

# YASKAWA

## YASKAWA AC Drive GA700

High Performance Type

200 V CLASS, 0.4 to 110 kW

400 V CLASS, 0.4 to 630 kW

### Best Value for Your Applications



Certified for  
ISO9001 and  
ISO14001



JQA-QMA14913 JQA-EM0202

# Best Value for Your Applications

Yaskawa Electric Corporation is here to provide “The Answers” for your company.

Our number one priority at Yaskawa Electric Corporation is to always keep the customer’s perspective in mind by leading the industry in meeting demands with uncompromising quality and trust.

Our new GA700 carries on the proud tradition of our product concepts: Flexible, Easy, Sustainable.

With a highly efficient, flexible motor control, powerful and extendable functionality along with a broad power range, the GA700 is the drive of choice for almost any task.

Application Notes

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Global Service Network

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# 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					4726	642 A	4675	675 A
400					4810	726 A	4726	726 A
450					4930	810 A	4810	810 A
500							4930	930 A
560					4H12	1090 A		
630							4H12	1200 A

Note: The GA70A 4726 to GA70A 4H12 are under development.

\* Available in Japan only

# Model Number

Drives can be customized according to your specifications.

CIPR- GA70 A 2 004 A B A A - C A A A A A

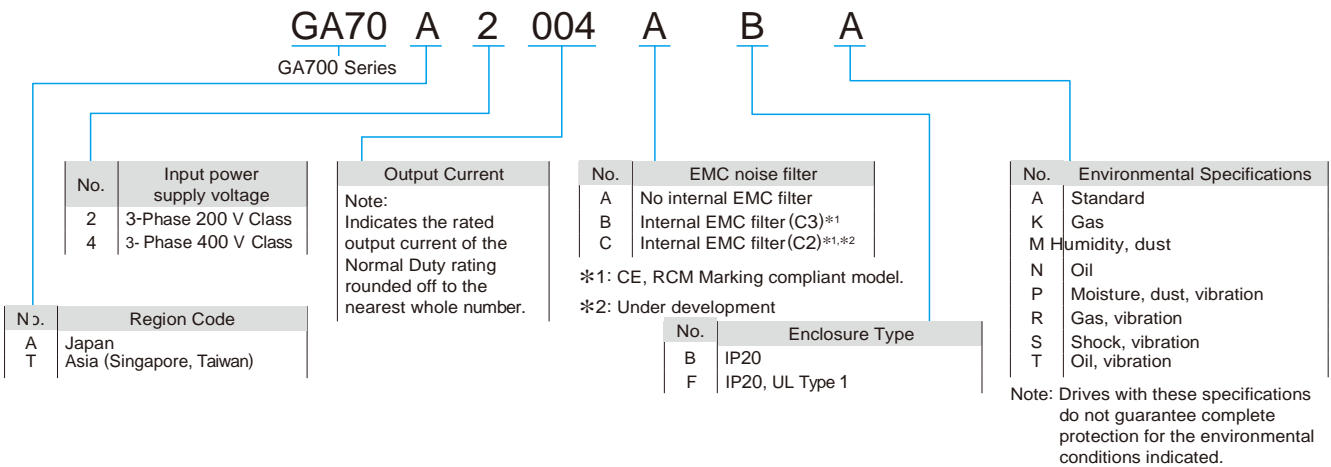
1            2            3            4            5            6            7            8            9            10           11           12           13           14

No	Description
1	Product series
2	Region code · A: Japan · T: Asia (Singapore, Taiwan)
3	Input power supply voltage · 2: 3-phase AC 200 V Class · 4: 3-phase AC 400 V Class
4	Output Current Note: Indicates the rated output current of the Normal Duty rating rounded off to the nearest whole number.
5	EMC noise filter · A: No internal EMC filter (Standard) · B: Internal category C3 EMC filter · C: Internal category C2 EMC filter
6	Protection Design · B: IP20 (Standard) · F: IP20, UL Type1
7	Environmental specification · A: Standard · K: Gas-resistant · M: Humidity-resistant and dust-resistant · N: Oil-resistant · P: Humidity-resistant, dust-resistant, and vibration-resistant · R: Gas-resistant and vibration-resistant · S: Vibration-resistant · T: Oil-resistant and vibration-resistant Note: Drives with these specifications do not guarantee complete protection for the environmental conditions indicated.
8	Design revision order
9	Control circuit terminal board · A: Relay output/screw clamp terminal board type · C: Photocoupler output/screw clamp terminal board type (Standard)

No	Description
10	Option card (connector CN5-A) · A: No option card (Standard) · D: AI-A3 (Analog Input) · E: DI-A3 (Digital Input) · F: SI-C3 (CC-Link) · G: SI-ET3 (MECHATROLINK-III) · H: SI-N3 (DeviceNet) · J: SI-P3 (PROFIBUS-DP) · K: SI-T3 (MECHATROLINK-II) · M: SI-S3 (CANopen) · N: SI-ES3 (EtherCAT)* · P: SI-EM3 (Modbus TCP/IP)* · R: SI-EN3 (EtherNet/IP)* · S: SI-EP3 (PROFINET)*
11	Option card (connector CN5-B) · A: No option card (Standard) · B: AO-A3 (Analog Monitor) · C: DO-A3 (Digital Output)
12	Option card (connector CN5-C) · A: No option card (Standard) · U: PG-B3 (Complementary Type PG) · V: PG-X3 (Motor PG Feedback Line Driver Interface) · W: PG-F3 (encoder interface (for Endat and HIPERFACE)) · Z: PG-RT3 (Motor Feedback Resolver TS2640N321E64 Interface)
13	Keypad · A: LCD keypad (Standard) · B: LCD keypad (humidity-resistant and dust-resistant) · D: Bluetooth LCD Keypad · E: Bluetooth LCD Keypad (humidity-resistant and dust-resistant) · F: LED keypad · G: LED keypad (humidity-resistant and dust-resistant)
14	Special applications A: Standard

\*: Contact Yaskawa for EtherCAT, Modbus TCP/IP, EtherNet/IP and PROFINET.

