Quick Start Guide

Premium Current Vector Control

EVO 8000 Series

Table of Contents

Chapter 1│Safety

1.1 General Safety

Safety Information:

Warning:　Indicates highly dangerous consequences such as fire, serious injury and death when failing to comply with the instructions.

Caution:　Indicates dangerous consequences such as moderate injury and equipment damage when failing to comply with the instructions.

1.1.1 Usage

Danger
1.　The drive is used to control the speed of 3 phase synchronous and asynchronous motors, which must not be used for single phase or other purposes. Failure to comply could cause drive damage or serious injury by fire.
2.　The drive must not be used in any medical equipment in which human life may involve.
3.　The drive is manufactured according to strict quality control standard. However, bypass the safety protection in case the drive failure causes death or serious injury.

1.1.2 Receiving

Warning
1.　Do not install damaged drive or any drive without complete components inside. Failure to comply could result in accident.

1.1.3 Installation

Warning
1.　Carry the drive by the bottom as carrying by the front cover may cause injury and damage from the main body of the drive falling.
2.　Attach the drive to metal or other nonflammable materials. Keep away from heat and flammable items.
3.　A control panel must have cooling fans, air vents and room for ventilation when the drive is installed inside.

1.1.4 Wiring

Danger
1. Allow only qualified electrical engineers to install the drive. Failure to comply could cause electrical shocks to personnel or damage to the drive.
2. Ensure the power supply is off when connecting. Failure to comply could cause electrical shocks.
3. Ensure the ground terminal PE is properly wired. Failure to comply could cause electrical shocks from the drive cover. Therefore ground the drive and motor for personnel safety.
4. Do not touch the main circuit terminal. Keep the main circuit off drive cover to avoid electrical shocks.
5. The terminal for braking resistor is B1 and B2. Do not connect it to any other terminals. Failure to comply could cause a fire.

Warning
1. Do not connect three-phase power supply to terminals U, V and W. Failure to comply could damage the drive.
2. An output reactor is recommended when the cable connecting between the drive and motor is over 100 meters. Failure to comply could result in drive damage with overcurrent caused by over-distributed capacitance.
3. Never connect the output terminals to capacitors or unapproved LC/RC filters. Failure to comply could damage the drive components.
4. Separate the drive main circuit cables and control circuit cables. Failure to comply could cause interference to the control signals
5. Ensure the phase of power supply and rated voltage match the label on the drive. Failure to comply could drive damage.

1.1.5 Operation

Danger
1. Connect the power after completion of wiring and closing the front cover. Opening the front cover when the power is on could cause an electrical shock.
2. Keep other personnel off the equipment when setting the drive fault restart and momentary power loss restart functions. Failure to comply could cause damage to the personnel and equipment.
3. Once the drive is powered, the terminals are live even when drive is not in operation. Touching the terminals could cause electrical shocks.

4. Cancel run command before resetting the alarm and fault. Failure to comply could cause physical injury.

Warning
1. Do not start or stop the drive by connection or disconnection the power supply. Failure to comply could cause drive damage.
2. Ensure the motor and equipment are in proper use before operation. Failure to; comply could damage the equipment.
3. The temperature of the braking resistor and heatsink could be very high during operation. Do not touch it or it could result in scald.
4. For lift applications, please install mechanical brakes.
5. Adjust a few parameters only if necessary as the defaults are optimum settings for most of applications. Editing parameters indiscriminately could cause equipment abnormal operation.
6. Interlock the electricity supply with AC drive supply when both are available to a motor.

1.1.6 Maintenance

Danger
1. Do not touch the main circuit of the drive when power is on. Failure to comply could cause electrical shocks.
2. Disconnect the power supply before opening the front cover of the drive.
3. Maintain the drive only when the CHARGE indicator light is off or 5 minutes after turning off power supply, so as to avoid charged capacitors causing physical injury.
4. Allow only qualified electric engineers and electrician to maintain, repair and replace the AC drive modules.
Warning
1. The release of breaker on the AC drive primary side could be caused by incorrect wiring, short circuit and damaged drive components. Investigate and remove the problem before reconnecting the breaker.
2. Do not use a megger (insulation resistor) to test the drive control circuit. Failure to comply could cause drive damage.

Notice:

All the instruction photographs and diagrams of opened drive in this manual are only for illustration. Do not attempt to operate any AC drives with the cover opened.

1.2 Warning Label

The warning label is on the front of the drive. Please read it carefully and follow the instructions.

- Read the user manual before operation.

- Risk of electrical shock. Shut off main power and wait for 5 minutes before servicing.

- Hot surface. Risk of burn.

Warning Label

1.3 AC Drive Application Precautions

1.3.1 AC Drive Selection

1.3.1.1 Drive Capacity

Before driving motors, ensure the motor rated current is lower than the drive rated output. In addition, when a single AC drive is driving more than 1 motor in parallel, make sure the drive capacity is higher than 110% of total motor rated current.

1.3.1.2 Starting Torque

The motor characteristics at start and during acceleration are limited by the drive overcurrent. If higher starting torque is needed, use a higher rating drive or increase capacity of both motor and drive.

1.3.1.3 Emergency Stop

When a drive fault occurs, protection function will be automatically triggered to shut off the output but the motor may not stop immediately. Therefore please install mechanical brake if immediate stop is necessary.

1.3.2 Settings

1.3.2.1 Upper Limits

The maximum output frequency of the drive is 400Hz. If the upper limit is set incorrectly, the motor will run at higher than its rated speed and cause danger. Please set the limit of output frequency in Frequency Upper Limit parameter. The default setting of the rated output frequency is 60Hz.

1.3.2.2 DC Braking

Excessive DC braking current and duration could cause motor overheat.

1.3.2.3 Acceleration /Deceleration Time (Acc./Dec. Time)

Acceleration and deceleration time is determined by the motor torque, load torque and load inertia. Set a longer Acc./Dec. time after Stall Prevention function is triggered. In addition, the acceleration and deceleration time will be extended depending on the Stall Prevention duration. If faster acceleration and deceleration are required, install proper braking options or use a higher rating motor and AC drive.

1.3.3 General Handling

1.3.3.1 Wiring

Connecting power supply to output terminals U/T1, V/T2 and W/T3 will damage the drive. Check all the connections and wiring sequence before turning on the power. Failure to comply could cause drive damage.

1.3.3.2 Maintenance

Capacitors in the drive may still be charged for a short time after shutting off the power. Wait for the amount of time specified on the drive before any maintenance. Failure to comply could cause electrical shocks to personnel. Besides, do not touch the heatsink which can be very hot during operation. Replace the cooling fan only when the heatsink has cooled down after shutting off the power. In addition, when a synchronous motor is coasting to stop, it regenerates voltage to keep the drive terminals live even when the drive power is off. Wait until the motor is fully stopped before drive maintenance. Failure to comply could cause electrical shocks to personnel.

1.3.3.3 Wiring Tools

Use only the tools suggested by the terminal supplier during drive maintenance.

1.3.3.4 Transportation and installation

Do not explore the drive to the environment containing the halogens or DOP gas during transportation or installation.

1.4 Warranty

1.4.1 Warranty Period

Contact local distributor for details.

1.4.2 Warranty Restrictions

Warranty is not applicable when the drive is not properly used according to the manual regardless warranty period.

Chapter 2 | Product

2.1 Component Names

2.1.1 IP20 Enclosure
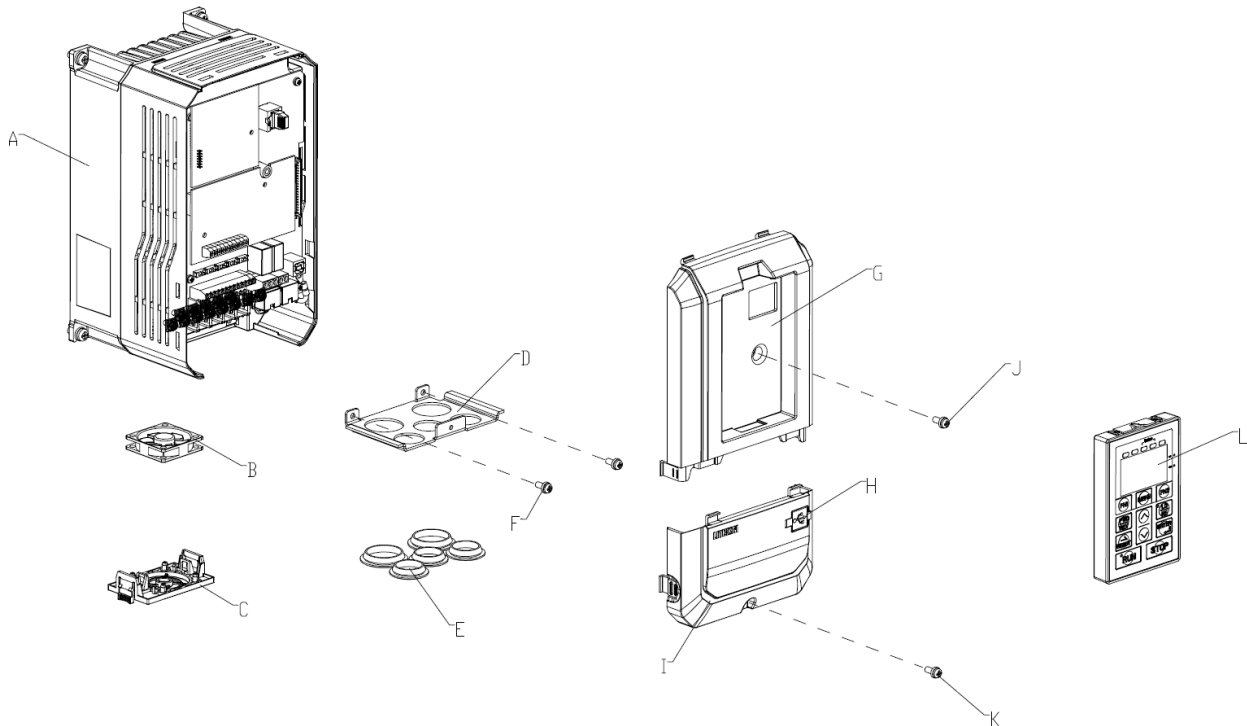
A – Heatsink
B – Cooling fan
C – Cooling fan guard
D – Conduit bracket
E – Rubber bushing

F – Terminal cover screw
G – Front cover
H – USB port
I – Terminal cover
J – Front cover screw

K – Terminal cover screw
L – Keypad

2.1.2 NEMA Type 1 Enclosure
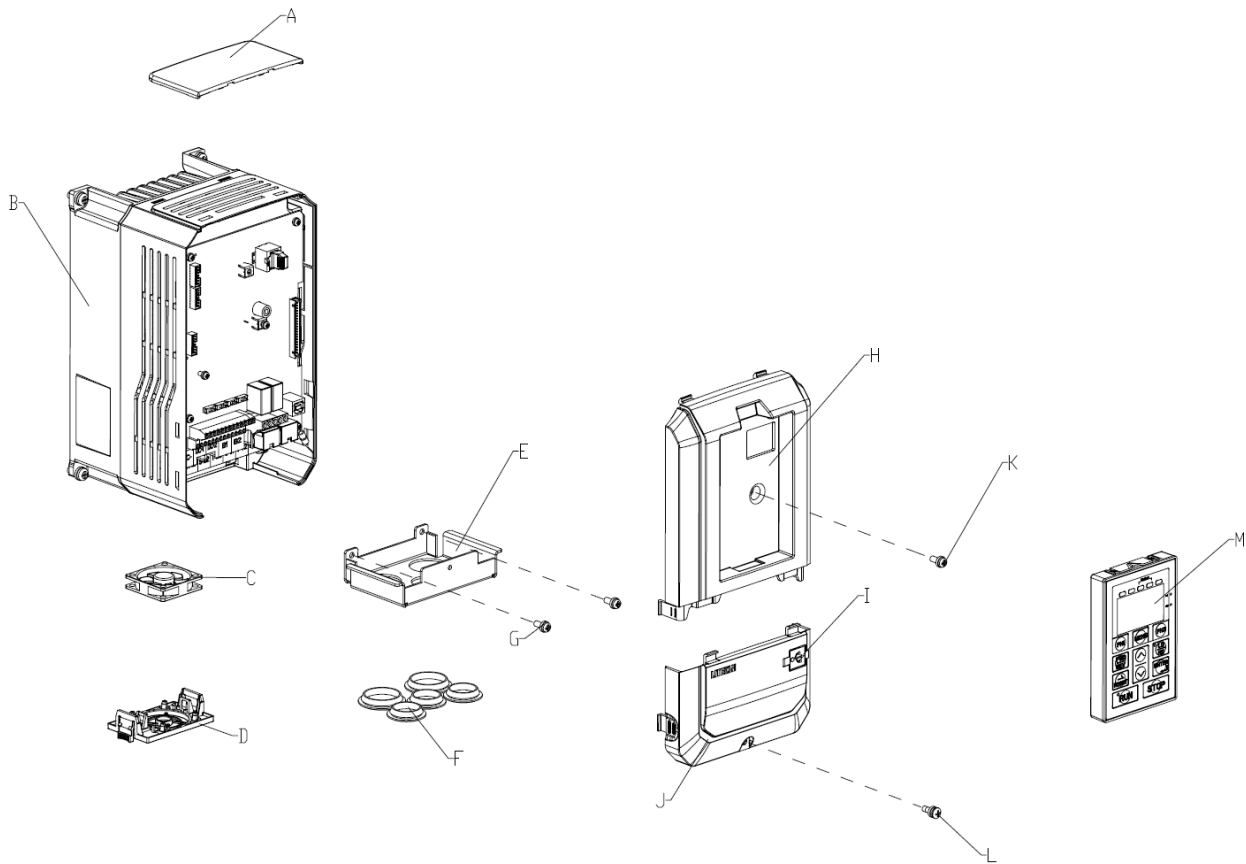
A –Top protective cover
B – Heatsink
C – Cooling fan
D – Cooling fan guard
E – Conduit bracket

F – Rubber bushing
G – Terminal cover screw
H – Front cover
I – USB port
J –Terminal cover

K – Front cover screw
L –Terminal cover screw
M – Keypad

2.2 Receiving Checklist

Check the following when receiving the drive:

1.   Is the packaging box in good condition? Any damage or damp ?   If so, contact the distributor or local Lite-On representative.
2.   Is the model label on the box same as what you purchased?   If not, contact the distributor or local Lite-On representative.

3.   After opening the box, is there any damp mark inside the box? Any damage or crack on
    the drive enclosure?
    If so, contact the distributor or local Lite-On representative.

4.   Does the drive nameplate show the same model number as the carton label?   If not, contact the distributor or local Lite-On representative.
5.   Are the manual and keypad in the carton?   If not, contact the distributor or local Lite-On representative.

2.3 Nameplate

Model number ⟶ MODEL:EVO800043SD75E20
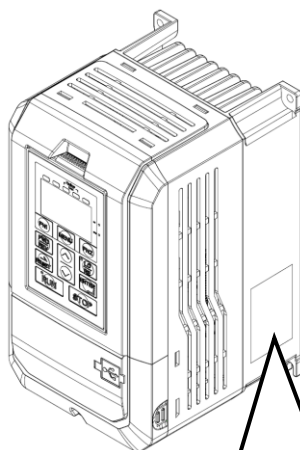
Applicable motor rating ⟶ MOTOR RATING: 0.75kW/1.5kW

Input power supply ⟶ INPUT: AC3PH 380-480V 50/60Hz

Output power supply ⟶ OUTPUT: AC3PH 0-480V 0-400Hz 3.4A/4.1A

11D754315331T10001000001
IP20

LISTED
IND. CONT. EQ.
E466871

LITEON
LiteON ELECTRONICS, INC.

MADE IN TAIWAN

2.4 Model Number Definition

```
EVO  -  8000  [ ][ ]  S  D75  E  20  F
```

Product Series:
EVO: Lite-On AC Drive

Series Name

Voltage Class:
21: AC 220V 1Phase
23: AC 220V 3 Phases
43: AC 440V 3 Phases

Version:
S: Standard

Power Ratings:
0D2: 0.2kW
0D4: 0.4kW
D75: 0.75kW
1D5: 1.5kW
2D2: 2.2kW

Keypad Type:
E: LED
C: LCD

Enclosure:
00: IP00
20: IP20
N[ ]: NEMA[ ]

Filter:
[ ]: No Filter
F: Filter Built-In
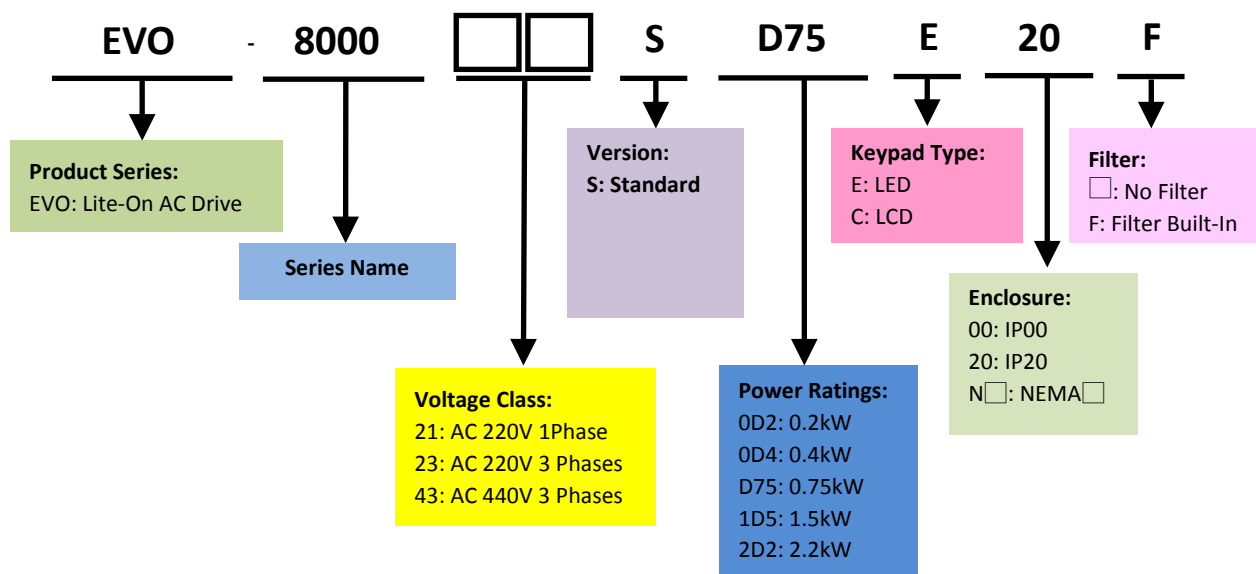
2.5 Power Ratings

400V Class													
Model No.	EVO800043S		D75	1D5	2D2	3D7	5D5	7D5	011	015	018	022	030
Max. Motor Capacity	HP	HD	1	2	3	5	7.5	10	15	20	25	30	40
		ND	2	3	5	7.5	10	15	20	25	30	40	50
	kW	HD	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30
		ND	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37
Rated Input	Current (ND)		6.7	8.9	11.3	17.6	21	32.8	38.8	45.8	53.8	63.8	78.1
	Current (HD)		5.3	7.9	9.6	14.9	20	25	30.1	38.5	45.9	49.5	62.4
	Input Voltage (V)		Three Phases, 380 to 480 V										
	Input Frequency (Hz)		-15% to +10% , 50/60Hz										
Rated Output	Current (ND)		4.1	5.4	6.9	10.7	13	24	31	38	43.2	56.8	70.1
	Current (HD)		3.4	4.8	5.5	9	12	17.7	23.9	31	37.5	43.6	59.7
	Output Frequency(Hz)		0 to 400 Hz										
	Carrier Frequency (kHz)		1 to 16kHz										
Cooling Method			Fan										
Frame Size			1			2		3			4		

2.6 Common Specifications

Item		Specification
Control Characteristic	Control Method	V/F, Closed-Loop V/F Control, IM/PM Motor Closed-Loop Vector Control, IM/PM Motor Open-Loop Vector Control
	Output Frequency	1 to 400 Hz
	Frequency Accuracy	Digital Input: Within ±0.01% of the max. output frequency
		Analog Input: Within ±0.1% of max. output frequency (-10℃ to +50℃)
	Frequency Setting Resolution	Digital Input : 0.01Hz
		Analog Output: 1/1000 of max. frequency
	Starting Torque [1]	150% / 3Hz (V/F and Closed-Loop V/F Control) 200% / 0.3Hz (IM Open-Loop Vector Control) 200% / 0r/min (IM/PM Motor Closed-Loop Vector Control) 100% / 5% speed (PM Motor Open-Loop Vector Control)
	Speed Control Range [1]	1: 40 (V/F and Closed-Loop V/F Control) 1:200 (IM Open-Loop Vector Control) 1:20 (PM Motor Open-Loop Vector Control) 1:1500 (IM/PM Motor Closed-Loop Vector Control)
	Speed Control Accuracy [1]	±0.2% (Open-Loop Vector Control)
		±0.02% (Closed-Loop Vector Control)
	Speed Response	Over 10 Hz (Open-Loop Vector Control)
		Over 50 Hz (Current Vector Control)
	Acc/Dec Time	0.0 to 6000.0
	Braking Torque	Approx. 20%
	V/F Pattern	15 fixed patterns and 1 programmable pattern
	Overload Capacity	120% for 1 min. in every 10 min. (Normal Duty) 150% for 1 min. in every 10 min. (Heavy Duty)
	Parameter Function	Torque Control, Speed/Torque Control Switching, Feed Forward Control, Zero Speed Holding, Momentary Power Restart, Speed Search, Overtorque/Undertorque Detection, Torque Limit, Multi-Step Speed Operation, Acc./Dec. Switch, S-Curve Acc./Dec., 3-Wire Sequence Control, Auto-Tuning, Cooling Fan ON/OFF Switch, Slip Compensation, Torque Compensation, Frequency Jump, Upper/lower Limits for Frequency Command, DC Braking at Run/Stop, PID Control including Pause Function, Energy Saving

		Mode, Fault Restart, Kinetic Energy Braking, Auto Voltage Adjustment, Overvoltage Suppression, Traverse, etc.
Operating Environment	Area of Use	Indoor without corrosive gas/liquid or flammable gas/liquid/oil mist/dust
	Ambient Temperature	-10℃ to +50℃, -10℃ to +40℃ (NEMA1), below 90% RH without froze or condensation
	Storage Temperature	-20℃ to +60℃
	Altitude	Up to 1000 meters
	Shock	10 to 20 Hz (9.8 m/s2) , 20 to 55 Hz (5.9 m/s2)
	Enclosure	IP20, NEMA1 (with optional NEMA kit)
Number of I/O	Analog Input (AI)	2 points (AI1: 0 to 10V, -10V to 10V (12 bits); AI2: 0/4 to 20mA, 0V to 10V, 0 to 5V)
	Digital Input (DI)	8 points
	Analog Output (AO)	2 points FM: 0 to 10V, -10V to 10V (10 bits), AM: 0 or 4 to 20mA (10 bits), 0 to 10V(11 bits)
	Digital Output (DO)	2 points
	Relay Output (RO)	2 points
	Pulse Input (PI)	1 point
	Pulse Output (PO)	1 point
Communications		Modbus (RS-485 port), USB port
Communication Option Card		Profibus-DP, CANopen, DeviceNet EtherCAT, Ethernet, Profinet, LONWORKS, Powerlink

