177)
	U/T1, V/T2, W/T3	60	22 to 60 (38 to 60)	27	M6	⑤	8 to 9		U/T1, V/T2, W/T3	80 × 2P	22 to 100 × 2P (80 to 100 × 2P)	-	M10	⊞	20 (177)
	- , +1	80	30 to 80 (50 to 80)	27	M8	⑥	10 to 12		- , +1	100 × 2P	30 to 125 × 2P (100 to 125 × 2P)	-	M10	⊞	20 (177)
	B1, B2	30	8 to 30 (8 to 30)	21	M6	⊖	3 to 3.5		+3	60 × 2P	22 to 60 × 2P (50 to 60 × 2P)	-	M10	⊞	20 (177)
2169	R/L1, S/L2, T/L3	80	50 to 100 (80 to 100)	37	M10	⑧	12 to 14	2360	R/L1, S/L2, T/L3	125 × 2P	60 to 125 × 2P (125 × 2P)	-	M12	⊞	35 (310)
	U/T1, V/T2, W/T3	80	50 to 125 (80 to 125)	37	M10	⑧	12 to 14		U/T1, V/T2, W/T3	125 × 2P	60 to 125 × 2P (125 × 2P)	-	M12	⊞	35 (310)
	- , - , +1, +1*3	38*4	22 to 50 (50)	28	M6	⑤	8 to 9		- , +1	150 × 2P	100 to 150 × 2P (150 × 2P)	-	M12	⊞	35 (310)
	+3	60	30 to 80*5 (50 to 80)*5	28	M8	⑥	8 to 9		+3	80 × 2P	38 to 150 × 2P (150 × 2P)	-	M12	⊞	35 (310)
2211	R/L1, S/L2, T/L3	100	50 to 100 (80 to 100)	37	M10	⑧	12 to 14	2415	R/L1, S/L2, T/L3	125 × 2P	60 to 125 × 2P (125 × 2P)	-	M12	⊞	35 (310)
	U/T1, V/T2, W/T3	125	50 to 125 (80 to 125)	37	M10	⑧	12 to 14		U/T1, V/T2, W/T3	125 × 2P	60 to 125 × 2P (125 × 2P)	-	M12	⊞	35 (310)
	- , - , +1, +1*3	50	22 to 50 (50)	28	M6	⑤	8 to 9		- , +1	150 × 2P	100 to 150 × 2P (150 × 2P)	-	M12	⊞	35 (310)
	+3	80	30 to 80*5 (50 to 80)*5	28	M8	⑥	8 to 9		+3	80 × 2P	38 to 150 × 2P (150 × 2P)	-	M12	⊞	35 (310)

- *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 +1 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 · Normal Duty 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), ⊞ : Hex self-locking nut

Catalog code GA70A □	Terminal	Recommended Gauge mm ²	Wire Range (IP20 Compatible Gauge) mm ²	Wire Stripping Length ¹⁾ mm	Terminal Screw		Tightening Torque N·m	Catalog code GA70A □	Terminal	Recommended Gauge mm ²	Wire Range (IP20 Compatible Gauge) mm ²	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	4004	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		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		- , +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		B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	⊖	1.5 to 1.7

(Continue)

Terminal Specifications

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), ⊙ : Hex self-locking nut

Catalog code GA70A□	Terminal	Recommended Gauge mm ²	Wire Range (IP20 Compatible Gauge) mm ²	Wire Stripping Length ¹⁾ mm	Terminal Screw		Tightening Torque N·m	Catalog code GA70A□	Terminal	Recommended Gauge mm ²	Wire Range (IP20 Compatible Gauge) mm ²	Wire Stripping Length ¹⁾ mm	Terminal Screw		Tightening Torque N·m
					Size	Shape							Size	Shape	
4005	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4038	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
4007	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4044	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
4009	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	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
4012	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	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	3.5	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
4018	R/L1, S/L2, T/L3	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4089	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	3.5	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	5.5	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
4023	R/L1, S/L2, T/L3	8	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7	4103	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	5.5	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	14	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
4031	R/L1, S/L2, T/L3	14	2 to 22 (8 to 22)	18	M5	⊖	2.3 to 2.5*2	4140	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	8	2 to 14 (5.5 to 14)	18	M5	⊖	2.3 to 2.5*2		U/T1, V/T2, W/T3	60*4	50 to 125 (80 to 125)	37	M10	⑧	12 to 14
	-, +1, +2	14	2 to 38 (8 to 38)	20	M6	⑤	5 to 5.5		-, -, +1, +1*3	30*4	22 to 50 (50)	28	M6	⑤	8 to 9
	B1, B2	3.5	2 to 14 (2 to 14)	10	M4	⊖	1.5 to 1.7		B1, B2	50	30 to 80*5 (50 to 80)*5	28	M8	⑥	8 to 9

(Continue)

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), ⊕ : Hex self-locking nut

Catalog code GA70A □	Terminal	Recommended Gauge mm ²	Wire Range (IP20 Compatible Gauge) mm ²	Wire Stripping Length ¹ mm	Terminal Screw		Tightening Torque N·m	Catalog code GA70A □	Terminal	Recommended Gauge mm ²	Wire Range (IP20 Compatible Gauge) mm ²	Wire Stripping Length ¹ mm	Terminal Screw		Tightening Torque N·m	
					Size	Shape							Size	Shape		
4168	R/L1, S/L2, T/L3	80	50 to 100 (80 to 100)	37	M10	⑧	12 to 14	4568	R/L1, S/L2, T/L3	125 × 4P	60 to 125 × 4P (125 × 4P)	-	M12	⊕	35 (310)	
	U/T1, V/T2, W/T3	80	50 to 125 (80 to 125)	37	M10	⑧	12 to 14		U/T1, V/T2, W/T3	100 × 4P	60 to 150 × 4P (125 to 150 × 4P)	-	M12	⊕	35 (310)	
	- , - , +1, +1*3	38*4	22 to 50 (50)	28	M6	⑤	8 to 9		- , +1	100 × 4P	80 to 150 × 4P (150 × 4P)	-	M12	⊕	35 (310)	
	B1, B2	60	30 to 80*5 (50 to 80) *5	28	M8	⑥	8 to 9		+3	80 × 4P	30 to 125 × 4P (100 to 125 × 4P)	-	M12	⊕	35 (310)	
4208	R/L1, S/L2, T/L3	50 × 2P	22 to 100 × 2P (80 to 100 × 2P)	-	M10	⊕	20 (177)	4675	R/L1, S/L2, T/L3	125 × 4P	60 to 125 × 4P (125 × 4P)	-	M12	⊕	35 (310)	
	U/T1, V/T2, W/T3	50 × 2P	22 to 100 × 2P (80 to 100 × 2P)	-	M10	⊕	20 (177)		U/T1, V/T2, W/T3	100 × 4P	60 to 150 × 4P (125 to 150 × 4P)	-	M12	⊕	35 (310)	
	- , +1	80 × 2P	30 to 125 × 2P (100 to 125 × 2P)	-	M10	⊕	20 (177)		- , +1	125 × 4P	80 to 150 × 4P (150 × 4P)	-	M12	⊕	35 (310)	
	+3	38 × 2P	22 to 60 × 2P (50 to 60 × 2P)	-	M10	⊕	20 (177)		+3	100 × 4P	30 to 125 × 4P (100 to 125 × 4P)	-	M12	⊕	35 (310)	
4250	R/L1, S/L2, T/L3	50 × 2P	22 to 100 × 2P (80 to 100 × 2P)	-	M10	⊕	20 (177)	4810	R/L1, S/L2, T/L3	150 × 2P × 2	125 - 150 × 2P × 2 (-)	-	M12	⊕	35 (310)	
	U/T1, V/T2, W/T3	50 × 2P	22 to 100 × 2P (80 to 100 × 2P)	-	M10	⊕	20 (177)		U/T1, V/T2, W/T3	125 × 2P × 2	100 - 125 × 2P × 2 (-)	-	M12	⊕	35 (310)	
	- , +1	80 × 2P	30 to 125 × 2P (100 to 125 × 2P)	-	M10	⊕	20 (177)		- , +1	100 × 4P × 2	80 - 150 × 4P × 2 (-)	-	M12	⊕	35 (310)	
	+3	50 × 2P	22 to 60 × 2P (50 to 60 × 2P)	-	M10	⊕	20 (177)		+3	100 × 4P	80 - 150 × 4P (-)	-	M12	⊕	35 (310)	
4296	R/L1, S/L2, T/L3	80 × 2P	22 to 100 × 2P (80 to 100 × 2P)	-	M10	⊕	20 (177)	4930	R/L1, S/L2, T/L3	150 × 2P × 2	125 - 150 × 2P × 2 (-)	-	M12	⊕	35 (310)	
	U/T1, V/T2, W/T3	80 × 2P	22 to 100 × 2P (80 to 100 × 2P)	-	M10	⊕	20 (177)		U/T1, V/T2, W/T3	150 × 2P × 2	125 - 150 × 2P × 2 (-)	-	M12	⊕	35 (310)	
	- , +1	100 × 2P	30 to 125 × 2P (100 to 125 × 2P)	-	M10	⊕	20 (177)		- , +1	100 × 4P × 2	100 - 150 × 4P × 2 (-)	-	M12	⊕	35 (310)	
	+3	60 × 2P	22 to 60 × 2P (50 to 60 × 2P)	-	M10	⊕	20 (177)		+3	125 × 4P	100 - 150 × 4P (-)	-	M12	⊕	35 (310)	
4371	R/L1, S/L2, T/L3	125 × 2P	60 to 125 × 2P (125 × 2P)	-	M12	⊕	35 (310)	4H11	R/L1, S/L2, T/L3	100 × 4P × 2	100 - 150 × 4P × 2 (-)	-	M12	⊕	35 (310)	
	U/T1, V/T2, W/T3	125 × 2P	60 to 125 × 2P (125 × 2P)	-	M12	⊕	35 (310)		U/T1, V/T2, W/T3	100 × 4P × 2	80 - 150 × 4P × 2 (-)	-	M12	⊕	35 (310)	
	- , +1	125 × 2P	100 to 150 × 2P (150 × 2P)	-	M12	⊕	35 (310)		- , +1	150 × 4P × 2	125 - 150 × 4P × 2 (-)	-	M12	⊕	35 (310)	
	+3	100 × 2P	38 to 150 × 2P (150 × 2P)	-	M12	⊕	35 (310)		+3	80 × 4P × 2	60 - 150 × 4P × 2 (-)	-	M12	⊕	35 (310)	
4389	R/L1, S/L2, T/L3	125 × 2P	60 to 125 × 2P (125 × 2P)	-	M12	⊕	35 (310)	4H12	R/L1, S/L2, T/L3	125 × 4P × 2	100 - 150 × 4P × 2 (-)	-	M12	⊕	35 (310)	
	U/T1, V/T2, W/T3	125 × 2P	60 to 125 × 2P (125 × 2P)	-	M12	⊕	35 (310)		U/T1, V/T2, W/T3	125 × 4P × 2	100 - 150 × 4P × 2 (-)	-	M12	⊕	35 (310)	
	- , +1	150 × 2P	100 to 150 × 2P (150 × 2P)	-	M12	⊕	35 (310)		- , +1	150 × 4P × 2	125 - 150 × 4P × 2 (-)	-	M12	⊕	35 (310)	
	+3	125 × 2P	38 to 150 × 2P (150 × 2P)	-	M12	⊕	35 (310)		+3	100 × 4P × 2	80 - 150 × 4P × 2 (-)	-	M12	⊕	35 (310)	
4453	R/L1, S/L2, T/L3	125 × 4P	60 to 125 × 4P (125 × 4P)	-	M12	⊕	35 (310)	*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 mm ² , tighten to a tightening torque of 4.1 to 4.5 N·m. *3: Terminals - and +1 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 · Normal Duty rated current value · Wiring distance: 100 m or shorter	4568	R/L1, S/L2, T/L3	125 × 4P	60 to 125 × 4P (125 × 4P)	-	M12	⊕	35 (310)
	U/T1, V/T2, W/T3	100 × 4P	60 to 150 × 4P (125 to 150 × 4P)	-	M12	⊕	35 (310)			U/T1, V/T2, W/T3	100 × 4P	60 to 150 × 4P (125 to 150 × 4P)	-	M12	⊕	35 (310)
	- , +1	100 × 4P	80 to 150 × 4P (150 × 4P)	-	M12	⊕	35 (310)			- , +1	100 × 4P	80 to 150 × 4P (150 × 4P)	-	M12	⊕	35 (310)
	+3	80 × 4P	30 to 125 × 4P (100 to 125 × 4P)	-	M12	⊕	35 (310)			+3	80 × 4P	30 to 125 × 4P (100 to 125 × 4P)	-	M12	⊕	35 (310)

*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 +1 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 · Normal Duty rated current value
 · Wiring distance: 100 m or shorter

Dimensions

Enclosure Protection Design

200 V Class

HD: Heavy Duty, ND: Normal Duty

Catalog Code GA70A□	2004	2006	2008	2010	2012	2018	2021	2030	2042	2056	2070	2082	2110	2138	2169	2211	2257	2313	2360	2415	
Max. Applicable Motor Capacity (kW)	HD	0.4	0.75	1.1	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
	ND	0.75	1.1	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	Optional (Install a UL Type 1 kit on an IP20/UL Open Type drive.)																				

400 V Class

HD: Heavy Duty, ND: Normal Duty

Catalog Code GA70A□	4002	4004	4005	4007	4009	4012	4018	4023	4031	4038	4044	4060	4075	4089	4103	
Max. Applicable Motor Capacity (kW)	HD	0.4	0.75	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45
	ND	0.75	1.5	2.2	3	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
IP20/UL Open Type	IP20 supported with standard model															
IP20/UL Type 1	Optional (Install a UL Type 1 kit on an IP20/UL Open Type drive.)															

Catalog Code GA70A□	4140	4168	4208	4250	4296	4371	4389	4453	4568	4675	4810	4930	4H11	4H12	
Max. Applicable Motor Capacity (kW)	HD	55	75	90	110	132	160	200	220	250	315	400	450	500	560
	ND	75	90	110	132	160	200	220	250	315	355	450	500	560	630
IP20/UL Open Type	IP20 supported with standard model												*		
IP20/UL Type 1	Optional (Install a UL Type 1 kit on an IP20/UL Open Type drive.)												*		
IP00/UL Open Type	*												IP00/UL Open Type supported with standard model		

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

IP20/UL Open Type

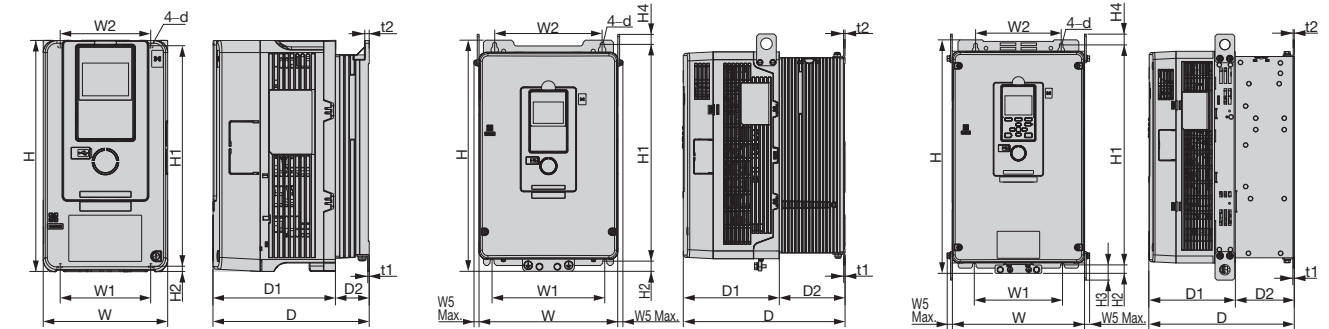


Figure 1

Figure 2

Figure 3

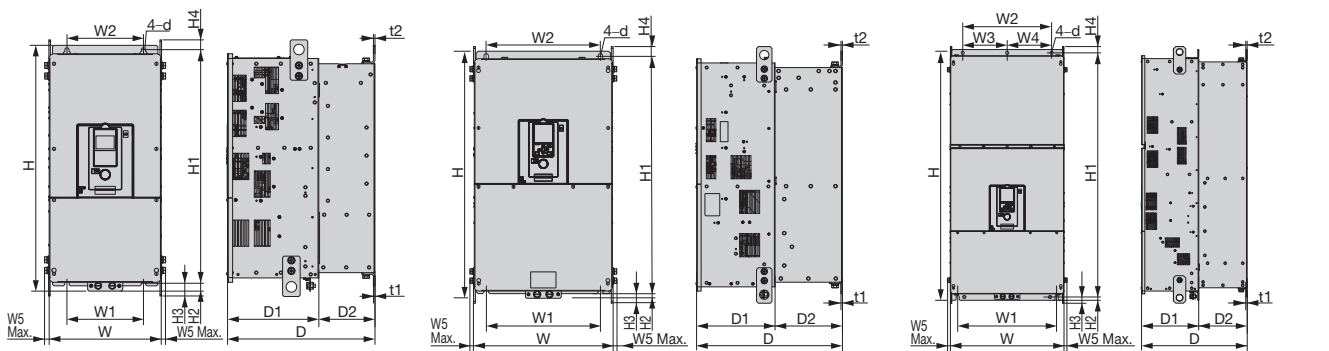


Figure 4

Figure 5

Figure 6

IP00/UL Open Type

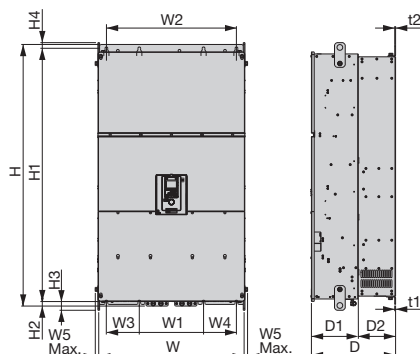


Figure 7

(Catalog code GA70A4810, 4930, 4H11, 4H12)

200 V Class: IP20/UL Open Type

Catalog Code GA70A	Figure	Dimensions mm																	Weight* kg	
		W	H	D	D1	D2	W1	W2	W3	W4	W5	H1	H2	H3	H4	t1	t2	d	STD	EMC
2004	1	140	260	176	138	38	102	102	—	—	—	248	6	—	—	1.6	5	M5	3.5	3.5
2006																				
2008																				
2010																				
2012																				
2018	1	140	260	211	138	73	102	102	—	—	—	248	6	—	—	1.6	5	M5	3.8	3.8
2021																				
2030	1	140	260	211	138	73	102	102	—	—	—	248	6	—	—	1.6	5	M5	4.2	4.2
2042																				
2056	1	180	300	202	134	68	140	140	—	—	—	284	8	—	—	1.6	1.6	M5	6.0	6.0
2070	1	220	350	227	140	87	192	192	—	—	—	335	8	—	—	2.3	2.3	M6	8.5	8.5
2082	1	220	350	227	140	87	192	192	—	—	—	335	8	—	—	2.3	2.3	M6	9.5	9.5
2110	2	240	400	280	166	114	195	186	—	—	12	375	17.5	—	17.5	2.3	2.3	M6	18	19
2138	3	255	450	280	166	114	170	165	—	—	12	424	16	29	21	2.3	2.3	M6	21	22
2169	3	264	543	335	186	149	190	182	—	—	12	516	17.5	28.5	20.5	2.3	2.3	M8	34	35
2211	3	264	543	335	186	149	190	182	—	—	12	516	17.5	28.5	20.5	2.3	2.3	M8	35	36
2257	4	312	700	420	260	160	218	218	—	—	18	659	28	43.5	28.5	4.5	4.5	M10	58	59
2313																			61	61
2360	5	440	800	472	254	218	370	370	—	—	20	757	28	44	30	4.5	4.5	M12	100	106
2415	5	440	800	472	254	218	370	370	—	—	20	757	28	44	30	4.5	4.5	M12	106	112