# Catalog Code





# Standard Specifications

HD: Heavy Duty, ND: Normal Duty

## 400 V Class

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	
z	Rated Input Current*2	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	
	Overload Tolerance	· HD Rating: 150% of rated output current for 60s · ND Rating: 110% of rated output current for 60s 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.																
Measures for Harmonics	DC Reactor	External options												Built-in				
		Braking Transistor																
Braking Function	Braking Transistor	Built-in																
		EMC filter EN61800-3, C2/C3																
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*3	kVA	HD	1.5	2.8	3.7	5.3	7.1	9.3	13	17	24	33	40	34	46	57
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						
Max. Applicable Motor Capacity*1	kW	HD	55	75	90	110	132	160	200	220	250	315						
		ND	75	90	110	132	160	200	220	250	315	355						
Input	Rated Input Current*2	A	HD	105	142	170	207	248	300	373	410	465	584					
		ND	142	170	207	248	300	373	410	465	584	657						
Output	Rated Output Current	A	HD	112	150	180	216	260	304	371	414	453	605					
		ND	140	168	208	250	296	371	389	453	568	675						
	Overload Tolerance	· HD Rating: 150% of rated output current for 60s · ND Rating: 110% of rated output current for 60s 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.																
Measures for Harmonics	DC Reactor	Built-in																
		Braking Function	Braking Transistor	Built-in				External options										
EMC filter EN61800-3, C2/C3																		
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*3	kVA	HD	84	113	136	165	198	239	297	327	370	465				
ND	113		136	165	198	239	297	327	370	465	523							

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

\*2: The value displayed is the input current when operating standard Yaskawa motors at the maximum applicable capacity with the rated load at the rated motor speed. This value may fluctuate based on the power supply side impedance, as well as the input current, power supply transformer, input side reactor, and wiring conditions.

\*3: Rated input capacity is calculated with a power line voltage of 480 V.

Features  
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## Common Specifications

Item	Specifications
Control Method	The following controls are selected by parameters. · V/f Control · Closed Loop V/f Control · Open Loop Vector Control · Closed Loop Vector Control · Advanced Open Loop Vector Control · 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	· 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 $\Omega$ ), 4 to 20 mA (250 $\Omega$ ), 0 to 20 mA (250 $\Omega$ ) Main speed reference : Pulse train input (max. 32 kHz)
Starting Torque	· V/f Control: 150%/3 Hz · Closed Loop V/f Control: 150%/3 Hz · Open Loop Vector Control: 200%/0.3 Hz · Closed Loop Vector Control: 200%/0 min <sup>-1</sup> · Advanced Open Loop Vector Control: 200%/0.3 Hz · Open Loop Vector Control for PM: 100%/5% speed · Advanced Open Loop Vector Control for PM: 200%/0 min <sup>-1</sup> · Closed Loop Vector Control for PM: 200%/0 min <sup>-1</sup> · EZ Open Loop Vector Control: 100%/1% speed  Note: Drive capacity must be selected appropriately to obtain this starting torque under Open Loop Vector Control, Closed Loop Vector Control, Advanced Open Loop Vector Control, Advanced Open Loop Vector Control for PM, and Closed Loop Vector Control for PM.
Speed Control Range	· V/f Control 1:40 · Closed Loop V/f Control 1:40 · Open Loop Vector Control 1:200 · Closed Loop Vector Control 1:1500 · Advanced Open Loop Vector Control 1:200 · 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  Note: · Advanced Open Loop Vector Control for PM is valid when high frequency injection is enabled (n8-57=1). · For Advanced Open Loop Vector Control for PM contact your Yaskawa or nearest agent when not using SSR1 series or SST4 series motors manufactured by Yaskawa Motor Co., Ltd.
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 • 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  Note: • Catalog codes GA70 2004 to 2138 and 4002 to 4168 have a built-in braking transistor. • 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). • Short-time deceleration torque refers to the torque required to decelerate the motor (uncoupled from the load) from the rated speed to zero. Actual specifications may vary depending on motor characteristics. • Continuous regenerative torque and short-time deceleration torque for motors 2.2 kW and larger vary depending on motor characteristics.
V/f Characteristics	Select from 15 predefined V/f patterns, or a user-set V/f pattern.
Main Control Functions	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 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% 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	Open chassis type (IP20): -10°C to +50°C Enclosed wall-mounted type (UL Type 1): -10°C to +40°C · Do not use the drive in a location where the temperature changes suddenly to improve the drive reliability. · When installing the drive in an enclosure, use a cooling fan or air conditioner to keep the internal air temperature in the permitted range. · Do not let the drive freeze. · Derate the output current and output voltage to install the drive in areas with ambient temperatures ≤ 60 °C.
	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*1
	Shock	· 10 Hz to 20 Hz, 1 G (9.8 m/s <sup>2</sup> ) Note: 0.2 G for AG70X4930/AG70X4H12 · 20 Hz to 55 Hz, Catalog code GA70 2004 to 2211, 4002 to 4168: 0.6 G (5.9 m/s <sup>2</sup> ), Catalog code GA70 2257 to 2415, 4208 to 4675: 0.2 G (2.0 m/s <sup>2</sup> )
	Standards Compliance	· UL61800-5-1*2 · EN61800-3:2004+A1:2012*2 · IEC/EN61800-5-1*2 · Two Safe Disable inputs and 1EDM output according to ISO/EN13849-1 Cat.3 Plc, IEC/EN61508 SIL3*2 Note: Used by setting functions to multi-function digital output terminals. · RCM*3 · EAC*3 · CSA*3 [Vessel Standards] · Germanischer Lloyd*3 · DNV*3 · ABS*3 · NK*3 · BV*3 · CCS*3 · KR*3
Protection Design	Open chassis type (IP20), Enclosure wall-mounted type (UL Type 1) Note: Installing the UL Type 1 kit to a drive in an open chassis type (IP20) makes the drive compliant with an enclosure wall-mounted type (UL Type 1).	

\*1: Altitudes over 1000 m and up to 3000 m are possible by derating the output current by 1% for every 100 m.

Contact a Yaskawa representative or salesperson for more information.

\*2: Approval pending for catalog codes GA70 2169 to 2415, and GA70 4371 to 4675.