*1. Results tested in labs

2.7 Product Dimensions

Frame Size 1

EVO800043SD75E20, EVO800043S1D5E20, EVO800043S2D2E20
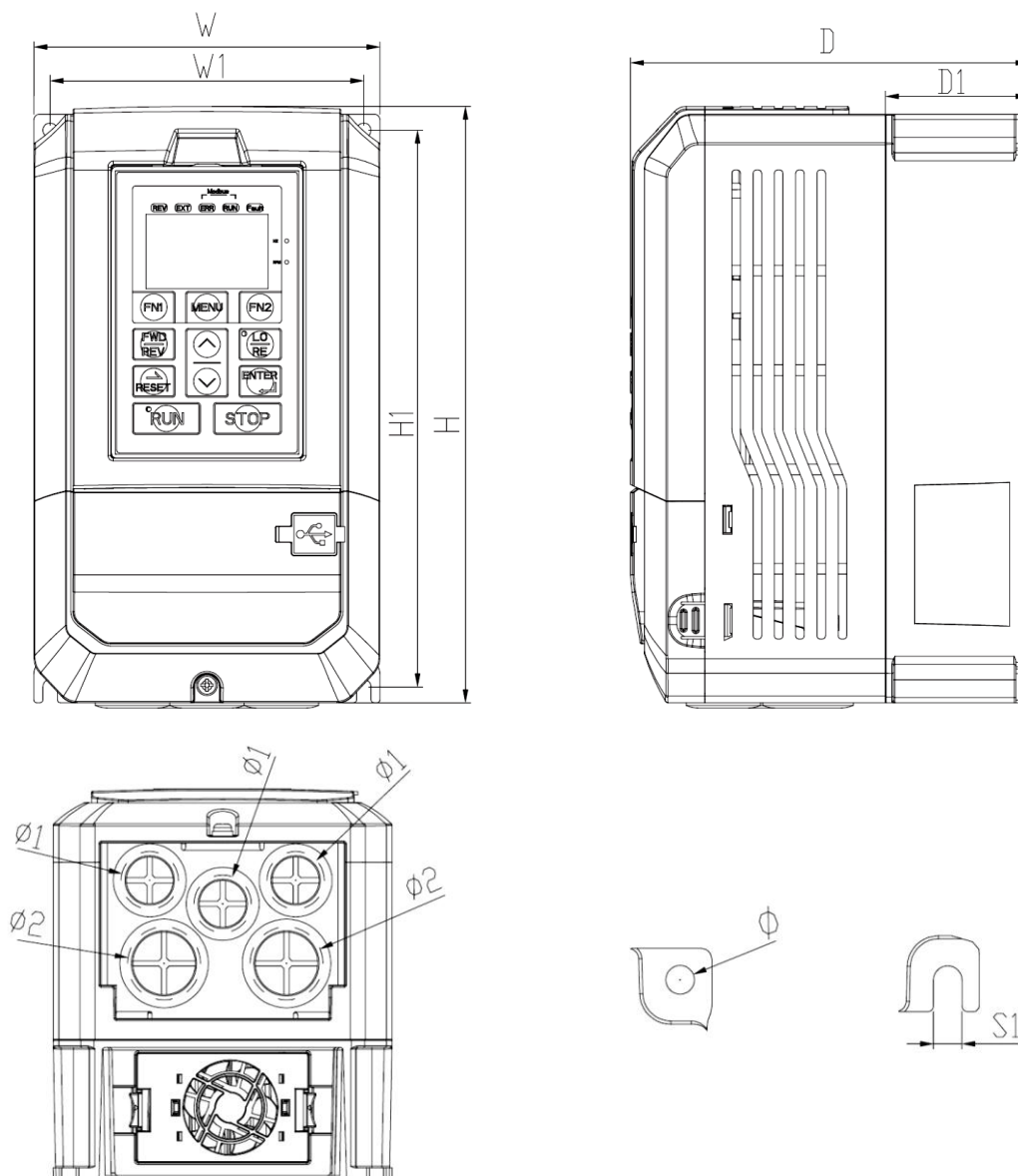
Series	Frame Size	W	W1	H	H1	D	D1	S1	Φ	Φ1	Φ2
EVO8000	1	130[5.12]	118[4.65]	225[8.85]	210[8.26]	150[5.9]	54[2.12]	5.5[0.22]	5.5[0.22]	22[0.86]	28[1.1]

Unit: mm/inch

Frame Size 2

EVO800043S3D7E20, EVO800043S5D5E20
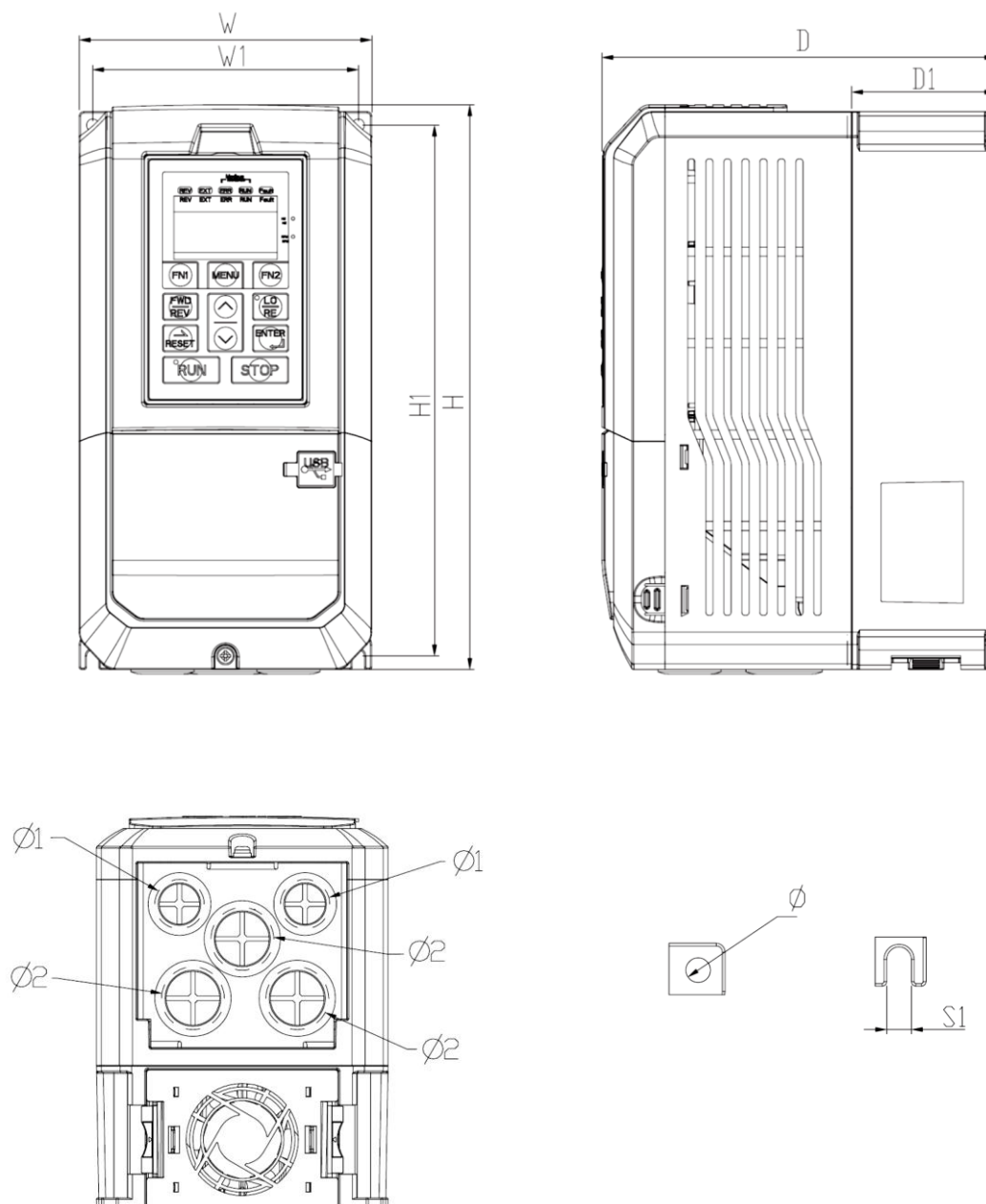
Series	Frame Size	W	W1	H	H1	D	D1	S1	Φ	Φ1	Φ2
EVO8000	2	130[5.12]	118[4.65]	250[9.84]	235[9.25]	175[6.88]	64[2.51]	5.2[0.20]	5.5[0.22]	22[0.86]	28[1.1]

Unit: mm/inch

Frame Size 3

EVO800043S7D5E20, EVO800043S011E20, EVO800043S015E20
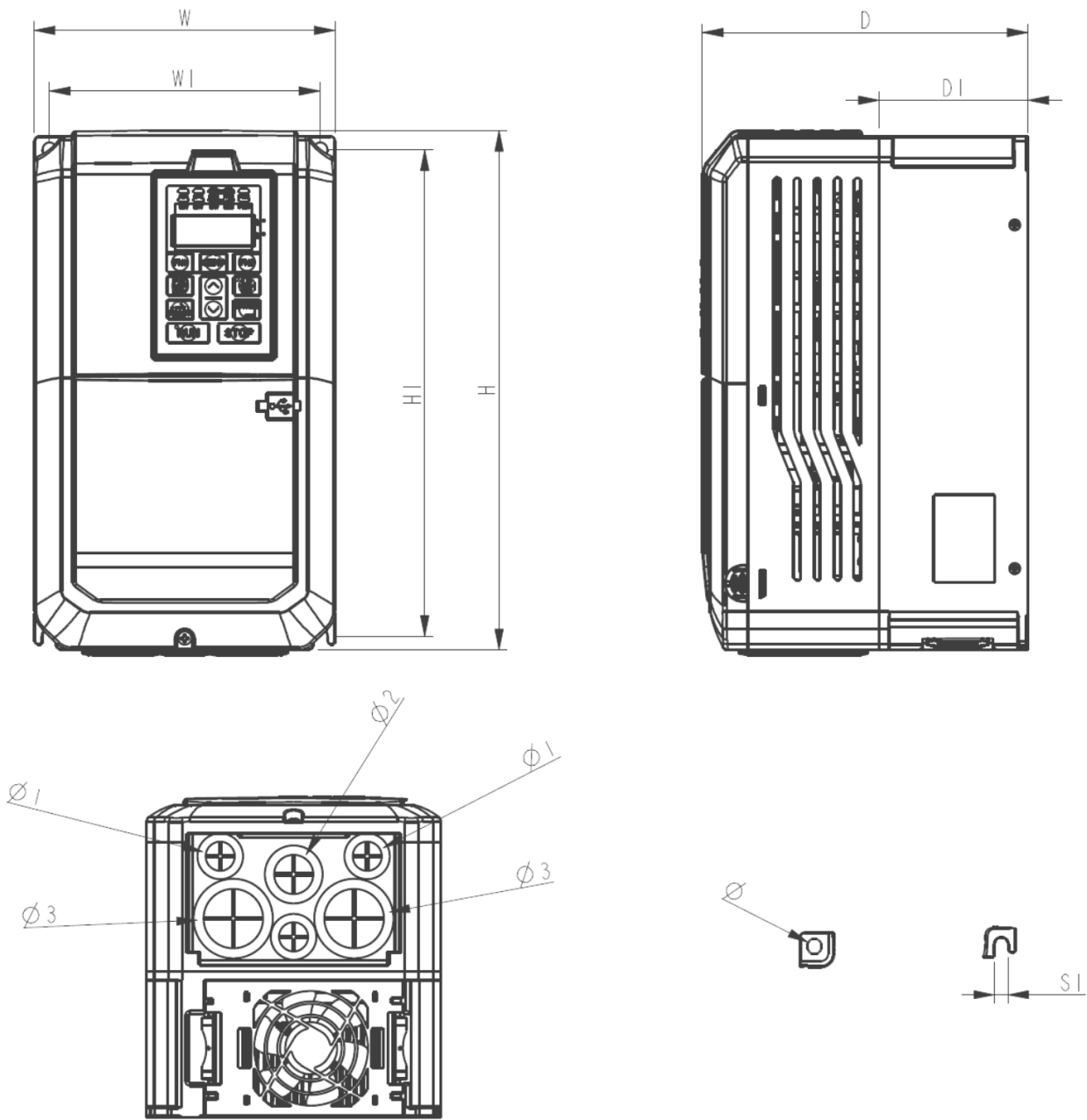
Series	Frame Size	W	W1	H	H1	D	D1
EVO8000	3	180[7.09]	162[6.38]	310[2.2]	290.6[11.44]	195[7.68]	89[3.5]
		S1	Φ	Φ1	Φ2	Φ3	
		8.4[0.33]	8.4[0.33]	22[0.86]	28[1.1]	44[1.73]	

Unit: mm/inch

Frame Size 4

EVO800043S018E20, EVO800043S022E20, EVO800043S030E20
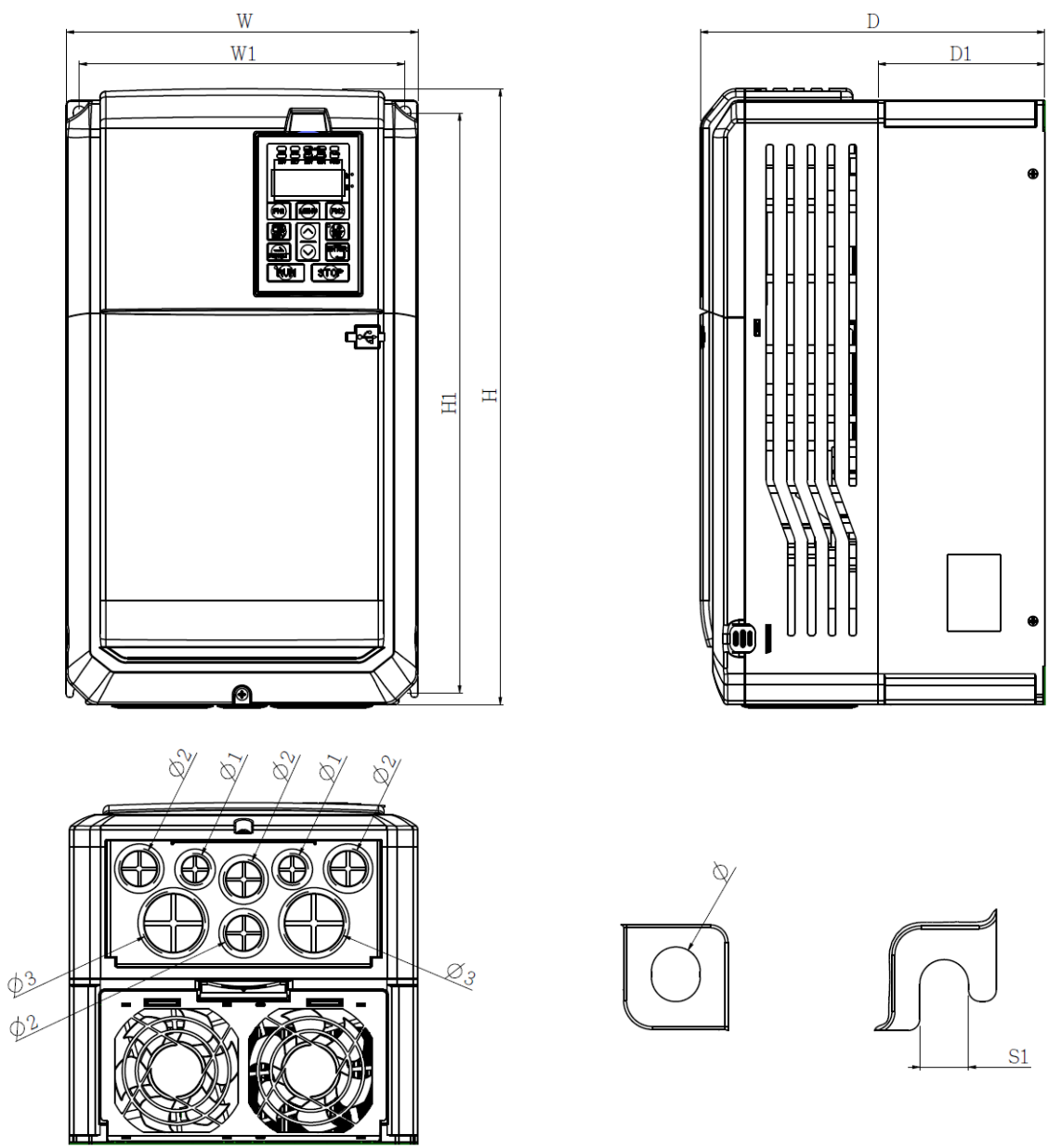
Series	Frame Size	W	W1	H	H1	D	D1
EVO8000	4	240[9.45]	222[8.74]	420[16.53]	395.5[15.57]	235[9.25]	113.7[4.47]
		S1	Φ	Φ1	Φ2	Φ3	
		8.4[0.33]	8.4[0.33]	22[0.86]	28[1.1]	44[1.73]	

Unit: mm/inch

Chapter 3 | Drive Installation

3.1 Installation Environment

To ensure the optimum drive performance, install the AC drive in a proper environment specified below.

Environment	Conditions
Area of Use	Indoors
Ambient Temperature	● -10°C to +40°C (NEMA 1 enclosure) ● -10°C to +50°C (IP20 enclosure) ● Do not install the drive in environments with wide temperature fluctuations so as to ensure the drive reliability. ● When the drive is installed in an enclosure cabinet, make sure the cooling works properly to keep the temperature within the specified levels. ● Do not allow the drive to freeze. ● When drives are installed side-by-side in a cabinet, follow the instruction illustrated in Figure 3.2 to ensure the air flow.
Humidity	● Under 90% RH ● Free of condensation
Storage Temperature	-20°C to +60°C
Surrounding Area	● Free from water, oil, metal shavings or other foreign materials. ● Free from flammable materials (e.g., wood) ● Free from harmful gases and liquids ● Free from direct sunlight ● Free from oil mist, corrosive gas, flammable gas or dust. ● Free from radioactive material ● Green Class 2 or above
Altitude	Up to 1000 m without derating. Up to 2000 meters with 1% rated current derated for every 100 m counted from 1000 m.
Vibration	● 10 to 20 Hz at 9.8 m/s2 ● 20 to 55 Hz at 5.9 m/s2 (2A0004 to 2A0211, 4A0002 to 4A0165) , or 2.0 m/s2 (2A0250 to 2A0415, 4A0208 to 4A1200)
Enclosure	IP20/NEMA 1.

3.2 Installation Direction and Spacing

3.2.1 Installation Direction

Install the AC drive upright for better cooling.

OK NG NG
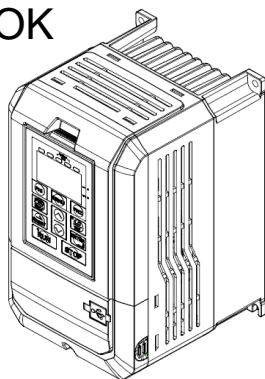
a. Upright installation   b. Horizontal installation   c. Transverse installation
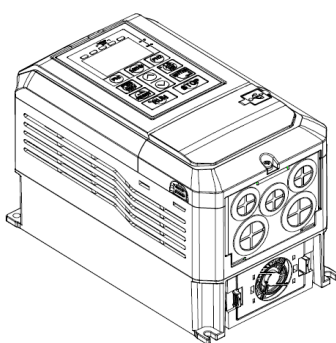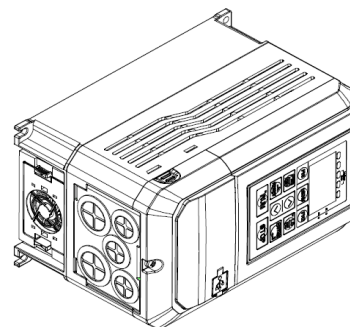
Figure 3.1 Installation Direction

3.2.2 Installation Spacing

3.2.2.1 Single Drive Installation

Install the AC drive as illustrated below to ensure the required space for airflow and wiring.
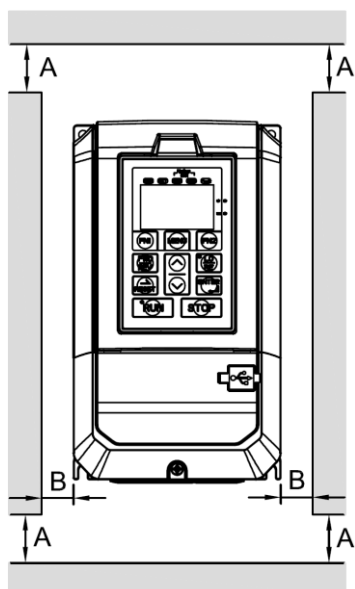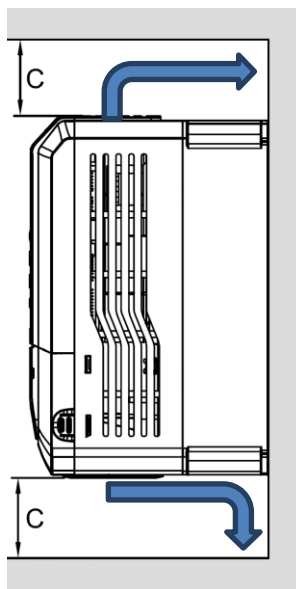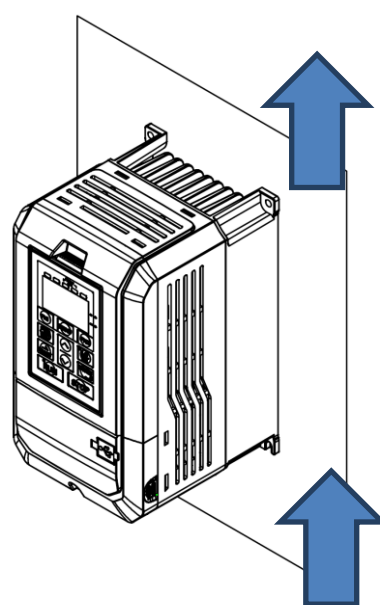
A – Minimum 50 mm   B - Minimum 30 mm   C - Minimum   150 mm

Figure 3.2 Installation Spacing for Single Drive

Note: Same amount of space is required for IP00 and NEMA 1 enclosure.

3.2.2.2 Side-by-Side Installation

Install the AC drives as illustrated below to ensure the required space for airflow and wiring.

A – Minimum 50 mm   B - Minimum 30 mm   C - Minimum 10 mm   D - Minimum 150 mm
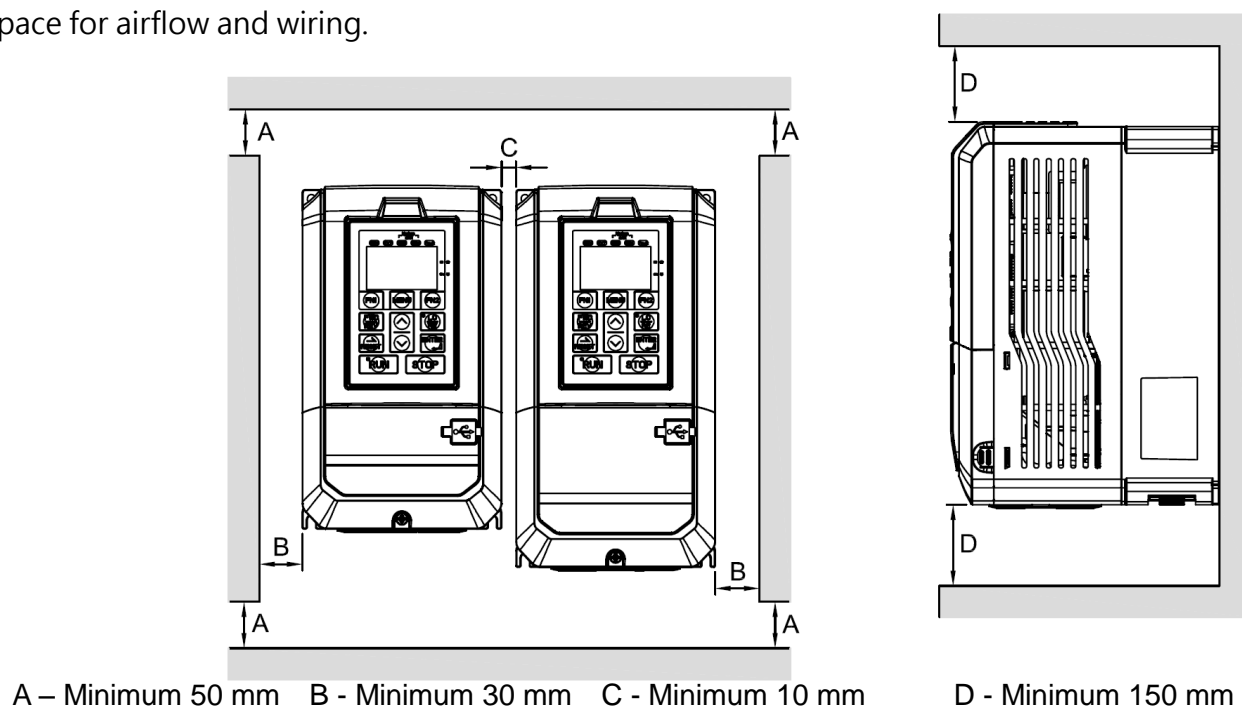
Figure 3.3 Installation Space for Side-by-Side Installation

Note: When installing drives of different sizes, align the tops of the drives for easier cooling fan replacement.