400 V Class: IP20/UL Open Type

Catalog Code GA70A	Figure	Dimensions mm																	Weight* kg	
		W	H	D	D1	D2	W1	W2	W3	W4	W5	H1	H2	H3	H4	t1	t2	d	STD	EMC
4002	1	140	260	176	138	38	102	102	—	—	—	248	6	—	—	1.6	5	M5	3.4	3.4
4004																				
4005																				
4007	1	140	260	211	138	73	102	102	—	—	—	248	6	—	—	1.6	5	M5	3.7	3.7
4009																				
4012	1	140	260	211	138	73	102	102	—	—	—	248	6	—	—	1.6	5	M5	4.0	4.0
4018																				
4023																				
4031	1	180	300	202	134	68	140	140	—	—	—	284	8	—	—	1.6	1.6	M5	5.5	5.5
4038																				
4044	1	220	350	227	140	87	192	192	—	—	—	335	8	—	—	2.3	2.3	M6	8.0	8.0
4060	1	220	350	246	140	106	192	192	—	—	—	335	8	—	—	2.3	2.3	M6	13	13
4075	2	240	400	280	166	114	195	186	—	—	12	375	17.5	—	17.5	2.3	2.3	M6	15	15
4089	3	255	450	280	166	114	170	165	—	—	12	424	16	29	21	2.3	2.3	M6	20	21
4103	3	255	450	280	166	114	170	165	—	—	12	424	16	29	21	2.3	2.3	M6	24	25
4140	3	264	543	335	186	149	190	182	—	—	12	516	17.5	28.5	20.5	2.3	2.3	M8	36	37
4168	3	264	543	335	186	149	190	182	—	—	12	516	17.5	28.5	20.5	2.3	2.3	M8	37	38
4208	4	312	700	420	260	160	218	218	—	—	18	659	28	43.5	28.5	4.5	4.5	M10	60	61
4250																			62	63
4296																			65	66
4371	5	440	800	472	254	218	370	370	—	—	20	757	28	44	30	4.5	4.5	M12	106	111
4389	5	440	800	472	254	218	370	370	—	—	20	757	28	44	30	4.5	4.5	M12	112	117
4453	6	510	1136	480	260	220	450	450	225	225	20	1093	25.5	43.5	30.5	4.5	4.5	M12	198	198
4568																			207	207
4675	6	510	1136	480	260	220	450	450	225	225	20	1093	25.5	43.5	30.5	4.5	4.5	M12	207	207
4810	7	760	1367.5	440	245	195	336	680	172	172	20	1324	23.5	45.5	29.5	4.5	4.5	M12	363	—
4930																			368	—
4H11																			—	—
4H12																			—	—

Note: External and mounting dimensions are different for standard installation and external heatsink installation. Refer to page 50 for external heatsink installation.
 *: Approximate weights for hardware REV version D and later models. Approximate weights for hardware REV version C or earlier models can be found in the technical documentation. Contact your Yaskawa or nearest sales representative for more information. Check the "REV" column printed on the nameplate located on the right-hand side of the drive to determine the hardware REV version. STD indicates standard models. EMC indicates models with internal category C3 EMC filters. For models GA70A4453 to 4675, there is no difference in weight depending on the hardware REV version.

Dimensions

■ IP20/UL Type 1

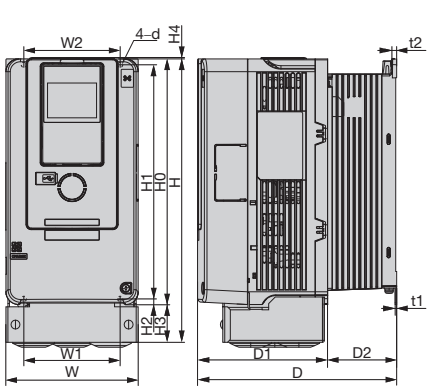


Figure 1

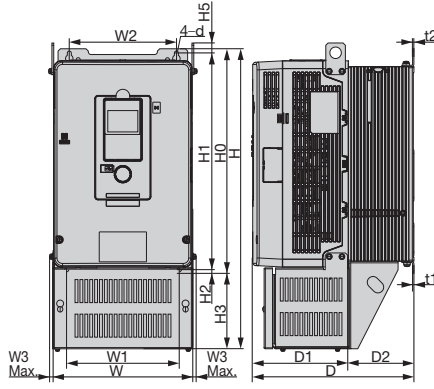


Figure 2

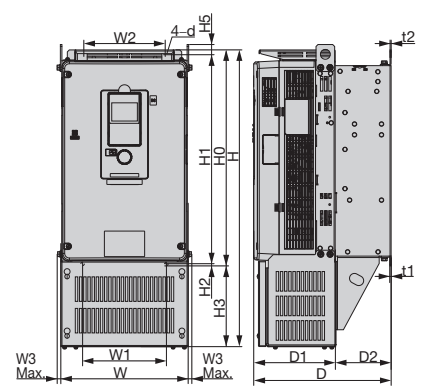


Figure 3

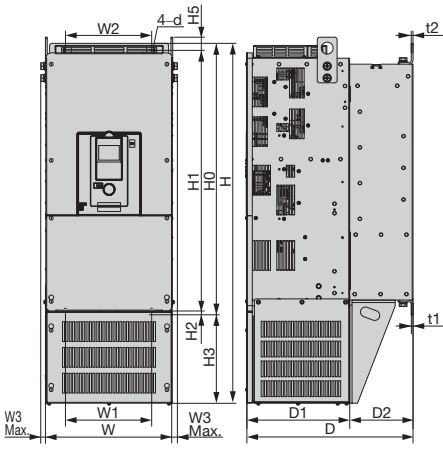


Figure 4

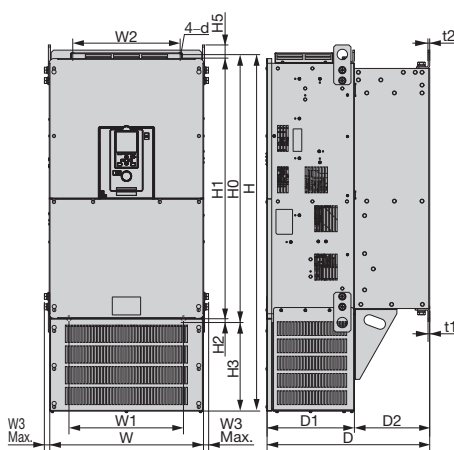


Figure 5

200 V Class: IP20/UL Type 1

Catalog Code GA70A...	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	STD	EMC	
2004	1	140	300	176	138	38	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.1	4.1	900-192-121-001 (100-202-326)
2006																					
2008																					
2010																					
2012																					
2018	1	140	300	211	138	73	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.4	4.4	900-192-121-001 (100-202-326)
2021																					
2030	1	140	300	211	138	73	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.8	4.8	900-192-121-001 (100-202-326)
2042																					
2056	1	180	340	202	134	68	140	140	—	300	284	8	40	1.5	—	1.6	1.6	M5	7.0	7.0	900-192-121-002 (100-202-327)
2070	1	220	400	227	140	87	192	192	—	350	335	8	50	1.5	—	2.3	2.3	M6	9.0	9.0	900-192-121-003 (100-202-328)
2082	1	220	435	227	140	87	192	192	—	350	335	8	85	1.5	—	2.3	2.3	M6	10.5	10.5	900-192-121-004 (100-202-329)
2110	2	244	500	280	166	114	195	186	10	400	375	17.5	100	—	17.5	2.3	2.3	M6	20	21	900-192-121-005 (100-202-330)
2138	3	259	580	280	166	114	170	165	10	450	424	16	130	—	21	2.3	2.3	M6	24	25	900-192-121-006 (100-208-526)
2169	3	268	700	335	186	149	190	182	10	543	516	17.5	157	—	20.5	2.3	2.3	M8	39	40	900-192-121-007 (100-208-527)
2211	3	268	770	335	186	149	190	182	10	543	516	17.5	227	—	20.5	2.3	2.3	M8	41	42	900-192-121-008 (100-208-528)
2257	4	316	915	420	260	160	218	218	16	700	659	28	215	—	28.5	4.5	4.5	M10	63	64	900-192-121-009 (100-208-549)
2313	4	316	915	420	260	160	218	218	16	700	659	28	215	—	28.5	4.5	4.5	M10	66	66	900-192-121-009 (100-208-549)
2360	5	444	1045	472	254	218	370	370	18	800	757	28	245	—	30	4.5	4.5	M12	109	115	900-192-121-010 (100-213-136)

400 V Class: IP20/UL Type 1

Catalog Code GA70A...	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	STD	EMC	
4002	1	140	300	176	138	38	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.0	4.0	900-192-121-001 (100-202-326)
4004																					
4005																					
4007																					
4009	1	140	300	211	138	73	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.3	4.3	900-192-121-001 (100-202-326)
4012																					
4018	1	140	300	211	138	73	102	102	—	260	248	6	40	1.5	—	1.6	5	M5	4.6	4.6	900-192-121-001 (100-202-326)
4023																					
4031	1	180	340	202	134	68	140	140	—	300	284	8	40	1.5	—	1.6	1.6	M5	6.5	6.5	900-192-121-002 (100-202-327)
4038																					
4044	1	220	400	227	140	87	192	192	—	350	335	8	50	1.5	—	2.3	2.3	M6	9.0	9.0	900-192-121-003 (100-202-328)
4060	1	220	400	246	140	106	192	192	—	350	335	8	50	1.5	—	2.3	2.3	M6	14	14	900-192-121-003 (100-202-328)
4075	2	244	500	280	166	114	195	186	10	400	375	17.5	100	—	17.5	2.3	2.3	M6	18	18	900-192-121-005 (100-202-330)
4089	3	259	580	280	166	114	170	165	10	450	424	16	130	—	21	2.3	2.3	M6	23	24	900-192-121-006 (100-208-526)
4103	3	259	580	280	166	114	170	165	10	450	424	16	130	—	21	2.3	2.3	M6	28	29	900-192-121-006 (100-208-526)
4140	3	268	700	335	186	149	190	182	10	543	516	17.5	157	—	20.5	2.3	2.3	M8	41	42	900-192-121-007 (100-208-527)
4168	3	268	700	335	186	149	190	182	10	543	516	17.5	157	—	20.5	2.3	2.3	M8	42	43	900-192-121-007 (100-208-527)
4208	4	316	915	420	260	160	218	218	16	700	659	28	215	—	28.5	4.5	4.5	M10	65	66	900-192-121-009 (100-208-549)
4250	4	316	915	420	260	160	218	218	16	700	659	28	215	—	28.5	4.5	4.5	M10	67	68	900-192-121-009 (100-208-549)
4296	4	316	915	420	260	160	218	218	16	700	659	28	215	—	28.5	4.5	4.5	M10	70	71	900-192-121-009 (100-208-549)
4371	5	444	1045	472	254	218	370	370	18	800	757	28	245	—	30	4.5	4.5	M12	114	119	900-192-121-010 (100-213-136)

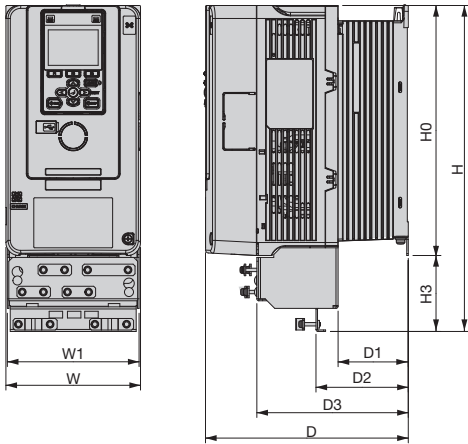
Note: UL Type 1 kit (option) is required. The values in the table are the dimensions for the UL Type 1 kit mounted to the IP20/UL Open Type drive.

*: Approximate weights for product revision version D and later models. Approximate weights for product revision version C or earlier models can be found in the technical documentation. Contact your Yaskawa or nearest sales representative for more information. Check the "REV" column printed on the nameplate located on the right-hand side of the drive to determine the product revision version.

STD indicates standard models. EMC indicates models with internal category C3 EMC filters.

Dimensions

■ IP20/UL Open Type (Shield Clamp Kit)



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

Catalog Code GA70A	Dimensions mm									Shield Clamp Kit Model (Code No.)
	W	H	D	D1	D2	D3	W1	H0	H3	
2004	140	339	176	38	61	123	137	260	79	900-195-896-001 (100-206-983)
2006										
2008										
2010										
2012	140	339	211	73	96	158	137	260	79	900-195-896-001 (100-206-983)
2018										
2021										
2030										
2042	180	439	202	68	93	148	175	298	141	900-195-896-002 (100-206-984)
2056										
2070										
2082										
2110	220	468	227	87	112	174	220	350	118	900-195-896-003 (100-229-140)
2138										
2169										
2211										
2110	240	490	280	114	139	217	244	390	100	900-195-896-007 (100-229-144)
2138										
2169										
2211										
2138	255	582	280	114	151	226	259	440	142	900-195-896-009 (100-229-146)
2169										
2211										
2211										
2169	264	697	335	149	189	266	268	533	164	900-195-896-012 (100-233-647)
2211										
2211										
2211										
2211	264	697	335	149	189	266	268	533	164	900-195-896-013 (100-233-700)
2211										
2211										
2211										

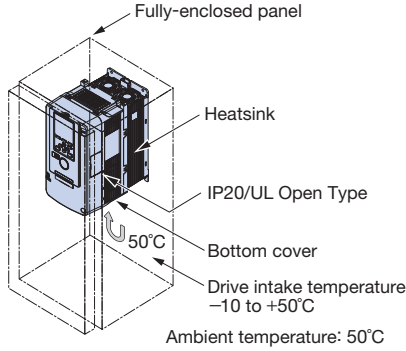
400 V Class: IP20/UL Open Type (Shield Clamp Kit)

Catalog Code GA70A	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)
4004										
4005										
4007										
4009	140	339	211	73	96	158	137	260	79	900-195-896-001 (100-206-983)
4012										
4018										
4023										
4031	180	439	202	68	93	148	175	298	141	900-195-896-002 (100-206-984)
4038										
4044										
4060										
4060	220	468	227	87	112	174	220	350	118	900-195-896-005 (100-229-142)
4075										
4089										
4103										
4103	240	490	280	114	139	217	244	390	100	900-195-896-008 (100-229-145)
4089										
4103										
4140										
4140	255	582	280	114	151	226	259	440	117	900-195-896-010 (100-233-645)
4168										
4168										
4168										
4168	255	582	280	114	151	226	259	440	142	900-195-896-011 (100-233-646)
4168										
4168										
4168										
4168	264	697	335	149	189	266	268	533	164	900-195-896-014 (100-233-701)
4168										
4168										
4168										
4168	264	697	335	149	189	266	268	533	164	900-195-896-012 (100-233-647)
4168										
4168										
4168										

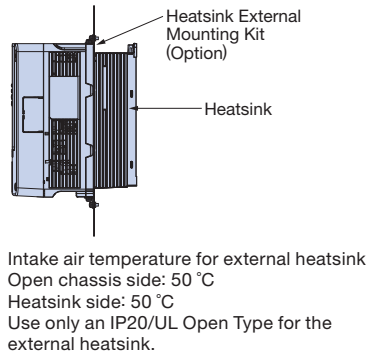
Fully-Enclosed Design and Drive Watt Loss Data

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.

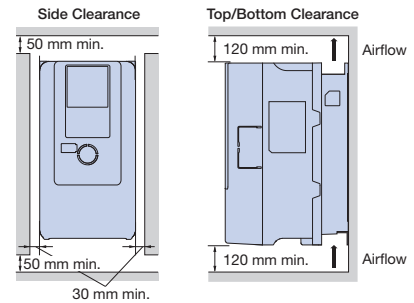
· Cooling Design for Fully-Enclosed Panel



· Mounting the External Heatsink



· 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 Heavy Duty Ratings

Catalog Code GA70A2	004	006	008	010	012	018	021	030	042	056	070	082	110	138	169	211	257	313	360	415		
Rated Output Current	A	3.2	5	6.9	8	11	14	17.5	25	33	47	60	75	88	115	145	180	215	283	346	415	
Carrier Frequency	kHz	8	8	8	8	8	8	8	8	8	8	8	8	8	5	5	5	5	5	5	5	
Watt Loss*	Internal	W	35	37	40	44	50	47	56	74	88	112	145	179	155	212	275	314	398	502	582	644
	Heatsink	W	18	26	36	43	61	82	105	174	183	267	373	478	563	680	820	991	1252	1643	1978	2359
	Total Watt Loss	W	53	63	76	87	111	129	161	248	271	379	518	657	718	892	1095	1305	1650	2145	2560	3003

400 V Class Heavy Duty Ratings

Catalog Code GA70A4	002	004	005	007	009	012	018	023	031	038	044	060	075	089	103		
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	
Carrier Frequency	kHz	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
Watt Loss*	Internal	W	38	42	46	48	37	46	65	73	101	119	148	126	165	184	237
	Heatsink	W	15	28	37	45	61	82	140	150	211	272	354	389	527	617	779
	Total Watt Loss	W	53	70	83	93	98	128	205	223	312	391	502	515	692	801	1016

Catalog Code GA70A4	140	168	208	250	296	371	414	453	568	675	810	930	H11	H12		
Rated Output Current	A	112	150	180	216	260	304	371	414	453	605	720	810	930	1090	
Carrier Frequency	kHz	5	5	5	5	5	5	5	2	2	2	2	2	2		
Watt Loss*	Internal	W	300	486	446	558	692	824	777	963	1086	1328	2009	2030	2553	2763
	Heatsink	W	956	1274	1432	1464	2061	2346	2212	2696	3035	3995	5424	6102	7092	8197
	Total Watt Loss	W	1256	1760	1878	2022	2753	3170	2989	3659	4121	5323	7433	8132	9646	10959

200 V Class Normal Duty Ratings

Catalog Code GA70A2	004	006	008	010	012	018	021	030	042	056	070	082	110	138	169	211	257	313	360		
Rated Output Current	A	3.5	6	8	9.6	12.2	17.5	21	30	42	56	70	82	110	138	169	211	257	313	360	
Carrier Frequency	kHz	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Watt Loss*	Internal	W	35	38	42	49	56	53	75	95	129	149	177	202	192	269	338	384	519	579	655
	Heatsink	W	16	25	34	46	62	88	125	206	227	302	403	467	631	814	941	1131	1534	1794	2071
	Total Watt Loss	W	51	63	76	95	118	141	200	301	356	451	580	669	823	1083	1279	1515	2053	2373	2726

400 V Class Normal Duty Ratings

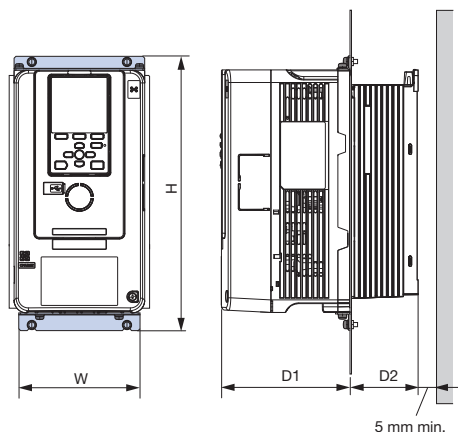
Catalog Code GA70A4	002	004	005	007	009	012	018	023	031	038	044	060	075	089	103		
Rated Output Current	A	2.1	4.1	5.4	7.1	8.9	11.9	17.5	23.4	31	38	44	59.6	74.9	89.2	103	
Carrier Frequency	kHz	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
Watt Loss*	Internal	W	39	44	48	52	42	57	82	108	138	145	168	157	185	212	264
	Heatsink	W	16	33	31	44	58	84	144	185	222	270	335	444	527	665	766
	Total Watt Loss	W	55	77	79	96	100	141	226	293	360	415	503	601	712	877	1030

Catalog Code GA70A4	140	168	208	250	296	371	389	453	568	675	810	930	H11	H12		
Rated Output Current	A	140	168	208	250	296	371	389	453	568	675	810	930	1090	1200	
Carrier Frequency	kHz	2	2	2	2	2	2	2	2	2	2	2	2	2		
Watt Loss*	Internal	W	393	574	493	686	805	1022	867	1086	1429	1526	2314	2330	3003	3169
	Heatsink	W	1126	1348	1465	1738	2155	2553	2393	3035	3989	4572	6170	7028	8301	9193
	Total Watt Loss	W	1519	1922	1958	2424	2960	3575	3260	4121	5418	6098	8484	9358	11304	12362

*: 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.