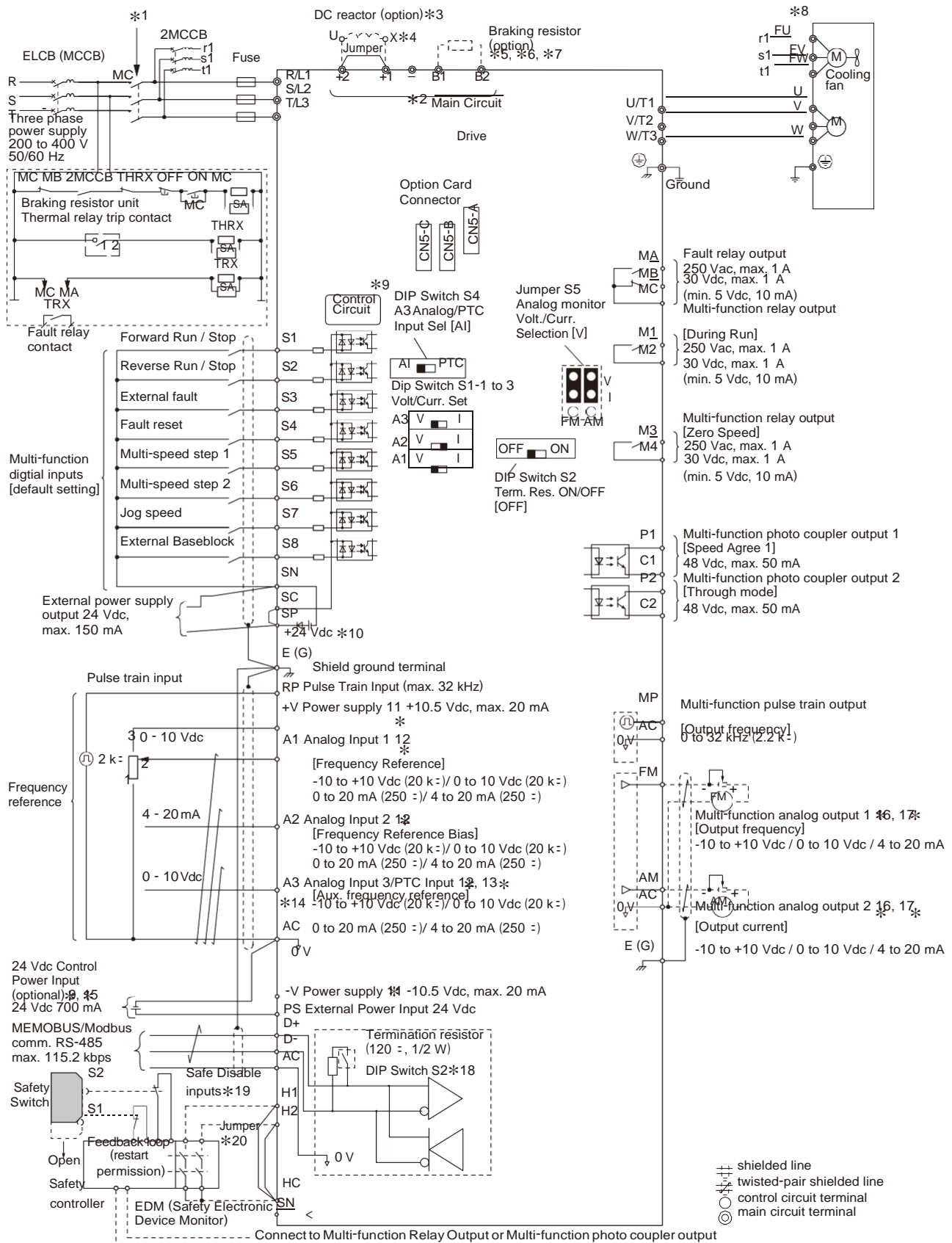
\*3: Approval pending.

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

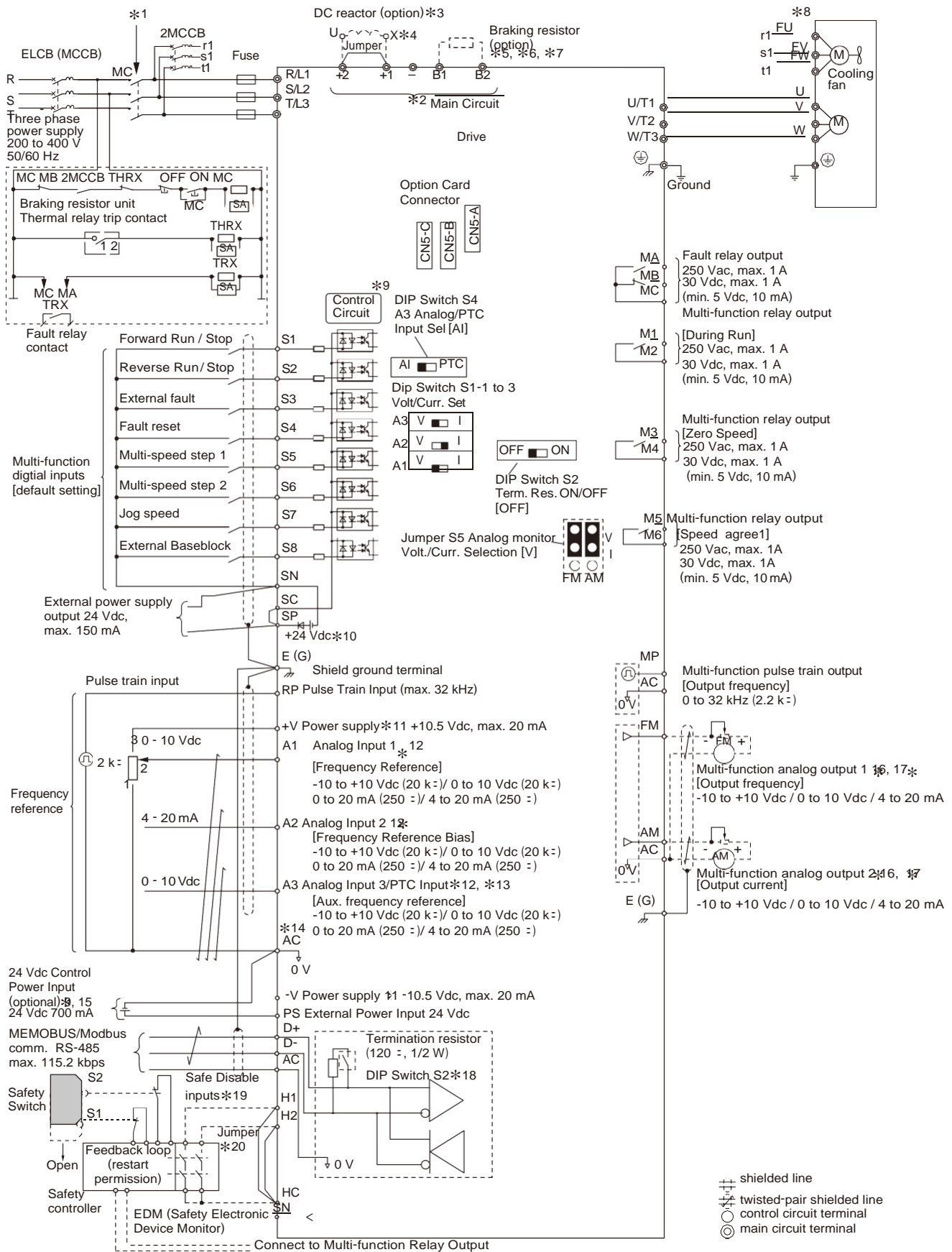
## Standard Connection Diagram Multi-Function Photocoupler Output Type C (Standard)



- \*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 4675 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: Connect a 24 V power supply to terminals PS-AC to operate the control circuit while the main circuit power supply is OFF.
- \*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: No jumper necessary between terminals SC and SN or terminals SC and 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 network.
- \*19: Use only sourcing mode for Safe Disable input.
- \*20: Disconnect the wire jumper between H1 and HC, and H2 and HC to use the Safe Disable input.