3.3 Keypad and Terminal Cover Installation

It is not necessary to remove the keypad before wiring. You just need to loosen the terminal cover screw and remove the terminal cover.

440V 1 to 40HP model enclosure are non-metal. Loosen terminal cover screw and remove terminal cover for wiring. After wiring, affix the terminal cover back in position and tighten the screw. For wiring instructions and screw tightening torque please refer to Chapter 4.
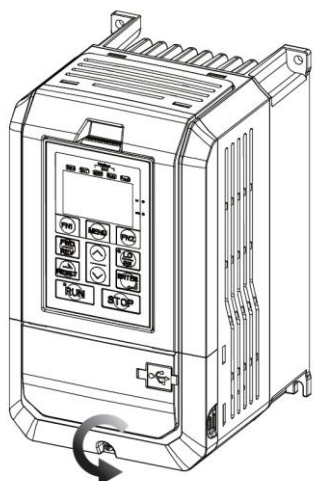
Step 1: Loosen the Screw
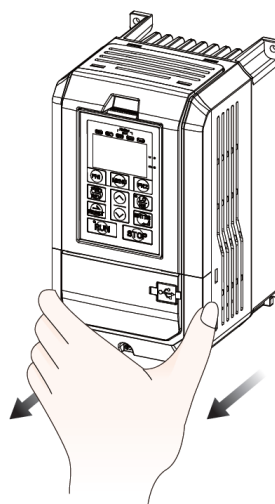
Step 2: Remove the Terminal Cover
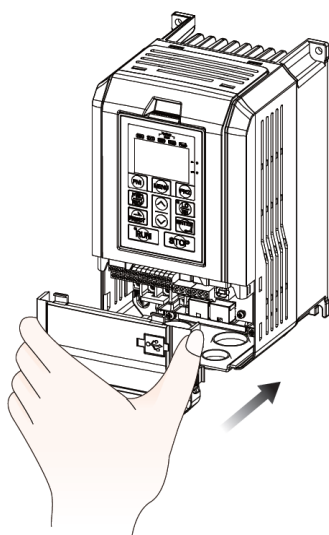
Step 3: Affix the Terminal Cover After Wiring
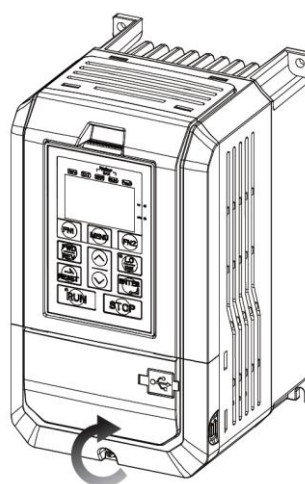
Step 4: Tighten the Screw

3.4 Wiring Protection

3.4.1 Drive and Input Cable Protection for Short-Circuit Situations

Protect the drive and input power cable by using fuse in case potential short-circuit situations cause overheat. Please refer to the following figure for proper wiring.
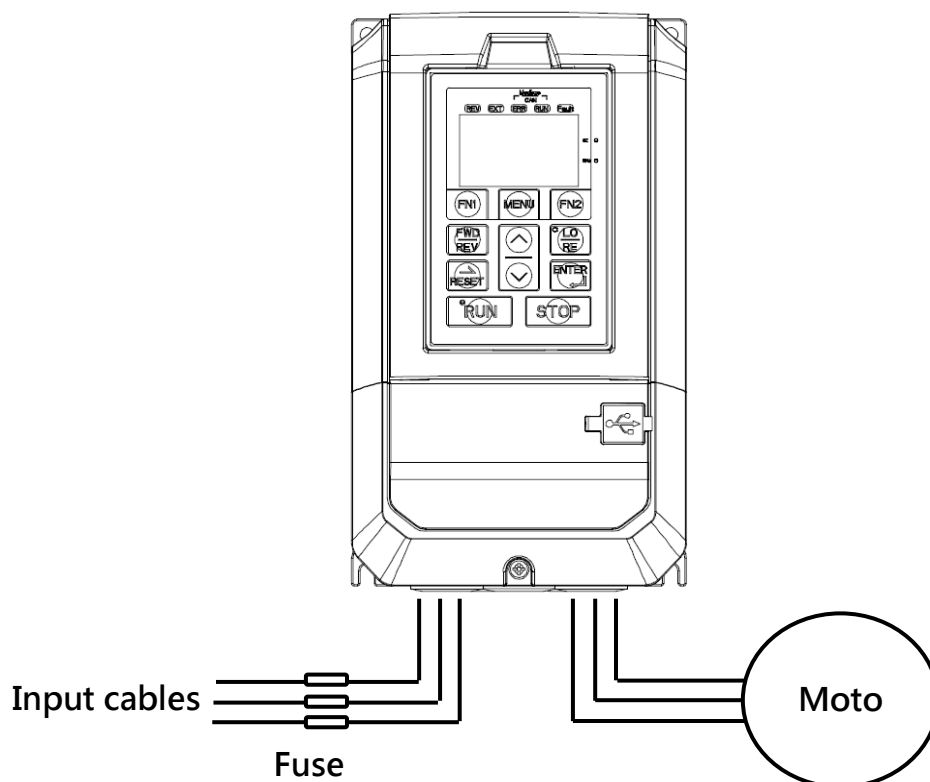
Figure 3.4 Fuse Installation

3.4.2 Motors and Output Cable Protection for Short-Circuit Situations

If the output cables are properly selected according to the drive rated current, the drive itself is fully capable of protecting the motor and output cables in case of short-circuit situations.

Note: If a single drive runs more than 1 motor, a separate thermal overload switch or a circuit breaker is required.

3.5 Keypad Remote Usage

Keypad mounted on the drive can be removed and connected to the drive using an extension cable to facilitate operation when the drive is installed in a location where it cannot be easily accessed. It can also be permanently mounted remote locations such as panel doors using an extension cable and an installation support set.

3.5.1 Remote Operation

3.5.1.1 Remote Operation
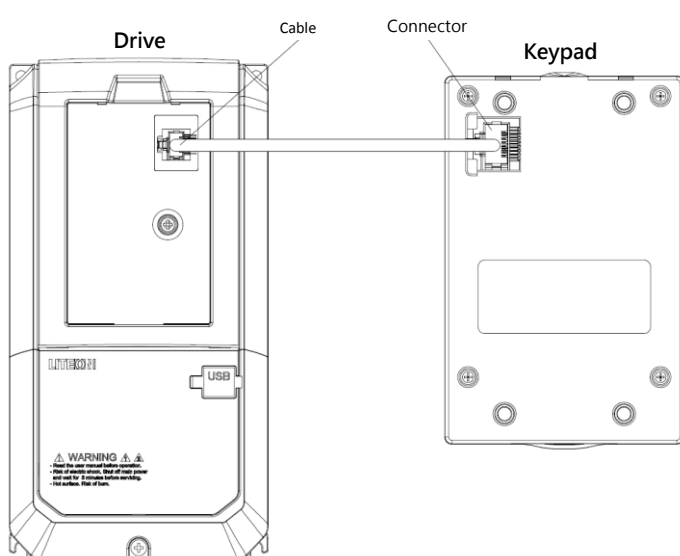
3.5.1.2 Keypad Dimensions
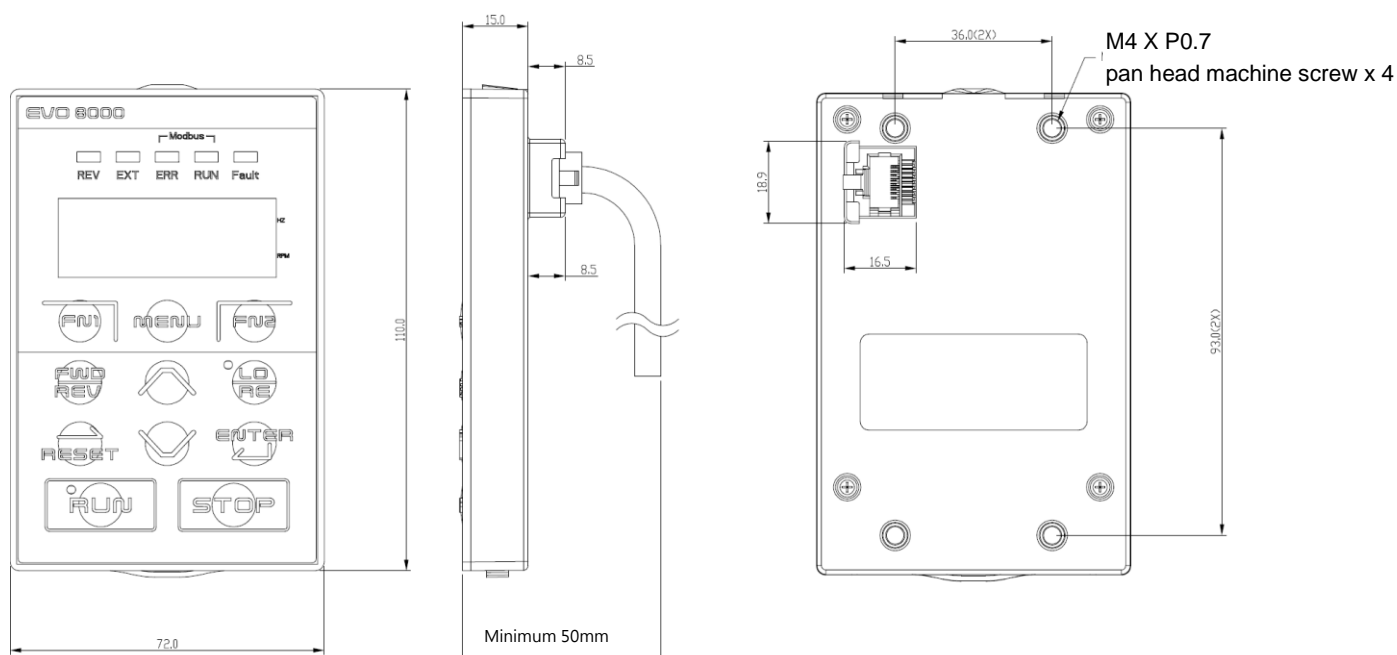
3.5.2 External/Face-Mount

3.5.2.1 External/Face-Mount

Keypad

M4 X P0.7
pan head machine screw x 4

Enclosure panel
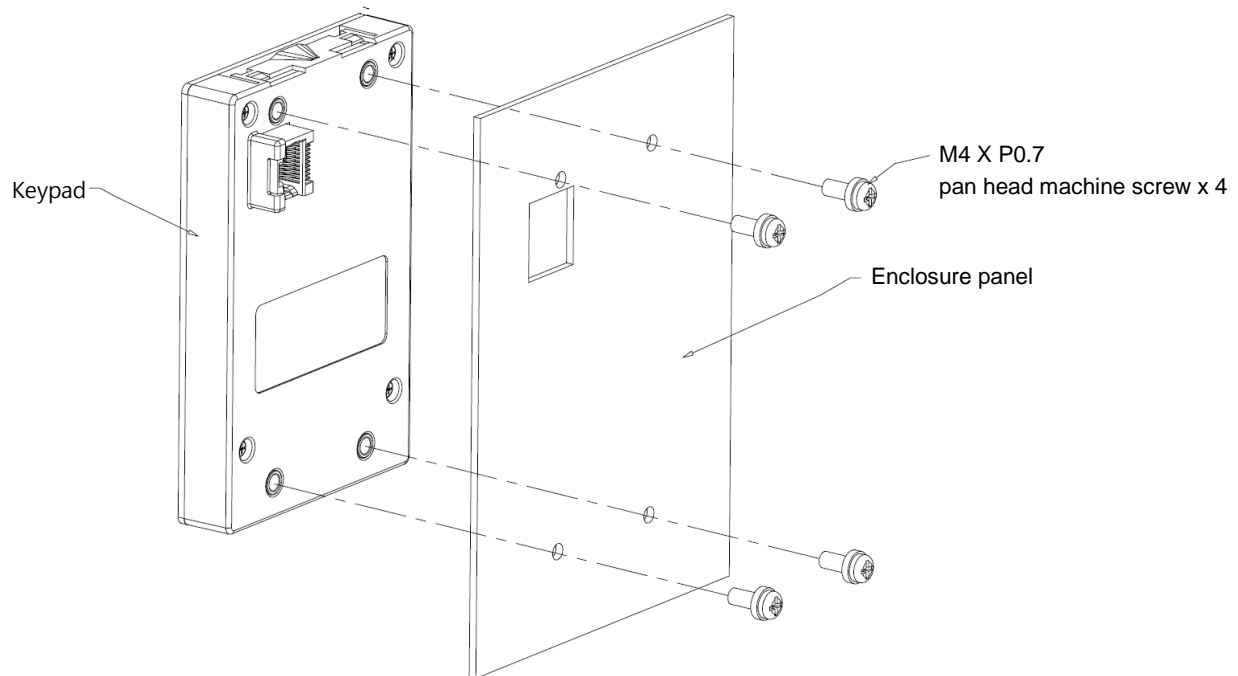
3.5.2.2 Panel Cut-Out Dimensions

21.6

2.7

93.0(2X)

33.9

36.0(2X)
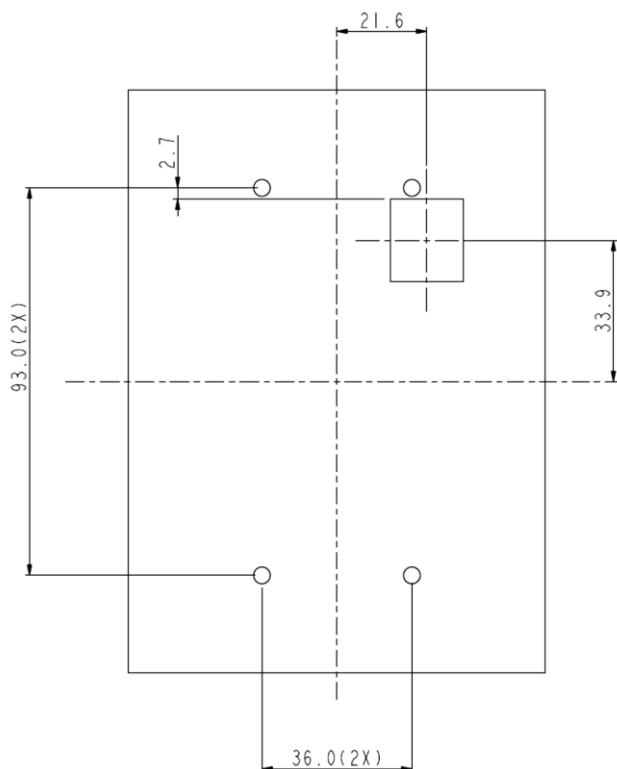
Chapter 4 | Wiring

4.1 Wiring Safety

Danger
■ Turn off all the power to the equipment before wiring. Wiring during power on could cause electrical shocks to personnel. ■ Allow only qualified personnel for installation, wiring, repairing and parts replacement. ■ Capacitors in the drive may still be charged for a short time after shutting off the power. Wait for the amount of time specified on the drive before any maintenance. ■ Never touch input or output power cables. Do not connect any circuit to drive enclosure.

Warning
■ Properly connect the motor ground terminal. Contacts between the motor ground terminal and motor enclosure could cause electrical shocks or a fire. ■ Ensure terminal screws are all tightened. Loose connection to the main circuit could cause overheat or a fire. ■ Verify if the rated voltage of the drive matches the voltage of the incoming power supply before applying power. ■ Perform all wiring as specified in the wiring diagrams provided when installing braking options. Failure to comply could result in drive, braking components damage or a fire. ■ Do not disconnect the motor from the drive while the drive is outputting voltage. ■ Do not use unshielded cable for control circuit wiring. Failure to comply could cause abnormal operation of drive. ■ Use shielded twisted-pair cables and connect the shield to ground terminal of the drive. ■ Do not modify the drive circuits. Failure to comply could cause drive damage. ■ Ensure all connections are correct after connecting the drive with other devices. ■ Rubber grommets located on conduit box shall be removed and replaced with conduit hubs in the end use installation. ■ Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes", or the equivalent

4.2 Main Circuit
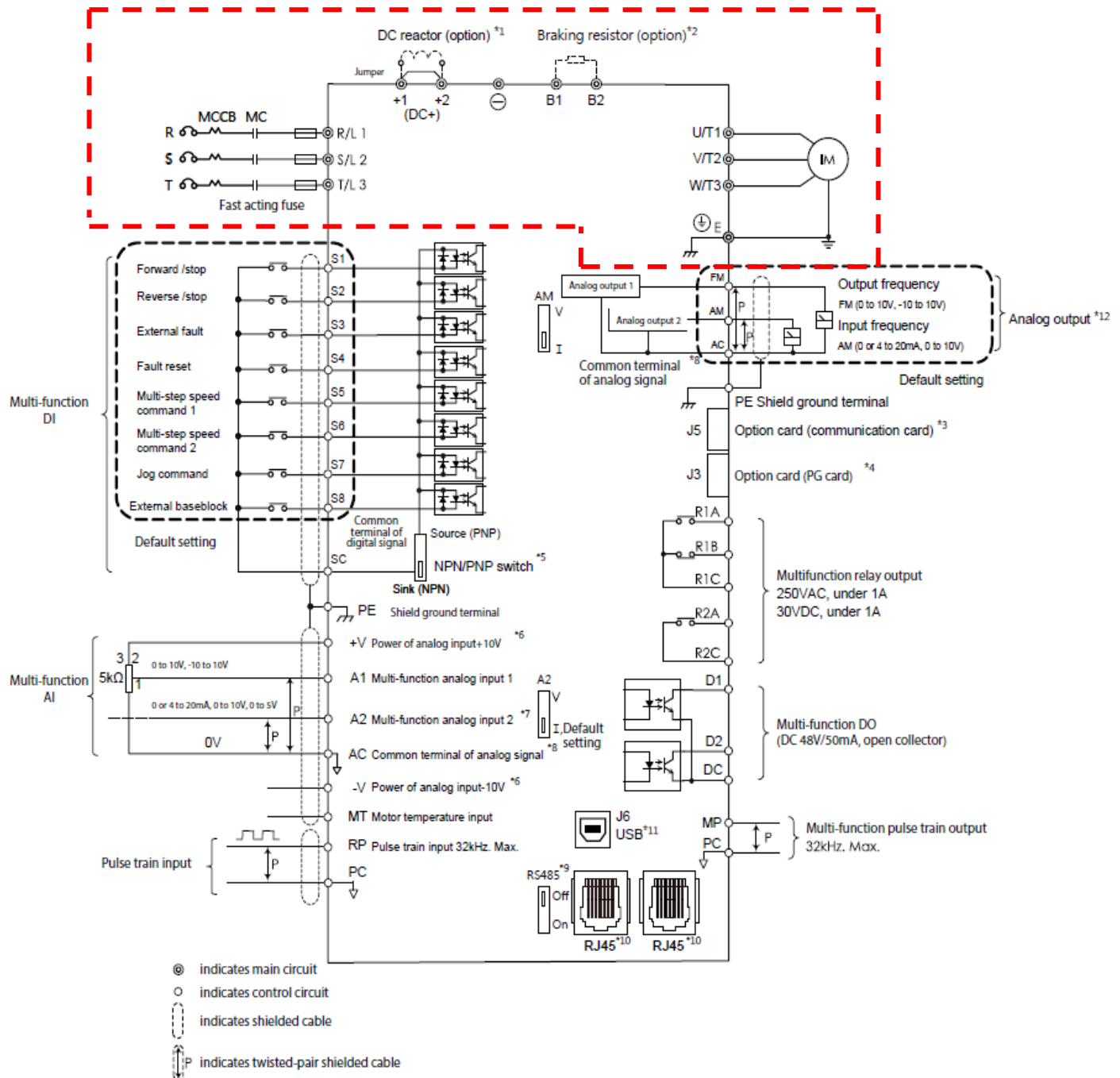
- Remove DC+(+1/+2) jumper before installing DC reactor.
- Ensure the Stall Prevention function is off when using a braking resistor.

4.2.1 Main Circuit Terminal
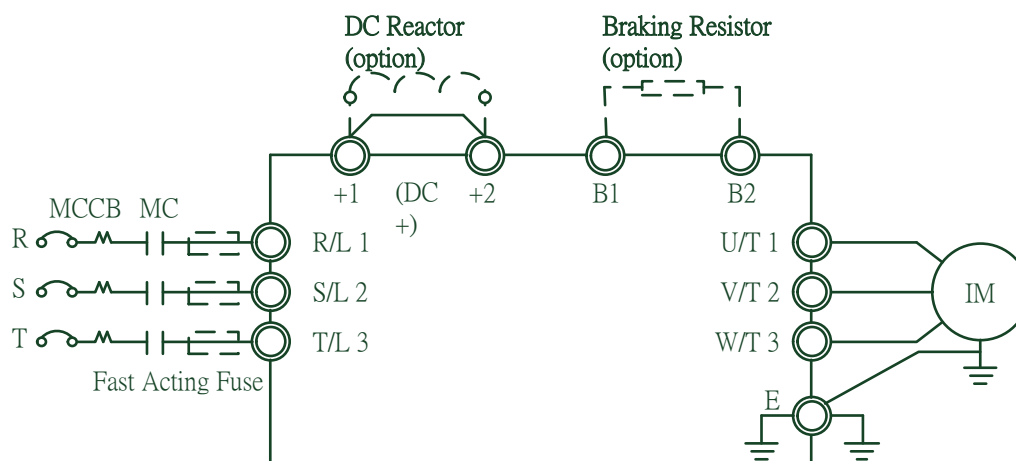
Table 4.2.1 Main Circuit Terminals

Terminal Name	Terminal Description
R/L1, S/L2, T/L3	Power input terminal
U/T1, V/T2, W/T3	Power output terminal
+1, +2 (DC+)	DC reactor terminal. Please remove the jumper before installation
B1, B2	Braking resistor terminal. Select option as per the specifications. (Please refer to Chapter 7.1)
E	Ground terminal

4.2.2 Main Circuit Wiring

4.2.2.1 Power Input Terminal

- Install a molded case circuit breaker (MCCB) between three phase AC input power and main circuit terminals R/L1, S/L2 and T/L3. A magnetic contactor (MC) in series connection is also suggested so as to shut off the power by drive protection functions. Install a R-C varistor on both ends of the MC.
- Ensure main circuit terminal screws are tightened to avoid vibration loosening the screws which could cause electric sparks.

4.2.2.2 Power Output Terminal

- When connecting a noise filter at AC drive output terminals U/T1, V/T2 and W/T3, always

use an inductive L-filter. Do not install any power capacitor, L-C or R-C filter.

■ Connect AC drive output terminals U/T1, V/T2 and W/T3 to motor input terminals U, V and W respectively. Ensure the motor and drive terminals are in same phase sequence or the motor will rotate reversely.

■ Do not connect power cable to output terminals of the drive. Failure to comply could cause drive damage and a fire.

4.2.2.3 DC Reactor and Braking Resistor Terminal:

■ The terminal is to connect a DC reactor so as to improve power factor. The drive is shipped from the factory with a short-circuit jumper. Remove the jumper before connecting a DC reactor.

DC Reactor (option)

+1   +2
(DC+)
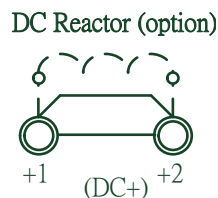
■ If the drive is used in a high-frequency or heavy duty application which requires frequent braking or shorter deceleration time, install an optional braking resistor to increase the braking torque.