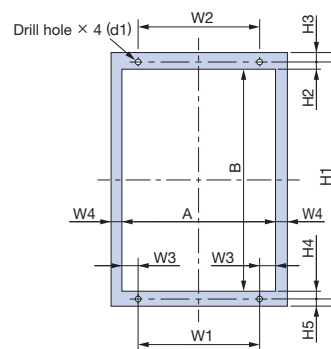
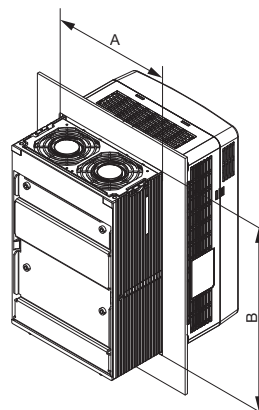
● Heatsink External Mounting Kit

When the heatsink is installed outside the drive, additional attachments are required. Additional attachments are not required for models GA70A2110 and above, and GA70A4075 and above because installing a heatsink outside the drive can be performed on these models by replacing their standard mounting feet. For details, refer to YASKAWA AC Drive Option External Heatsink Installation Kit Instruction Manual (TOEP C720600 03).



● Panel Modification for External Heatsink

(For models of catalog codes GA70A2004 to 2415, GA70A4002 to 4389)



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.

Figure 1

200 V Class

Catalog Code GA70A: []	Figure	Dimensions mm															Heatsink External Mounting Kit Model (Code No.)	
		W	H	D1	D2	W1	W2	W3	W4	H1	H2	H3	H4	H5	A	B		d1
2004	1	140	294	138	38	102	102	16	3	282	23	6	26	6	134	233	M5	900-193-209-001 (100-203-229)
2006																		
2008																		
2010																		
2012																		
2018	1	140	294	138	73	102	102	16	3	282	23	6	26	6	134	233	M5	900-193-209-001 (100-203-229)
2021																		
2030																		
2042	1	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)
2056																		
2070	1	220	384	140	87	192	192	11	3	371	27	7	25	6	214	319	M6	900-193-209-003 (100-203-231)
2082																		
2110	1	240	400	166	114	195	204	14.5	8	385	19.5	7.5	19.5	7.5	224	346	M6	No attachments
2138	1	255	450	166	114	170	210	34.5	8	436	20	8	20	6	239	396	M6	
2169	1	264	543	186	149	190	220	29	8	527	19.5	8.5	20.5	7.5	248	487	M8	
2211																		
2257	1	312	700	260	160	218	263	39	8	675	33	12	32	13	296	610	M10	
2313																		
2360	1	440	800	254	218	370	310	23	12	773	31.5	14	31.5	13	416	710	M12	
2415																		

400 V Class

Catalog Code GA70A: []	Figure	Dimensions mm															Heatsink External Mounting Kit Model (Code No.)	
		W	H	D1	D2	W1	W2	W3	W4	H1	H2	H3	H4	H5	A	B		d1
4002	1	140	294	138	38	102	102	16	3	282	23	6	26	6	134	233	M5	900-193-209-001 (100-203-229)
4004																		
4005																		
4007																		
4009																		
4012	1	140	294	138	73	102	102	16	3	282	23	6	26	6	134	233	M5	900-193-209-001 (100-203-229)
4018																		
4023																		
4031	1	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)
4038																		
4044	1	220	384	140	87	192	192	11	3	371	27	7	25	6	214	319	M6	900-193-209-003 (100-203-231)

400 V Class (continued)

Catalog Code GA70A	Figure	Dimensions mm															Heatsink External Mounting Kit Model (Code No.)	
		W	H	D1	D2	W1	W2	W3	W4	H1	H2	H3	H4	H5	A	B		d1
4060	1	220	384	140	106	192	192	11	3	371	27	7	25	6	214	319	M6	900-193-209-003 (100-203-231) No attachments
4075	1	240	400	166	114	195	204	14.5	8	385	19.5	7.5	19.5	7.5	224	346	M6	
4089	1	255	450	166	114	170	210	34.5	8	436	20	8	20	6	239	396	M6	
4103																		
4140	1	264	543	186	149	190	220	29	8	527	19.5	8.5	20.5	7.5	248	487	M8	
4168																		
4208	1	312	700	260	160	218	263	39	8	675	33	12	32	13	296	610	M10	
4250																		
4296	1	440	800	254	218	370	310	23	12	773	31.5	14	31.5	13	416	710	M12	
4371																		
4389																		

● Panel Modification for External Heatsink (For models of catalog codes GA70A4453 to 4H12)

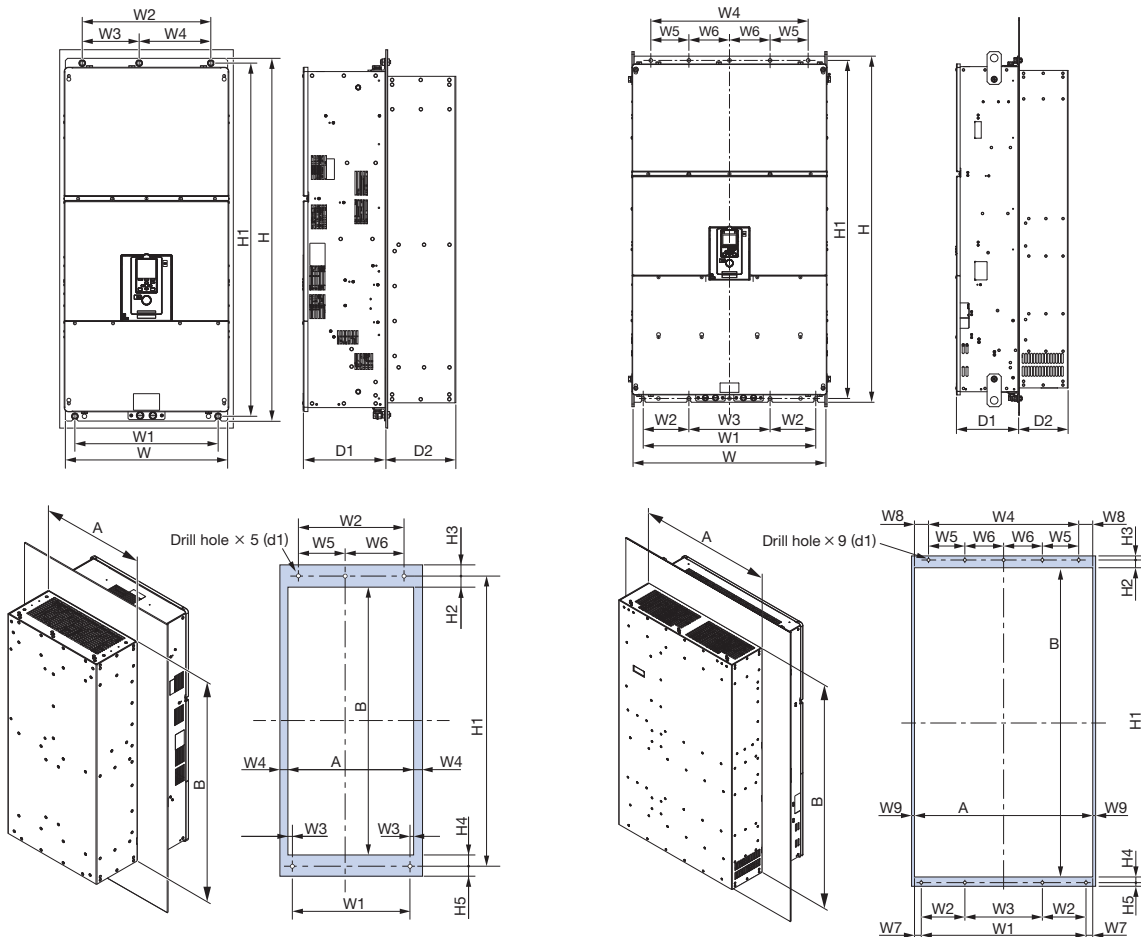


Figure 2

Figure 3

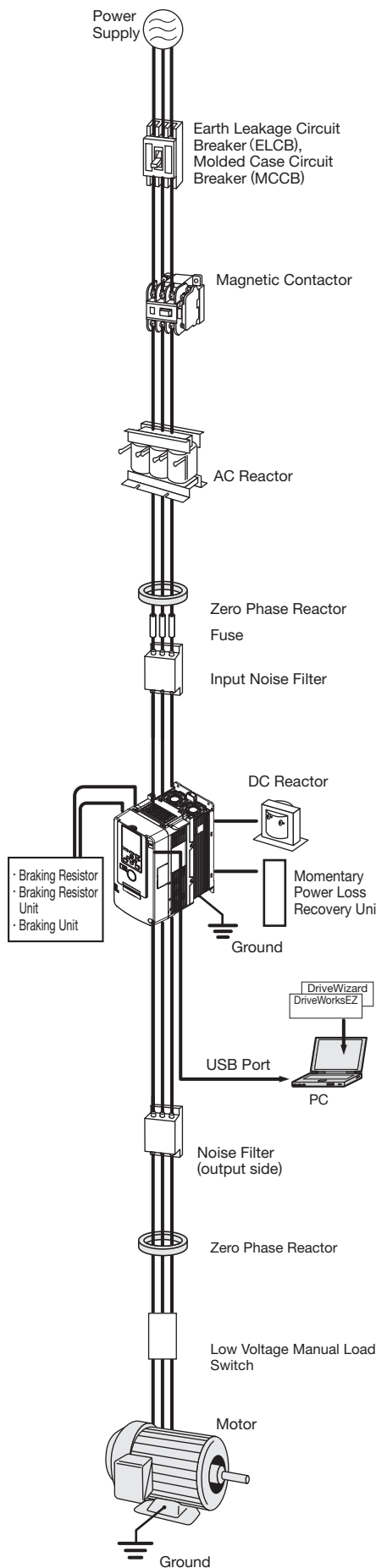
400 V Class

Catalog Code GA70A	Figure	Dimensions mm																				
		W	H	D1	D2	W1	W2	W3	W4	W5	W6	W7	W8	W9	H1	H2	H3	H4	H5	A	B	d1
4453	2	510	1140	260	220	450	404	18	12	179	225	—	—	—	1110	34	15	34	15	486	1042	M12
4568																						
4675																						
4810	3	760	1364	245	195	680	172	336	620	150	160	28	58	12	1332	32	16.8	34	15	736	1266	M12
4930																						
4H11																						
4H12																						

Note: 1. The heatsink external mounting kit is not required.

2. 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.

Peripheral Devices and Options



Name	Purpose	Model, Manufacturer	Page
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* by Mitsubishi Electric Corporation	P.54
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* by Mitsubishi Electric Corporation	P.54
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* by Fuji Electric FA Components & Systems Co., Ltd	P.55
AC Reactor	Improve the input power ratio of the drive. The DC reactor is built in for models of catalog codes GA70A2110 and above, and GA70A4060 and above. (The DC reactor is optional for models of catalog codes GA70A2082 and below, and GA70A4044 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.	UZBA series	P.56
DC Reactor	· Suppresses harmonic current · Improves the power factor of the input power supply	UZDA series	P.58
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 Proterial, Ltd.	P.61
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 Fuji Electric FA Components & Systems Co., Ltd	P.59
Capacitor-Type Noise Filter	Reduces noise from the line that enters into the drive input power system. The noise filter can be used in combination with a zero-phase reactor. Note: Available for drive input only. Do not connect the noise filter to the output terminals.	3XYG 1003 by Okaya Electric Industries Co., Ltd.	P.65
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 GA700 Technical Manual.	RTEN series by TDK-Lambda Corporation B84143B series by EPCOS, Inc. FN series by Schaffner EMC K.K.	P.62
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.64
Braking Resistor	Used to shorten the deceleration time by dissipating regenerative energy through a resistor. Usage 3% ED, requires a separate attachment.	ERF150WJ series CF120-B579 series	P.66
Attachment for Braking Resistor	A braking resistor can be attached to the drive.	900-192-126-001	P.71
External Heatsink Attachment for Braking Unit	Use the external heatsink attachment for installation with the heatsink outside the enclosure.	EZZ021711A	P.71
Braking Resistor Unit	Used to shorten the deceleration time by dissipating regenerative energy through a resistor unit (10% ED). With built-in thermal relay.	LKEB series	P.66
Braking Unit	Shortened deceleration time results when used with a Braking Resistor Unit.	CDBR series	P.66
PC cable	Connect the drive and PC when using DriveWizard or DriveWorksEZ. The cable length must be 3 m or less.	Commercially available USB2.0 A-miniB cable.	P.72
LED Keypad	Connects to the drive for easy operation with the LED display. Allows for remote operation. Includes a Copy function for saving drive settings.	JVOP-KPLEA04□□□	P.72
Bluetooth LCD Keypad	Bluetooth connection enables the drive to be operated from a smartphone.	JVOP-KPLCC04□□□	P.72
Compact Keypad Panel Mounting Kit	Use this attachment when you install the keypad on the surface of a control panel.	900-192-933-001 900-192-933-002	P.73
Keypad Extension Cable	Used as an extension cable when operating the keypad remotely.	WV001: 1 m WV003: 3 m	P.72
Momentary Power Loss Recovery Unit	Ensures continuous drive operation for a power loss of up to 2 s.	P0010 (200 V class) P0020 (400 V class)	P.65
Frequency Meter, Current Meter		DCF-6A	P.74
Frequency Setting Potentiometer (2 kΩ)		RV30YN	P.74
Frequency Meter Adjusting Potentiometer (20 kΩ)		RV30YN20S	P.74
Control Dial for Frequency Setting Potentiometer	Allows the user to set and monitor the frequency, current, and voltage using an external device.	K-2901-M	P.74
Output Voltage Meter		SCF-12NH	P.75
Potential Transformer		UPN-B	P.75
Heatsink External Mounting Kit	Required when the heatsink is installed outside the control panel. Note: In this case, current derating may be required.	—	P.50
UL Type 1 Kit	To change an IP20/UL Open Type drive to an IP20/UL Type 1 drive.	—	P.46
Low Voltage Manual Load Switch	Prevents shock from the voltage created on the terminals board from a coasting PM motor.	AICUT, LB series* by Aichi Electric Works Co., Ltd	—

*: 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, 2 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 SIEPC73060093
	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
	EtherCAT Interface	SI-ES3	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through EtherCAT communication with the host controller.	TOBPC73060096 SIEPC73060096
	EtherNet/IP Interface	SI-EN3	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through EtherNet/IP communication with the host controller.	TOEPC73060092 SIEPC73060092
	Modbus TCP/IP Interface	SI-EM3	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through Modbus TCP/IP communication with the host controller.	TOEPC73060091 SIEPC73060091
	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.	TOEPC73060089 SIEPC73060089
	Multi Protocol EtherNet Interface	JOHB-SMP3	Used for running or stopping the drive, setting or referencing parameters, and monitoring output frequency, output current, or similar items through EtherNet communications, such as Modbus TCP/IP, EtherNet/IP, EtherCAT, and PROFINET, with the host controller. Set communication protocol to be used with the DIP switch on the communication option card. Environmental specifications include resistance to humidity, dust, and gas.	TOBPC7306000H SIEPC7306000I*1 SIEPC7306000J*2 SIEPC7306000L*3 SIEPC7306000K*4
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 Note: Not available in Advanced Open Loop Vector for PM.	TOBPC73060075
	Line Driver PG	PG-X3	For control modes requiring a PG encoder for motor feedback or PM 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
	Motor Encoder Feedback (EnDat, HIPERFACE) Interface	PG-F3	For control modes requiring a PG encoder for PM motor feedback. Encoder type: EnDat 2.1/01, EnDat 2.2/01, and EnDat 2.2/22 (HEIDENHAIN), HIPERFACE (SICK STEGMANN) Maximum input frequency: 20 kHz (Used with low-speed gearless motors.) Note: EnDat 2.2/22 does not have maximum input frequency. Wiring length: 20 m max. for the encoder, 30 m max. for the pulse monitor Pulse monitor: Matches RS-422 level Note: EnDat 2.2/22 is not available. [Encoder power supply: 5 V, max current 330 mA or 8 V, max current 150 mA] Use one of the following encoder cables. EnDat2.1/01, EnDat2.2/01 : 17-pin cable from HEIDENHAIN EnDat2.2/22 : 8-pin cable from HEIDENHAIN HIPERFACE : 8-pin cable from SICK STEGMANN	TOBPC73060077
	Resolver Interface for TS2640N321E64	PG-RT3	For control modes requiring a PG encoder for motor feedback or PM 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. (100 m max. for the SS5 and SS7 series motors manufactured by Yaskawa and PG cables manufactured by Yaskawa Controls Co., Ltd.)	TOBPC73060087

Note: 1. The communication file required when operating the communication card with the configurator can be downloaded from e-Mecha Site (www.e-mechatronics.com).