# 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 4675 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: Connect a 24 V power supply to terminals PS-AC to operate the control circuit while the main circuit power supply is OFF.
- \*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: No jumper necessary between terminals SC and SN or terminals SC and 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 network.
- \*19: Use only sourcing mode for Safe Disable input.
- \*20: Disconnect the wire jumper between H1 and HC, and H2 and HC to use the Safe Disable input.

# Terminal Specifications

## Terminal Functions

### Main Circuit Terminals

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 4675
Max. Applicable Motor Capacity	0.4 to 18.5	22, 30	37 to 110	0.4 to 18.5	22 to 75	90 to 220	260 to 355
R/L1, S/L2, T/L3	Main circuit input power supply			Main circuit input power supply			
R1/L11, S1/L21, T1/L31	-			-			
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,-) Braking unit (+3,-)	DC power supply (+1,-)	DC power supply (+1,-)	DC power supply (+1,-) Braking unit (+3,-)	
-	-	-	-	-	-	-	
+3	-	-	-	-	-	-	
⊕	Ground terminal (100 Ω or less)			Ground terminal (10 Ω or less)			

Note: 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 Input Terminals (200 V/400 V Class)

Terminal Type	Terminal	Signal Function (default)	Description (Signal Level)	
Multi-Function Digital Input	S1	Multi-function input selection 1 (ON: Forward run OFF: Stop)	<ul style="list-style-type: none"> <li>• Photocoupler</li> <li>• 24 V, 6 mA</li> </ul> Note: 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. <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> <li>• External power supply: No jumper necessary between terminals SC and SN or terminals SC and SP.</li> </ul>	
	S2	Multi-function input selection 2 (ON: Reverse run OFF: Stop)		
	S3	Multi-function input selection 3 (External fault, N.O.)		
	S4	Multi-function input selection 4 (Fault reset)		
	S5	Multi-function input selection 5 (Multi-step speed reference 1)		
	S6	Multi-function input selection 6 (Multi-step speed reference 2)		
	S7	Multi-function input selection 7 (Jog frequency)		
	S8	Multi-function input selection 8 (Baseblock(N.O.))		
	SN	Digital input power supply 0V 24V transducer power supply 0V		Multi-function digital input power supply and sensor power supply, 24 Vdc (max. 150 mA) Note: Do not install a jumper between terminals SP and SN. Failure to comply will damage the drive.
	SC	Multi-functions input common		
SP	Multi-function input power supply +24 Vdc			
Safety Input	H1	Safety Input1	Remove the jumper between terminals H1-HC and H2-HC when using the Safe Disable input. <ul style="list-style-type: none"> <li>• 24 Vdc 6 mA</li> <li>• ON: Normal operation</li> <li>• OFF: Output disabled</li> <li>• Internal impedance 4.7 kΩ</li> <li>• Switching time at least 2 ms</li> </ul>	
	H2	Safety Input2		
	HC	Safety input common	Safety input common Note: Do not install a jumper between terminals HC and SN. Failure to comply will damage the drive.	
Main Frequency Reference Input	RP	Multi-function pulse train input (Main frequency reference)	<ul style="list-style-type: none"> <li>• Scaling: 0.1 Hz to 32 kHz</li> <li>• H duty: 30% to 70%</li> <li>• H level voltage: 3.5 V to 13.2 V</li> <li>• L level voltage: 0.0 V to 0.8 V</li> <li>• impedance: 3 k Ω</li> </ul>	
	+V	Setting power supply	10.5 V (20 mA max.)	
	-V	Setting power supply	-10.5 V (20 mA max.)	
	A1	Multi-function analog input 1 (Main frequency reference)	Voltage input or current input DIP switch S1-1 and H3-01 can be used to set the voltage or current output for terminal A1 (Terminal A1 Signal Level Select.) DIP switch S1-2 and H3-09 can be used to set the voltage or current output for terminal A2 (Terminal A2 Signal Level Select.) <ul style="list-style-type: none"> <li>• - 10 to +10 Vdc for - 100 to +100% (impedance 20 kΩ)</li> <li>• 0 to 10 Vdc for 0 to 100% (impedance 20 kΩ)</li> <li>• 4 to 20 mA for 0 to 100%, 0 to 20 mA for 0 to 100% (impedance 250 Ω)</li> </ul>	
	A2	Multi-function analog input 2 (Frequency reference bias with terminal A1)		
	A3	Multi-function analog input 3/PTC input (Auxiliary frequency reference)	Voltage input or current input Selected with dip switches S1-3 and H3-05 (Terminal A3 Signal Level Select.) <ul style="list-style-type: none"> <li>• - 10 to +10 Vdc for - 100 to +100% (impedance 20 kΩ)</li> <li>• 0 to 10 Vdc for 0 to 100% (impedance 20 kΩ)</li> <li>• 4 to 20 mA for 0 to 100%, 0 to 20 mA for 0 to 100% (impedance 250 Ω)</li> </ul> PTC input (For motor overheat protection) Set DIP switch S4 to "PTC" and set DIP switch S1-3 to "V" to set terminal A3 for PTC input.	
	AC	Frequency reference common	0 V	
E (G)	Shielded cable	-		
Fault Relay Output	MA	N.O. output (Fault)	<ul style="list-style-type: none"> <li>• Relay output</li> <li>• 30 Vdc or less, 10 mA to 1 A</li> <li>• 250 Vac or less, 10 mA to 1 A</li> <li>• Minimum load: 5 Vdc, 10 mA (Values only for reference)</li> </ul>	
	MB	N.C. output (Fault)		
	MC	Digital output common		