Braking Resistor (option)

B1   B2
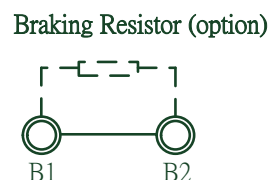
■ Please refer to the wiring diagram when installing braking options.

4.2.2.4 Ground Terminal

■ Use grounding cables of dimensions regulated by electrical equipment standard. Shrink wiring distance to prevent leakage current resulting unstable electrical potential at the terminal distant from grounding terminal.

■ Do not use share the same grounding cable with welding machines or any device requiring large current. Failure to comply could cause drive or equipment malfunction.

■ Do not wind the grounding cable when multiple drives are installed. Failure to comply could cause drive or equipment malfunction.

■ Ensure the neutral of the input side and drive terminal " ⏚ " are grounded

according to the local electrician regulations. TN and TT system are suggested for the drive primary side.

4.2.2.5 Jumper

- EVO8000 complies with the European LVD standard EN 61800-5-1 (2007) reducing the current leakage to below 10mA DC under testing condition regulated by IEC 60990 (1999).
- Follow the instructions below to remove the jumper if an even lower current leakage to a even lower level.
- Removing the jumper may increase the signal interference.
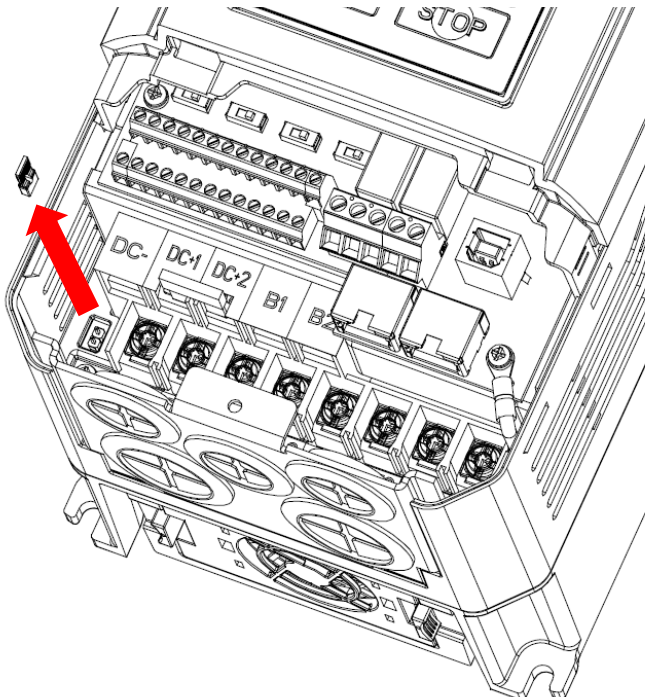
4.2.3 Main Circuit Cable Size and Tightening Torque

Select the cables and crimp terminals according to Table 4.2.2.

1. The recommended cables are 600 V vinyl-sheathed cables which have continuous temperature tolerance up to 75°C with ambient temperature tolerance up to 40 °C, wiring distance up to 100 meters and conditions suitable for on Normal Duty mode.

2. Terminal +1, +2, B1 and B2 are only for connecting DC reactor and braking resistor options. Do not connect it to other devices.

3. Consider the amount of voltage drop when selecting cable sizes. Increase the cable size when the voltage drop exceeds 2% of the motor rated voltage. The amount of voltage drop can be calculated using the following formula:

Line drop voltage (V) = 3 $\times$ cable resistance (Ω/km) $\times$ cable length (m) $\times$ current (A) $\times$ 10^{-3}

Table 4.2.2 Cable Size and Tightening Torque (Three-phase 400 V)

Drive Rating	Terminal	Asia		USA		Europe & China		Terminal Screw Thread	Tightening Torque Nm (lb.in.)
		Suggested Cable Size mm2	Applicable Cable Size mm2	Suggested Cable Size AWG, kcmil	Applicable Cable Size AWG, kcmil	Suggested Cable Size mm2	Applicable Cable Size mm2		
0.75kW to 2.2kW	R,S,T,U,V ,W,PE	2.1	2.1 to 8.4	14	14 to 8	2.1	2.1 to 8.4	M4	1.57 (13.9)
3.7kW to 5.5kW	R,S,T,U,V ,W,PE	5.3	5.3 to 8.4	10	10 to 8	5.3	5.3 to 8.4	M4	1.57 (13.9)

4.3 Control Circuit
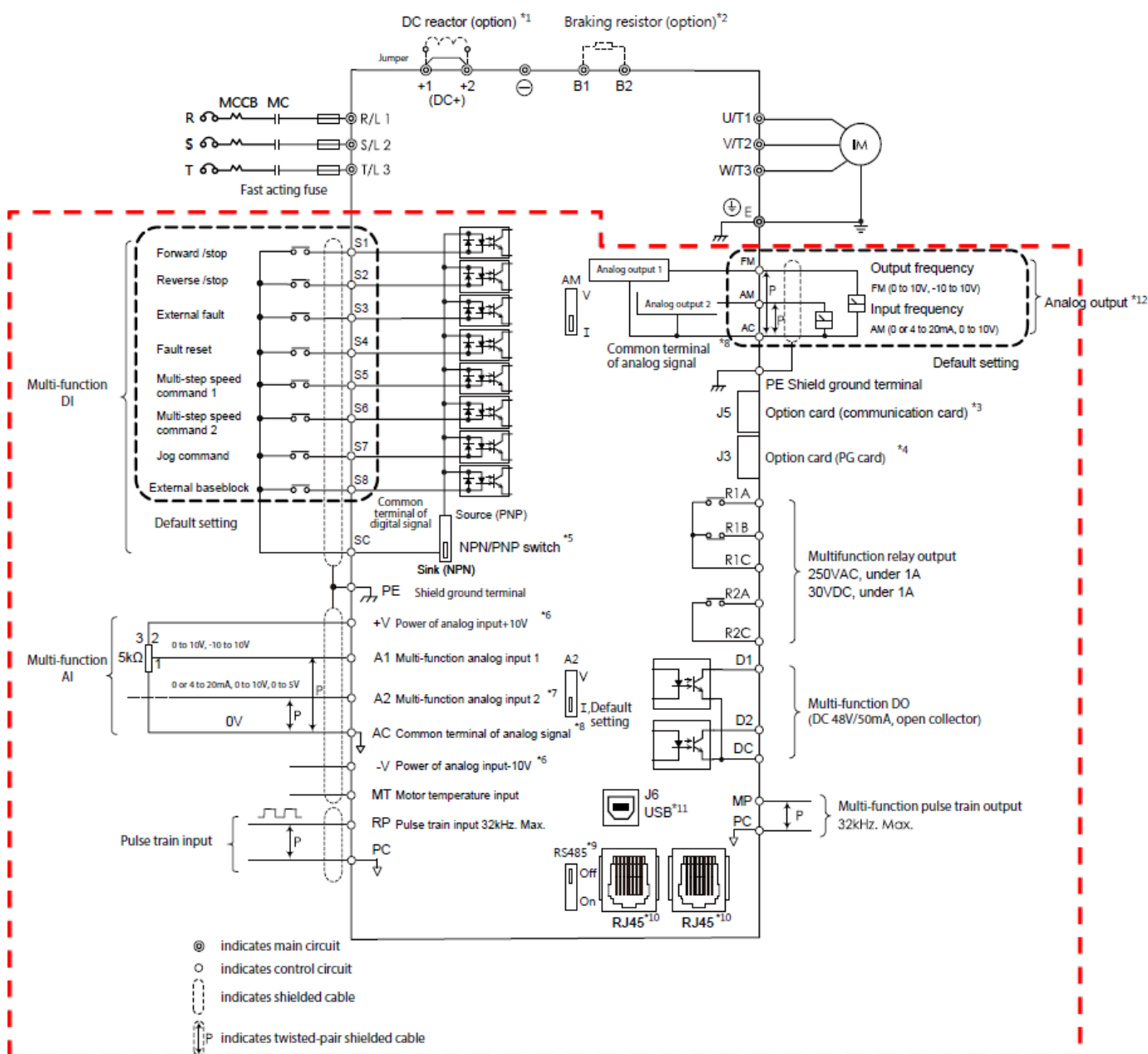
- ■ J5 is the port for communication option card. Please refer to the instructions during installation.
- ■ J3 is the port for PG feedback option card. Such option card may be needed depending on the control method. Please refer to the instructions during installation.
- ■ Multi-function analog input S1 to S8 can be switched between Sink (NPN) mode and Source (PNP) mode. The default setting is NPN mode.

30

- +V and -V are for analog auxiliary power. Do not connect +V with -V.
- DIP switch A2 is used to set the analog input type as voltage or current.
- DIP switch AM is used to set the analog output type as voltage or current.
- AC (Analog Common) is the common terminal of analog signal.
- DIP switch RS-485 is used to set RS-485 termination resistor. Switch it ON in the last drive when using a single drive to run more than one motor.
- RJ45 is the communication port for RS-485.
- USB port is used to connect to a PC through a USB cable.
- Analog output is used to connect a frequency meter, current meter, voltage meter and power meter.

4.3.1 Control Circuit Terminals

-V	SC	S1	S2	S3	S4	S5	S6	S7	S8	PC	P1	P2
+V	A1	A2	AC	FM	AM	AC	MT	RP	AC	MP	AC	PE

R1A	R1B	R1C	R2A	R2C
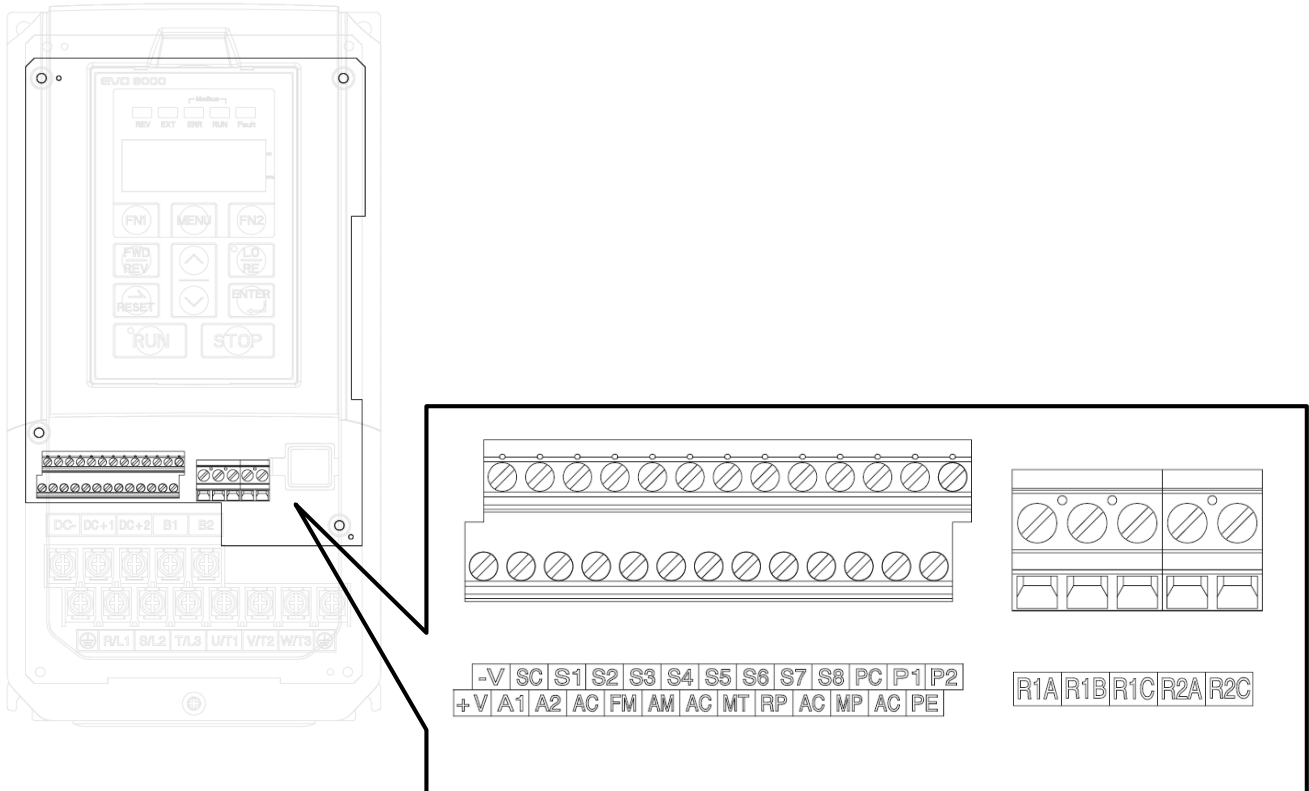
4.3.1.1 Input Terminals

Table 4.3.1.1 Control Circuit Input Terminal

Terminal Type	Terminal Code	Terminal Name	Terminal Description
Multi-Function Digital Inputs	S1	Digital input terminal 1 (forward/stop)	Photocoupler, 24 V, 8 mA. Use NPN/PNP switch to select multi-function digital input type. The default is NPN mode.
	S2	Digital input terminal 2 (reverse/stop)	
	S3	Digital input terminal 3 (external fault 1)	
	S4	Digital input terminal 4 (fault reset)	
	S5	Digital input terminal 5 (multi-step speed 1)	
	S6	Digital input terminal 6 (multi-step speed 2)	
	S7	Digital input terminal 7 (Jog command)	
	S8	Digital input terminal 8 (baseblock (normal open))	
	SC	Digital input common terminal for NPN/PNP mode switch. Select the mode correctly when connecting.	
Multi-Function Analog Inputs	+V	Auxiliary power terminal +10V	Analog input power+10V
	-V	Auxiliary power terminal -10V	Analog input power-10V
	A1	Analog input terminal 1 (main frequency command)	Voltage input 0 to 10V / -10V to +10V
	A2	Analog input terminal 2 (auxiliary frequency command)	Voltage or current input (Selectable). 0 or 4 to 20mA, 0 to 10V, 0 to 5V
	PE	Ground terminal	The ground terminal for control signals to avoid interference. Use shielded cables only.
	AC	Common terminal for analog signals	
	MT	Motor temperature signal terminal	Connects the temperature sensor of AC motor for the drive to know the motor temperature and trigger necessary protections.
Pulse Train Inputs	RP	Pulse train input (frequency command)	Input frequency up to 32KHz
	PC	Common terminal for pulse train signals	

4.3.1.2 Output Terminals

Table 4.3.1.2 Control Circuit Output Terminals

Terminal Type	Terminal Code	Terminal Name	Terminal Description
Multi-Function Relay Output	R1A	Relay 1 normal open	Relay output DC 30 V, 3 A AC 250 V, 5 A
	R1B	Relay 1 normal closed	
	R1C	Relay 1 common	
	R2A	Relay 2 normal open	
	R2C	Relay 2 normal closed	
Multi-Function Photocoupler Output	D1	Photocoupler Output terminal 1 (zero speed)	Photocoupler Output 48 V, 2 to 50 mA
	D2	Photocoupler Output terminal 2 (speed agree)	
	DC	Photocoupler Output terminal	
Multi-Function Analog Output	FM	Programmable analog output terminal (output frequency)	Voltage Output 0 to 10V, -10 to +10V
	AM	Multi-function analog output terminal (output current)	Voltage or current output (Selectable) 0 or 4 to 20mA, 0 to 10V
	AC	Analog common terminal	
Multi-Function Pulse Train Output	MP	Multi-function pulse train output (output frequency)	32KHz Max
	PC	Pulse train common terminal	

<1> Do not assign frequent switching functions such as ON/OFF to terminals R1 and R2, which may shorten the relay terminal life.

4.3.2 Control Circuit Wiring

The applicable functions in parameter Group E can be assigned to multi-function digital inputs (S1 to S8), multi-function relay outputs (R1, R2), multi-function digital outputs (D1, D2), multi-function analog input (A1, A2) and multi-function analog output (FM, AM). The default settings are listed in Figure 4.3.1.1 and Figure 4.3.1.2.

■ For safety, always check the emergency stop operation after wiring. Emergency stop circuit is necessary to stop the drive immediately in a safe manner to prevent any injuries.

■ Do not remove the drive covers or touch the circuit boards when the power is on. Failure to comply could cause electrical shocks to personnel.

■ Separate control circuit wiring from main circuit wiring and other power lines. Failure to comply could cause drive malfunction.

- Insulate shielded cable with tape to avoid contact with equipment and other signal lines. Improper insulation could cause drive or equipment malfunction.
- Always use shielded twisted-pair cables to prevent drive and equipment malfunction cause by electrical interference.
- Ground the shield to the ground terminal of drive. Failure to comply could cause erroneous operation or damage to the drive and equipment. Wire ground terminal and main circuit terminals before wiring control circuit terminals.

4.3.2.1 Digi Input Connecting

Digi Input Connecting 1

PLC Terminal	EVO8000 Terminal
Y0	S1
Y1	S2
Y2	S3
Y3	S4
COM0/V0	S5
Y4	S6
Y5	S7
Y6	
Y7	
COM1/V1	SC (24V)

Source(PNP)

NPN/PNPS Switch

Sink(NPN)

LOAD

PLC (High Active/Source/PNP)

EVO8000

DC24V

DC0V

External Power Supply

Digi Input Connecting 2

PLC Terminal	EVO8000 Terminal
Y0	S1
Y1	S2
Y2	S3
Y3	S4
COM0	S5
Y4	S6
Y5	S7
Y6	
Y7	
COM1	SC (0V)

Source(PNP)

NPN/PNPS Switch

Sink(NPN)

LOAD

PLC (Low Active/Sink/NPN)

EVO8000

DC24V

DC0V

External Power Supply

4.3.2.2 Pulse Input Connecting

High Active

Low Active
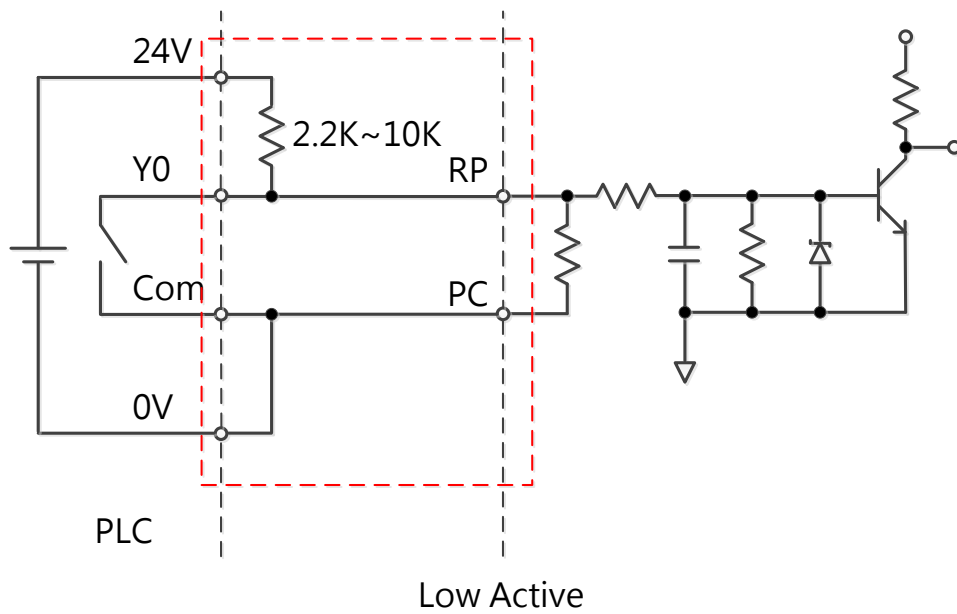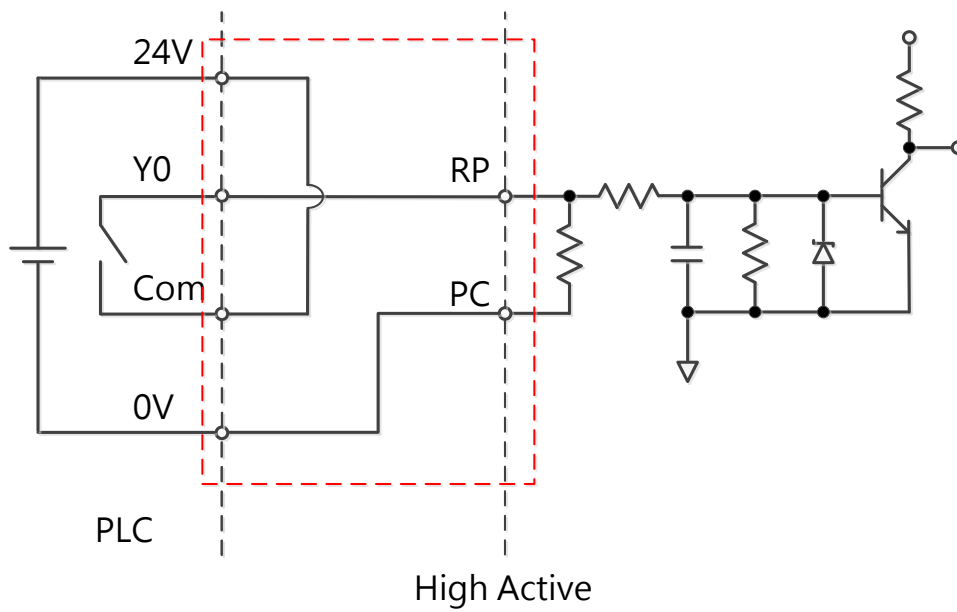
4.3.3 Control Circuit Cable Size and Tightening Torque

Select the cable according to Table 4.3.3.1. Use crimp ferrules on the cable ends for simpler and more reliable wiring.

Table 4.3.3.1 Cable Size and Tightening Torque

Terminal	Screw Size	Tightening Torque Nm (lb.in.)	Bare Cable		Ferrule-Type Terminal		Cable Type
			Applicable Size mm2 (AWG)	Suggested Size mm2 (AWG)	Applicable Size mm2 (AWG)	Suggested Size mm2 (AWG)	
S1, S2, S3, S4, S5, S6, S7, S8, SC, -V, +V, A1, A2, AC, FM, AM, AC, MT, RP, PE, DC, D1,D2	M2	0.23 (2.0)	0.13 to 1.31 (26 to 16)	0.13 (26)	0.13 to 0.33 (26 to 22)	0.13 (26)	Shielded cable, etc.
R1A, R1B, R1C, R2A, R2C	M2.6	0.59 (5.2)	0.13 to 2.08 (26 to 14)	0.13 (26)	0.13 to 0.33 (26 to 22)	0.13 (26)	Shielded cable, etc.