2. PG speed controller card is required for PG control.

- *1: Modbus TCP/IP Technical Manual
- *2: EtherNet/IP Technical Manual
- *3: EtherCAT Technical Manual
- *4: PROFINET Technical Manual

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)	Earth Leakage Circuit Breaker						Molded Case 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
1.1	NV32-SV	15	10/10	NV32-SV	10	10/10	NF32-SV	15	7.5/7.5	NF32-SV	10	7.5/7.5
1.5	NV32-SV	20	10/10	NV32-SV	15	10/10	NF32-SV	20	7.5/7.5	NF32-SV	15	7.5/7.5
2.2	NV32-SV	30	10/10	NV32-SV	20	10/10	NF32-SV	30	7.5/7.5	NF32-SV	20	7.5/7.5
3	NV32-SV	50	15/15	NV63-SV	40	15/15	NF63-SV	50	15/15	NF63-SV	40	15/15
3.7	NV32-SV	60	50/50	NV63-SV	50	15/15	NF125-SV	60	50/50	NF63-SV	50	15/15
5.5	NV125-SV	75	50/50	NV125-SV	75	50/50	NF125-SV	75	50/50	NF125-SV	75	50/50
7.5	NV250-SV	125	85/85	NV125-SV	100	50/50	NF250-SV	125	85/85	NF125-SV	100	50/50
11	NV250-SV	150	85/85	NV250-SV	125	85/85	NF250-SV	150	85/85	NF250-SV	125	85/85
15	*3	—	—	NV250-SV	150	85/85	*3	—	—	NF250-SV	150	85/85
18.5	*3	—	—	NV250-SV	175	85/85	*3	—	—	NF250-SV	175	85/85
22	*3	—	—	NV250-SV	225	85/85	*3	—	—	NF250-SV	225	85/85
30	*3	—	—	NV400-SW	250	85/85	*3	—	—	NF400-CW	250	50/25
37	*3	—	—	NV400-SW	300	85/85	*3	—	—	NF400-CW	300	50/25
45	*3	—	—	NV400-SW	400	85/85	*3	—	—	NF400-CW	400	50/25
55	*3	—	—	NV630-SW	500	85/85	*3	—	—	NF630-CW	500	50/25
75	*3	—	—	NV630-SW	600	85/85	*3	—	—	NF630-CW	600	50/25
90	*3	—	—									
110	*3	—	—									

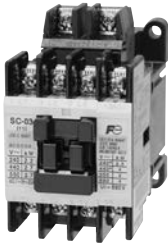
400 V Class

Motor Capacity (kW)	Earth Leakage Circuit Breaker						Molded Case 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	NV32-SV	20	5/5	NV32-SV	15	5/5	NF32-SV	20	2.5/2.5	NF32-SV	15	2.5/2.5
3.7	NV32-SV	30	5/5	NV32-SV	20	5/5	NF32-SV	30	2.5/2.5	NF32-SV	20	2.5/2.5
5.5	NV32-SV	30	5/5	NV32-SV	30	5/5	NF32-SV	30	2.5/2.5	NF32-SV	30	2.5/2.5
7.5	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
11	NV125-SV	60	25/25	NV63-SV	50	7.5/7.5	NF125-SV	60	25/25	NF63-SV	50	7.5/7.5
15	NV125-SV	75	25/25	NV125-SV	60	25/25	NF125-SV	75	25/25	NF125-SV	60	25/25
18.5	*4	—	—	NV125-SV	75	25/25	*4	—	—	NF125-SV	75	25/25
22	*4	—	—	NV125-SV	100	25/25	*4	—	—	NF125-SV	100	25/25
30	*4	—	—	NV250-SV	125	36/36	*4	—	—	NF250-SV	125	36/36
37	*4	—	—	NV250-SV	150	36/36	*4	—	—	NF250-SV	150	36/36
45	*4	—	—	NV250-SV	175	36/36	*4	—	—	NF250-SV	175	36/36
55	*4	—	—	NV250-SV	225	36/36	*4	—	—	NF250-SV	225	36/36
75	*4	—	—	NV400-SW	250	42/42	*4	—	—	NF400-CW	250	25/13
90	*4	—	—	NV400-SW	300	42/42	*4	—	—	NF400-CW	300	25/13
110	*4	—	—	NV400-SW	350	42/42	*4	—	—	NF400-CW	350	25/13
132	*4	—	—	NV400-SW	400	42/42	*4	—	—	NF400-CW	400	25/13
160	*4	—	—	NV630-SW	500	42/42	*4	—	—	NF600-CW	630	36/18
200	*4	—	—	NV630-SW	630	42/42	*4	—	—	NF600-CW	630	36/18
220	*4	—	—									
250	*4	—	—									
315	*4	—	—	NV800-SEW	800	42/42	*4	—	—	NF800-CEW	800	36/18
355	*4	—	—									
400	*4	—	—	NV1000-SB	1000	85	*4	—	—	NF1000-SEW	1000	85/43
450	*4	—	—									
500	*4	—	—	NV1200-SB	1200	85	*4	—	—	NF1250-SEW	1250	85/43
560	*4	—	—									
630	*4	—	—	NS1600 H *5	1600	70	*4	—	—	NF1600-SEW	1600	85/43

*1: Indicates whether an AC reactor or DC reactor is connected to the drive.
 *2: Icu: Rated ultimate short-circuit breaking capacity Ics: Rated service short-circuit breaking capacity
 *3: Drives with the motor capacity of 200 V class 22 kW and above (catalog codes: GA70A2110 to 2415) include a built-in DC reactor that improves the power factor.
 *4: Drives with the motor capacity of 400 V class 22 kW and above (catalog codes: GA70A4060 to 4H12) include a built-in DC reactor that improves the power factor.
 *5: NS series by Schneider Electric.

Magnetic Contactor

Base device selection on motor capacity.



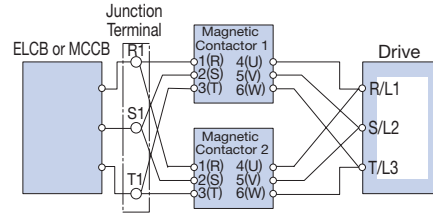
Magnetic Contactor
[Fuji Electric FA Components & Systems Co., Ltd]

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
1.1	SC-4-0	18	SC-05	13
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: Drives with the motor capacity of 200 V class 22 kW and above (catalog codes: GA70A2110 to 2415) include a built-in DC reactor that improves the power factor.

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.

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
355	*2	—	SC-N16	800
400				
450	*2	—	SC-N14×2*3	600*4
500				
560	*2	—	SC-N16×2*3	800*4
630				

*1: Indicates whether an AC reactor or DC reactor is connected to the drive.
*2: Drives with the motor capacity of 400 V class 22 kW and above (catalog codes: GA70A4060 to 4H12) include a built-in DC reactor that improves the power factor.
*3: Indicates the wiring of two magnetic contactors in parallel.
*4: Current of one magnetic contactor.

Peripheral Devices and Options (continued)

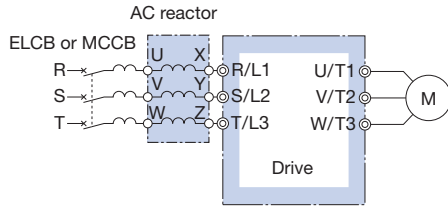
● AC Reactor (UZBA-B for 50/60 Hz Input)

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/T1, V/T2, W/T3) of the drive.

Dimensions (mm)

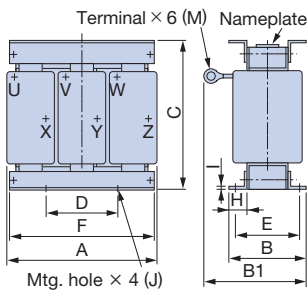


Figure 1

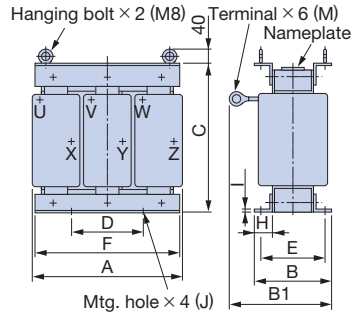


Figure 2

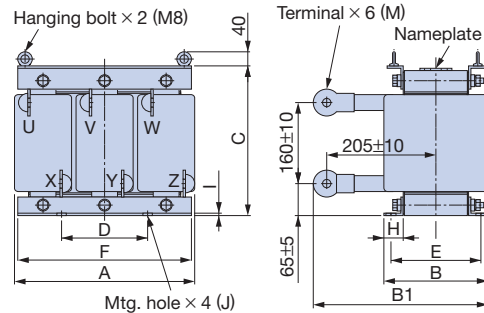


Figure 3

200 V Class

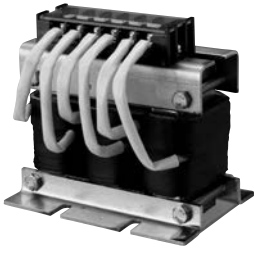
Motor Capacity (kW)	Current (A)	Inductance (mH)	Code No.	Figure	Dimensions (mm)													Weight (kg)	Watt Loss (W)
					A	B	B1	C	D	E	F	H	I	J	K	L	M		
3	20	0.53	100-250-562	1	130	88	114	105	50	70	130	22	3.2	M6	11.5	7	M5	3	35
3.7																			
5.5	30	0.35	100-250-578	1	130	88	119	105	50	70	130	22	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	500	0.02	100-250-589	2	330	162	281	270	150	130	320	40	4.5	M10	16	10	M12	55	200

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	250	0.09	100-250-575																
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	330	0.06	100-250-582																
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
355																			
400																			
450	490*1	0.04	100-250-588×2*2	2	330	176	293	275	150	150	320	40	4.5	M10	13	12	M12	60	340
500																			
560	660*1	0.03	100-250-597×2*2	3	330	216	353	285	150	185	320	40	4.5	M10	22	12	M16	80	300
630																			

*1: Current of one AC reactor. *2: Indicates the wiring of two AC reactors in parallel.

Terminal Type



Dimensions (mm)

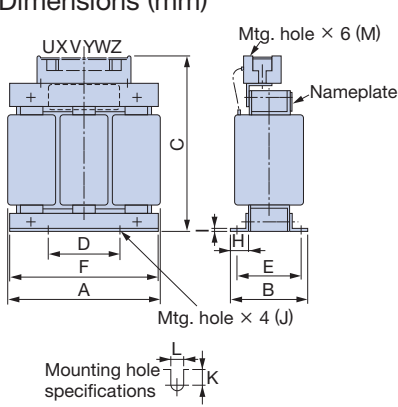


Figure 1

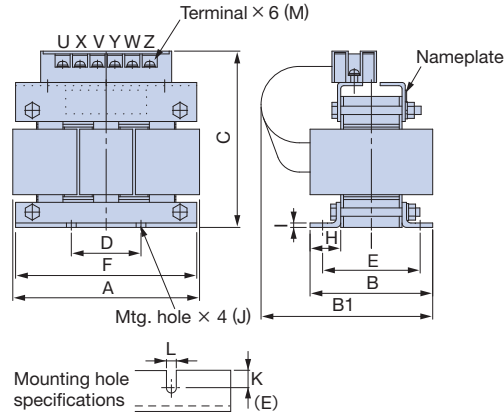


Figure 2

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
1.1	10	1.1	100-250-550	1	130	88	—	130	50	70	130	22	3.2	M6	9	7	M4	3	25
1.5																			
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	20	0.53	100-250-563	2	135	88	140	130	50	70	130	22	3.2	M6	9	7	M4	3	35
3.7																			
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	10	2.2	100-250-551	1	130	88	—	130	50	70	130	22	3.2	M6	9	7	M4	3	40
3.7																			
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

● DC Reactor (UZDA-B for DC circuit)

Base device selection on motor capacity.

Terminal Type



Dimensions (mm)

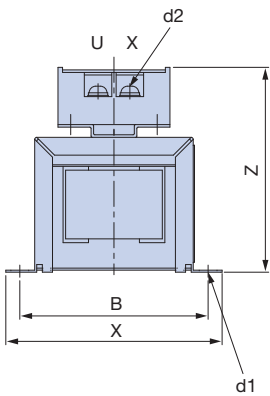


Figure 1

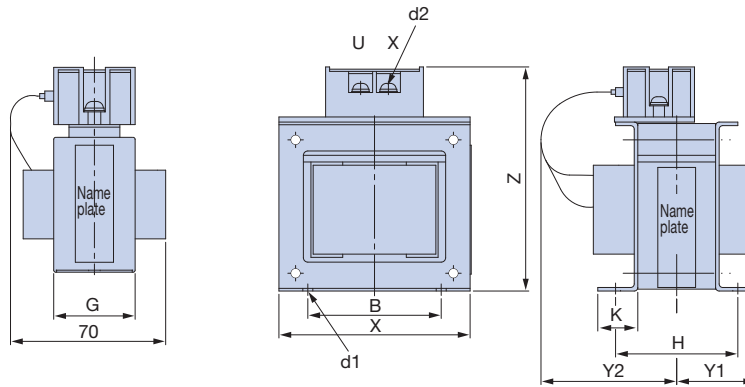


Figure 2

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 0.75 1.1 1.5 2.2 3 3.7	5.4	8	100-250-673	1	85	—	—	81	74	—	—	32	M4	M4	0.8	8
5.5 7.5 11 15 18.5	18	3	100-250-661	2	86	84	36	101	60	55	18	—	M4	M4	2	18
22 to 110	36	1	100-250-669	2	105	94	46	129	64	80	26	—	M6	M4	3.2	22
	72	0.5	100-250-678	2	105	124	56	135	64	100	26	—	M6	M6	4.9	29
	90	0.4	100-250-680	2	133	147.5	52.5	160	86	80	25	—	M6	M6	6.5	44
22 to 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 0.75 1.5 2.2 3 3.7	3.2	28	100-250-665	1	85	—	—	81	74	—	—	32	M4	M4	0.8	9
5.5 7.5 11 15 18.5	5.7	11	100-250-675	1	90	—	—	88	80	—	—	32	M4	M4	1	11
22 to 630	12	6.3	100-250-659	2	86	84	36	101	60	55	18	—	M4	M4	2	16
	23	3.6	100-250-663	2	105	104	46	118	64	80	26	—	M6	M4	3.2	27
	33	1.9	100-250-667	2	105	109	51	129	64	90	26	—	M6	M4	4	26
	47	1.3	100-250-671	2	115	142.5	57.5	136	72	90	25	—	M6	M5	6	42
22 to 630	Built-in															

Fuse and Fuse Holder

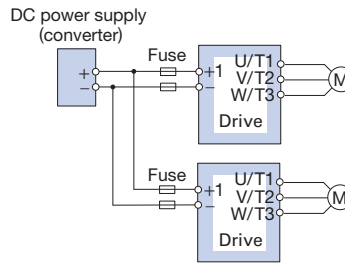
Install a fuse to the drive input terminals to prevent damage in case a fault occurs.

Refer to the instruction manual for information on UL-approved components.

[Fuji Electric FA Components & Systems Co., Ltd]

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 34.



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 GA70A:.....	AC Power Supply Input								DC Power Supply Input							
	Fuse				Fuse Holder				Fuse				Fuse Holder			
	Model	Code No.	Rated Shortcircuit Breaking Current (kA)	Qty.	Model	Code No.	Qty.	Figure	Model	Code No.	Rated Shortcircuit Breaking Current (kA)	Qty.	Model	Code No.	Qty.	Figure
2004																
2006	CR2LS-30/UL	100-250-772	10	3	CM-1A	100-250-746	1	1	CR2LS-30/UL	100-250-772	10	2	CM-1A	100-250-746	1	1
2008																
2010																
2012	CR2LS-50/UL	100-250-773	10	3	CM-1A	100-250-746	1	1	CR2LS-50/UL	100-250-773	10	2	CM-1A	100-250-746	1	1
2018																
2021	CR2LS-75/UL	100-250-755	10	3	CM-1A	100-250-746	1	1	CR2LS-75/UL	100-250-755	10	2	CM-1A	100-250-746	1	1
2030	CR2LS-100/UL	100-250-771	10	3	CM-1A	100-250-746	1	1	CR2LS-100/UL	100-250-771	10	2	CM-1A	100-250-746	1	1
2042	CR2L-125	100-250-751	100	3	CM-2A	100-250-748	1	2	CR2L-150/UL	100-250-752	10	2	CM-2A	100-250-748	1	2
2056	CR2L-150/UL	100-250-752	10	3	CM-2A	100-250-748	1	2	CR2L-175	100-251-661	100	2	CM-2A	100-250-748	1	2
2070	CR2L-225	100-251-662	100	3		*			CR2L-225	100-251-662	100	2		*		
2082																
2110	CR2L-260/UL	100-250-783	10	3		*			CR2L-260/UL	100-250-783	10	2		*		
2138	CR2L-300	100-250-767	100	3		*			CR2L-350/UL	100-250-784	10	2		*		
2169	CR2L-350/UL	100-250-784	10	3		*			CR2L-400	100-250-753	100	2		*		
2211	CR2L-450	100-250-769	100	3		*			CR2L-450	100-250-769	100	2		*		
2257																
2313	CR2L-600	100-250-754	100	3		*			CR2L-600	100-250-754	100	2		*		
2360									CS5F-800	100-251-716	200					
2415	CS5F-800	100-251-716	200	3		*			CS5F-1200	100-250-763	200	2		*		

*: Manufacturer does not recommend a specific fuse holder for this fuse.