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

Terminal Type	Terminal	Signal Function (default)	Description (Signal Level)
Multi-Function Digital Output	M1	Multi-function digital output (During run)	<ul style="list-style-type: none"> <li>Relay output</li> <li>30 Vdc or less, 10 mA to 1 A</li> <li>250 Vac or less, 10 mA to 1 A</li> <li>Minimum load: 5 Vdc, 10 mA (Values only for reference)</li> </ul> Note: Refrain from assigning functions to terminals M1 and M2, M3 and M4, and M4 and M5 that involve frequent switching, as doing so may shorten relay performance life. Switching life is estimated at 200,000 times (assumes 1 A, resistive load).
	M2		
	M3	Multi-function digital output (zero speed)	
	M4	Multi-function digital output (Speed agree1)	
	M5*1	Multi-function digital output (Speed agree1)	
Multi-Function Photocoupler Output	P1	Multi-Function Photocoupler Output (Speed agree1)	<ul style="list-style-type: none"> <li>Photocoupler output</li> <li>48 Vdc or less, 2 to 50 mA</li> </ul> Note: Connect a flywheel diode as shown below when driving a reactive load such as a relay coil. Diode must be rated higher than the circuit voltage. <div style="text-align: right;"> <p>Flywheel diode</p> <p>External power 48 V max. (50 mA max.)</p> </div>
	C1	Multi-Function Photocoupler Output (Through mode)	
	P2		
C2			
Monitor Output	MP	Pulse train input (Output frequency)	Max. 32 kHz
	FM	analog monitor (1) (Output frequency)	Voltage or current output <ul style="list-style-type: none"> <li>0 to 10 Vdc for 0 to 100%</li> <li>- 10 to 10 Vdc for - 100 to 100%</li> <li>4 to 20 mA</li> </ul> Note: Set jumper S5, and H4-07 (Terminal FM Signal Level Select.) and H4-08 (Terminal AM Signal Level Select.) to select the signal type for terminals AM and FM.
		analog monitor (2) (Output current)	
	AM		
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 backup power to the drive control circuit, keypad, and option card. 21.6 Vdc to 26.4 Vdc, 700 mA
	AC	External 24 V power supply ground	0 V

## Serial Communication Terminals (200 V/400 V Class)

Classification	Terminal	Signal Function	Description (Signal Level)
MEMOBUS / Modbus communications	D+	Communications input (+)	MEMOBUS/Modbus communications: Use a RS-485 cable to connect the drive. Note: Set DIP switch S2 to ON to enable the termination resistor in the last drive in a MEMOBUS/Modbus network. <ul style="list-style-type: none"> <li>RS-485</li> <li>MEMOBUS/Modbus communications protocol 115.2 kbps (max.)</li> </ul>
	D-	Communications input (-)	
	AC	Shield ground	0 V

## Screw Terminal

The screw terminal type for the main circuit terminal (factory option) is being prepared.

## Tools for Wiring European Style Terminal Blocks (Recommended product)

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

Screw size	Screwtype	Recommended Product	Screw size	Screwtype	Recommended Product						
M4	Slot	Prepare the following two tools. <ul style="list-style-type: none"> <li>Bit [PHOENIX CONTACT] Model: SF-BIT-SL 1,0X4,0-70</li> <li>Torque screwdriver [PHOENIX CONTACT] Model: TSD-M 3NM (1.2 to 3 N·m)</li> </ul>	M10	Hex socket (WAF: 8)	Prepare the following three tools. <ul style="list-style-type: none"> <li>Bit [PHOENIX CONTACT] Model: SF-BIT-HEX 8-50</li> <li>Torque wrench that includes a torque measurement range of 14 N·m</li> <li>Bit socket holder of 6.35 mm</li> </ul>						
M5	Slot	When wiring drive models GA70 □ 2056 and GA70 □ 4089 or earlier models, be sure to correctly select tools based on the wire gauges. <p>Wiring Gauge: <math>\leq 25 \text{ mm}^2</math> or AWG10</p> <ul style="list-style-type: none"> <li>Bit [PHOENIX CONTACT] Model: SF-BIT-SL 1,2X6,5-70</li> <li>Torque screwdriver [PHOENIX CONTACT] Model: TSD-M 3NM (1.2 to 3 N·m)</li> </ul> <p>Wiring Gauge: <math>\geq 30 \text{ mm}^2</math> or AWG8</p> <ul style="list-style-type: none"> <li>Torque wrench that includes a torque measurement range of 4.5 N·m</li> <li>Bit socket holder of 6.35 mm</li> </ul>	<table border="1"> <thead> <tr> <th>Bit</th> <th>Torque screwdriver</th> <th>Torque wrench</th> </tr> </thead> <tbody> <tr> <td>           Application screw slot  </td> <td></td> <td></td> </tr> </tbody> </table>			Bit	Torque screwdriver	Torque wrench	Application screw slot 		
Bit	Torque screwdriver	Torque wrench									
Application screw slot 											
M6	Hex socket (WAF: 5)	Prepare the following three tools. <ul style="list-style-type: none"> <li>Bit [PHOENIX CONTACT] Model: SF-BIT-HEX 5-50</li> <li>Torque wrench that includes a torque measurement range of 9 N·m</li> <li>Bit socket holder of 6.35 mm</li> </ul>	<table border="1"> <thead> <tr> <th colspan="3">Bit socket holder</th> </tr> </thead> <tbody> <tr> <td colspan="3"> <p>S: 6.35 mm</p> </td> </tr> </tbody> </table>			Bit socket holder			<p>S: 6.35 mm</p>		
	Bit socket holder										
<p>S: 6.35 mm</p>											
Minus	Prepare the following three tools for the models GA70 □ 2110 to 2138, and GA70 □ 4103. <ul style="list-style-type: none"> <li>Bit [PHOENIX CONTACT] Model: SF-BIT-SL 1,2X6,5-70</li> <li>Torque wrench that includes a torque measurement range of 3.5 N·m</li> <li>Bit socket holder of 6.35 mm</li> </ul>										
M8	Hex socket (WAF: 6)	Prepare the following three tools. <ul style="list-style-type: none"> <li>Bit [PHOENIX CONTACT] Model: SF-BIT-HEX 6-50</li> <li>Torque wrench that includes a torque measurement range of 12 N·m</li> <li>Bit socket holder of 6.35 mm</li> </ul>									