4.3.4 Ferrule-Type Terminals

Always use ferrule-type terminals with insulated sleeves. Refer to Table 4.3.3.2. for dimensions. In addition, crimping tool CRIMPFOX ZA-3 manufactured by Phoenix Contact is recommended.
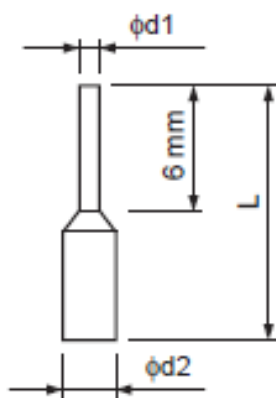
Table 4.3.3.2 Ferrule-Type Terminal Models and Sizes

Cable Size mm2 (AWG)	Type	L (mm)	d1 (mm)	d2 (mm)	Manufacturer
0.25 (24)	AI 0.25-6YE	10.5	0.8	2	Phoenix Contact
0.34 (22)	AI 0.34-6TQ	10.5	0.8	2	Phoenix Contact
0.5 (20)	AI 0.56-WH	14	1.1	2.5	Phoenix Contact

4.4 I/O Connections

4.4.1 NPN and PNP Mode Selection

Use Sink/Source DIP switch on the control board to set NPN/PNP mode for multi-function digital inputs S1 to S8. (Default: NPN mode)
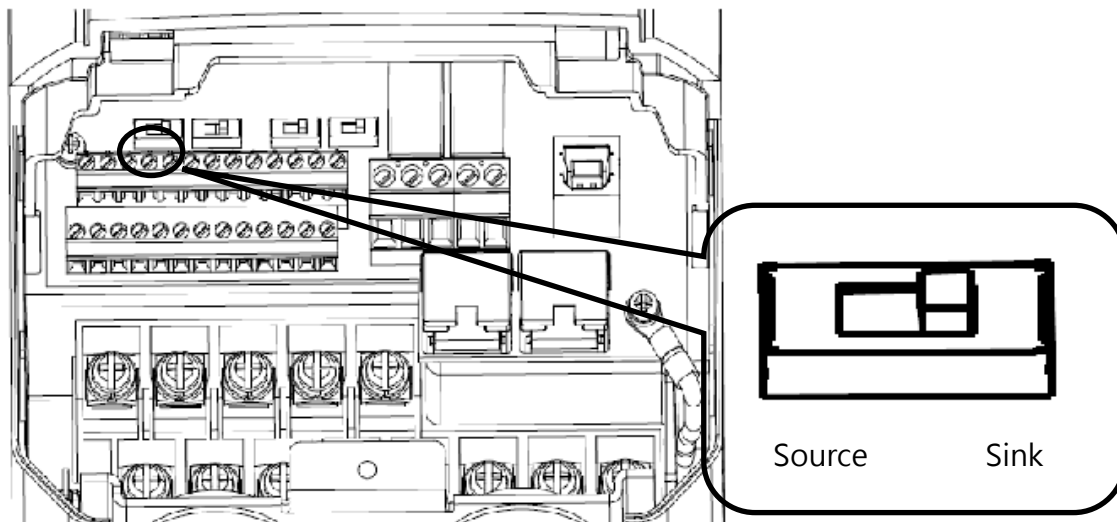
Figure 4.4.1 Sink/Source DIP Switch

4.4.2 Terminal A2 Voltage/Current Input Selection

Select voltage or current input at terminal A2
■ To select current as the input type, set DIP switch A2 to I and set parameter E3-06 to 0 (0 to 20 mA) or 1 (4 to 20 mA).
■ To select voltage as the input type, set DIP switch A2 to V and set parameter E3-06 to 2 (0 to 10 V) or 3 (0 to 5 V).
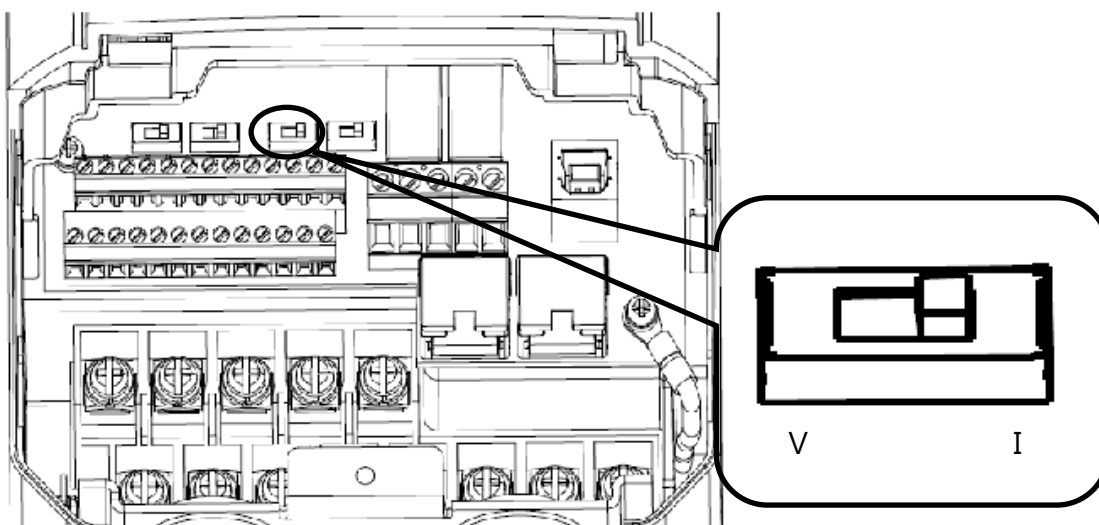
Figure 4.4.2 DIP Switch A2

Table 4.4.1 DIP Switch A2 Settings (Terminal A2)

Setting	Description
V	Voltage input (0 to 10 V or 0 to 5 V)
I	Current input (4 to 20 mA or 0 to 20 mA) (default)

Table 4.4.2 Parameter E3-06

No.	Parameter Name	Description	Setting Range	Default
E3-06	Terminal A2 Signal Level Selection	Selects the signal level for terminal A2. 0 : 0 ~ 20 mA 1 : 4 ~ 20 mA 2 : 0 ~ 10 V 3 : 0 ~ 5 V	0, 1, 2, 3	1

4.4.3 Terminal AM Voltage/Current Output Selection

Select voltage or current output type for terminal AM

■ To select voltage as the output type, set DIP switch AM to V and set parameter E4-04 to 0 (0 to 10 V) .

■ To select current as the output type, set DIP switch AM to I and set parameter E4-04 to 1 (0 to 20 mA) or 2 (4 to 20 mA).
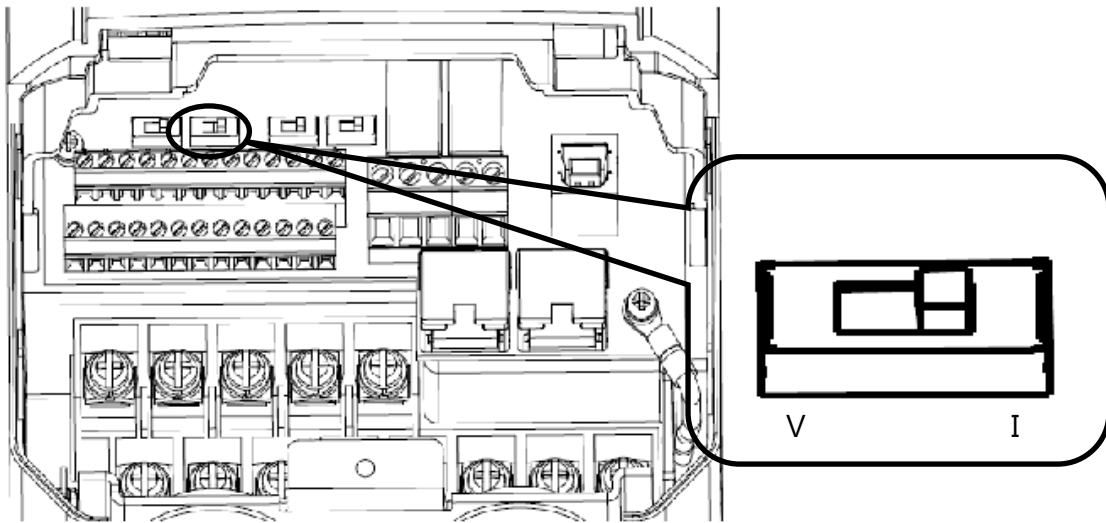
Figure 4.4.3 DIP Switch AM

Table 4.4.3 DIP Switch AM Setting (Terminal AM)

Setting	Description
V	Voltage output (0 to 10 V)
I	Current output (4 to 20 mA or 0 to 20 mA) (default)

Table 4.4.4 Parameter 4-04

No	Parameter Name	Description	Setting Range	Default
E4-04	Terminal AM Signal Level Selection	Selects the signal level for terminal AM 0 : 0 to 10 V 1 : 0 to 20 mA 2 : 4 to 20 mA	0, 1, 2	2

4.4.4 RS-485 Communication Termination ON / OFF Switch

The default of termination resistor for RS-485 communication is OFF. Switch it to ON when the drive is the last in a series of slave drives. Set this termination resistor on DIP switch RS485 illustrated in Figure 4.4.4.
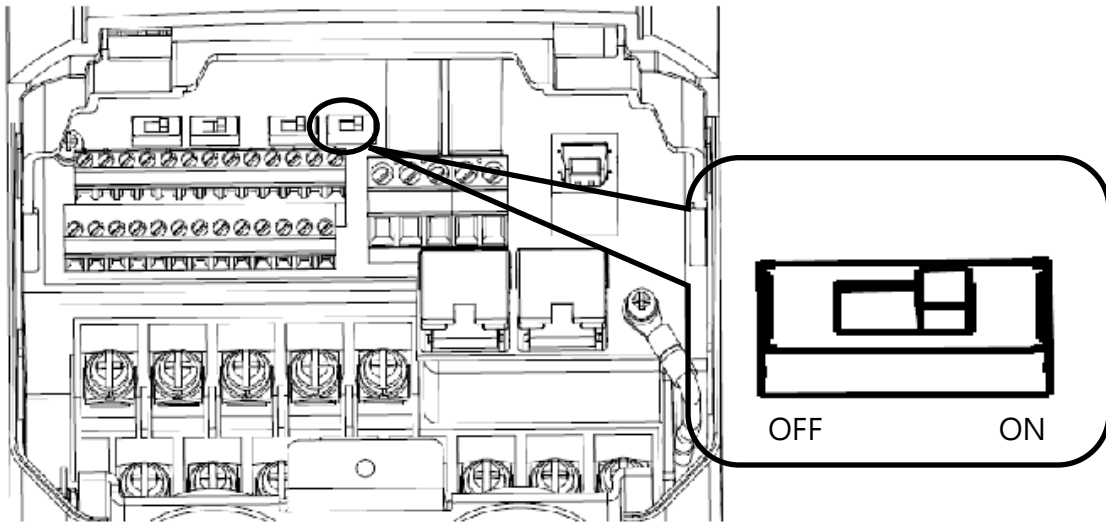
Figure 4.4.4 DIP Switch RS-485 Termination Resistor

4.5 Connection to PC

The drive is equipped with a USB port. The drive can connect to a PC through USB cable to manage parameter settings using LiteOn PC software.

Note: When USB connection is detected, the communication will be automatically switched from RS485 to USB, and return to RS-485 when USB is disconnected.
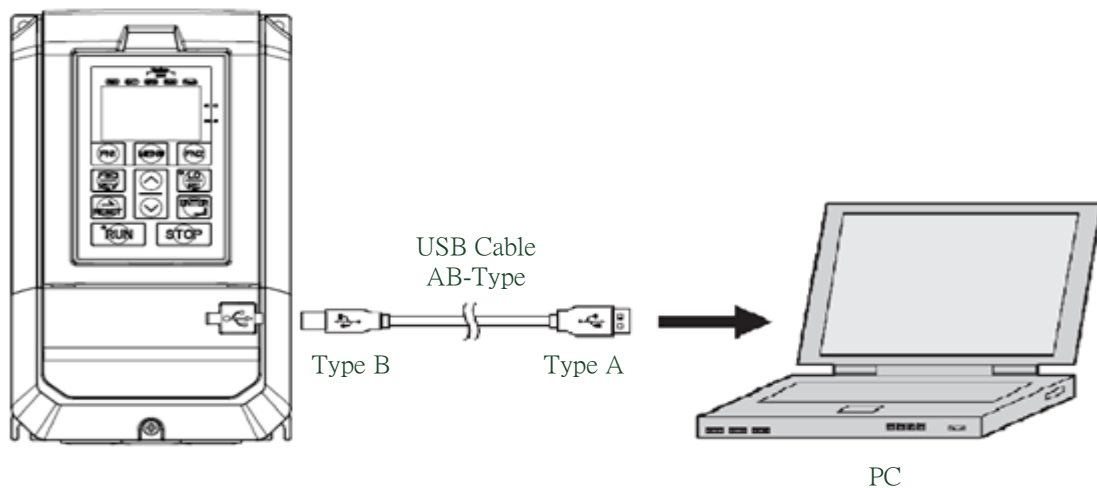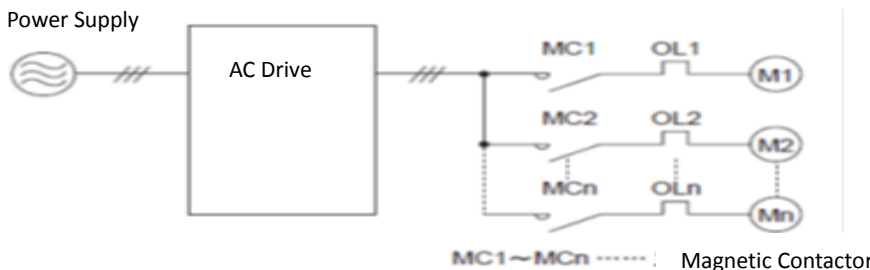
Figure 4.5 Connection to PC

4.6 Wiring Checklist

Table 4.6 Wiring Checklist

☐	No.	Item	Page
		Power Supply Voltage and Output Voltage	
☐	1	Power supply voltage is within the voltage range of specified drive input.	
☐	2	The motor voltage matches the drive output specifications.	
☐	3	The drive rating matches the motor rating.	
		Main Circuit Wiring	
☐	4	An MCCB of proper specifications is connected between the drive and motor.	
☐	5	Power cables are correctly connected to drive input terminals R/L1, S/L2 and T/L3.	
☐	6	Motor terminals and drive terminals U/T1, V/T2 and W/T3 are in same phase sequence. (Otherwise the motor will rotate reversely)	
☐	7	Power supply and motor power cable complies with electrician regulations.	
☐	8	The drive is properly grounded.	
☐	9	Drive terminal screws of the main circuit and ground are tightened.	
☐	10	An MC is installed for each motor if a single drive runs more than on motor. Note: Set MC1 to MCn OFF before operating the drive. Do not switch MC1 to MCn ON or OFF during run.	
☐	11	When using a braking resistor or braking unit, an MC is installed on the drive input side and able to shut off the power to drive when overloaded.	
		Control Circuit Wiring	
☐	12	Twisted-pair cables are used for all drive control circuit wiring.	
☐	13	Shielded cables are connected to the terminals.	
☐	14	Options (if any) are properly installed.	
☐	15	No wiring mistakes.	
☐	16	Do not use a buzzer to check wiring.	
☐	17	The control circuit terminal screws are tightened.	
☐	18	No cable clippings or screws are left inside the drive enclosure.	
☐	19	Control circuit wiring and main circuit wiring are separated.	

Chapter 5 | Keypad and Parameters

5.1 Keypad

Use the keypad to enter RUN and STOP commands, display data, fault, alarm and set parameters. The keypad of EVO 8000 series can be removed and connected to the drive using an extension cable. The remote keypad can be mounted on control panels with screws thread M4 X P0.7 and the screw length longer than the thickness of panel door.

5.1.1 Keys and Displays
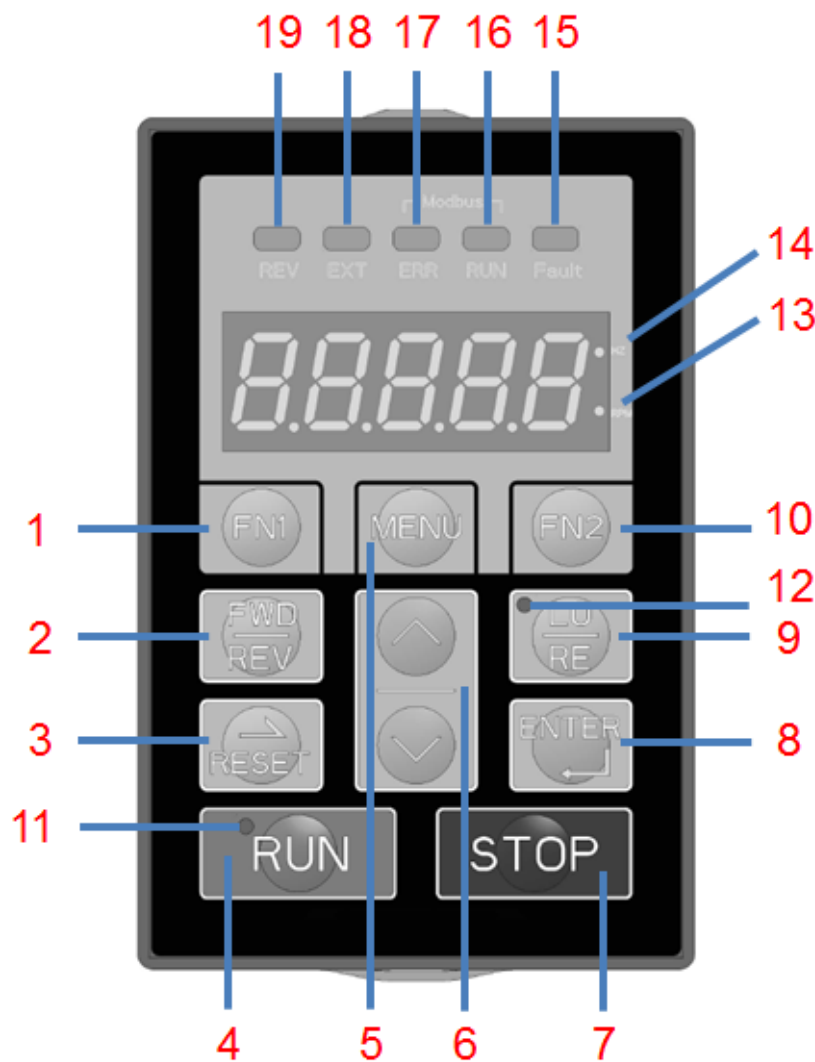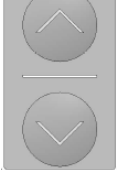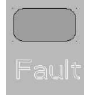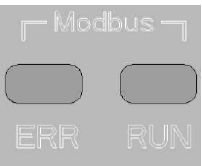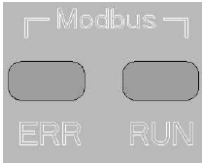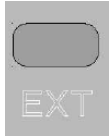
Figure 5.1.1 Keypad

Table 5.1.1 Keypad Keys and Displays

No	Display	Name	Function
1	FN1	FN1 Key	User-defined function key for Quick Setting Mode
2	FWD REV	FWD/REV Key	Forward/reverse selection
3	RESET	RESET Key	■ Moves the cursor to the right ■ Resets the drive to clear a fault situation
4	RUN	RUN Key	Runs the drive
5	MENU	MENU Key	■ Enters or exits the parameter group ■ Switches the displayed menu
6	UP/DOWN	UP/DOWN Key	Selects parameter numbers, increments and decrements setting value and frequency
7	STOP	STOP Key	Stops the drive
8	ENTER	ENTER Key	■ Enters parameter value, parameter and setting ■ Enters parameter setting menu.
9	LO RE	LO/RE Selection Key	Switches drive control between the keypad (LOCAL) and an external source (REMOTE)
10	FN2	FN2 Key	Retain
11	RUN	RUN Light	Refer to Table 5.1.2.2
12	LO RE	LO/RE Light	Refer to Table 5.1.2.2
13	RPM	RPM Light	Refer to Table 5.1.2.2
14	HZ	Hz Light	Refer to Table 5.1.2.2
15	Fault	Fault Light	Refer to Table 5.1.2.2

16		Modbus RUN Light	Refer to Table 5.1.2.2
17		Modbus ERR Light	Refer to Table 5.1.2.2
18		EXT Light	Refer to Table 5.1.2.2
19		REV Light	Refer to Table 5.1.2.2

5.1.2 Keypad Display

5.1.2.1 LED Display

Table 5.1.2.1 LED Display

Number /Letter	LED Display	Number /Letter	LED Display	Number /Letter	LED Display	Number /Letter	LED Display
0	0	9	9	i	i	r	r
1	1	A	A	J	J	S	S
2	2	b	b	K	Nil	t	t
3	3	c	c	L	L	U	U
4	4	d	d	M	Nil	v	v
5	5	E	E	n	n	W	Nil
6	6	F	F	o	o	X	Nil
7	7	G	G	P	P	y	Nil
8	8	H	H	q	Nil	Z	Nil

5.1.2.2 LED Indication

Table 5.1.2.2 LED Indication

Indicator Light	Lit	Blinking	Off
RUN	Drive in operation	■ Drive in deceleration ■ Output frequency below the minimum frequency	Drive not in operation
LO RE	Control from Local	Nil	Control from Remote
RPM	Displaying output speed	Nil	Nil
HZ	Displaying output frequency	Nil	Nil
Fault	During fault	Nil	Normal operation
bus RUN	Communication connected	Nil	Nil
Mod ERR	Communication error	Nil	Nil
EXT	Allows Run commands only from a remote source	Nil	Allows Run commands only from keypad
REV	Rotating reversely	Nil	Nil

5.1.3 Keypad Programming

■ Keypad Display Menu Structure

A. Standard setting mode: Press MENU to enter or exit the parameter group. Press ENTER, MENU, UP, DOWN and RESET to monitor and edit settings.
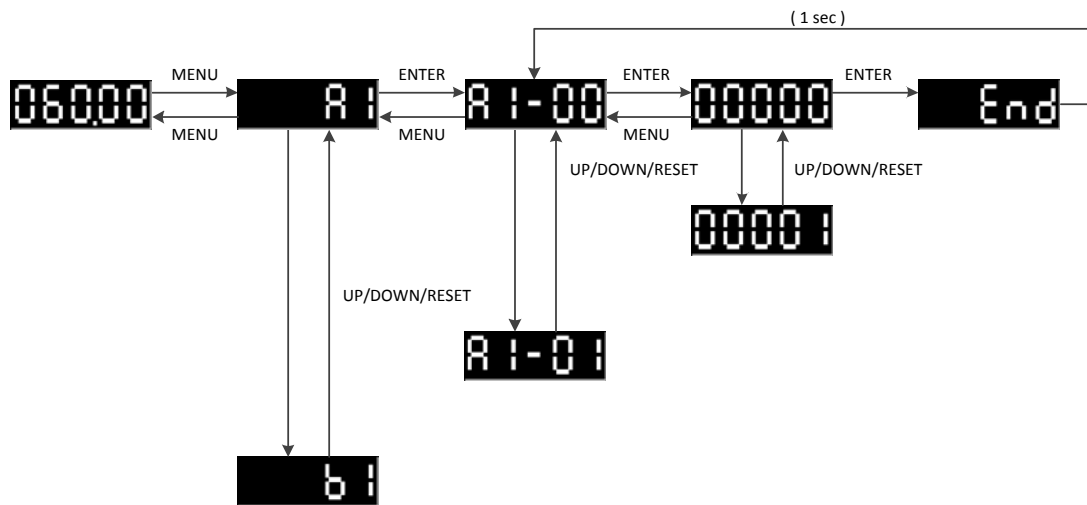
B. Quick setting mode: User must assign the function to the FN1 key in advance so as to quickly set the parameter by pressing FN1 key.
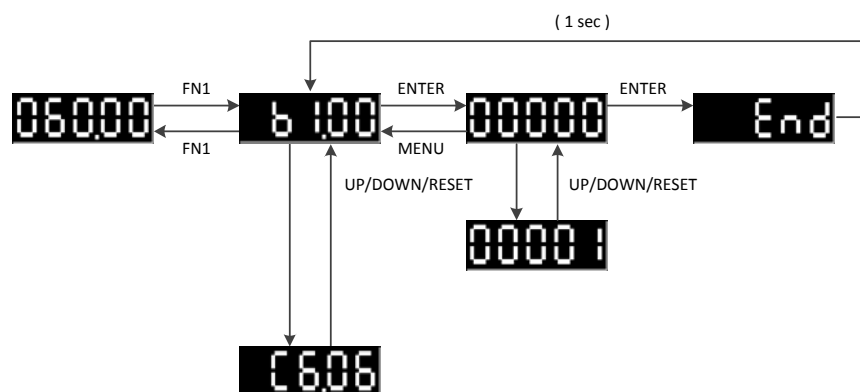
C. Quick monitor mode: Press FN2 key to quickly monitor part of the parameters and press UP and Down key to switch the parameter.
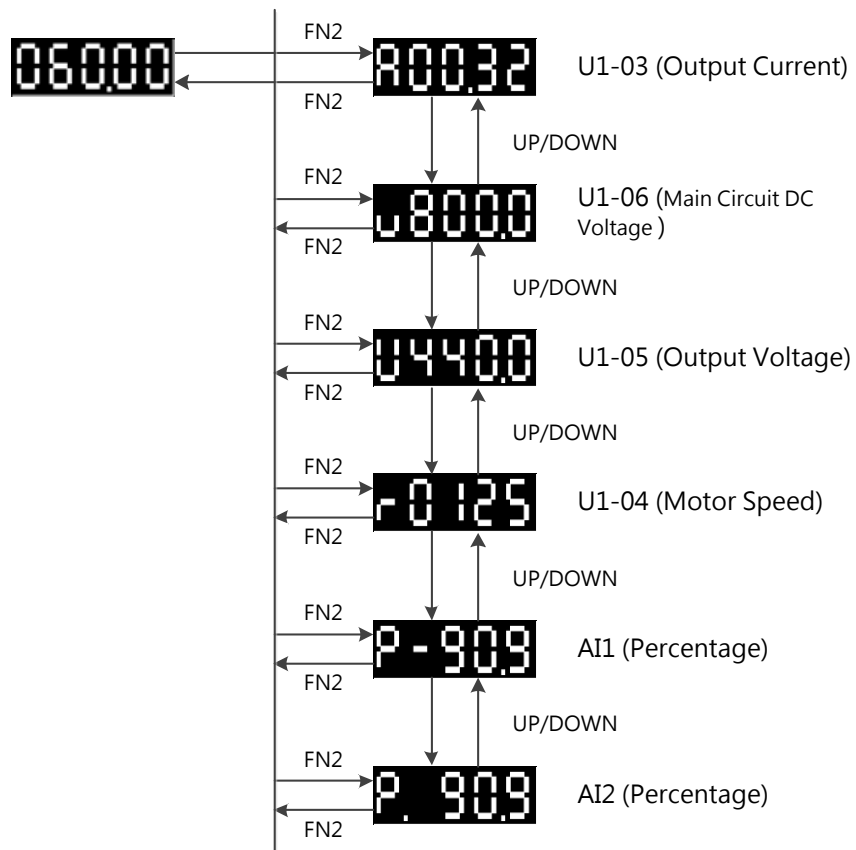
D. During-operation setting mode: Drive frequency is adjustable during operation in Local mode
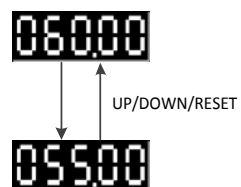
5.2 Parameter List