Fuse Holder Dimensions (mm)

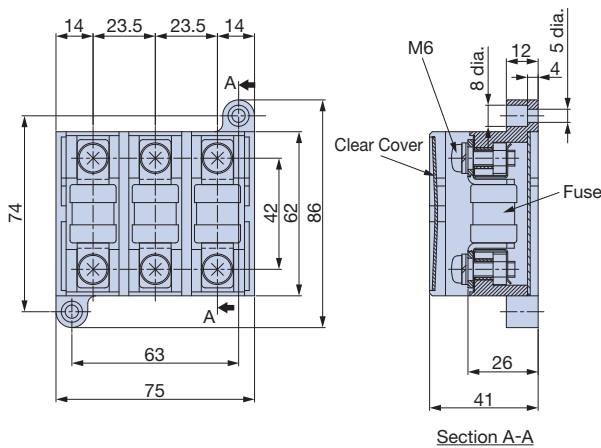


Figure 1

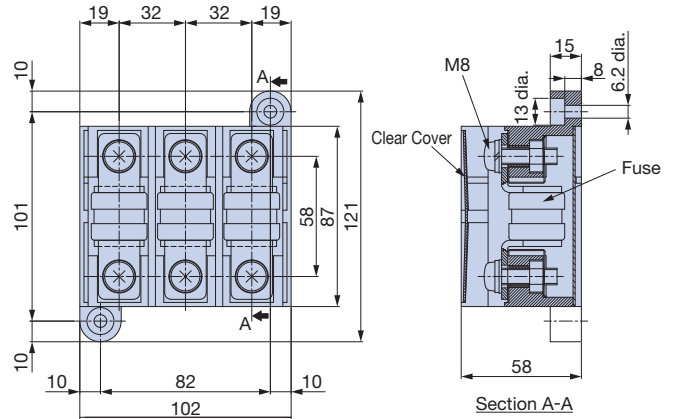


Figure 2

Fuse and Fuse Holder (continued)

400 V Class

Catalog Code GA70A	AC Power Supply Input								DC Power Supply Input							
	Fuse				Fuse Holder				Fuse				Fuse Holder			
	Model	Code No.	Rated Shortcircuit Breaking Current (kA)	Qty.	Model	Code No.	Qty.	Figure	Model	Code No.	Rated Shortcircuit Breaking Current (kA)	Qty.	Model	Code No.	Qty.	Figure
4002	CR6L-20/UL	100-250-758	100	3	CMS-4	100-250-749	3	3	CR6L-20/UL	100-250-758	100	2	CMS-4	100-250-749	2	3
4004	CR6L-30/UL	100-250-777	100	3	CMS-4	100-250-749	3	3	CR6L-30/UL	100-250-777	100	2	CMS-4	100-250-749	2	3
4005																
4007																
4009	CR6L-50/UL	100-250-781	100	3	CMS-4	100-250-749	3	3	CR6L-50/UL	100-250-781	100	2	CMS-4	100-250-749	2	3
4012																
4018																
4023	CR6L-75/UL	100-250-761	100	3	CMS-5	100-250-750	3	4	CR6L-75/UL	100-250-761	100	2	CMS-5	100-250-750	2	4
4031	CR6L-100/UL	100-250-756	100	3	CMS-5	100-250-750	3	4	CR6L-100/UL	100-250-756	100	2	CMS-5	100-250-750	2	4
4038																
4044	CR6L-150/UL	100-250-757	100	3	CMS-5	100-250-750	3	4	CR6L-150/UL	100-250-757	100	2	CMS-5	100-250-750	2	4
4060																
4075																
4089	CR6L-250/UL	100-251-715	100	3		*1			CR6L-250/UL	100-251-715	100	2		*1		
4103									CR6L-300/UL	100-250-785	100	2		*1		
4140	CR6L-300/UL	100-250-785	100	3		*1			CR6L-350/UL	100-250-779	100	2		*1		
4168	CR6L-400	100-250-780	100	3		*1			CR6L-400	100-250-780	100	2		*1		
4208																
4250	CS5F-600	100-250-782	200	3		*1			CS5F-600	100-250-782	200	2		*1		
4296																
4371																
4389	CS5F-800	100-251-716	200	3		*1			CS5F-800	100-251-716	200	2		*1		
4453																
4568									CS5F-1200	100-250-763	200	2		*1		
4675	CS5F-1000	100-250-762	200	3		*1			CS5F-1500	100-250-764	200	2		*1		
4810*2	CS5F-1200	100-250-763	200	3		*1			CS5F-1200	100-250-763	200	4		*1		
4930*2																
4H11*2	CS5F-1500	100-250-764	200	3		*1			CS5F-1500	100-250-764	200	4		*1		
4H12*2																

*1: Manufacturer does not recommend a specific fuse holder for this fuse.
 *2: Be sure to install fuses.

Fuse Holder Dimensions (mm)

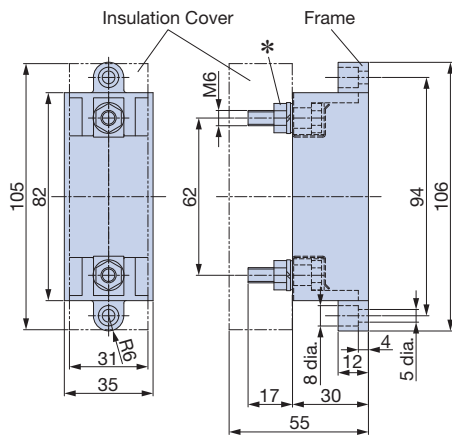


Figure 3

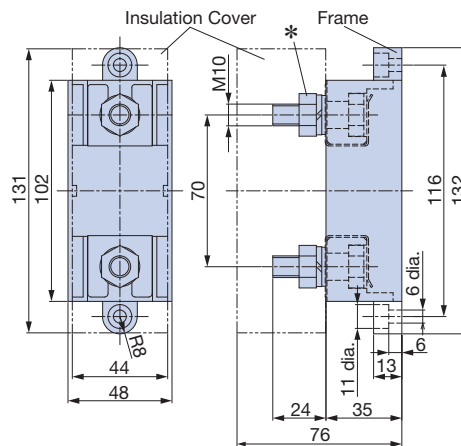


Figure 4

*: Mounting components supplied separately.
 Tighten bolt when fuse is installed.

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 and Yaskawa's ND 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



[Proterial, Ltd.]

Note: FINEMET is a trademark of Proterial, Ltd.

Connection Diagram

Compatible with the input and output side of the drive.

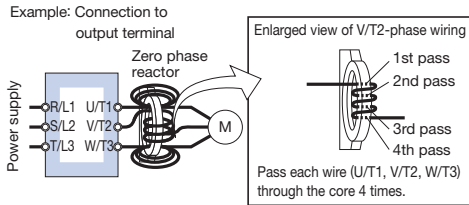


Diagram a

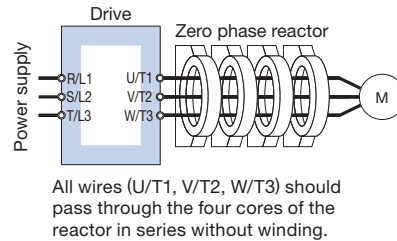


Diagram b

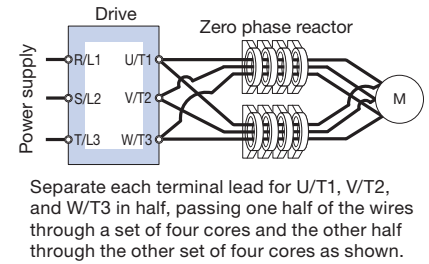
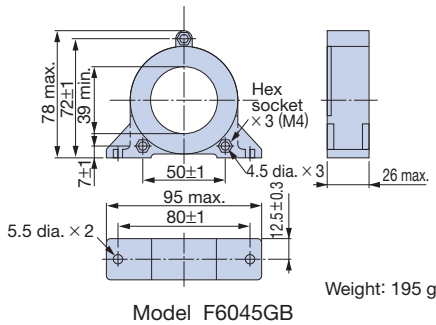
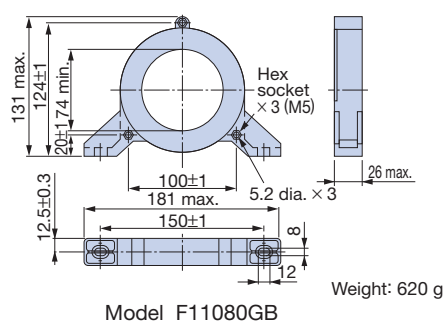


Diagram c

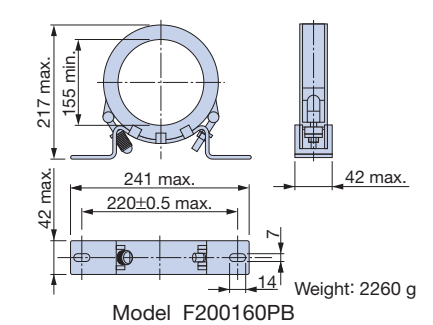
Dimensions (mm)



Model F6045GB



Model F11080GB



Model F200160PB

200 V Class

Motor Capacity (kW)	Zero Phase Reactor									
	GA700 (ND)		Input Side				Output Side			
	Input Side	Output Side	Model	Code No.	Qty.	Diagram	Model	Code No.	Qty.	Diagram
0.4										
0.75										
1.1	2	2	F6045GB	100-250-745	1	a	F6045GB	100-250-745	1	a
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	F11080GB	100-250-743	1	a	F6045GB	100-250-745	1	a
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								
15	22	14	F6045GB	100-250-745	4	b	F6045GB	100-250-745	4	b
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								
45	80	80	F11080GB	100-250-743	4	b	F11080GB	100-250-743	4	b
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	F200160PB	100-250-744	4	b	F200160PB	100-250-744	4	b

400 V Class

Motor Capacity (kW)	Zero Phase Reactor									
	GA700 (ND)		Input Side				Output Side			
	Input Side	Output Side	Model	Code No.	Qty.	Diagram	Model	Code No.	Qty.	Diagram
0.4										
0.75										
1.5										
2.2	2	2	F6045GB	100-250-745	1	a	F6045GB	100-250-745	1	a
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										
22	14	14	F6045GB	100-250-745	4	b	F6045GB	100-250-745	4	b
30										
37	22	22								
45	30	30	F6045GB	100-250-745	4	b	F6045GB	100-250-745	4	b
55	38	38								
75	60	60								
90	80	80	F11080GB	100-250-743	4	b	F11080GB	100-250-743	4	b
110										
132	50×2P	50×2P	F11080GB	100-250-743	4	b	F11080GB	100-250-743	4	b
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										
315	125×4P	100×4P	F200160PB	100-250-744	4	b	F200160PB	100-250-744	4	b
355										
400	125×4P	125×4P	F200160PB	100-250-744	4	b	F200160PB	100-250-744	4	b
450										
500	150×4P	150×4P	F200160PB	100-250-744	4	b	F200160PB	100-250-744	4	b
560	100×8P	100×8P								
630	125×8P	125×8P	F200160PB	100-250-744	8	c	F200160PB	100-250-744	8	c

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 mm ²	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 to 200, 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

*: 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)

Input Noise Filter

Base device selection on motor capacity.



[TDK-Lambda Corporation]

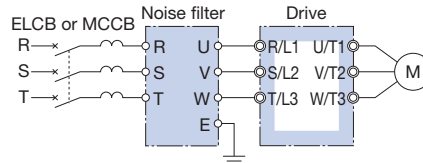


[EPCOS, Inc.]



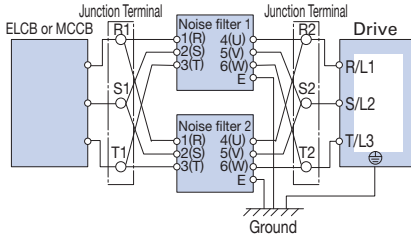
[Schaffner EMC K.K.]
Select the internal EMC filter type for CE Marking (EMC Directive) compliant model. Refer to the instruction manual for more information.

Connection Diagram



Note: Do not connect the input noise filter to the drive output terminals (U/T1, V/T2, W/T3). 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 by TDK-Lambda Corporation			
	Model	Code No.	Qty.	Rated Current (A)
0.4				
0.75	RTEN-5010	100-254-684	1	10
1.1				
1.5				
2.2	RTEN-5020	100-254-686	1	20
3				
3.7	RTEN-5030	100-254-687	1	30
5.5	RTEN-5040	100-254-688	1	40
7.5	RTEN-5060	100-254-689	1	60
11	RTEN-5100	100-255-051	1	100
15				
18.5				
22	RTEN-5150	100-255-052	1	150
30				
37				
45	RTEN-5200	100-255-053	1	200
55	RTEN-5300	100-255-055	1	300
75	RTEN-5200	100-255-053	2	400
90	RTEN-5250	100-255-054	2	500
110	RTEN-5300	100-255-055	2	600

Motor Capacity (kW)	Noise Filter by Schaffner EMC K.K.			
	Model	Code No.	Qty.	Rated Current (A)
0.4				
0.75				
1.1				
1.5				
2.2				
3				
3.7				
5.5	FN258L-42-07	100-250-467	1	42
7.5	FN258L-55-07	100-250-468	1	55
11	FN258L-75-34	100-250-470	1	75
15	FN258L-100-35	100-250-462	1	100
18.5	FN258L-100-35	100-250-462	1	100
22	FN258L-130-35	100-250-463	1	130
30	FN258L-130-35	100-250-463	1	130
37				
45	FN258L-180-07	100-250-465	1	180
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

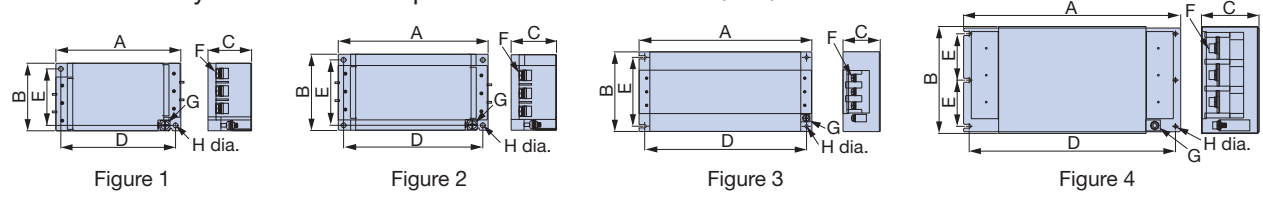
400 V Class

Motor Capacity (kW)	Noise Filter by TDK-Lambda Corporation			
	Model	Code No.	Qty.	Rated Current (A)
0.4				
0.75	RTEN-5006	100-254-685	1	6
1.5				
2.2	RTEN-5010	100-254-684	1	10
3				
3.7	RTEN-5020	100-254-686	1	20
5.5	RTEN-5030	100-254-687	1	30
7.5	RTEN-5040	100-254-688	1	40
11				
15	RTEN-5060	100-254-689	1	60
18.5				
22				
30	RTEN-5100	100-255-051	1	100
37				
45	RTEN-5150	100-255-052	1	150
55	RTEN-5200	100-255-053	1	200
75	RTEN-5250	100-255-054	1	250
90	RTEN-5300	100-255-055	1	300
110				
132	B84143B0400S080*	100-125-627	1	400
160				
200				
220				
250	B84143B1000S080*	100-125-628	1	1000
315				
355				
400				
450				
500				
560				
630				

Motor Capacity (kW)	Noise Filter by Schaffner EMC K.K.			
	Model	Code No.	Qty.	Rated Current (A)
0.4				
0.75				
1.5				
2.2				
3				
3.7				
5.5				
7.5				
11	FN258L-42-07	100-250-467	1	42
15	FN258L-55-07	100-250-468	1	55
18.5				
22	FN258L-75-34	100-250-470	1	75
30	FN258L-100-35	100-250-462	1	100
37	FN258L-100-35	100-250-462	1	100
45	FN258L-130-35	100-250-463	1	130
55	FN258L-180-07	100-250-465	1	180
75	FN359P-300-99	100-250-472	1	300
90	FN359P-400-99	100-250-473	1	400
110	FN359P-500-99	100-250-474	1	500
132	FN359P-600-99	100-250-475	1	600
160				
200				
220				
250				
315				
355				
400				
450				
500	FN359P-900-99	100-250-476	2	1800
560				
630				

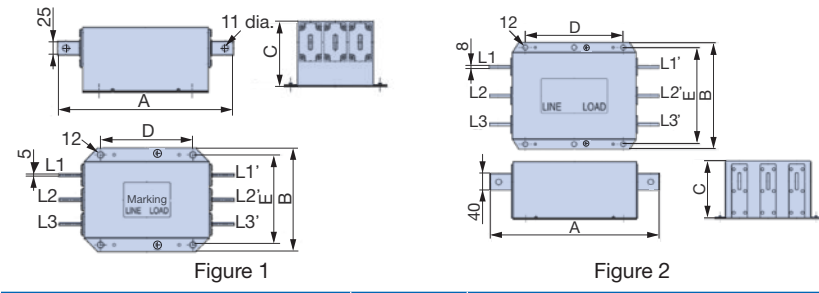
*: Manufactured by EPCOS, Inc.

Manufactured by TDK-Lamda Corporation Dimensions (mm)



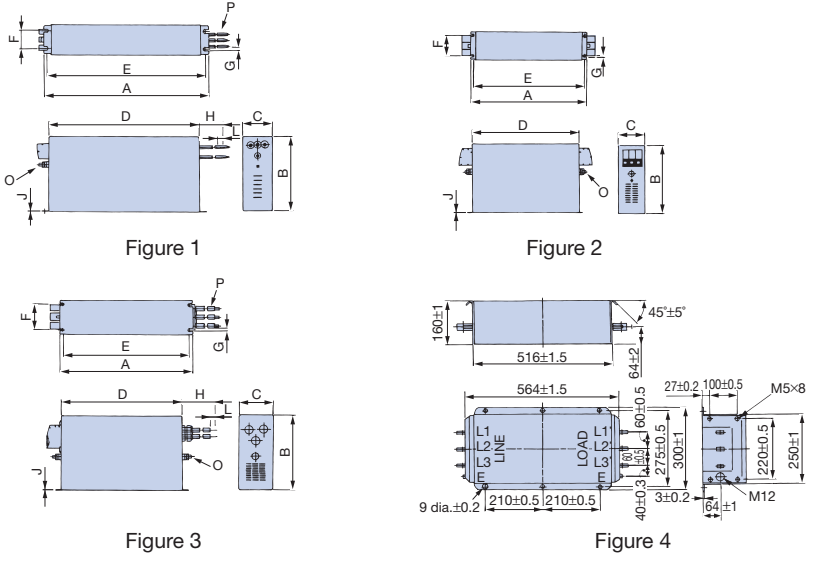
Model	Figure	Dimensions (mm)								Recommended Tightening Torque (N·m)
		A	B	C	D	E	F	G	H dia.	
RTEN-5006	1	120	63	42	110	53	M4	M4	4.5	M4 : 1.27 M5 : 2.5
RTEN-5010	1	120	63	42	110	53	M4	M4	4.5	
RTEN-5020	2	140	70	42	130	60	M4	M4	4.5	
RTEN-5030	2	140	70	42	130	60	M4	M4	4.5	
RTEN-5040	2	170	90	54	160	80	M5	M4	4.5	
RTEN-5060	2	170	90	54	160	80	M5	M4	4.5	
RTEN-5100	3	267	161	85	247	135	M8	M6	6.5	M6 : 4.8 M8 : 7.64 M10 : 11.8
RTEN-5150	3	290	190	88	270	164	M8	M6	6.5	
RTEN-5200	4	390	195	103	370	84.5	M10	M8	6.5	
RTEN-5250	4	390	195	103	370	84.5	M10	M8	6.5	
RTEN-5300	4	390	195	103	370	84.5	M10	M8	6.5	

Manufactured by EPCOS, Inc. Dimensions (mm)



Model	Figure	Dimensions (mm)					Weight (kg)
		A	B	C	D	E	
B84143B0400S080	1	320	190	120	170	165	7.5
B84143B1000S080	2	410	260	140	240	235	18.5

Manufactured by Schaffner EMC K.K. Dimensions (mm)



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		
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
FN258L-180-07	3	438±1.5	240	110±0.8	400±1.2	413	80	6.5	500	4	15	M10	50 mm ²	11
FN359P-.....	4	The dimensions are shown in Figure 4.											See above.	

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

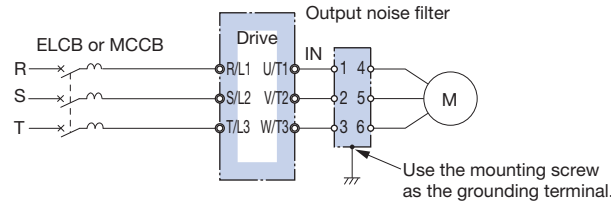
● Output Noise Filter

Base device selection on motor capacity.