# Terminal Specifications

## Terminal Size / Wire Gauge

### 200 V Class

Catalog code GA70A□	Terminal	Recommended Gauge mm <sup>2</sup>	Wire Range (IP20 Compatible Gauge) mm <sup>2</sup>	Wire Stripping Length*1 mm	Terminal Screw		Tightening Torque N·m	Catalog code GA70A□	Terminal	Recommended Gauge mm <sup>2</sup>	Wire Range (IP20 Compatible Gauge) mm <sup>2</sup>	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	Slot (-)	1.5 to 1.7	2056	R/L1, S/L2, T/L3	22	2 to 22 (8 to 22)	18	M5	Slot (-)	2.3 to 2.5*2
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	14	2 to 14 (5.5 to 14)	18	M5	Slot (-)	2.3 to 2.5*2
	- , +1, +2	2	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1, +2	38	2 to 38 (8 to 38)	20	M6	Hex socket (WAF: 5)	5 to 5.5
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	14	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7
2006	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	2070	R/L1, S/L2, T/L3	38	2 to 38 (22 to 38)	20	M6	Hex socket (WAF: 5)	5 to 5.5
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	22	2 to 22 (14 to 22)	20	M6	Hex socket (WAF: 5)	5 to 5.5
	- , +1, +2	2	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1, +2	50	2 to 50 (22 to 50)	20	M6	Hex socket (WAF: 5)	5 to 5.5
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	14	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7
2008	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	2082	R/L1, S/L2, T/L3	50	2 to 50 (22 to 50)	20	M6	Hex socket (WAF: 5)	5 to 5.5
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	30	2 to 30 (14 to 30)	20	M6	Hex socket (WAF: 5)	5 to 5.5
	- , +1, +2	2	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1, +2	60	2 to 60 (22 to 60)	20	M6	Hex socket (WAF: 5)	5 to 5.5
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	14	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7
2010	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	2110	R/L1, S/L2, T/L3	38	22 to 38 (22 to 38)	27	M6	Hex socket (WAF: 5)	8 to 9
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	38	22 to 38 (22 to 38)	27	M6	Hex socket (WAF: 5)	8 to 9
	- , +1, +2	2	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1	60	30 to 60 (30 to 60)	27	M8	Hex socket (WAF: 6)	10 to 12
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	22	8 to 22 (8 to 22)	21	M6	Minus (-)	3 to 3.5
2012	R/L1, S/L2, T/L3	3.5	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	2138	R/L1, S/L2, T/L3	60	22 to 60 (38 to 60)	27	M6	Hex socket (WAF: 5)	8 to 9
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	60	22 to 60 (38 to 60)	27	M6	Hex socket (WAF: 5)	8 to 9
	- , +1, +2	3.5	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1	80	30 to 80 (50 to 80)	27	M8	Hex socket (WAF: 6)	10 to 12
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	30	8 to 30 (8 to 30)	21	M6	Minus (-)	3 to 3.5
2018	R/L1, S/L2, T/L3	3.5	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	2169	R/L1, S/L2, T/L3	80	50 to 100 (80 to 100)	37	M10	Hex socket (WAF: 8)	12 to 14
	U/T1, V/T2, W/T3	3.5	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	80	50 to 125 (80 to 125)	37	M10	Hex socket (WAF: 8)	12 to 14
	- , +1, +2	5.5	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , - , +1, +1*3	38*4	22 to 50 (50)	28	M6	Hex socket (WAF: 5)	8 to 9
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		+3	60	30 to 80*5 (50 to 80)*5	28	M8	Hex socket (WAF: 6)	8 to 9
2021	R/L1, S/L2, T/L3	8	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	2211	R/L1, S/L2, T/L3	100	50 to 100 (80 to 100)	37	M10	Hex socket (WAF: 8)	12 to 14
	U/T1, V/T2, W/T3	3.5	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	125	50 to 125 (80 to 125)	37	M10	Hex socket (WAF: 8)	12 to 14
	- , +1, +2	8	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , - , +1, +1*3	50	22 to 50 (50)	28	M6	Hex socket (WAF: 5)	8 to 9
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		+3	80	30 to 80*5 (50 to 80)*5	28	M8	Hex socket (WAF: 6)	8 to 9
2030	R/L1, S/L2, T/L3	14	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	2030	R/L1, S/L2, T/L3	14	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7
	U/T1, V/T2, W/T3	8	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	8	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7
	- , +1, +2	14	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1, +2	14	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2
	B1, B2	3.5	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	3.5	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7
2042	R/L1, S/L2, T/L3	14	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	2042	R/L1, S/L2, T/L3	14	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7
	U/T1, V/T2, W/T3	14	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	14	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7
	- , +1, +2	22	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1, +2	22	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2
	B1, B2	5.5	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	5.5	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7

- \*1: Remove the insulator from the tips of wires to the length shown in "Wire Stripping Length."  