Parameter	Name	Description	Setting Range
		Group A, Initialization	
		A1: Basic Settings	

A1-01 <4>	Access Level Selection	Selects access level (edit /view)
		0: View Only
		  Access to only parameter A1-01
		1: User-Defined Parameter Access
		  Access to only parameter A1-01 and A2-00 to A2-31
		2: All Parameter Access
		  All parameters can be edited and viewed
			Default: 2
			Range: 0, 1, 2

A1-02	Control Method Selection	0: Open-Loop V/F Control 1: Closed-Loop V/F Control 2: Open-Loop Vector Control 3: Closed-Loop Vector Control 4: PM Open-Loop Vector Control 5: PM Closed-Loop Vector Control 6: Closed-Loop Torque Control 7: Position Control	Default: 0 Min.: 0 Max.: 7
A1-03	Reset	Resets parameter settings to defaults. After resetting parameters, the value will become 0. 2538: Resets 2-Wire Sequence/ 50Hz / 380V 2541: Resets 2-Wire Sequence / 50Hz / 415V 2544: Resets 2-Wire Sequence / 50Hz / 440V 2546: Resets 2-Wire Sequence / 50Hz / 460V 2638: Resets 2-Wire Sequence / 60Hz / 380V 2641: Resets 2-Wire Sequence / 60Hz / 415V 2644: Resets 2-Wire Sequence / 60Hz / 440V 2646: Resets 2-Wire Sequence / 60Hz / 460V 3538: Resets 3-Wire Sequence / 50Hz / 380V 3541: Resets 3-Wire Sequence / 50Hz / 415V 3544: Resets 3-Wire Sequence / 50Hz / 440V 3546: Resets 3-Wire Sequence / 50Hz / 460V 3638: Resets 3-Wire Sequence / 60Hz / 380V 3641: Resets 3-Wire Sequence / 60Hz / 415V 3644: Resets 3-Wire Sequence / 60Hz / 440V 3646: Resets 3-Wire Sequence / 60Hz / 460V	Default: 0 Range: 0 to 3646

Parameter	Name	Description	Setting Range
A1-04	Password	Set password to parameter A1-05 and enter the password to parameter A1-04 to unlock it. Parameters A1-01 to A1-03, A1-06, A2-01 to A2-32 cannot be edited until correct password is entered to A1-04	Default: 0000 Min.: 0000 Max.: 9999
A1-05	Password Setting		
A1-06	ND/HD Selection	0: Heavy Duty (HD) 1: Normal Duty (ND)	Default: 0 Range: 0, 1
A2: User-Defined Parameters			
A2-00 to A2-31	User-Defined Parameters 1 to 32	Selects up to 32 parameters and assigns them to parameter A2-00 to A2-31. Saved parameters can be viewed in User-Defined Parameter Access. To assign specific parameters to A2-00 to A2-31, set parameter A1-01 to 2. The saved parameters A2-00 to A2-31 can only be viewed if A1-01 is set to 1	Range: A1-00 to F1-18
A2-32	User-Defined Parameter Automatic Save	Saves the most recently edited parameters. 0: Do not save list of recently edited parameters 1: Save list of recently edited parameters	Default: 1 Range: 0, 1

Group b, Application

b1: Operation Mode Selection

Parameter	Name	Description	Setting Range
b1-00	Frequency Command Selection 1	0: Keypad 1: Control Circuit Terminal (Analog Input) 2: Terminal Up/Down 3: Modbus Communication 4: Pulse Train Input (Including PWM signal input)	Default: 1 Min.: 0 Max.: 4
b1-01	Run Command Selection 1	0: Keypad 1: Control Circuit Terminal (Sequence Control Input) 2: Modbus Communication	Default: 1 Range: 0, 1, 2
b1-02	Stopping Method Selection	0: Ramp to Stop 1: Coast to Stop 2: DC Braking to Stop 3: Coast to Stop with Timer	Default: 0 Min.: 0 Max.: 3
b1-03	Reverse Rotation Selection	0: Reverse Rotation Enabled Drive accepts a run command of both forward and reverse directions 1: Reverse Rotation disabled	Default: 0 Range: 0, 1

Parameter	Name	Description	Setting Range
		Drive can accept only run command of forward direction	
b1-05	Run Command Action after Switch	0: Ignore Active Run Command at the New Source If a Run command at the new source is active, the drive will not start or the drive will stop operation if it was running when switching from the old source to the new source. The drive can start only when the Run command is removed and given again. 1: Accept Active Run Command at the New Source If a run command at the new source is active, the drive will accept it and run the motor immediately right after switching from the old source to the new source.	Default: 0 Range: 0, 1
b1-06	Run Command Selection during Programming	0: Run command disabled during Programming 1: Run command enabled during Programming 2: Prohibit programming during run 　The programming mode cannot be displayed during run except for monitoring parameter Group U.	Default: 0 Range: 0, 1, 2
b1-07	Frequency Command Selection 2	Enabled while E1-00 to E1-07 is set to 4 and the DIP switch is set to OFF 0: Keypad 1: Control Circuit Terminal (Analog Input) 2: Terminal Up/Down 3: Modbus Communication 4: Pulse Train Input (Including PWM signal input)	Default: 0 Min.: 0 Max.: 4
b1-08	Run Command Selection 2	Enabled while E1-00 to E1-07 is set to 4 and the DIP switch is set to OFF 0: Keypad 1: Control Circuit Terminal (Sequence Control Input) 2: Modbus Communication	Default: 0 Range: 0, 1, 2
b1-09 <7>	Frequency superposition Selection	0: Disabled 1: Enabled	Default: 0 Range: 0, 1
b1-10	Run Command at Power up	Determines to accept or ignore an active Run command from Remote during power up.	Default: 0 Range: 0, 1

Parameter	Name	Description	Setting Range
		0：Ignore 　Drive ignores an active run command during 　power up 1：Accept 　Drive accepts an active run command at power 　up and runs the motor immediately.	
b1-12 <7>	Local/ Remote switching Enable during Operating	0 ：Disabled 1 ：Enabled	Default： 0 Range: 0, 1
		b2: DC Braking	
b2-00	Zero Speed Holding (DC Braking) Start Level	Sets the start frequency for Zero Speed Holding (DC braking). Enabled when b1-02 (Stopping Method Selection) is set to 0 (Ramp to Stop)	Default: 0.5Hz Min.: 0.0 Hz Max.: 10.0 Hz
b2-01	DC Braking Current	Sets the DC braking current as a percentage of the drive rated current	Default: 50% Min.: 0% Max.: 100%
b2-02	DC Braking Time at Start	Sets the DC braking time at start to stop a coasting motor before restarting it or to apply braking torque at start when high starting torque is needed. Disabled when set to 0.00.	Default: 0.00 s Min.: 0.00 s Max.: 99.99 s
b2-03	DC Braking Time at Stop	Sets the DC braking time at stop to stop a motor rotating with high inertia. Disabled when set to 0.00.	Default: Determined by A1-02 Min.: 0.00s Max.: 99.99s
		b3: Speed Search	
b3-00	Speed Search Setting	0 :Disabled 1 :Enabled and searched from the highest 　frequency 2 : Enabled and searched from the frequency 　command 3 :Retain 4 :Retain	Default: 0 Range: 0, 1, 2
b3-01	Speed Search Operating Current	Sets the current level as a percentage of the drive rated current below which Speed Search is deactivated.	Default: 80% Min.: 0 % Max.: 100%
		b4: Timer Function	
b4-00	Timer Function On-Delay Time	Sets the on-delay and off-delay time to switch on/off the timer output.	Default: 0.1 s Min.: 0.1 s

Parameter	Name	Description	Setting Range
			Max.: 3000.0 s
b4-01	Timer Function Off-Delay Time		Default: 0.0 s Min.: 0.0 s Max.: 3000.0 s
	b5: PID Control		
b5-00	PID Control Setting	0 : PID Control Disabled 1 : PID Control Enabled (D Control for Deviation Signal U4-01) 2 : PID Control Enabled (D Control for Feedback Signal U4-05) 3 : PID Control Enabled (Frequency Command + PID Output from D Controlled Deviation) 4 : PID Control Enabled (Frequency Command + PID Output from D Controlled Feedback)	Default: 0 Min.: 0 Max.: 4
b5-01 <4>	Proportional Gain Setting (P)	Sets the P gain for PID input.	Default: 1.00 Min.: 0.00 Max.: 25.00
b5-02 <4>	Integral Time Setting (I)	Deviation appears between PID target value and feedback value when using only proportional control. To reduce the deviation, set integral time (I).	Default: 1.0 s Min.: 0.0 s Max.: 360.0 s
b5-03 <4>	Integral Time (I) Limit Setting	Sets the maximum output from the I (integral) control as a percentage of the maximum frequency (d1-02)	Default: 100.0% Min.: 0.0% Max.: 100.0%
b5-04 <4>	Derivative Time (D)	Sets derivative time for D control.	Default: 0.00 s Min.: 0.00 s Max.: 10.00 s
b5-05 <4>	PID Output Limit	Sets the maximum output from PID control as a percentage of the maximum frequency.	Default: 100.0% Min.: 0.0% Max.: 100.0%
b5-06 <4>	PID Bias Voltage Adjustment	Sets the PID bias voltage adjustment as a percentage of the maximum frequency to add to the PID control output.	Default: 0.0% Min.: -100.0% Max.: 100.0%
b5-07 <4>	PID Primary Delay Time	Sets the delay time for the PID output filter.	Default: 0.00 s Min.: 0.00 s Max.: 10.00 s
b5-08	PID Output Selection	0 : Normal PID Output 1 : Reverse PID Output Reverses the +/- sign of the PID output	Default: 0 Range: 0, 1
b5-09	PID Output Gain	Sets a PID output gain	Default: 1.00

Parameter	Name	Description	Setting Range
			Min.: 0.00 Max.: 25.00
b5-10	PID Output Reverse Selection	Determines whether or not a negative PID output reverses the drive rotating direction. 0 : Reverse Disabled 1 : Reverse Enabled	Default: 0 Range: 0, 1

b5-11	PID Feedback Low /High Detection Selection	0 : Multi-Function Output Only
		1 : Feedback Low /High Alarm
		   The drive continues operation when an alarm is displayed)
		2 : Feedback Low /High Fault
		   A fault will cause the drive to stop the motor.
		3 : Multi-Function Output only when PID is Disabled
		   Same action as b5-11=0.
		4 : Feedback Low /High Alarm (detection disabled when PID is disabled)
		5 : Feedback Low /High Fault (detection disabled when PID is disabled)
		6 : Multi-Function Output (Keep running without an alarm displayed)
		7 : Multi-Function Output Only (detection working when drive running or not)
			Default: 0
			Min.: 0
			Max.: 7

b5-12	PID Feedback Low Detection Level	Sets the PID feedback level used for detection. When the PID feedback falls below this level for longer than the time set to b5-13, PID feedback loss will be detected.	Default: 0% Min.: 0% Max.: 100%
b5-13	PID Feedback Low Detection Time	Sets the PID feedback time used for detection. When the PID feedback falls below the level set to b5-12 for longer than this time, PID feedback loss will be detected.	Default: 1.0 s Min.: 0.0 s Max.: 25.5 s
b5-14	PID Sleep Start Level	Sets the PID level to trigger the drive to sleep.	Default: 0.0Hz Min.: 0.0 Hz Max.:<5>
b5-15	PID Sleep Delay Time	Sets the delay time used to activate/deactivate the PID Sleep function. When this parameter is set to 0.0, PID Sleep function will be stopped.	Default: 0.0 s Min.: 0.0 s Max.: 25.5 s
b5-16	PID Command Acc./Dec. Time	Sets the PID command acceleration /deceleration time used for PID target soft-start function.	Default: 0.0 s Min.: 0.0 s Max.: 200.0 s
b5-17	PID Target	0 :PID Target Disabled	Default: 0

Parameter	Name	Description	Setting Range
	Selection	1 : PID Target Enabled	Range: 0, 1
b5-18	PID Target Value	Sets the PID target value as a percentage of the maximum output frequency when b5-17=1 and no other ananlog input sets the PID Target.	Default: 0.00% Min.: 0.00% Max.: 100.00%
b5-19	PID Target Value Units	0 : 0.01Hz 1 : 0.01% (Maximum Frequency is 100%) 2 : r/min. (Number of Motor Poles must be set) 3 : User Defined (Defined by b5-24 and b5-25)	Default: 1 Range: 0, 1, 2, 3
b5-20 <7>	PID Output Lower Limit	Sets the lower limit as a percentage of the maximum output frequency set in d1-02 for PID output.	Default: 0.0% Min.: -100.0% Max.: 100.0%
b5-21 <7>	PID Input Limit	The higher PID Input value is, the higher PID output value will be. Sets this parameter to limit the PID input value.	Default: 1000.0% Min.: 0.0% Max.: 1000.0%
b5-22	PID Feedback High Detection Level	Sets the level for PID feedback high detection as a percentage of the maximum output frequency. PID feedback high will be detected when the feedback exceeds the level set in b5-22 for longer than the time set in b5-23.	Default: 100% Min.: 0% Max.: 100%
b5-23	PID Feedback High Detection Time	Sets the time for PID feedback high detection. PID feedback high will be detected when the feedback exceeds the level set in b5-22 for longer than the time set in b5-23.	Default: 1.0 s Min.: 0.0 s Max.: 25.5 s
b5-24	PID Target Display Value	Sets a value to display to U4-00 and U4-03 when the drive runs at the maximum output frequency	Determined by b5-19 Min.: 1 Max.: 60000
b5-25	PID Target Display Digits	Sets the number of decimal places to display. 0 : No Decimal Places 1 : 1 Decimal Place 2 : 2 Decimal Places 3 : 3 Decimal Places	Determined by b5-19 Min.: 0 Max.: 3
b5-26 <7>	Frequency Command Display During PID	0 : Displays frequency command after the PID compensation. 1 : Displays frequency command before the PID compensation.	Default: 0 Range: 0, 1
b5-27 <7>	PID Output Direction 2	Sets the direction when PID output value is minus. 0 : Reverse is not allowed. 1 : Reverse is allowed.	Default: 1 Range: 0, 1
b5-28	PID Disconnection	When a PID feedback disconnection alarm	Default: 30.0 Hz

Parameter	Name	Description	Setting Range
	Output Frequency	occurs, the drive will run at the frequency set to b5-28, and return to PID control when disconnection alarm is reset.	Min.:0.0Hz Max.: Determined by d1-02, L2-00, d1-13
		b6: Dwell Function	
b6-00	Dwell Frequency at Start	Sets the frequency to b6-00 used to be held for the time set in b6-01 during acceleration.	Default: Determined by A1-02 Min.: 0.0 Hz Max.: Determined by d1-02, L2-00, d1-13
b6-01	Dwell Time at Start		Default: 0.0 s Min.: 0.0 s Max.: 10.0 s
b6-02	Dwell Frequency at Stop	Sets the frequency to b6-02 used to be held for the time set in b6-03 during deceleration.	Default: 0.0Hz Min.: 0.0 Hz Max.: Determined by d1-02, L2-00, d1-13
b6-03	Dwell Time at Stop		Default: 0.0 s Min.: 0.0 s Max.: 10.0 s
		b7: Droop Function	
b7-00	Droop Control Gain	Sets the amount of speed reduction when the torque reference is 100%. The gain is set as a percentage of the maximum output frequency. A setting of 0.0% disables the Droop control function.	Default: 100% Min.: 0% Max.: 100%
b7-01	Droop Control Delay Time	Adjusts the responsiveness of Droop control. Reduce the setting if the reaction time is too long, and increase the setting if hunting occurs.	Default: 0.05 s Min.: 0.03 s Max.: 2.00 s
b7-02	Droop Control Limit Selection	0 : Droop Control Limit Disabled 1 : Droop Control Limit Enabled	Default: 1 Min.: 0 Max.: 1
		b9 : Position Control / Zero Speed Holding<7>	
b9-00	Position Control/ Zero Speed Holding Gain	Sets the response of Zero Speed Holding in FOC with PG control method or response of Position Control in Position Control control method.	Default: 5% Min.: 0% Max.: 100%
b9-01	Zero Speed Holding Stop Width	Sets the signal output width in which the Zero Speed Holding function will stop.	Default: 12 pulse Min.: 0 pulse Max.: 4096 pulse
b9-02	Zero Speed	0 : Zero Speed Holding Disabled.	Default: 0

Parameter	Name	Description	Setting Range
	Holding On/ Off	Drive coasts to stop when the frequency is zero. 1 ： Zero Speed Holding Enabled. Zero Speed Holding starts when the frequency is zero. The holding current is set in b2-01 and it will be limited to below 20% of the drive rated current.	Min.: 0 Max.: 1
b9-03	Zero Speed Holding Time	Sets the Zero Speed Holding time. Drive will coast to stop when the Zero Speed Holding time is longer than this setting. Set 00.00 to disable Zero Speed Holding or set 99.99 to enable this function continuesely .	Default： 0.10sec Min.: 00.00sec Max.: 99.99sec
b9-04	Position Control Input Command Direction	0 : Forward 1 : Reverse	Default： 0 Min.: 0 Max.: 1

Group C, Tuning

C1: Acc./Dec. Time

Parameter	Name	Description	Setting Range
C1-00 <4>	Acceleration Time 1	Sets the time that the drive accelerates from 0Hz to the maximum output.	
C1-01 <4>	Deceleration Time 1	Sets the time that the drive decelerates from the maximum output to 0Hz.	
C1-02 <4>	Acceleration Time 2	Sets the time that the drive accelerates from 0Hz to the maximum output.	
C1-03 <4>	Deceleration Time 2	Sets the time that the drive decelerates from the maximum output to 0Hz.	
C1-04 <4>	Acceleration Time 3 (Acceleration Time 1 for Motor 2)	Sets the time that the drive accelerates from 0Hz to the maximum output.	Default: 10.0 s Min.: 0.0 s Max.: 6000.0 s
C1-05 <4>	Deceleration Time 3 (Deceleration Time 1 for Motor 2)	Sets the time that the drive decelerates from the maximum output to 0Hz.	
C1-06 <4>	Acceleration Time 4 (Acceleration Time 2 for Motor 2)	Sets the time that the drive accelerates from 0Hz to the maximum output.	
C1-07 <4>	Deceleration Time 4 (Deceleration Time	Sets the time that the drive decelerates from the maximum output to 0Hz.	

Parameter	Name	Description	Setting Range
	2 for Motor 2)		
C1-08	Fast Stop Time	Sets the time to stop the drive faster.	
C1-09	Acc./Dec. Time Unit Selection	Set the units of time for C1-00 to C1-08. 0 : 0.01 s (0.00 to 600.00 s) 1 : 0.1 s (0.00 to 6000.0 s)	Default: 1 Range: 0, 1
C1-10	Acc./Dec. Time Switch Frequency	Sets the frequency level. The drive will switch the acceleration and deceleration time at this level.	Default: 0.0 Hz Min.: 0.0 Hz Max.: Determined by d1-02, L2-00
C1-11	Jog Acc. Time	Sets the time to accelerate from 0 Hz to Jog Frequency Command (L1-16).	Default: 10.0 s Min.: 0.0 s Max.: 6000.0 s
C1-12	Jog Dec. Time	Sets the time to decelerate from Jog Frequency Command (L1-16) to 0 Hz.	Default: 10.0 s Min.: 0.0 s Max.: 6000.0 s
C2: S-Curve Characteristics			
C2-00	S-Curve Characteristic at Acc. Start	Sets S-curve times for each acceleration or deceleration. Actual Acceleration Time= Determined Acc. Time+(C2-00+C2-01)/ 2 Actual Deceleration Time= Determined Dec. Time+(C2-02+C2-03) / 2	Default: 0.20 s Min.: 0.00 s Max.: 10.00 s
C2-01	S-Curve Characteristic at Acc. End		Default: 0.20 s Min.: 0.00 s Max.: 10.00 s
C2-02	S-Curve Characteristic at Dec. Start		Default: 0.20 s Min.: 0.00 s Max.: 10.00 s
C2-03	S-Curve Characteristic at Dec. End		Default: 0.20 s Min.: 0.00 s Max.: 10.00 s
C3: Torque Compensation			
C3-00 <4>	Torque Compensation Gain	Sets the gain for the motor 1 Torque compensation	Default: Determined by A1-02 Min.:0.00 Max.:2.50
C3-01	Motor 2 Torque Compensation Gain	Sets the gain for the motor 2 Torque compensation	Default: Determined by A1-02 Min.: 0.00 Max.: 2.50

Parameter	Name	Description	Setting Range
C3-02 <4>	Torque Compensation Primary Delay Time	Sets the Torque compensation primary delay time.	Default: Determined by A1-02 Min.: 0 ms Max.:10000 ms
C3-03	Torque Compensation Primary Delay Time 2	Sets the delay time used during motor regeneration or Speed Search.	Default: 150ms Min.: 0 ms Max.: 10000 ms
C3-04	Torque Compensation at Start (Forward)	Sets the torque compensation at start with forward rotation as a percentage of the motor rated torque	Default: 0.0% Min.: 0.0% Max.: 200.0%
C3-05	Torque Compensation at Start (Reverse)	Sets the torque compensation at start with reverse rotation as a percentage of the motor rated torque	Default: 0.0% Min.: -200.0% Max.: 0.0%
C3-06	Torque Compensation Time at Start	Sets the time to apply the torque compensation at start determined by C3-04, C3-05.	Default: 10 ms Min.: 0 ms Max.: 200 ms
C4: ASR (Automatic Speed Regulator)			
C4-00 <4>	ASR Proportional Gain 1 (P)	Sets the ASR proportional gain 1.	Default: Determined by A1-02 Min.: 0.00 Max.: 300.00
C4-01 <4>	ASR Integral Time 1 (I)	Sets the ASR integral time 1.	Default: Determined by A1-02 Min.: 0.000 s Max.: 10.000 s
C4-02 <4>	ASR Proportional Gain 2 (P)	Sets the ASR proportional gain 2.	Default: Determined by A1-02 Min.: 0.00 Max.: 300.00
C4-03 <4>	ASR Integral Time 2 (I)	Sets the ASR integral time 2.	Default: Determined by A1-02 Min.: 0.000 s Max.: 10.000 s
C4-05	ASR Primary Delay Time	Sets the primary delay time when the torque command is given by ASR.	Default: Determined by A1-02 Min.: 0.000 s Max.: 0.500 s