[NEC Tokin Corporation]

Connection Diagram



Dimensions (mm)

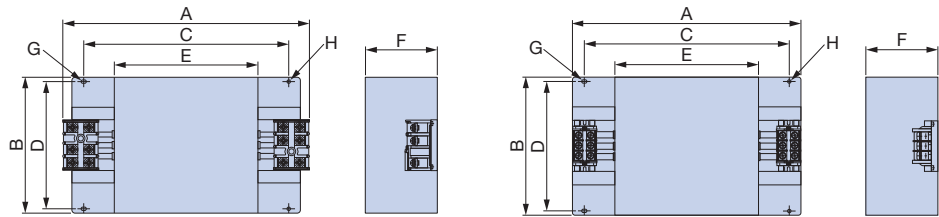


Figure 1

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																
3	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
3.7																
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
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	13.95
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	13.95
45																
55																
75																
90																
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	13.95

*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 62.

*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	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
5.5																
7.5	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
11																
15	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
18.5																
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	13.95
45																

(Continue)

400 V Class (continued)

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	
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	13.95
90			3	330												
110			4	440												
132			5	550												
160			6	660												
200			7	770												
220			8	880												
250			9	990												
315			9	990												
355			10	1100												
400			11	1210												
450			12	1320												

*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 62.
 *2: Weight of one filter.

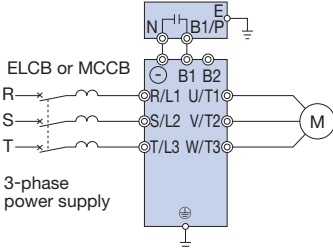
● Momentary Power Loss Recovery Unit



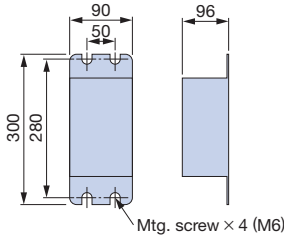
Weight: 2 kg

Connection Diagram

Momentary Power Loss Recovery Unit



Dimensions (mm)



Model	Code No.
200 V Class: P0010	100-228-475
400 V Class: P0020	100-228-476

Note: Functions as a back-up power supply for drives with 11 kW (HD)/15 kW (ND) or less. Allows the drive to ride through a power loss up to 2 s long. The drive alone can continue running through a power loss lasting 0.1 s to 1.0 s. Results may vary with drive capacity.

● Capacitor-Type Noise Filter

Capacitor-type noise filter exclusively designed for drive input.

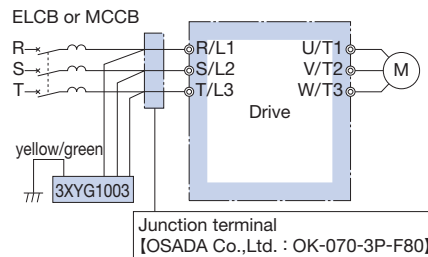
For both 200 V and 400 V classes, the noise filter can be used with a zero-phase reactor.

Note: The capacitor-type noise filter can be used for drive input only. Do not connect the noise filter to the output terminals.

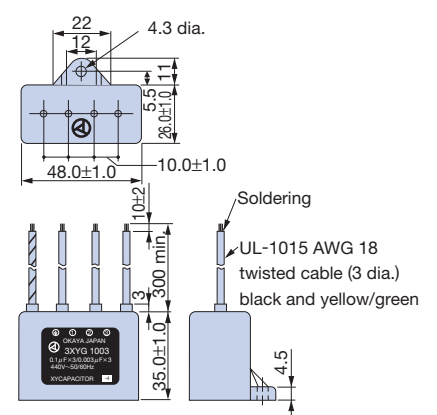


[Okaya Electric Industries Co., Ltd.]

Connection Diagram



Dimensions (mm)



Specifications

Model	Code No.
3XYG 1003	100-250-542

Rated Voltage	Capacitance (3 devices each)	Operating Temperature (°C)
440 V	X (Δ connection) : 0.1 μF±20 % Y (λ connection) : 0.003 μF±20 %	-40 to +85

Note: For use with 460 V and 480 V units, contact Yaskawa directly.

● Braking Unit, Braking Resistor, Braking Resistor Unit

Braking units and braking resistors are required to brake the drive. However, the braking unit for drives with catalog codes GA70A2004 through 2138 and GA70A4002 through 4168 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 GA70A2169, GA70A2211, GA70A4140, and GA70A4168, a junction terminal is required. Yaskawa recommends Mibu Denki Industrial Co., Ltd. as a manufacturer of the junction terminal.



200 V Class

Max. Applicable Motor (kW)	ND/HD	GA700 Catalog Code	Braking Unit Model CDBR- Qty.	Braking Resistor (Duty Factor: 3% ED, 10 s max.)*1										Braking Resistor Unit (Duty Factor: 10% ED, 10 s max.)*1					Min.*2 Connectable Resistance (Ω)
				No Fuse					With Fuse										
				Model ERF150WJ	Resistance (Ω)	Qty.	Diagram	Braking Torque*3 (%)	Model CF120-B579	Resistance (Ω)	Qty.	Diagram	Braking Torque*3 (%)	Model LKEB-	Resistor Specifications (per unit)	Qty.	Diagram	Braking Torque*3 (%)	
0.4	HD	2004	Built-in	201	200	1	A	220	B	200	1	A	220	20P7	70 W 200 Ω	1	B	220	48
0.75	ND	2004	Built-in	201	200	1	A	125	B	200	1	A	125	20P7	70 W 200 Ω	1	B	125	48
	HD	2006																	
1.1	ND	2006	Built-in	201	200	1	A	85	B	200	1	A	85	20P7	70 W 200 Ω	1	B	85	48
	HD	2008																	
1.5	ND	2008	Built-in	101	100	1	A	125	C	100	1	A	125	21P5	260 W 100 Ω	1	B	125	48
	HD	2010																	
2.2	ND	2010	Built-in	700	70	1	A	120	D	70	1	A	120	22P2	260 W 70 Ω	1	B	120	48 16
	HD	2012																	
3	ND	2012	Built-in	620	62	1	A	100	E	62	1	A	100	23P7	390 W 40 Ω	1	B	150	16
	HD	2018																	
3.7	ND	2018	Built-in	620	62	1	A	80	E	62	1	A	80	23P7	390 W 40 Ω	1	B	125	16
	HD	2021																	
5.5	ND	2021	Built-in	620	62	2	A*4	110	E	62	2	A*4	110	25P5	520 W 30 Ω	1	B	115	16
	HD	2030																	
7.5	ND	2030	Built-in											27P5	780 W 20 Ω	1	B	125	16 9.6
	HD	2042																	
11	ND	2042	Built-in											2011	2400 W 13.6 Ω	1	B	125	9.6
	HD	2056																	
15	ND	2056	Built-in											2015	3000 W 10 Ω	1	B	125	9.6
	HD	2070																	
18.5	ND	2070	Built-in											2015	3000 W 10 Ω	1	B	100	9.6
	HD	2082																	
22	ND	2082	Built-in											2015	3000 W 10 Ω	1	B	85	9.6
	HD	2110																	
30	ND	2110	Built-in											2022	4800 W 6.8 Ω	1	B	90	6.4
	HD	2138																	
37	ND	2138	Built-in											2022	4800 W 6.8 Ω	1	B	70	6.4
	HD	2169*5																	
45	ND	2169*5	2037D 1											2015	3000 W 10 Ω	2	F	80	5.0
	HD	2211*5																	
55	ND	2211*5	2022D 2											2022	4800 W 6.8 Ω	2	G	120	6.4
	HD	2257																	
75	ND	2257	2110D 1											2022	4800 W 6.8 Ω	3	D	110	1.6
	HD	2313																	
90	ND	2313	2110D 1											2022	4800 W 6.8 Ω	4	D	120	1.6
	HD	2360																	
110	ND	2360	2110D 1											2018	4800 W 8 Ω	5	D	100	1.6
	HD	2415																	

*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 (elevators, hoists, etc.) may require more braking power than is possible with only the standard braking unit and braking resistor. If the braking torque exceeds the value shown in the table, the capacity of the braking resistor must be increased.
 *4: When using multiple braking resistors or braking resistor units, connect them in parallel.
 *5: When connecting a braking unit or a braking resistor unit with this AC drive, a junction terminal is required. For details, see the connection diagram on page 68.

Note: 1. Braking resistor (ERF150WJ and CF120-B579) requires a separate attachment for installation. See attachment for braking resistor on page 71.
 2. Use the retrofit attachment when replacing an older model CDBR braking unit (CDBR-□B, CDBR-□C). Refer to TOBP C720600 01 1000-Series Option CDBR, LKEB Installation Manual for more details.
 3. Use the External Heatsink Attachment for installation with the heatsink outside the enclosure. Refer to page 71 for details.
 4. If the built-in fuse on a braking resistor blows, then the entire braking resistor should be replaced.
 5. See the connection diagram on page 68.

400 V Class

Max. Applicable Motor (kW)	ND/HD	GA700 Catalog Code	Braking Unit		Braking Resistor (Duty Factor: 3% ED, 10 s max.)*1									Braking Resistor Unit (Duty Factor: 10% ED, 10 s max.)*1					Min.*2 Connectable Resistance (Ω)
					No Fuse				With Fuse					Resistor Specifications (per unit)					
					Model ERF150WJ	Resistance (Ω)	Qty.	Diagram	Braking Torque*3 (%)	Model CF120-B579	Resistance (Ω)	Qty.	Diagram	Braking Torque*3 (%)	Model LKEB-	Qty.	Diagram	Braking Torque*3 (%)	
0.4	HD	4002	Built-in	751	750	1	A	230	F	750	1	A	230	40P7	70 W 750 Ω	1	B	230	165
0.75	ND	4002	Built-in	751	750	1	A	130	F	750	1	A	130	40P7	70 W 750 Ω	1	B	130	165
	HD	4004																	
1.5	ND	4004	Built-in	401	400	1	A	125	G	400	1	A	125	41P5	260 W 400 Ω	1	B	125	165 110
	HD	4005																	
2.2	ND	4005	Built-in	301	300	1	A	115	H	300	1	A	115	42P2	260 W 250 Ω	1	B	135	110
	HD	4007																	
3	ND	4007	Built-in	201	200	1	A	125	J	250	1	A	100	42P2 43P7	260 W 250 Ω 390 W 150 Ω	1	B	100 150	110 55
	HD	4009																	
3.7	ND	4009	Built-in	201	200	1	A	105	J	250	1	A	83	43P7	390W 150 Ω	1	B	135	55
	HD	4012																	
5.5	ND	4012	Built-in	201	200	2	A*4	135	J	250	2	A*4	105	45P5	520 W 100 Ω	1	B	135	55 32
	HD	4018																	
7.5	ND	4018	Built-in	-	-	-	-	-	-	-	-	-	-	47P5	780 W 75 Ω	1	B	130	32
	HD	4023																	
11	ND	4023	Built-in	-	-	-	-	-	-	-	-	-	-	4011	1040 W 50 Ω	1	B	135	32 20
	HD	4031																	
15	ND	4031	Built-in	-	-	-	-	-	-	-	-	-	-	4015	1560 W 40 Ω	1	B	125	20
	HD	4038																	
18.5	ND	4038	Built-in	-	-	-	-	-	-	-	-	-	-	4018	4800 W 32 Ω	1	B	125	20 19.2
	HD	4044																	
22	ND	4044	Built-in	-	-	-	-	-	-	-	-	-	-	4022	4800 W 27.2 Ω	1	B	125	19.2
	HD	4060																	
30	ND	4060	Built-in	-	-	-	-	-	-	-	-	-	-	4030	6000 W 20 Ω	1	B	125	19.2
	HD	4075																	
37	ND	4075	Built-in	-	-	-	-	-	-	-	-	-	-	4030	6000 W 20 Ω	1	B	100	19.2
	HD	4089																	
45	ND	4089	Built-in	-	-	-	-	-	-	-	-	-	-	4045	9600 W 13.6 Ω	1	B	125	10.6 8.7
	HD	4103																	
55	ND	4103	Built-in	-	-	-	-	-	-	-	-	-	-	4045	9600 W 13.6 Ω	1	B*4	100	8.7
	HD	4140*5																	
75	ND	4140*5	Built-in	-	-	-	-	-	-	-	-	-	-	4030	6000 W 20 Ω	2	H*4	100	7.2
	HD	4168*5																	
90	ND	4168*5	Built-in	-	-	-	-	-	-	-	-	-	-	4045	9600 W 13.6 Ω	2	H*4 C	100	5.2 12.8
	HD	4208																	
110	ND	4208	4220D	1	-	-	-	-	-	-	-	-	-	4030	6000 W 20 Ω	3	D	100	3.2
	HD	4250																	
132	ND	4250	4220D	1	-	-	-	-	-	-	-	-	-	4045	9600 W 13.6 Ω	4	D	140	3.2
	HD	4296																	
160	ND	4296	4220D	1	-	-	-	-	-	-	-	-	-	4045	9600 W 13.6 Ω	4	D	140	3.2
	HD	4371																	
200	ND	4371	4220D	1	-	-	-	-	-	-	-	-	-	4045	9600 W 13.6 Ω	4	D	120	3.2
	HD	4389																	
220	ND	4389	4220D	1	-	-	-	-	-	-	-	-	-	4037	9600 W 16 Ω	5	D	110	3.2
	HD	4453																	
250	ND	4453	4220D	1	-	-	-	-	-	-	-	-	-	4037	9600 W 16 Ω	5	D	90	3.2
	HD	4568																	
315	ND	4568	4220D	2	-	-	-	-	-	-	-	-	-	4045	9600 W 13.6 Ω	6	E	100	3.2
	HD	4675																	
355	ND	4675	4220D	2	-	-	-	-	-	-	-	-	-	4045	9600 W 13.6 Ω	8	E	120	3.2
	HD	4810																	
400	ND	4810	4220D	2	-	-	-	-	-	-	-	-	-	4037	9600W 16 Ω	10	F	100	3.2
	HD	4930																	
450	ND	4810	4220D	2	-	-	-	-	-	-	-	-	-	4037	9600W 16 Ω	10	F	100	3.2
	HD	4930																	
500	ND	4930	4220D	2	-	-	-	-	-	-	-	-	-	4037	9600W 16 Ω	10	F	90	3.2
	HD	4H11																	
560	ND	4H11	4220D	3	-	-	-	-	-	-	-	-	-	4037	9600W 16 Ω	15	F	120	3.2
	HD	4H12																	
630	ND	4H12	4220D	3	-	-	-	-	-	-	-	-	-	4037	9600W 16 Ω	15	F	100	3.2

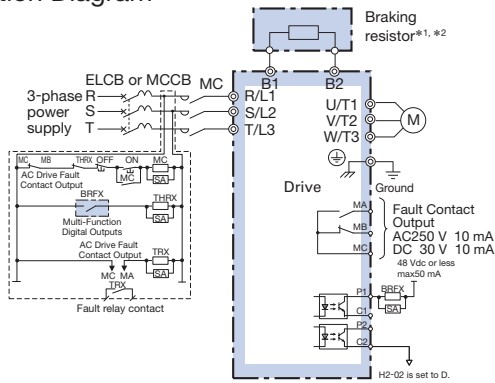
- *1: Refers to a motor coasting to stop with a constant torque load. Constant output and regenerative braking will reduce the duty factor.
- *2: Assumes the use of a single braking unit. The braking unit should have a resistance higher than the minimum connectable resistance value and be able to generate enough braking torque to stop the motor.
- *3: Applications with a relatively large amount of regenerative power (elevators, hoists, etc.) may require more braking power than is possible with only the standard braking unit and braking resistor. If the braking torque exceeds the value shown in the table, the capacity of the braking resistor must be increased.
- *4: When using multiple braking resistors or braking resistor units, connect them in parallel.
- *5: When connecting a braking unit or a braking resistor unit with this AC drive, a junction terminal is required. For details, see the connection diagram on page 68.

- Note: 1. Braking resistor (ERF150WJ and CF120-B579) requires a separate attachment for installation. See attachment for braking resistor on page 71.
2. Use the retrofit attachment when replacing an older model CDBR braking unit (CDBR-□B, CDBR-□C). Refer to TOBP C720600 01 1000-Series Option CDBR, LKEB Installation Manual for more details.
 3. Use the External Heatsink Attachment for installation with the heatsink outside the enclosure. Refer to page 71 for details.
 4. If the built-in fuse on a braking resistor blows, then the entire braking resistor should be replaced.
 5. See the connection diagram on page 68.

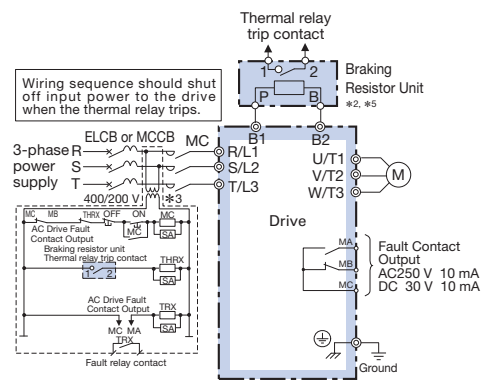
Peripheral Devices and Options (continued)

Connection Diagram

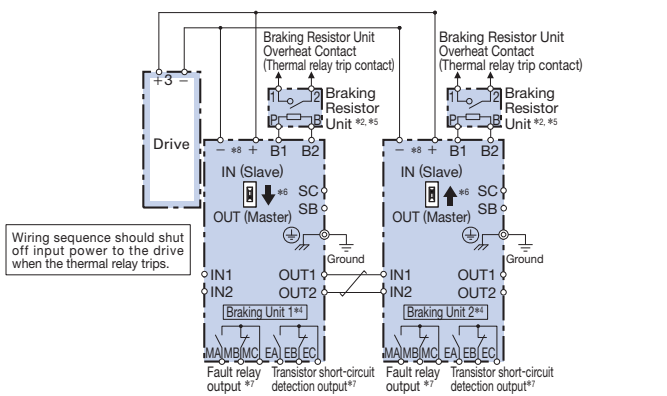
Footnotes are listed on page 69.