 \*2: When using wire with a gauge over 30 mm<sup>2</sup>, 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

Catalog code GA70A□	Terminal	Recommended Gauge mm <sup>2</sup>	Wire Range (IP20 Compatible Gauge) mm <sup>2</sup>	Wire Stripping Length*1 mm	Terminal Screw		Tightening Torque N · m	Catalog code GA70A□	Terminal	Recommended Gauge mm <sup>2</sup>	Wire Range (IP20 Compatible Gauge) mm <sup>2</sup>	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	Slot (-)	1.5 to 1.7	4038	R/L1, S/L2, T/L3	14	2 to 22 (8 to 22)	18	M5	Slot (-)	2.3 to 2.5*2
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	14	2 to 14 (5.5 to 14)	18	M5	Slot (-)	2.3 to 2.5*2
	- , +1, +2	2	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1, +2	22	2 to 38 (8 to 38)	20	M6	Hex socket (WAF: 5)	5 to 5.5
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	5.5	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7
4004	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	4044	R/L1, S/L2, T/L3	14	2 to 14 (3.5 to 14)	18	M5	Slot (-)	2.3 to 2.5*2
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	14	2 to 14 (5.5 to 14)	18	M5	Slot (-)	2.3 to 2.5*2
	- , +1, +2	2	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1, +2	22	2 to 22 (3.5 to 22)	18	M5	Slot (-)	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	8	2 to 8 (2 to 8)	10	M4	Slot (-)	1.5 to 1.7
4005	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	4060	R/L1, S/L2, T/L3	14	2 to 14 (3.5 to 14)	18	M5	Slot (-)	2.3 to 2.5*2
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	14	2 to 14 (5.5 to 14)	18	M5	Slot (-)	2.3 to 2.5*2
	- , +1, +2	2	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1	22	2 to 22 (3.5 to 22)	18	M5	Slot (-)	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	14	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7
4007	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	4075	R/L1, S/L2, T/L3	22	2 to 22 (3.5 to 22)	18	M5	Slot (-)	2.3 to 2.5*2
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	22	2 to 22 (3.5 to 22)	18	M5	Slot (-)	2.3 to 2.5*2
	- , +1, +2	2	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1	30	2 to 30 (3.5 to 30)	18	M5	Slot (-)	2.3 to 2.5*2
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	14	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7
4009	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	4089	R/L1, S/L2, T/L3	30	2 to 30 (5.5 to 30)	18	M5	Slot (-)	2.3 to 2.5*2
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	30	2 to 30 (5.5 to 30)	18	M5	Slot (-)	2.3 to 2.5*2
	- , +1, +2	2	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1	38	2 to 38 (22 to 38)	20	M6	Hex socket (WAF: 5)	5 to 5.5
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	22	2 to 22 (3.5 to 22)	18	M5	Slot (-)	2.3 to 2.5*2
4012	R/L1, S/L2, T/L3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	4103	R/L1, S/L2, T/L3	38	22 to 60 (38 to 60)	27	M6	Hex socket (WAF: 5)	8 to 9
	U/T1, V/T2, W/T3	2	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	38	22 to 60 (38 to 60)	27	M6	Hex socket (WAF: 5)	8 to 9
	- , +1, +2	3.5	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , +1	50	30 to 80 (50 to 80)	27	M8	Hex socket (WAF: 6)	10 to 12
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	30	8 to 30 (8 to 30)	21	M6	Minus (-)	3 to 3.5
4018	R/L1, S/L2, T/L3	3.5	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	4140	R/L1, S/L2, T/L3	60*4	50 to 100 (80 to 100)	37	M10	Hex socket (WAF: 8)	12 to 14
	U/T1, V/T2, W/T3	3.5	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	60*4	50 to 125 (80 to 125)	37	M10	Hex socket (WAF: 8)	12 to 14
	- , +1, +2	5.5	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , - , +1, +1*3	30*4	22 to 50 (50)	28	M6	Hex socket (WAF: 5)	8 to 9
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	50	30 to 80*5 (50 to 80)*5	28	M8	Hex socket (WAF: 6)	8 to 9
4023	R/L1, S/L2, T/L3	8	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7	4168	R/L1, S/L2, T/L3	80	50 to 100 (80 to 100)	37	M10	Hex socket (WAF: 8)	12 to 14
	U/T1, V/T2, W/T3	5.5	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		U/T1, V/T2, W/T3	80	50 to 125 (80 to 125)	37	M10	Hex socket (WAF: 8)	12 to 14
	- , +1, +2	14	2 to 22 (2 to 22)	18	M5	Slot (-)	2.3 to 2.5*2		- , - , +1, +1*3	38*4	22 to 50 (50)	28	M6	Hex socket (WAF: 5)	8 to 9
	B1, B2	2	2 to 5.5 (2 to 5.5)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	60	30 to 80*5 (50 to 80)*5	28	M8	Hex socket (WAF: 6)	8 to 9
4031	R/L1, S/L2, T/L3	14	2 to 22 (8 to 22)	18	M5	Slot (-)	2.3 to 2.5*2	*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 <sup>2</sup> , 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 ter *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	R/L1, S/L2, T/L3	14	2 to 22 (8 to 22)	18	M5	Slot (-)	2.3 to 2.5*2
	U/T1, V/T2, W/T3	8	2 to 14 (5.5 to 14)	18	M5	Slot (-)	2.3 to 2.5*2		U/T1, V/T2, W/T3	8	2 to 14 (5.5 to 14)	18	M5	Slot (-)	2.3 to 2.5*2
	- , +1, +2	14	2 to 38 (8 to 38)	20	M6	Hex socket (WAF: 5)	5 to 5.5		- , +1, +2	14	2 to 38 (8 to 38)	20	M6	Hex socket (WAF: 5)	5 to 5.5
	B1, B2	3.5	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7		B1, B2	3.5	2 to 14 (2 to 14)	10	M4	Slot (-)	1.5 to 1.7