Parameter	Name	Description	Setting Range
C4-06	ASR Gain Switching Frequency	Sets the frequency to switch between C4-00 and C4-02 (ASR proportional gain), and between C4-01 and C4-03 (ASR integral time 1, 2).	Default: 0.0 Hz Min.: 0.0 Hz Max.: Determined by d1-02, L2-00
C4-11 <4>	Motor 2 ASR Proportional Gain 1 (P)	Sets the motor 2 ASR proportional gain.	Default: Determined by d1-12 Min.: 0.00 Max.: 300.00
C4-12 <4>	Motor 2 ASR Integral Time 1	Sets the motor 2 ASR integral time.	Default: Determined by d1-12 Min.: 0.000 s Max.: 10.000 s
C4-13 <4>	Motor 2 ASR Proportional Gain 2 (P)	Sets the motor 2 ASR proportional gain 2.	Default: Determined by d1-12 Min.: 0.00 Max.: 300.00
C4-14 <4>	Motor 2 ASR Integral Time 2	Sets the motor 2 ASR integral time 2.	Default: Determined by d1-12 Min.:0.000 s Max.:10.000 s
C4-16	Motor 2 ASR Primary Delay Time	Sets the motor 2 primary delay time when the torque command is given by ASR	Default: Determined by d1-12 Min.:0.000 s Max.:0.500 s
C4-17	Motor 2 ASR Gain Switching Frequency	Sets the frequency to switch between C4-00 and C4-02 (ASR proportional gain), and between C4-01 and C4-03 (ASR integral time 1, 2).	Default: 0.0 Hz Min.:0.0 Hz Max.: Determined by d1-02, L2-00
C5: Slip Compensation			
C5-00 <4>	Slip Compensation Gain	Sets the slip compensation gain to improve the speed accuracy for heavy loads.	Default: Determined by A1-02 Min.: 0.0 Max.: 2.5
C5-01 <4>	Slip Compensation Primary Delay Time	Sets the slip compensation primary delay time to stabilize the motor speed or to improve the speed response.	Default: Determined by A1-02 Min.: 0 ms Max.:10000ms
C5-02	Slip Compensation Limit	Sets the maximum slip compensation as percentage of the rated slip for motor 1.	Default: 200% Min.: 0 % Max.: 250 %

Parameter	Name	Description	Setting Range
C5-08 <4>	Motor 2 Slip Compensation Gain	Sets the slip compensation gain to improve the speed accuracy for heavy loads at motor 2.	Default: Determined by d1-12 Min.: 0.0 Max.: 2.5
C5-09 <4>	Motor 2 Slip Compensation Primary Delay Time	Sets the slip compensation primary delay time to stabilize the motor 2 speed or to improve the speed response.	Default: Determined by d1-12 Min.: 0 ms Max.:10000ms
C5-10	Motor 2 Slip Compensation Limit	Sets the motor 2 maximum slip compensation as percentage of the rated slip for motor 1.	Default: 200% Min.: 0 % Max.: 250 %
C6: Carrier Frequency			
C6-00	Carrier Frequency Selection	Sets the switching frequency of the drive output transistors. Adjust this setting to reduce audible noise and leakage current. 0: Determined by C6-01 to C6-03 1: Retain 2: 2.0 kHz 3: 3.0 kHz 4: 4.0 kHz 5: 5.0 kHz 6: 6.0 kHz 7: 7.0 kHz 8: 8.0 kHz 9: 9.0 kHz 10: 10.0 kHz 11: 11.0 kHz 12: 12.0 kHz 13: 13.0 kHz 14: 14.0 kHz 15: 15.0 kHz 16: 16.0 kHz	Default: Determined by A1-02 and o2-03. Once A1-06 is redefined, the default will be changed accordingly Min.: 0 Max.: 16
C6-01	Maximum Carrier Frequency	Set 0 to parameter C6-00 to enable this setting. Sets the maximum and minimum carrier frequency in V/F Control that the drive will adjust carrier frequency according to the output frequency.	Default: Determined by C6-00 Min.: 2.0 kHz Max.: 16.0 kHz
C6-02	Minimum Carrier Frequency		Default: Determined by C6-00 Min.: 2.0 kHz Max.: 16.0 kHz

Parameter	Name	Description	Setting Range
C6-03	Carrier Frequency Proportional Gain		Default: Determined by C6-00 Min.: 0 Max.: 99
Group L, Frequency Command			
L1: Frequency Command			
L1-00 <4>	Frequency Command 1	To use speed commands for each multi-step speed, set E1-□□ to 5, 6, 7 and 8 (multi-step speed command 1, 2, 3, 4). Sets E1-□□ to 9 for Jog frequency command. The upper limit is determined by d1-02 and L2-00. In PM Closed-Loop Vector Control, o1-00 will be automatically set to 1 with the unit set to %. When L2-00 (Frequency Upper Limit) is adjusted, the exceeded frequency in L1-00 to L1-15 will be automatically set to the upper limit determined in L2-00.	Default:5.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-01 <4>	Frequency Command 2		Default: 8.00 Hz Min.: 0.00 Hz Max.: Determined by d1-02, L2-00
L1-02 <4>	Frequency Command 3		Default: 10.00Hz Min.: 0.00 Hz Max.: Determined by d1-02, L2-00
L1-03 <4>	Frequency Command 4		Default: 12.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-04 <4>	Frequency Command 5		Default: 15.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-05 <4>	Frequency Command 6		Default: 20.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-06 <4>	Frequency Command 7		Default: 25.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-07 <4>	Frequency Command 8		Default: 30.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-08	Frequency		Default: 35.00Hz

Parameter	Name	Description	Setting Range
<4>	Command 9		Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-09 <4>	Frequency Command 10		Default: 40.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-10 <4>	Frequency Command 11		Default: 42.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-11 <4>	Frequency Command 12	To use speed commands for each multi-step speed, set E1-□□ to 5, 6, 7 and 8 (multi-step speed command 1, 2, 3, 4). Sets E1-□□ to 9 for Jog frequency command.	Default: 45.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-12 <4>	Frequency Command 13	The upper limit is determined by d1-02 and L2-00.	Default: 50.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-13 <4>	Frequency Command 14	In PM Closed-Loop Vector Control, o1-00 will be automatically set to 1 with the unit set to %.	Default: 50.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-14 <4>	Frequency Command 15	When L2-00 (Frequency Upper Limit) is adjusted, the exceeded frequency in L1-00 to L1-15 will be automatically set to the upper limit determined in L2-00.	Default: 50.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-15 <4>	Frequency Command 16		Default: 50.00Hz Min.: 0.00Hz Max.: Determined by d1-02, L2-00
L1-16 <4>	Jog Frequency Command	Sets the Jog frequency command.	Default: 6.00 Hz Min.: 0.00Hz Max.: 400.00 Hz
	L2: Frequency Upper/ Lower Limit		
L2-00	Frequency Command Upper Limit	Sets the upper limit as a percentage of the maximum output frequency	Default: 100.0 % Min.: 0.0 % Max.: 110.0 %
L2-01	Frequency Command Lower	Sets the lower limit as a percentage of the maximum output frequency	Default: 0.0% Min.: 0.0 %

Parameter	Name	Description	Setting Range
	Limit		Max.: 110.0 %
		L3: Jump Frequency	
L3-00	Jump Frequency 1	Sets the Jump frequency range to avoid operation at the speed causing resonance in the machinery. Set L3-00 to L3-03 to 0.0 Hz to disable Jump frequency. When setting more than 1 Jump frequency, follow the condition below. L3-00 $\leqq$ L3-01 $\leqq$ L3-02	Default: 0.0 Hz Min.: 0.0 Hz Max.: Determined by d1-02, L2-00
L3-01	Jump Frequency 2		
L3-02	Jump Frequency 3		
L3-03	Jump Frequency Range	Sets the Jump frequency range to avoid.	Default: 1.0 Hz Min.: 0.0 Hz Max.: d1-02
		L4: Frequency Command Hold and Up/Down 2 Command	
L4-00	Up/ Down Frequency Command Hold	Determines whether or not to save the frequency command or the frequency bias (Up/Down 2) value when the Stop command is entered or the power supply is shut off. 0 : Clear the Up/Down frequency at stop 1 : Save the Up/Down frequency at stop 2 : Accept the Up/Down frequency at stop	Default: 0 Range: 0, 1, 2
L4-01 <4>	Frequency Command Bias (Up/Down 2)	Sets the bias used to add to or subtract from the frequency command by Up/Down 2.	Default:0.00 Hz Min.: 0.00 Hz Max.: 99.99 Hz
L4-02 <4>	Frequency Command Acc./Dec Setting (Up/Down 2)	Sets the acceleration/deceleration times to increase or decrease the frequency command bias for Up/Down 2. 0 : Current Acc./Dec. Time 1 : Acc./Dec. Time 4 set in C1-06 and C1-07	Default: 0 Range: 0, 1
L4-03 <4>	Up/Down Frequency Command Save	Saves the frequency command from Up/Down 1 or Up/Down 2	Default: 0.00Hz Min.: 0.00 Hz Max.: Determined by d1-02, d1-13 and L2-00
L4-04	Frequency Command Hold	0: Disabled 1: Enabled	Default: 0 Range 0, 1
		L5 : Torque Control	
L5-00	Torque Command	Apply a filter with the time constant set to	Default : 0 ms

Parameter	Name	Description	Setting Range
	Delay Time	parameter d5-02 to the torque reference signal to eliminate oscillation resulting from an unstable torque reference signal. Increase the setting when oscillation occurs during torque control.	Min.: 0 ms Max.: 1000 ms
L5-01	Speed Limit Selection	Selects the speed limit for Torque Control. 1 : Frequency Command (b1-00 or b1-07) 2 : L5-02 and L5-03	Default : 1 Min.: 1 Max.: 2
L5-02	Forward Speed Limit	Sets the forward speed limit during Torque Control as a percentage of highest speed when L5-01 = 2.	Default : 10 % Min.: 0 % Max.: 120 %
L5-03	Reverse Speed Limit	Sets the reverse speed limit during Torque Control as a percentage of highest speed when L5-01 = 2.	Default : 10 % Min.: 0 % Max.: 120 %
L5-04	Speed/Torque Control Switch Delay Time	Sets the delay time for switching between Speed Control and Torque Control.	Default : 0 ms Min.: 0 ms Max.: 1000 ms
L5-06 <7>	Torque Command Delay Time 2	Apply a filter with the time constant set to parameter d5-02 to the torque reference signal to eliminate oscillation resulting from an unstable torque reference signal. Increase the setting when oscillation occurs during torque control.	Default : 10 ms Min.: 0 ms Max.: 1000 ms
		L6: Offset Frequency	
L6-00 <4>	Offset Frequency 1	Sets the offset value as a percentage of the maximum output frequency to add to or subtract from the frequency command. Select the offset frequency in E1-□□= 53, 54 and 55 (Offset Frequency 1 to 3).	Default: 0.0% Min.: -100.0% Max.: 100.0%
L6-01 <4>	Offset Frequency 2	Sets the offset value as a percentage of the maximum output frequency to add to or subtract from the frequency command. Select the offset frequency in E1-□□= 53, 54 and 55 (Offset Frequency 1 to 3).	Default: 0.0% Min.: -100.0% Max.: 100.0%
L6-02 <4>	Offset Frequency 3	Sets the offset value as a percentage of the maximum output frequency to add to or subtract from the frequency command. Select the offset frequency in E1-□□= 53, 54 and 55 (Offset Frequency 1 to 3).	Default: 0.0% Min.: -100.0% Max.: 100.0%

Parameter	Name	Description	Setting Range
		Group d, Motor Parameters	
		d1: V/F Characteristics	
d1-00	Input Voltage Setting	Sets the input voltage of the drive. Always set the input voltage of the drive (not motor) to this parameter.	Default: 230 V Min.: 155 V Max.: 255V <3>
d1-01	V/F Pattern Selection	0 : 50 Hz (Constant Torque Characteristic 1) 1 : 60 Hz (Constant Torque Characteristic 2) 2 : 60 Hz (Constant Torque Characteristic 3), 50 Hz base 3 : 72 Hz (Constant Torque Characteristic 4), 60 Hz base 4 : 50 Hz (Derated Torque Characteristic 1) 5 : 50 Hz (Derated Torque Characteristic 2) 6 : 60 Hz (Derated Torque Characteristic 3) 7 : 60 Hz (Derated Torque Characteristic 4) 8 : 50 Hz (High Starting Torque Characteristic 1) 9 : 50 Hz (High Starting Torque Characteristic 2) A : 60 Hz(High Starting Torque Characteristic 3) B : 60 Hz(High Starting Torque Characteristic 4) C : 90 Hz, 60 Hz base D : 120 Hz, 60 Hz base E : 180 Hz, 60 Hz base F : 60Hz (Constant Torque Characteristic) (Default)	Default: F Range: 0 to 9; A to F
d1-02	Maximum Output Frequency	When d1-01 $\leqq$ E, parameters d1-02 to d1-11 can be used to monitor the V/F pattern. When d1-01 = F, parameters d1-02 to d1-11 can be used to create a V/F pattern.	Default: <1> Min.: 25.0 Hz Max.: 400.0 Hz
d1-03	Maximum Voltage		Default: <1> Min.: 0.0 V Max.: 255.0 V <3>
d1-04	Base Frequency		Default: <1> Min.: 0.0 Hz Max.: Defined by d1-02
d1-05	Base Voltage		Default: <1> Min.: 0.0 V Max.: 255.0 V <3>
d1-06	Middle Output Frequency		Default: <1> Min.: 0.0 Hz

Parameter	Name	Description	Setting Range
			Max.: Defined by d1-02
d1-07	Middle Output Frequency Voltage		Default: <1> Min.: 0.0 V Max.: 255.0 V <3>
d1-08	Minimum Output Frequency		Default: <1> Min.: 0.0 Hz Max.: Defined by d1-02
d1-09	Minimum Output Frequency Voltage	When d1-01 ≦ E, parameters d1-02 to d1-11 can be used to monitor the V/F pattern. When d1-01 = F, parameters d1-02 to d1-11 can be used to create a V/F pattern.	Default: <1> Min.: 0.0 V Max.: 255.0 V <3>
d1-10	Middle Output Frequency 2		Default: 0.0 Hz Min.: 0.0 Hz Max.: Defined by d1-02
d1-11	Middle Output Frequency Voltage 2		Default: 0.0 V Min.: 0.0 V Max.: 255.0 V <3>
d1-12	Motor 2 Control Method Selection	0 : Open-Loop V/F Control 1 : Retain 2 : Open-Loop Vector Control 3 : Retain A permanent motor cannot be Motor 2.	Default: 0 Min.: 0 Max.: 3
d1-13	Motor 2 Maximum Output Frequency		Default: <1> Min.: 25.0 Hz Max.: 400.0 Hz
d1-14	Motor 2 Maximum Voltage		Default: <1> Min.: 0.0 V Max.: 255.0 V <3>
d1-15	Motor 2 Base Frequency	Sets the Motor 2 V/F pattern in d1-13 to d1-22.	Default: <1> Min.: 0.0 Hz Max.: Defined by d1-13
d1-16	Motor 2 Base Voltage		Default: <1> Min.: 0.0 V Max.: 255.0 V <3>
d1-17	Motor 2 Middle Output Frequency		Default: <1> Min.: 0.0 Hz Max.: Defined by d1-13

Parameter	Name	Description	Setting Range
d1-18	Motor 2 Middle Output Frequency Voltage		Default: <1> Min.: 0.0 V Max.: 255.0 V <3>
d1-19	Motor 2 Minimum Output Frequency		Default: <1> Min.: 0.0 Hz Max.: Defined by d1-13
d1-20	Motor 2 Minimum Output Frequency Voltage		Default: <1> Min.: 0.0 V Max.: 255.0 V <3>
d1-21	Motor 2 Middle Output Frequency 2		Default: 0.0 Min.: 0.0 Hz Max.: Defined by d1-13
d1-22	Motor 2 Middle Output Frequency Voltage 2		Default: 0.0 V Min.: 0.0 V Max.: 255.0 V <3>
		d2: Motor Parameters	
d2-00	Motor Rated Current	Sets the motor rated current. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 10% of drive rated current Max.: 200% of drive rated current
d2-01	Motor Rated Speed (For Slip Compesation)	Sets the motor rated speed used for slip compesation. This will be set automatically during Auto-Tuning. Alarm OPE17 will be detected when this value is set incorrectly.	Default: o2-03, A1-06 Min.: 0 rpm Max.: 60000 rpm
d2-02	Motor No-Load Current	Sets the motor no-load current. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 0.0 A Max.: d2-00 (excluding d2-00)
d2-03	Number of Motor Poles	Sets the number of motor poles. This will be set automatically during Auto-Tuning.	Default: 4 Min.: 2 Max.: 48
d2-04	Motor Line-to-Line Resistance	Sets the line-to-line resistance. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 0.000 Ω Max.:65.000 Ω
d2-05	Motor Leakage Inductance	Sets the voltage drop caused by the motor leakage inductance relative to the motor rated frequency and current. This will be set	Default: o2-03, A1-06 Min.: 0.00 mH Max.:650.00 mH

Parameter	Name	Description	Setting Range
		automatically during Auto-Tuning.	
d2-06	Motor Rotor Resistance	Sets the motor rotor resistance. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 0.000 Ω Max.:65.000 Ω
d2-07	Motor Mutual Inductance	Sets the motor mutual inductance. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 0.0 mH Max.:6500.0 mH
d2-10	Motor Rated Capacity	Sets the motor rated capacity. This will be set automatically during Auto-Tuning. (1HP = 0.746 kW)	Default: o2-03 Min.: 0.00 kW Max.: 650.00kW
d2-11	Motor 2 Rated Current	Sets Motor 2 rated current. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 10% of drive rated current Max.: 200% of drive rated current
d2-12	Motor 2 Rated Slip	Sets Motor 2 rated slip. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 0.00 Hz Max.: 20.00 Hz
d2-13	Motor 2 No-Load Current	Sets Motor 2 no-load current. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 0 A Max.: d2-11
d2-14	Number of Motor 2 Poles	Sets the number of motor 2 poles. This will be set automatically during Auto-Tuning.	Default: 4 Min.: 2 Max.: 48
d2-15	Motor 2 Line-to-Line Resistance	Sets the motor 2 line-to-line resistance. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 0.000 Ω Max.: 65.000 Ω
d2-16	Motor 2 Leakage Inductance	Sets the motor 2 voltage drop caused by the motor leakage inductance relative to the motor rated frequency and current. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 0.00 mH Max.:650.00 mH
d2-17	Motor 2 Rotor Resistance	Sets the motor 2 rotor resistance. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 0.000 Ω Max.: 65.000 Ω
d2-18	Motor 2 Mutual Inductance	Sets the motor 2 mutual inductance. This will be set automatically during Auto-Tuning.	Default: o2-03, A1-06 Min.: 0.00 mH Max.:6500.0 mH
d2-21	Motor 2 Rated Capacity	Sets the motor 2 rated capacitor. This will be set automatically during Auto-Tuning.	Default: o2-03 Min.: 0.00 kW Max.: 650.00kW

Parameter	Name	Description	Setting Range
d3: PM Motor Parameters			
d3-00 <7>	PM Motor Type Selection	0 : IPM Motor 1 : SPM Motor	Default: 1 Range: 0, 1
d3-01	PM Motor Rated Capacity	Sets the motor rated capacity.	Default: Determined by o2-03 Min.: 0.00 kW Max.: 650.00kW
d3-02	PM Motor Rated Current	Sets the motor rated current.	Default: Determined by o2-03 Min.: 10% of drive rated current Max.: 200% of drive rated current
d3-03	Number of PM Motor Poles	Sets the number of motor poles.	Default: Determined by o2-03 Min.: 2 Max.: 48
d3-04	PM Motor Rotor Resistance (r 1)	Sets the resistance per motor phase in units of 0.001 Ω. Refrain from change once this parameter is set.	Default: Determined by o2-03 Min.: 0.000 Ω Max.: 65.000 Ω
d3-05	PM Motor d-Axis Inductance (Ld)	Sets the motor d-axis inductance in units of 0.01 mH. Refrain from change once this parameter is set.	Default: Determined by o2-03 Min.: 0.00 mH Max.: 600.00 mH
d3-06	PM Motor q-Axis Inductance (Lq)	Sets the motor q-axis inductance in units of 0.01mH. Refrain from change once this parameter is set.	Default: Determined by o2-03 Min.: 0.00 mH Max.: 600.00 mH
d3-07	PM Motor Induction Voltage Constant 1 (Ke)	Sets the induced peak voltage per motor phase in units of 0.1 mV/(rad/s) (electrical angle). Set this parameter when driving an IPM motor (SSR1 or SST4 series). Set 0 to d3-09 before setting.	Default: Determined by o2-03 Min.: 0.0 mV/(rad/s) Max.: 2000.0 mV/(rad/s)
d3-09	PM Motor Induction Voltage Constant 2 (Ke)	Sets the induced line-to-line voltage in units of 0.1 mV/ (r/min) (mechanical angle). Set this parameter when driving an SPM motor. Set 0 to d3-07 before setting.	Default: Determined by o2-03 Min.: 0.0 mV/ (r/min) Max.: 2000.0 mV/ (r/min)

Parameter	Name	Description	Setting Range
d3-10 <7>	PM Motor Rated Voltage	Sets the PM motor rated voltage according to the motor nameplate.	Default: 200.0 V Min.: 0.0 V Max.: 255.0 V <3>
d3-11 <7>	PM Motor Base Frequency	Sets the PM motor base frequency according to the motor nameplate.	Default: 87.5 Hz Min.: 0.0 Hz Max.: 400.0 Hz
d3-12 <7>	PM Motor Base Speed	Sets the PM motor base speed according to the motor nameplate.	Default: 1750 rpm Min.: 0 rpm Max.: 24000 rpm

Group E, Multi-Function Terminals

E1: Multi-Function Digital Inputs

Parameter	Name	Description	Setting Range
E1-00	Terminal S1 Function Selection	0 : 2-Wire Sequence Control (Forward/Stop) / 3-Wire Sequence Control (Stop)	Default : 0 Range: 0 to 73 / 100 to 173
E1-01	Terminal S2 Function Selection	1 : 2-Wire Sequence Control (Reverse/Stop) / 3-Wire Sequence Control (Stop) 2 : 3-Wire Sequence 3 : Local/Remote Selection	Default : 1 Range: 0 to 73 / 100 to 173
E1-02	Terminal S3 Function Selection	4 : Command Source 1/2 Selection 5 to 8: Multi-Step Speed Command 1 to 4 9 : Jog Frequency	Default : 23 Range: 0 to 73 / 100 to 173
E1-03	Terminal S4 Function Selection	10 : Up Command 11: Down Command 12: Up 2 Command	Default : 39 Range: 0 to 73 / 100 to 173
E1-04	Terminal S5 Function Selection	13: Down 2 Command 14, 15: FJOG/RJOG Command 16: Acc./Dec. Time Selection 1	Default : 5 Range: 0 to 73 / 100 to 173
E1-05	Terminal S6 Function Selection	17: Acc./Dec. Time Selection 2 18: Acc./Dec. Ramp Hold 19: Base Block	Default : 6 Range: 0 to 73 / 100 to 173
E1-06	Terminal S7 Function Selection	21: Fast Stop (Normal Open) 23 to 38 : External Fault 39: Fault Reset	Default : 9 Range: 0 to 73 / 100 to 173
E1-07	Terminal S8 Function Selection	40 : oH2 (AC drive Overheat Alarm) 41 : Multi-Function Analog Input Selection 45: Communication Mode 46: PID Disable 47: PID Integral Reset 48: PID Integral Hold	Default : 19 Range: 0 to 73 / 100 to 173