Connection Diagram A

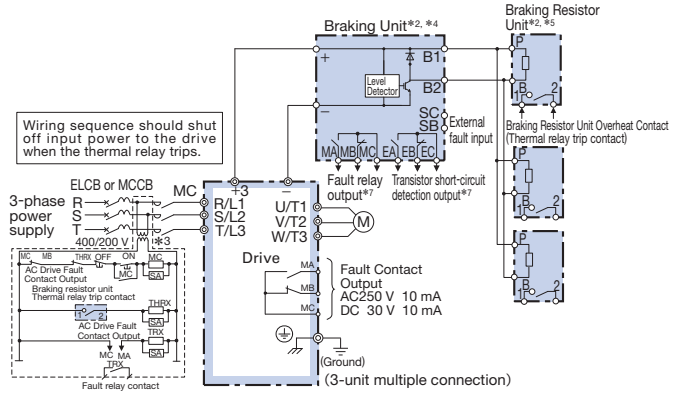


Connection Diagram B

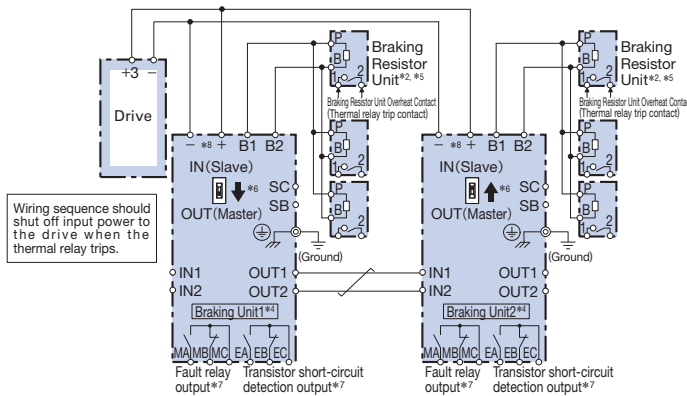


Connection Diagram C

(Braking Units in Parallel*)

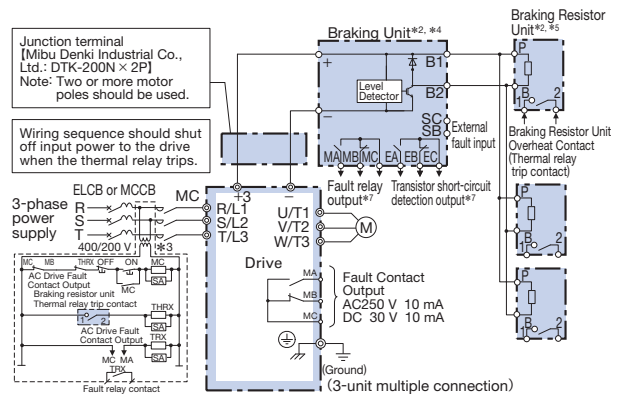


Connection Diagram D

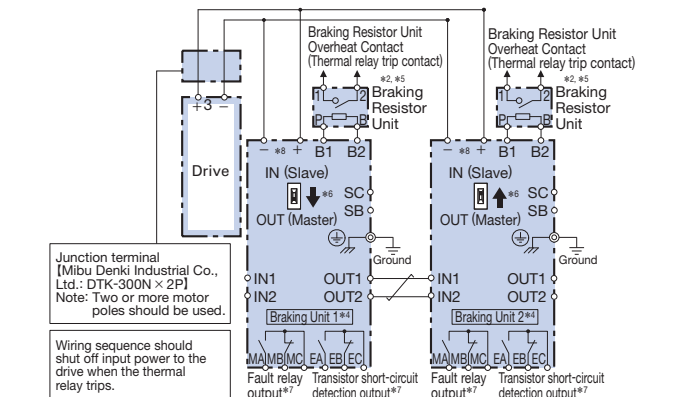


Connection Diagram E

(Braking Units in Parallel*)

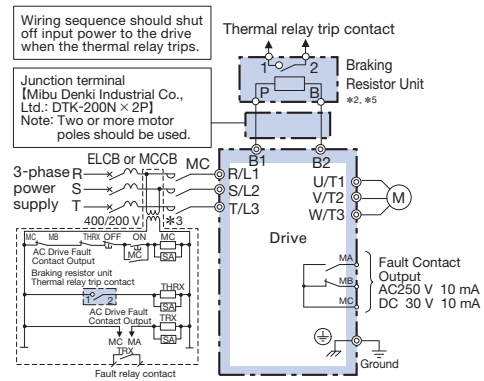


Connection Diagram F



Connection Diagram G

(Braking Units in Parallel*)



Connection Diagram H

- *1: Set L8-01 to 1 to enable braking resistor overload protection in the drive when using braking resistors, and set a multi-function input to "Braking Resistor Fault" (H1-::: = D). Wiring sequence should shut off power to the drive when a fault output is triggered. CF120-B579 series does not need to be wired an external sequence.
- *2: Set L3-04 to 0 [Stall Prevention during Decel = Disabled] when using a braking unit, a braking resistor, or a braking resistor unit. If L3-04 is set to 1 [Enabled] (default setting), the drive may not stop within the specified deceleration time.
- *3: 200 V class drives do not require a control circuit transformer.
- *4: 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 GA70A2004 to 2138, and GA70A4002 to 4168), 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.
- *5: Be sure to protect non-Yaskawa braking resistors by thermal overload relay.
- *6: 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.
- *7: 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.
- *8: Connect directly to the drive terminal or install a terminal block.
- *9: Contact your Yaskawa or nearest sales representative for a replacement manual when connecting braking units CDBR-:::B, CDBR-:::C, and CDBR-:::D in parallel.

Model, Code No.
Braking Unit
200 V Class

Model CDBR-□□□□□	Enclosure Protection Design	Code No.
2022D	IP20	100-091-707
	UL Type 1	100-091-754
2037D	IP20	100-091-712
	UL Type 1	100-091-759
2110D	IP00	100-091-524
	UL Type 1	100-091-530

400 V Class

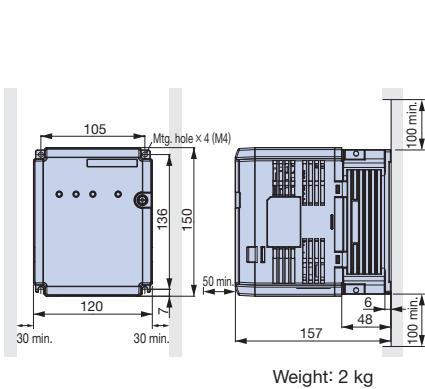
Model CDBR-□□□□□	Enclosure Protection Design	Code No.
4045D	IP20	100-091-722
	UL Type 1	100-091-769
4220D	IP00	100-091-526
	UL Type 1	100-091-532

Watt Loss

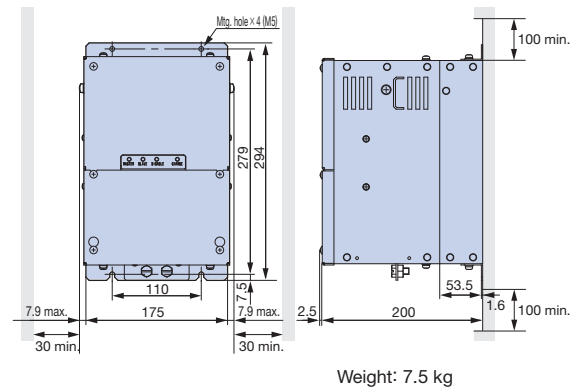
Model CDBR-□□□□□	Watt Loss (W)
2022D	27
2037D	38
2110D	152
4045D	36
4220D	152

Dimensions (mm)
Braking Unit

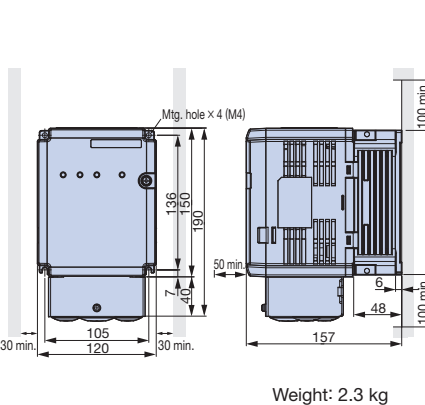
Open Chassis [IP20]
CDBR-2022D, -2037D, -4045D



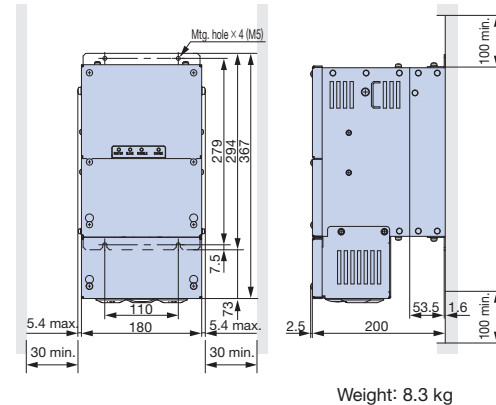
Open Chassis [IP00]
CDBR-2110D, -4220D



Enclosure Wall-Mounted [UL Type 1]
CDBR-2022D, -2037D, -4045D



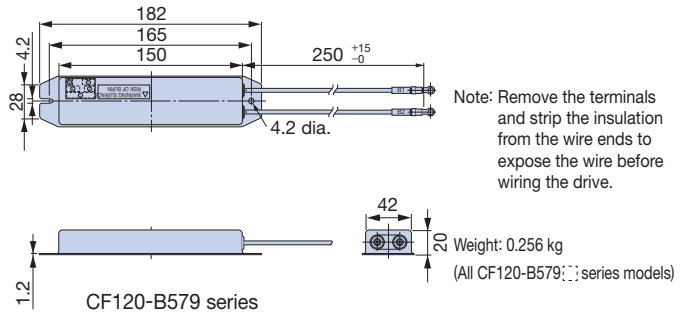
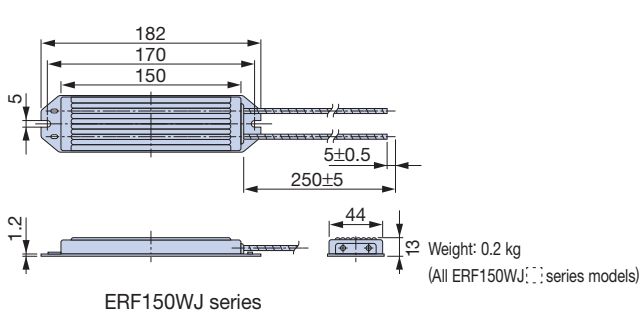
CDBR-2110D, -4220D



Peripheral Devices and Options (continued)

Braking Resistor

An optional separate attachment is need to install the braking resistor to the drive.
Refer to the Attachment for Braking Resistor on page 71.



Note: Remove the terminals and strip the insulation from the wire ends to expose the wire before wiring the drive.

Braking Resistor Unit (stand-alone)

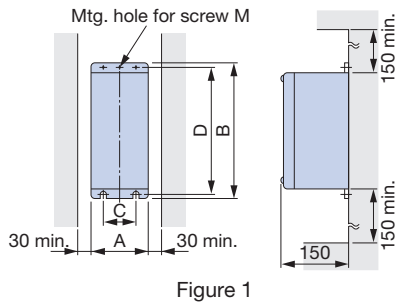


Figure 1

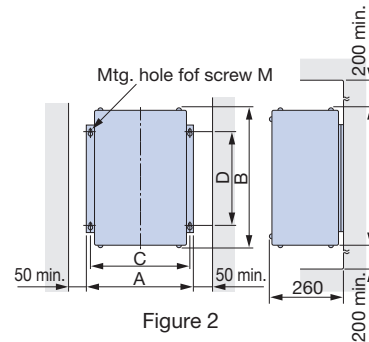


Figure 2

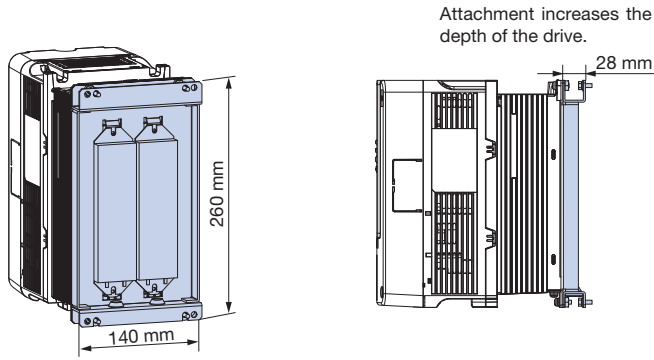
Applicable Voltage: 200 V Class

Braking Resistor Unit Model LKEB-□□□□□□□□	Figure	Dimensions (mm)					Weight (kg)	Allowable Average Power Consumption (W)
		A	B	C	D	M		
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: 400 V Class

Braking Resistor Unit Model LKEB-□□□□□□□□	Figure	Dimensions (mm)					Weight (kg)	Allowable Average Power Consumption (W)
		A	B	C	D	M		
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

● Attachment for Braking Resistor



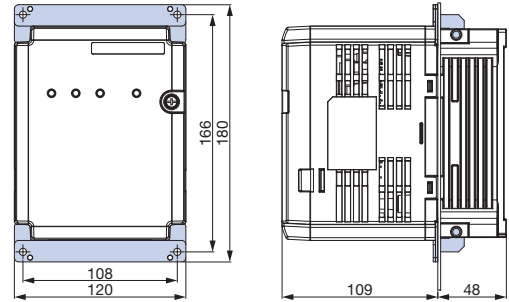
Model	Code No.
900-192-126-001	100-202-333

● Braking Unit External Heatsink Attachment

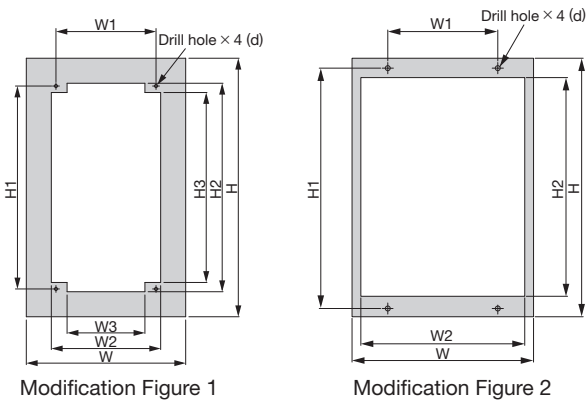
Use the external heatsink attachment for installation with the heatsink outside the enclosure.

Attachment	Model CDBR- 	Model (Code No.)
	2022D	EZZ021711A (100-066-355)
	2037D	
	4030D	
	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.

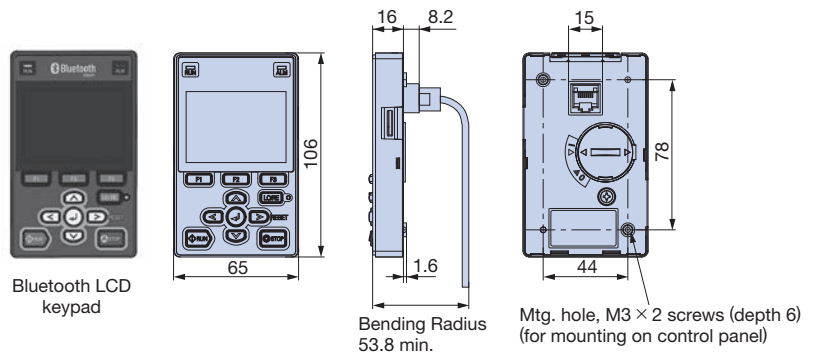
Bluetooth LCD Keypad

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- and dust-resistant	JVOP-KPLCC04MBA	100-225-009
Humidity- and dust-resistant (built-in clock battery)	JVOP-KPLCC04MBB	100-249-032

- *: The second "B" from the end of the model number is the design revision order.
- Note: 1. Available in the GA700 software versions: 1016 and later.
 2. Certified international standards: CE, FCC, IC (Industry Canada), CMIIT, KC, MIC
 3. 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.
 4. CR2016 lithium manganese dioxide batteries manufactured by Maxell, Ltd. or the equivalent are recommended for the clock battery.

Dimensions (mm)



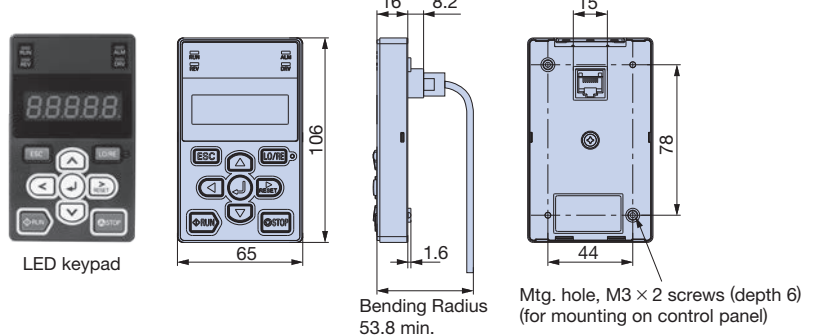
LED Keypad

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	100-219-384
Humidity- and dust-resistant	JVOP-KPLEA04MAA	100-206-378

- *: The second "A" from the end of the model number is the design revision order.

Dimensions (mm)

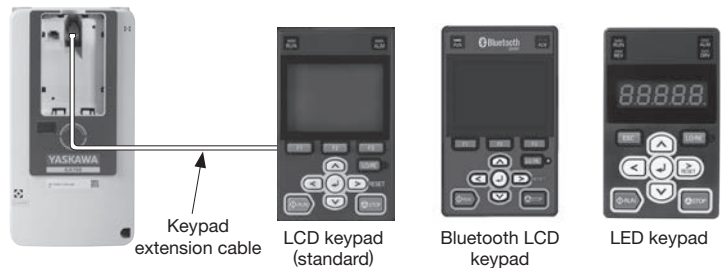


Keypad Extension Cable

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.

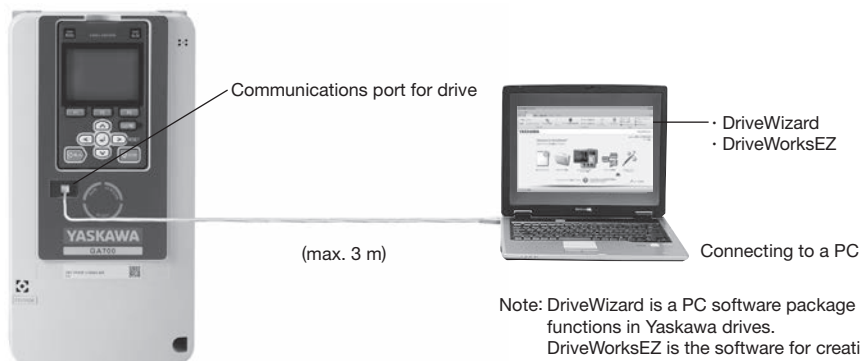
- Note: 1. Never use this cable for connecting the drive to a PC. Doing so may damage the PC.
 2. You can also use a commercially available LAN cable (straight-through) for the operator extension cable.



PC Cable

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

Connection

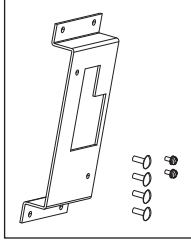


Note: DriveWizard is a PC software package for managing parameters and functions in Yaskawa drives. DriveWorksEZ is the software for creating custom application programs for the drive through visual programming.

● Keypad Mounting Bracket

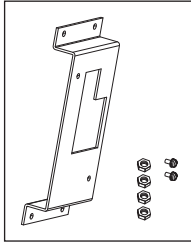
This bracket is required to mount the LCD, Bluetooth LCD Keypad, or LED keypad on the control panel.