# Dimensions

## Enclosures

### 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
Open Chassis [IP20]		IP20 supported with standard model														
Enclosure Wall-Mounted [UL Type1]		Option supported (Install UL Type 1 kit for IP20)														

Catalog Code GA70A		4140	4168	4208	4250	4296	4371	4389	4453	4568	4675
Max. Applicable Motor Capacity (kW)	HD	55	75	90	110	132	160	200	220	250	315
	ND	75	90	110	132	160	200	220	250	315	355
Open Chassis [IP20]		IP20 supported with standard model									
Enclosure Wall-Mounted [UL Type1]		Option supported (Install UL Type 1 kit for IP20)					*				

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

### Open Chassis [IP20]

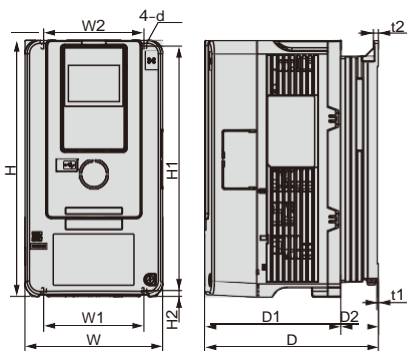


Figure 1

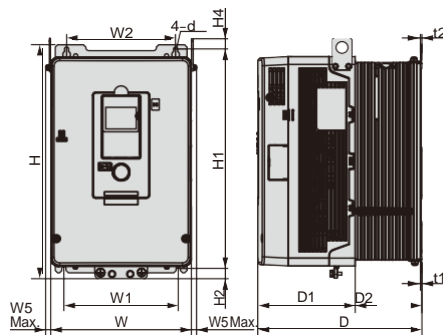


Figure 2

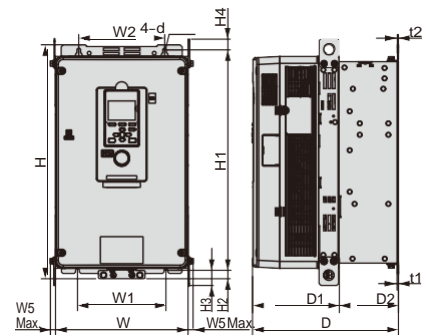


Figure 3

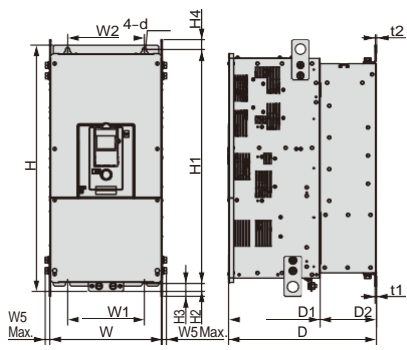


Figure 4

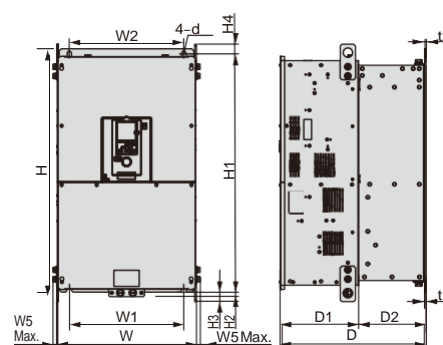


Figure 5

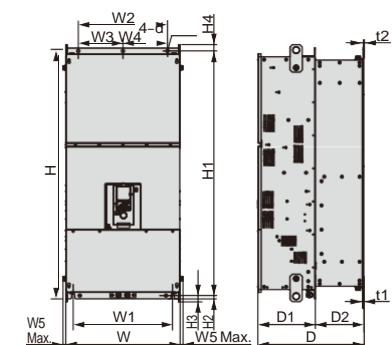


Figure 6

200 V Class

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													
4002	1	140	260	176	138	38	102	102	-	-	-	248	6	-	-	1.6	5	M5	3.5													
4004				211		73													102	102	1.6	5	M5	3.9								
4005																								211	73	102	102	1.6	5	M5	4.2	
4007				211	73	102													102	1.6	5	M5	6.0									
4009																							211	73	102	102	1.6	5	M5	7.5		
4012				211	73	102													102	1.6	5	M5								12		
4018		211	73				102	102				1.6	5			M5	17															
4023				211	73	102											102	1.6	5	M5	22											
4031		211	73				102	102				1.6	5			M5					25											
4038				211	73	102											102	1.6	5	M5	38											
4044		211	73				102	102				1.6	5			M5					39											
4060				211	73	102											102	1.6	5	M5	71											
4075	2	240	400				280	166	114	195	186	-	-	12	375	17.5					-	17.5	2.3	2.3	M6	17						
4089	3	255	450	280	166	114	170	165	-	-	12	424	16	29	21	2.3	2.3	M6	22													
4103																			264	543	335	186	149	190	182	516	17.5	28.5	20.5	2.3	2.3	M8
4140		264	543	335	186	149	190	182			516	17.5	28.5	20.5	2.3	2.3	M8	38														
4168																		39														
4208		4	312	700	420	260	160	218			218	-	-	18	659	28	43.5	28.5	4.5	4.5	M10	71										
4250	5	440	800	472	254	218	370	370	-	-	20	757	28	44	30	4.5	4.5	M12	122													
4371																			126													
4389																			198													
4453																			207													
4568	6	510	1136	480	260	220	450	450	225	225	20	1093	25.5	43.5	30.5	4.5	4.5	M12	198													
4675																			207													

Note: External and mounting dimensions are different for standard mounting and panel through mounting.  
Please refer to P.37 for panel through mounting.

# Dimensions

## ■ Enclosure Wall-Mounted 【UL Type1】

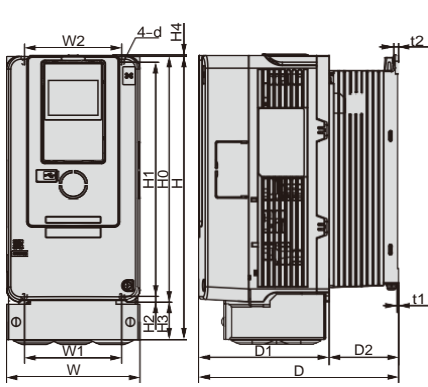


Figure 1

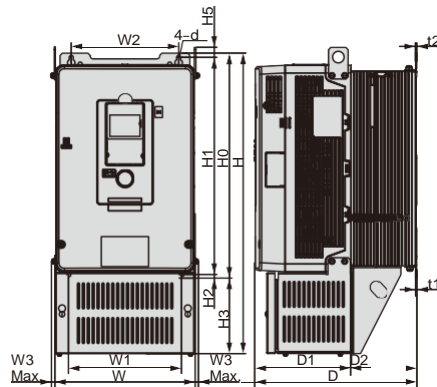


Figure 2

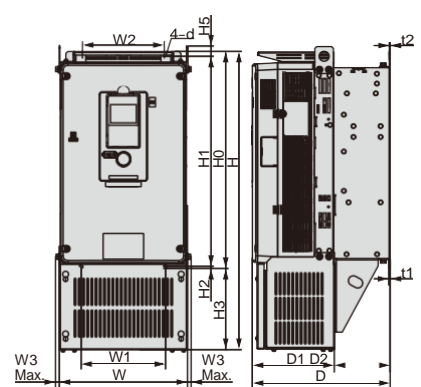


Figure 3

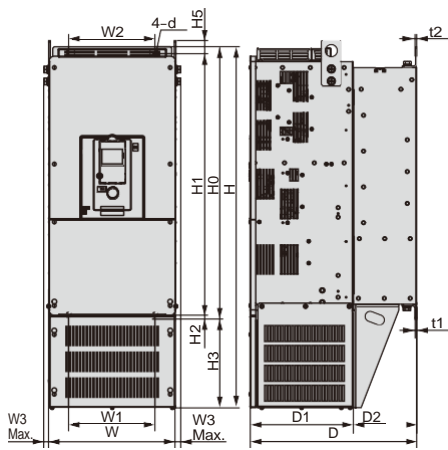


Figure 4

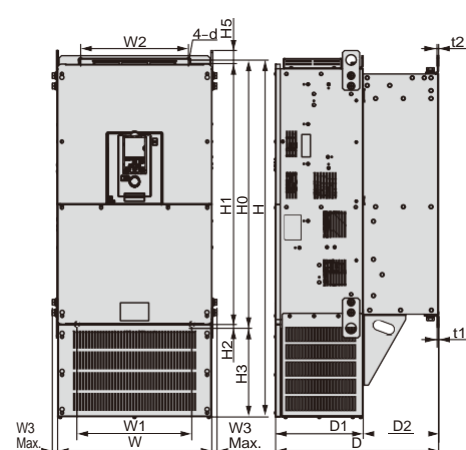


Figure 5



200 V Class: UL Type 1

Catalog Code GA70A	Dimensions mm																	Weight kg	UL Type1 Kit Code No. (Model No.)												
	Figure	W	H	D	D1	D2	W1	W2	W3	H0	H1	H2	H3	H4	H5	t1	t2			d											
4002	1	140	300	176	138	38	102	102	-	260	248	6	40	1.5	-	1.6	5	M5	4.1	900-192-121-001 (100-202-326)											
4004				211		73													4.5												
4005				211		73													4.8												
4007				211		73													4.8												
4009				211		73													4.8												
4012				211		73													4.8												
4018				211		73													4.8												
4023				211		73													4.8												
4031				180		340													202		134	68	140	140	300	284	8	40	1.6	7.0	900-192-121-002 (100-202-327)
4038				220		400													227		140	87	192	192	350	335	8	50	2.3	2.3	M6
4044	220	400	246	140	106	192	192	350	335	8	50	2.3	2.3	M6	13	900-192-121-003 (100-202-328)															
4060	220	400	246	140	106	192	192	350	335	8	50	2.3	2.3	M6	13	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	20	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	25	900-192-121-006 (100-208-526)											
4103																			29												
4140																			43												
4168																			44												
4208	4	316	915	420	260	160	218	218	16	700	659	28	215	-	28.5	4.5	4.5	M10	76	900-192-121-009 (100-208-549)											
4250																			76												
4296																			76												
4371	5	444	1045	472	254	218	370	370	18	800	757	28	245	-	30	4.5	4.5	M12	130	900-192-121-010 (100-213-136)											

Note: UL Type 1 kit (option) is required. The values in the table are the dimensions of the UL Type 1 kit mounted to the IP20 open chassis type.

# GA700

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