Installation Support Set A



Model	Code No.	Notes
900-192-933-001	100-203-008	For screw tightening

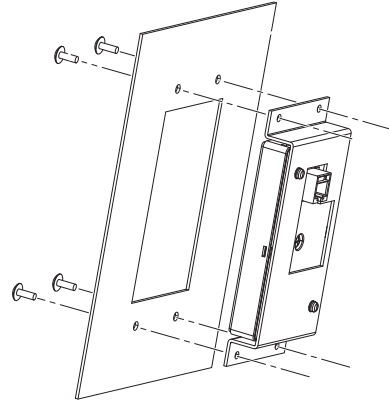
Installation Support Set B



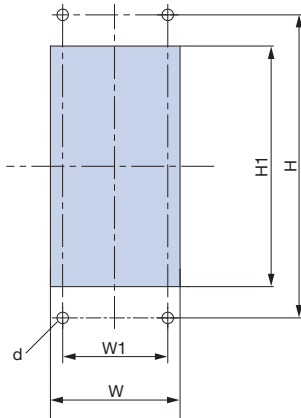
Model	Code No.	Notes
900-192-933-002	100-203-009	For nut fixing

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

- Product Lineup
- Model Number / Catalog Code
- Basic Instructions
- Model Selection
- Standard Specifications
- Standard Connection Diagram
- Terminal Specifications
- Dimensions
- Fully-Enclosed Design and Drive Watt Loss Data
- Peripheral Devices and Options
- Application Notes
- Warranty
- Global Service Network

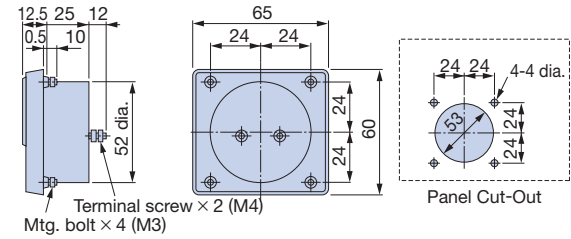
● Frequency Meter/Current Meter



Model	Code No.
Scale-75 Hz full-scale: DCF-6A	100-250-730
Scale-65/130 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 GA700 multi-function analog monitor output default setting is 0 to 10 V, set frequency meter adjusting potentiometer (20 kΩ) or parameter H4-02 (analog monitor output gain) within the range of 0 to 3 V.

Dimensions (mm)



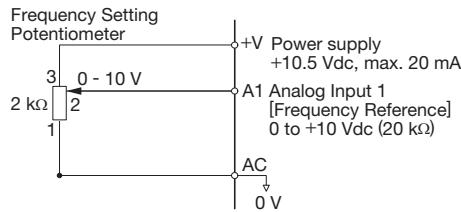
Weight: 0.3 kg

● Frequency Setting Potentiometer/Frequency Meter Adjusting Potentiometer

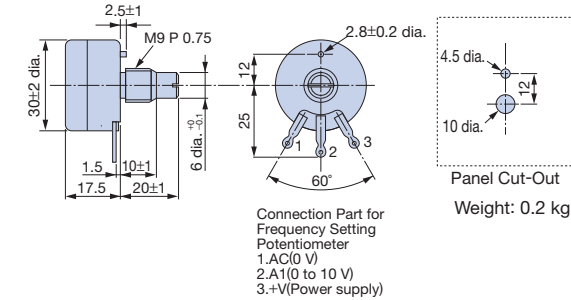


Model	Code No.
2 kΩ : RV30YN	100-250-722
20 kΩ : RV30YN20S	100-250-723

Connection diagram

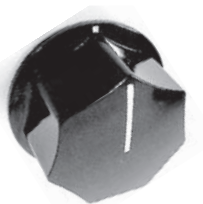


Dimensions (mm)



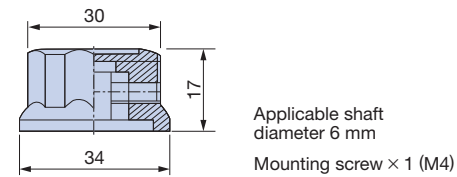
Weight: 0.2 kg

● Control Dial for Frequency Setting Potentiometer/Frequency Meter Adjusting Potentiometer



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

Dimensions (mm)

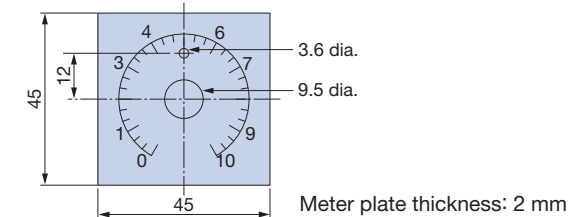


● Meter Plate for Frequency Setting Potentiometer/Frequency Meter Adjusting Potentiometer



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

Dimensions (mm)

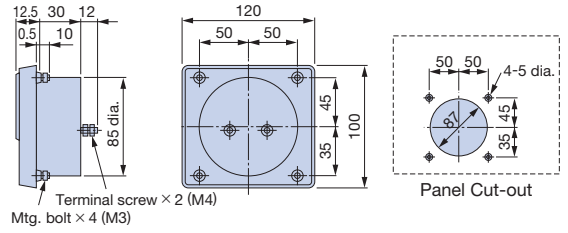


● Output Voltage Meter



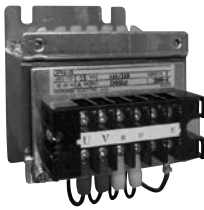
Model	Code No.
Scale-300 V full-scale (Rectification Type Class 2.5: SCF-12NH)	100-250-739
Scale-600 V full-scale (Rectification Type Class 2.5: SCF-12NH)	100-250-740

Dimensions (mm)



Weight: 0.3 kg

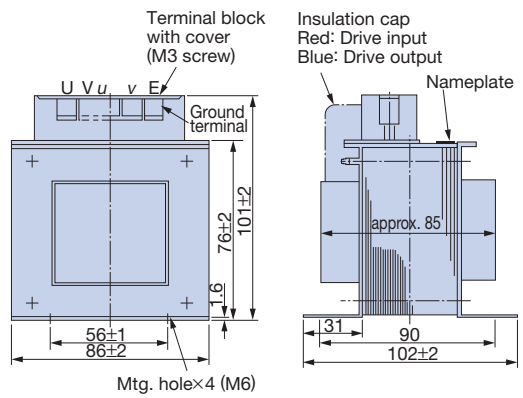
● Potential Transformer



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

● Application Notes

Selection

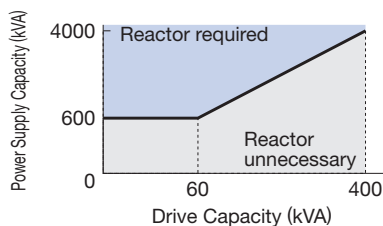
■ Installing a Reactor

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 GA70A2110 and above, GA70A4060 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.



■ Drive Capacity

The rated output current of the drive output amps should be equal to or greater than the motor rated current. When running a specialized motor or more than one motor in parallel from a single drive, the capacity of the drive should be larger than 1.1 times of the total motor rated current.

■ Overload continuous operation at low frequency

The rated current and overload capacity are derated at low frequency (less than 6 Hz). As a guide, the output frequency is 75% at 3 Hz and 50% at 0 Hz. For high-torque and long-time/continuous operation at low frequency, take one of the following measures: reduce the load, increase the speed, or increase the drive capacity. No these measures are required if the drive is operated at low frequency for a short duration of only a few seconds, or is in the acceleration or deceleration range. Note that further derating is required when the carrier frequency is increased from the default value. Use the carrier frequency at or below the default value as much as possible.

■ Starting Torque

The overload rating for the drive determines the starting and accelerating characteristics of the motor. Expect lower torque than when running from line power. To get more starting torque, use a larger drive or increase both the motor and drive capacity.

■ 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 GA700-compatible devices.

■ Repetitive Starting/Stopping

Cranes (hoists), elevators, punching presses, and other such applications with frequent starts and stops often exceed 150% of their 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 cranes and other applications 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

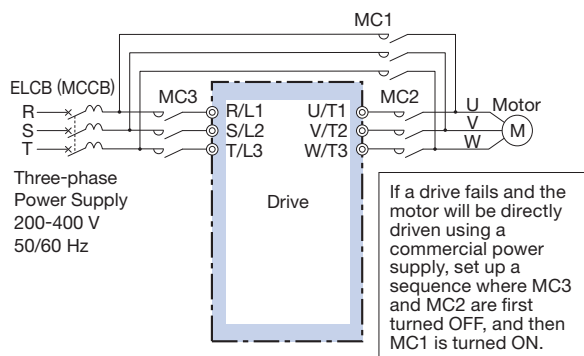
The drive should be installed upright as specified in the manual. Although the drive can be installed on its side, an appropriate amount of airflow and current derating are required.

■ Installation of Bypass Circuit

If the fuse blows or the circuit breaker (MCCB) trips, check the cable wiring and selection of peripheral devices and identify the cause.

If the cause cannot be identified, do not turn ON the power supply or operate the device. Contact your Yaskawa representative.

If a drive fails and the motor will be directly driven using a commercial power supply, install the bypass circuit shown in the diagram below. If this bypass circuit is not installed, remove the drive and then connect the motor to a commercial power supply. (In other words, after disconnecting the cables connected to the main circuit terminals, such as main circuit power supply input terminals R/L1, S/L2, and T/L3 and drive output terminals U/T1, V/T2, and W/T3, connect the motor to a commercial power supply.)



Settings

- Use V/f Control when running multiple induction motors at the same time.
- If using Open Loop Vector Control or Closed Loop Vector Control for PM motors, make sure that the proper motor code has been set to parameter E5-01 before performing a trial run.
- 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 close attention as follows when using DriveWorksEZ.

I/O terminal function of the drive will change with the function of the default terminal depending on the setting. Before test running the drive based on programs created by DriveWorksEZ, always check the I/O signal of the drive and the internal sequence. Failure to check may result in death or serious injury.

- 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 braking resistor or a power regenerative unit.

General Handling

- Shield Clamp Kit
An option for mounting a clamping device that fixes power cables to the bottom of the drive. Contact Yaskawa in advance for more information on installation options.
- 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.

Application Notes

■ 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.
- Tighten at the specified torque.
- Fix the cable with shield clamp option.

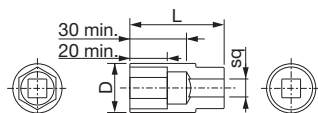
■ European Terminal Wiring Work

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 GA70A2257 and above or 4208 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 microSD 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 microSD card or if the free space on the microSD card is low, the microSD 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 performing 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.

■ 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 GA70A2211 and lower or 4168 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 an ELCB or an MCCB

- Be sure to install an ELCB or an MCCB that is recommended by Yaskawa at the power supply side of the drive to protect internal circuitry.
For CIPR-GA70A4810, CIPR-GA70A4930, CIPR-GA70A4H11, and CIPR-GA70A4H12, be sure to install fuses with an ELCB or an MCCB.
- 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 ELCB or an MCCB 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.

Application Notes

■ 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 during run when the contactor is installed between the motor and the drive. 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. The Speed Search function can be used to start a coasting motor.

Use an MC with delayed release if momentary power loss is a concern.

■ 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 non-standard 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 GA70A2110 and above, GA70A4060 and above.

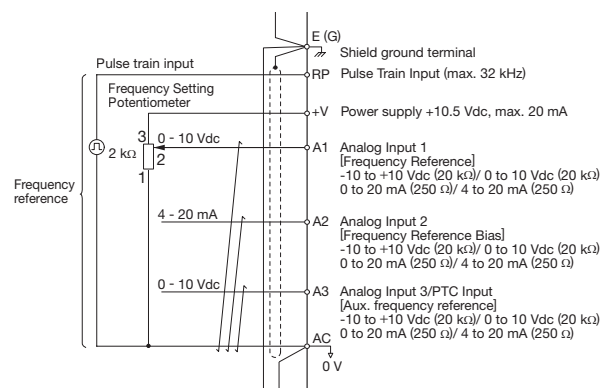
Refrain from using a capacitor or surge absorber on the output side as a way of improving the power factor, because high-frequency contents on the output side can lead to damage from overheat. This can also lead to problems with overcurrent.

■ 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.

■ Wire Gauges and Wiring Distance

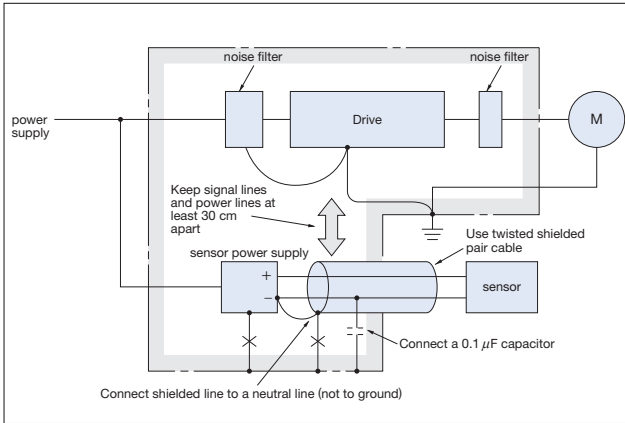
Motor torque can suffer as a result of voltage loss across a long cable running between the drive and motor, especially when there is low frequency output. Make sure that a large enough wire gauge is used. The LCD keypad requires an extensional cable for remote operation. If an analog signal is used 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 shielded cables as shown in the following figure and connect the shielding to terminal E.



Counteracting Noise

Because GA700 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 "Peripheral Devices and Options" on page 52.
- 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.



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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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:	1 to A	1, 2, 7 to A	1, 7 to A
Carrier Frequency Selection	(15 kHz or less)	(5 kHz or less)	(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 drive observing the following conditions.

- Select V/f control mode (A1-02=0)
- To start a coasting motor
 - a) Use the current detection type (b3-24=0) when using the speed search function, or
 - b) Set the DC injection braking time at start (b2-03=0.01 to 10.00 sec) to stop a coasting motor and restart it.

More than one PM motor cannot be connected to a single drive. The maximum wiring distance between the drive and the PM motor must be 100 m.

Notes on Motor Operation

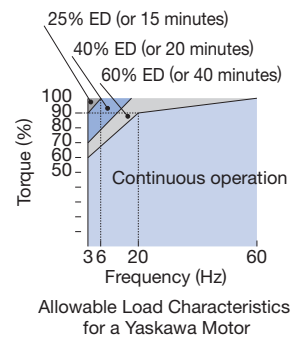
Motor Bearing Life

In applications involving constant speed over long periods, such as fans, pumps, extruders, and textile machinery, 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. 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.



Application Notes

■ 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 fans, blowers, turbines, and other 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.

Refer to Using a PM Motor below for more information on highly efficient motor using PM motors.

Using a PM Motor

■ If using a motor other than the Yaskawa PM motor, contact your Yaskawa or nearest sales representative.

■ When the power to a drive running a PM motor is shut off, voltage continues to be generated at the motor terminals while the motor coasts to stop. Take the precautions described below to prevent shock and injury:

- Applications where the machine can still rotate even though the drive has fully stopped should have a load switch installed to the output side of the drive. Yaskawa recommends manual load switches from the AICUT LB Series by Aichi Electric Works Co., Ltd.
- Do not connect to a load that could potentially rotate the motor faster than the maximum allowable speed even when the drive has been shut off.
- Wait at least one minute after opening the load switch on the output side before inspecting the drive or performing any maintenance.
- Do not open and close the load switch while the motor is running, as this can damage the drive.
- If the motor is coasting, make sure the power to the drive is turned on and the drive output has completely stopped before closing the load switch.

■ If the motor must be run using commercial power supply, use an IM motor.

■ A single drive is not capable of running multiple PM motors at the same time. Use a standard induction motor for such setups.

■ When starting in Open Loop Vector Control for PM, the half rotation angle (electrical angle) of the motor may rotate reverse.

■ The starting torque varies depending on the control mode and motor being used. Set up the motor with the drive after verifying the starting torque, allowable load characteristics, impact load tolerance, and speed control range. To use the device beyond these ranges, contact a Yaskawa representative or salesperson.

■ Even with a braking resistor, braking torque is less than 125% when running between 20% to 100% speed, and falls to less than half the braking torque when running at less than 20% speed in Open Loop Vector Control for PM.

■ In Open Loop Vector Control for PM, the allowable load inertia moment is 50 times less than the motor inertia moment. Use Closed Loop Vector Control for PM for applications exceeding this value.

■ When using a holding brake in Open Loop Vector Control for PM, release the brake prior to starting the motor. Failure to set the proper timing can result in speed loss. Conveyor, transport, and hoist applications using a holding brake should run an IPM motor in Closed Loop Vector Control for PM. Do not use this for conveyor machines and gravity load applications such as elevators in particular.

■ In Open Loop Vector Control, use the Short Circuit Braking function to stop the motor so that the motor coasting at a speed of at least 200 Hz can be started. A specialized braking resistor is required to use the Short Circuit Braking function. Contact a Yaskawa representative or salesperson for more information. Speed Search can be used to restart a coasting motor rotating slower than 200 Hz. If the motor cable is relatively long, however, the motor should instead be stopped using Short Circuit Braking function and then restarted.

Note: Short Circuit Braking creates a short-circuit in the motor windings to forcibly stop a coasting motor.

■ EZ Open Loop Vector Control is also able to drive SynRM (synchronous reluctance motor). Contact Yaskawa or your nearest sales representative for details.

■ If PG fails using a PM motor with PG and is replaced, maintain the state where the motor can be rotated and perform Z Pulse Offset Tuning (Rotational Auto-Tuning) and PM Rotational Auto-Tuning.

■ If oC (Overcurrent), STPo (Pull-Out Detection) or LSo (LSo Fault) is displayed on the keypad when restarting the motor, use search retry and Short Circuit Braking when starting the motor, and adjust accordingly.

● 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.

■ Submersible Motor

Because motor rated current is greater than a standard motor, select the drive capacity accordingly. Be sure to use a large enough motor cable to avoid decreasing the maximum torque level on account of voltage drop caused by a long motor cable.

■ 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. GA700 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 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.
- Cases of malfunction or errors caused by programs created by you using DriveWorksEZ.
- 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.

■ 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.

MEMO

Global Service Network



Region	Service Area	Service Location	Service Agency	Telephone/Fax
North America	U.S.A.	Chicago (HQ) Los Angeles San Francisco New Jersey Boston Ohio North Carolina	① YASKAWA AMERICA INC.	Headquarters Phone +1-847-887-7000 Fax +1-847-887-7370
	Mexico	Mexico City	② PILLAR MEXICANA. S.A. DE C.V.	Phone +52-555-660-5553 Fax +52-555-651-5573
South America	Brazil	São Paulo	③ YASKAWA ELÉTRICO DO BRASIL LTDA.	Phone +55-11-3585-1100 Fax +55-11-3585-1187
	Colombia	Bogota	④ VARIADORES LTD.A.	Phone +57-1-795-8250
Europe	Europe, South Africa	Hattersheim am Main	⑤ YASKAWA EUROPE GmbH	Phone +49-6196-569-300 Fax +49-6196-569-398
Asia	Japan	Tokyo, offices nationwide	⑥ YASKAWA ELECTRIC CORPORATION (Manufacturing, sales)	Phone +81-3-5402-4502 Fax +81-3-5402-4580
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Product Lineup
Model Number / Catalog Code
Basic Instructions
Model Selection
Standard Specifications
Standard Connection Diagram
Terminal Specifications
Dimensions
Fully-Enclosed Design and Drive Watt Loss Data
Peripheral Devices and Options
Application Notes
Warranty

Global Service Network

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