Parameter	Name	Description	Setting Range
		49: PID Soft-Start On/Off	
		50: PID Input Characteristics Switch	
		51: Motor 1/2 Switch	
		52: Timer Input	
		53, 54, 55: Offset Frequency 1/ 2/ 3	
		57: KEB Command 1 (Normal Open)	
		60: Program Lockout	
		61: Analog Frequency Command Hold	
		63: External Speed Search Command	
		65: DC Braking	
		69: Drive Enabled	
		70: Speed / torque control switch	
		71: Zero Speed Holding	
E2: Multi-Function Digital Output		
E2-00	Relay 1 Function Selection	0 : During Run 1 : Zero Speed Holding 2 : Frequency (Speed) Agree	Default: 0 Range: 0 to 49 / 100 to 149
E2-01	Relay 2 Function Selection	3 :User-Defined Frequency (Speed) Agree 4 : Drive Ready 5 : Uv (Undervoltage) Detection	Default: 11 Range: 0 to 49 / 100 to 149
E2-02	D1-DC Function Selection (Open Collector)	6 : During Baseblock 7 : Retain 8 : Frequency Command Source	Default: 1 Range: 0 to 49 / 100 to 149
E2-03	D2-DC Function Selection (Open Collector)	9 : Frequency Command Loss 10: Run Command Source 11 : Fault 12 : Communication Mode 13 : Alarm 14 : Fault Restart 15 : Timer Output 16 : Frequency (FOUT) Detection 1 17 : Frequency (FOUT) Detection 2 18: Overvoltage/ Undervoltage Detection 1 (normal open) 20: Overvoltage/ Undervoltage Detection 2 (normal open) 22 : During Reverse 23: Motor 1/ 2 Selection 24: During Regeneration 25 : During Restart 26 : Motor Overload Pre-Alarm (oL1)	Default: 2 Range: 0 to 49 / 100 to 149

Parameter	Name	Description	Setting Range
		27 : Drive Overheat Pre-Alarm (oH)	
		28 : Retain	
		29 : Mechanical Weakening Detection (Normal Open)	
		31 : During Torque Limit (Currenty Control)	
		32 : During Speed Limit	
		33 : During Speed Limit Circuit Operation (For Torque Control)	
		34 : Zero Speed Holding Stop	
		35: During Frequency Output	
		36: Drive Enabled	
		37: Watt Hour Pulse Output	
		38 : Local/Remote Mode	
		39 : During Speed Search	
		40 :PID Feedback Low	
		41 :PID Feedback High	
		42 : During KEB Operation	
		43 :Retain	
		44 : During Fast Stop	
		45 : Internal Cooling Fan Alarm	
		49 : Brake control (Desired frequency attained)	
		100 to 149: 0 to 49 with Inverse Output	
E2-05	Watt Hour Output Unit	Selects the output unit for the terminal assigned to E2-00 or E2-03=37 for one pulse signal. 0: 0.1 kWh units 1: 1 kWh units 2: 10 kWh units 3: 100 kWh units 4: 1000 kWh units	Default: 0 Min.: 0 Max.: 4
E2-06 <7>	Relay 1 On Delay	The definition of a relay1 on delay time.	Default: 0.0s Min.: 0.0s Max.: 3600.0s
E2-07 <7>	Relay 1 Off Delay	The definition of a relay1 off delay time.	Default: 0.0s Min.: 0.0s Max.: 3600.0s
E2-08 <7>	Relay 2 On Delay	The definition of a relay2 on delay time.	Default: 0.0s Min.: 0.0s Max.: 3600.0s
E2-09 <7>	Relay 2 Off Delay	The definition of a relay2 off delay time.	Default: 0.0s Min.: 0.0s Max.: 3600.0s

Parameter	Name	Description	Setting Range
	E3: Multi-Function Analog Input		
E3-00	Terminal A1 Signal Level Selection	0 : 0 to 10 V 1 :-10 to 10 V	Default: 0 Range: 0, 1
E3-01	Terminal A1 Function Selection	0 : Main Frequency Command 1 : Frequency Gain 2 : Output Frequency Lower Limit 3 : Auxiliary Frequency Command 4 : Output Voltage Bias 5 : Acc./Dec. Time Gain (Decrease Only) 6 : DC Braking (DB) Current 7 : Stall Prevention Level During Run 8 : PID Feedback 9 : PID Target 10: Differential PID Feedback 11 : Overtorque/ Undertorque Detection 12, 13, 14, 17 : Forward/Reverse/Regeneration Range/Forward and Reverse Torque Limit 15 : Toque Command / Torque Limit During Speed Control 16 : Torque Compesation 18: Communication Mode 1 19 : Communication Mode 2	Default: 0 Range: 0 to 19
E3-02 <4>	Terminal A1 Input Gain	Sets the terminal A1 input gain as a percentage when inputting 10V	Default: 100.0 % Min.: -999.9 % Max.: 999.9 %
E3-03 <4>	Terminal A1 Input Voltage Bias	Sets the terminal A1 input voltage bias as a percentage when inputting 0V	Default: 0.0 % Min.: -999.9 % Max.: 999.9 %
E3-05	Terminal A1 Input Filter Time	Sets the terminal A1 primary delay filter time, which can eliminate the interference	Default: 0.05 s Min.: 0.00 s Max.: 2.00 s
E3-06	Terminal A2 Signal Level Selection	0 : 0 to 20 mA 1 : 4 to 20 mA 2 : 0 to 10 V 3 : 0 to 5 V	Default: 1 Range: 0, 1, 2, 3

Parameter	Name	Description	Setting Range
E3-07	Terminal A2 Function Selection	0 : Main Frequency Command 1 : Frequency Gain 2 : Output Frequency Lower Limit 3 : Auxiliary Frequency Command 4 : Output Voltage Bias 5 : Acc./Dec. Time Gain (Decrease Only) 6 : DC Braking (DB) Current 7 : Stall Prevention Level During Run 8 : PID Feedback 9 : PID Target Value 10: Differential PID Feedback 11 : Overtorque/Undertorque Detection 12, 13, 14, 17 : Forward/Reverse /Regeneration Range/ Forward and Reverse Torque Limit 15: Torque Limit Using Torque Command/ Speed Limit 16: Slip Compensation 18, 19 :Communication Mode	Default: 3 Range: 0 to 19
E3-08 <4>	Terminal A2 Input Gain	Sets the terminal A2 input gain as a percentage when inputting 10V	Default: 100.0 % Min.: -999.9 % Max.: 999.9 %
E3-09 <4>	Terminal A2 Input Voltage Bias	Sets the terminal A2 input voltage bias as a percentage when inputting 0V.	Default: 0.0% Min.: -999.9 % Max.: 999.9 %
E3-10 <7>	Terminal A2 (4-20mA) Loss Action Selection	0 : Disabled 1 : Run According to P4-03 Setting and Display ANL 2 : Disacceleration to 0Hz and Display ANL 3 : Drive Stop and Display ACE	Default: 0 Range: 0 to 3
E3-11	Terminal A2 Input Filter Time	Sets the terminal A2 primary delay filter time, which can eliminate the interference.	Default: 0.05 s Min.: 0.00 s Max.: 2.00 s
E3-12	Analog Input Terminal Enable/ Disable Selection	Enables the analog inputs when Multi-Function Terminal Input E1-□□ = 41 (Multi-Function Analog Input Selection). 0: Both Terminal A1 and A2 Disabled 1: Only Analog Input Terminal A1 Enabled 2: Only Analog Input Terminal A2 Enabled 3: Both Terminal A1 and A2 Enabled	Default: 3 Range: 0, 1, 2, 3
	E4: Multi-Function Analog Output		

Parameter	Name	Description	Setting Range
E4-00	Terminal FM Signal Level Selection	0 : 0 to 10 V 1 : -10 to 10 V	Default: 0 Range: 0, 1
E4-01	Terminal FM Monitor Selection	Selects the terminal FM monitor. 0 : Frequency Command 1 : Output Frequency 2 : Output Current 3 : Motor Speed 4 : Output Voltage 5 : DC Voltage 6 : Output Power 7 :Torque Command 8 : AI1 Input 9 : AI2 Input 10 : Soft Starter Output Frequency 11 :Pulse Train Input	Default: 1 Range: 0 to 11
E4-02 <4>	Terminal FM Monitor Gain	Sets the terminal FM monitor gain.	Default: 100.0 % Min.: -999.9 % Max.: 999.9 %
E4-03 <4>	Terminal FM Monitor Voltage Bias	Sets the terminal FM voltage bias.	Default: 0.0 % Min.: -999.9 % Max.: 999.9 %
E4-04	Terminal AM Signal Level Selection	0: 0 to 10 V 1: 0 to 20 mA 2: 4 to 20 mA	Default: 0 Range: 0, 1, 2
E4-05	Terminal AM Monitor Selection	Selects the terminal AM monitor. 0 : Frequency Command 1 : Output Frequency 2 : Output Current 3 : Motor Speed 4 : Output Voltage 5 : DC Voltage 6 : Output Power 7 : Torque Command 8 : AI1Input 9 : AI2Input 10: Soft Starter Output Frequency 11 :Pulse Train Input	Default: 2 Range: 0 to 11
E4-06 <4>	Terminal AM Monitor Gain	Sets the terminal AM gain.	Default: 100.0 % Min.: -999.9 % Max.: 999.9 %
E4-07	Terminal AM	Sets the terminal AM voltage bias.	Default: 0.0 %

Parameter	Name	Description	Setting Range
<4>	Monitor Voltage Bias		Min.: -999.9 % Max.: 999.9 %
E5:Pulse Train Input/ Output			

E5-00	Pulse Train Input Function Selection	Selects the function for terminal RP.
		0 :Frequency Command
		1 : PID Feedback
		2 : PID Target
		3 : Speed Detection (Closed-Loop V/F Control)
		  (Only enabled when Motor 1 is selected in V/F
		  control method)
			Default: 0
			Range: 0, 1, 2, 3

E5-01 <4>	Pulse Train Input Scaling	Sets the frequency equal to 100% frequency in Hz.	Default: 1440 Hz Min.: 100 Hz Max.: 32000 Hz
E5-02 <4>	Pulse Train Input Gain	Sets the level of the input gain to terminal RP.	Default: 100.0% Min.: 0.0 % Max.: 1000.0 %
E5-03 <4>	Pulse Train Input Voltage Bias	Sets the level of the input voltage bias when no signal (0Hz) is input to terminal RP.	Default: 0.0% Min.: -100.0 Max.: 100.0
E5-04 <4>	Pulse Train Input Filter Time	Sets the pulse train input primary filter time in seconds.	Default: 0.10 s Min.: 0.00 s Max.: 2.00 s
E5-05	Pulse Train Input Minimum Frequency	Sets the minimum frequency detected by the pulse train input. Enabled when E5-00 = 0, 1, 2.	Default: 0.5 Hz Min.: 0.1 Hz Max.: 1000.0 Hz
E5-06 <4>	Pulse Train Monitor Selection	Sets the function of pulse train output terminal MP 0 : Frequency Command 1 : Output Frequency 2 : Soft Starter Output Frequency 3 : PID Feedback Value 4 : PID Target Value	Default: 0 Range: 0 to 4
E5-07 <4>	Pulse Train Monitor Scaling	Sets the pulse train output frequency when the specified monitor item is at 100%.	Default: 1440 Hz Min.: 100 Hz Max.: 32000 Hz
E5-08	Terminal RP Function Selection	0 : Pulse train input 1 : PWM signal input	Default: 0 Min.: 0 Max.: 1
E5-09 <4>	Average PWM Signal Times	1 to 100 times	Default: 1 Min.: 1

Parameter	Name	Description	Setting Range
			Max.: 100
E5-10	PWM Signal Cycle	1 to 999 ms	Default: 100 ms Min.: 1 ms Max.: 999 ms
E6: Optional Communication Card Settings			
E6-04 <7>	Torque Command Source Selection	0 : Torque Command Given by AI 1 : Torque Command Given by Communication	Default: 0 Min.: 0 Max.: 1
E6-06	Drive Station Address	Sets the drive station address.	Default: 1 Range: 1 to 31
E6-07	RS-485 Communication Baud Rate Setting	Sets the baud rate for terminals SG(+) and SG(-) of RS-485 communication. 0: 1200 bps (bit/sec) 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps 6 : 57600 bps 7 : 76800 bps 8 : 115200 bps	Default: 3 Range: 0 to 8
E6-08	RS-485 Communication Parity Selection	Selects the communication parity for terminals SG(+) and SG(-) of RS-485 communication. 0: 8, N, 2 (Modbus RTU) 1: 8, N, 1 (Modbus RTU) 2: 8, E, 1 (Modbus RTU) 3: 8, O, 1 (Modbus RTU) 4: 8, N, 2 (Modbus ASCII) 5: 8, N, 1 (Modbus ASCII) 6: 8, E, 1 (Modbus ASCII) 7: 8, O, 1 (Modbus ASCII) 8: 7, N, 2 (Modbus ASCII) 9: 7, N, 1 (Modbus ASCII) 10: 7, E, 1 (Modbus ASCII) 11: 7, O, 1 (Modbus ASCII)	Default: 1 Range: 0 to 11
E6-09	Communication Error Detection Time	Determines the detection time to trigger the communication error. (This function is disabled when set to 0)	Default: 0.0 s Range: 0.0 to 10.0 s
E6-10	Transmit Wait Time	Sets the wait time between sending and receiving data.	Default: 5ms Range: 5 to 65 ms

Parameter	Name	Description	Setting Range
E6-11	Drive Operation During Communication Error	0 : Display CE Alarm Only. Drive continues operation. 1 : Display CE Fault. Drive coasts to stop.	Default: 0 Range: 0 to 1

Group P, Protections

P1: Motor Protection Function

Parameter	Name	Description	Setting Range

P1-00	Motor Protection Function Selection	0 : Disabled
		  (Motor Overload Protection Disabled)
		1 : General-Purpose Motor (Standard Motor)
		2 : Drive Dedicated Motor
		  (Constant Torque Range 1 : 10)
		3 : Vector Motor (Constant Torque Range 1 : 100)
		4 : Derated Torque PM Motor
		5 : Constant Torque PM Motor
		  (Constant Torque Range 1 : 500)
		Sets 0 (disabled) when using one drive to run more than one motor. Install an overload relay between the drive and each motor.
			Default: 0
			Range: 0 to 5

P1-01	Motor Overload Protection Time	Sets the time for the drive to shut down on motor overload.	Default: 1.0 minute Min.: 0.1 minutes Max.: 5.0 minutes
P1-03	Motor Overheat Fault Operation Selection (MT Input)	Selects the drive operation when the MT input signal reaches the level of motor overheat fault. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Follows the fast stop time set in C1-08)	Default: 1 Range: 0 to 2

P2: Momentary Power Loss

Parameter	Name	Description	Setting Range
P2-00	Momentary Power Loss Operation Selection	0 : Disabled (Default) 1 : Recover if CPU Has Power 2 : KEB function if CPU Has Power 3 : Ramp to Stop with KEB Deceleration	Default: 0 Range: 0, 1, 2, 3
P2-01	Minimum Baseblock (bb) Time	Sets the minimum baseblock time when power is restored right after a momentary power loss. This determines the time the drive waits for the residual voltage in the motor to dissipate. Increase this value if overcurrent or overvoltage	Default: Determined by o2-03, A1-06 Min.: 0.1 s Max.: 5.0 s

Parameter	Name	Description	Setting Range
		occurs at the beginning of Speed Search and DC Braking.	
P2-03	Uv (Undervoltage) Detection Level	Sets the voltage level of undervoltage detection or KEB function activation.	Default: Determined by d1-00, o2-03 Min.: 150V Max.: 210V <3>
P2-04	KEB Deceleration Time	Sets the time to decelerate during KEB function.	Default: 0.0 s Min.: 0.0 s Max.: 6000.0 s
P2-05	Acceleration Time after KEB	Sets the time to reaccelerate from the speed when KEB function was deactivated to the set frequency command (operation frequency before power loss). When set to 0.0 s, the drive will accelerate to the previously active frequency according to the active acceleration time set by any of C1-00, C1-02, C1-04 or C1-06.	Default: 0.30 s Min.: 0.00s Max.: 6000.0s
P2-06 <7>	Emergency stop level before power off	Setting P2-06 for Emergency stop. When the detected voltage is below P2-06, the drive will immediately decelerate in accordance with the emergency stop time (C1-08).	Default: 250V Min.: 150V Max.: 280V
P2-07	KEB Detection Time	Sets the minimum duration of KEB operation after activation. KEB function will operate according to this detection time even if power recovers within this duration.	Default: 50 ms Min.: 0 ms Max.: 2000 ms
P2-08	Voltage Target During KEB	Sets the target value for the main circuit DC voltage or to deactivate KEB.	Default: <2> Min.: 150V Max.: 400V <3>
P2-09	KEB Method Selection	0 : KEB Operation Method 1 1 : KEB Operation Method 2 2 : KEB Operation Method 3	Default: 0 Range: 0, 1, 2
P2-10	Automatic voltage regulation (AVR)	0 : AVR is disabled 1 : AVR is enabled	Default: 1 Range: 0, 1
P2-11 <7>	Emergency stop Selection before power off	0 : Disabled 1 : Enabled	Default: 0 Range: 0, 1
		P3: Stall Prevention	
P3-00	Stall Prevention during	0 : Disabled 1 : Enabled the value set in P3-01.	Default: 1 Range: 0, 1

Parameter	Name	Description	Setting Range
	Acceleration	Acceleration stops when the output current exceeds the value set in P3-01. Acceleration continues when the output current drops 15% below the value set in P3-01.	
P3-01	Stall Prevention Level during Acceleration	Sets the output current level to activate the Stall Prevention function during acceleration.	Default: Determined by A1-06 Min.: 0% Max.: 150%
P3-02	Stall Prevention Limit during Acceleration	Sets the lower limit of Stall Prevention in the constant power range as a percentage of the drive rated output current.	Default: 50% Min.: 0 % Max.: 100 %

P3-03	Stall Prevention during Deceleration	0 : Disabled
		  The drive decelerates according to the set
		  deceleration time
		1 : Enabled (Without Braking Resistor)
			Default: 1
			Range: 0, 1

P3-04	Stall Prevention Level during Deceleration	Sets the voltage level to activate the Stall Prevention function during deceleration.	Default: 395V Min.: 330V Max.: 410V <3>
P3-05	Stall Prevention during Run	0 : Disabled 1 : Enabled (Deceleration Time 1) 2 : Enabled (Deceleration Time 2)	Default: 1 Range: 0, 1, 2
P3-06	Stall Prevention Level during Run	Sets the current level to activate the Stall Prevention function during run.	Default: Determined by A1-06 Min.: 30% Max.: 150%
P3-11	Stall Deceleration Time during Acceleration	Sets the deceleration time for a stall during acceleration	Default: 0.0 s Min.: 0.0 s Max.: 6000 s
	P4: Frequency Detection		
P4-00	Frequency Detection Level	Sets the detection level and width for the multi-function output terminal.	Default: 30.0 Hz Min.: 0.0 Hz Max.: Determined by d1-02, L2-00
P4-01	Frequency Detection Width		Default: 2.0 Hz Min.: 0.1 Hz Max.: 25.5 Hz
P4-02	Frequency Command Loss Detection Selection	Sets the drive operation when a frequency command loss is detected. 0: Drive Stop 1: Continue operation according to the setting	Default: 0 Range: 0, 1

Parameter	Name	Description	Setting Range
		in P4-03.	
P4-03	Frequency Command at Frequency Command Loss	Sets the frequency command level at which the drive runs when detecting a frequency command loss and when L4-02 is set to 1. Sets the value as a percentage of the maximum output frequency set in d1-02. (Sets the value as a percentage of the motor 2 maximum output frequency set in d1-13.)	Default: 80 % Min.: 0.0 % Max.: 100.0 %
P4-04	Frequency Command Loss Detection Time	When the frequency command falls below 90% of the command within this detection time, the frequency command loss will be detected.	Default: 20 ms Min.: 20 ms Max.: 400 ms
P5: Fault Restart			
P5-00	Number of Auto Restart Attempts	Sets the number of times to automatically attempt to restart the drive when detecting GF, OVA, OVD, OVC, OCA, OCD, OCC, OH, OL1, OL2, OT1, OT2, PF and LF1.	Default: 0 Min.: 0 Max.: 10
P5-01	Auto Restart Fault Output Operation	0 : Fault Output Disabled 1 : Fault Output Enabled	Default: 0 Range: 0, 1
P5-02	Fault Restart Interval Time	Sets the amount of time between restart attempts.	Default: 10.0 s Min.: 0.5 s Max.: 600.0 s
P6: Overtorque / Undertorque Detection			
P6-00	Overtorque / Undertorque Detection Selection 1	Sets the operation when the motor current or torque exceeds the P6-01 level for longer than the time set to P6-02. 0 : Disabled 1 : Overtorque Alarm at Speed Agree 2 : Overtorque Alarm at Run 3 : Overtorque Fault at Speed Agree 4 : Overtorque Fault at Run 5 : Undertorque Alarm at Speed Agree 6 : Undertorque Alarm at Run 7 : Undertorque Fault at Speed Agree 8 : Undertorque Fault at Run	Default: 0 Range: 0 to 8
P6-01	Overtorque / Undertorque Detection Level 1	Sets the level for overtorque/undertorque detection 1.	Default: 150% Min.: 0 % Max.: 300 %
P6-02	Overtorque / Undertorque Detection Time 1	Sets the time for overtorque/undertorque detection 1.	Default: 0.1 s Min.: 0.0 s Max.: 10.0 s

Parameter	Name	Description	Setting Range
P6-03	Overtorque / Undertorque Detection Selection 2	0 : Disabled 1 : Overtorque Alarm at Speed Agree 2 : Overtorque Alarm at Run 3 : Overtorque Fault at Speed Agree 4 : Overtorque Fault at Run 5 : Undertorque Alarm at Speed Agree 6 : Undertorque Alarm at Run 7 : Undertorque Fault at Speed Agree 8 : Undertorque Fault at Run	Default: 0 Range: 0 to 8
P6-04	Overtorque / Undertorque Detection Level 2	Sets the level for overtorque/undertorque detection 2.	Default: 150% Min.: 0% Max.: 300%
P6-05	Overtorque / Undertorque Detection Time 2	Sets the time for overtorque/undertorque detection 2.	Default: 0.1 s Min.: 0.0 s Max.: 10.0 s
P6-06	Mechanical Weakening Detection Operation	Sets the speed range to detect mechanical weakening and the operation when detected. 0 :Disabled 1 : Continue Operation if the Speed (Signed) is above P6-07 2 : Continue Operation if the Speed (Unsigned) is above P6-07 3 : Stop Operation if the Speed (Signed) is above P6-07 4 : Stop Operation if the Speed (Unsigned) is above P6-07 5 : Continue Operation if the Speed (Signed) is below P6-07 6 : Continue Operation if the Speed (Unsigned) is below P6-07 7 : Stop Operation if the Speed (Signed) is below P6-07 8 : Stop Operation if the Speed (Unsigned) is below P6-07	Default: 0 Range: 0 to 8
P6-07	Mechanical Weakening Detection Speed Level	Sets the speed level for Mechanical Weakening Detection as a percentage of the maximum output frequency.	Default: 110.0% Min.: -110.0% Max.: 110.0%
P6-08	Mechanical Weakening Detection Time	If the condition set in P6-06 lasts the time set in this parameter, Mechanical Weakening is detected.	Default: 0.1 s Min.: 0.0 s Max.: 10.0 s
P6-09	Mechanical Weakening Detection Start	Sets the cumulative drive operation time to activate Mechanical Weakening Detection. If U3-00 reaches the value set in this parameter,	Default: 0 Min.: 0 Max.: 65535

Parameter	Name	Description	Setting Range
	Time	Mechanical Weakening is detected.	
P6-10	Forward Torque Limit		Default: 200% Min.: 0% Max.: 300%
P6-11	Reverse Torque Limit	Sets the torque limits as a percentage of the motor rated torque.	Default: 200% Min.: 0% Max.: 300%
P6-12	Forward Regenerative Torque Limit		Default: 200% Min.: 0% Max.: 300%
P6-13	Reverse Regenerative Torque Limit		Default: 200% Min.: 0% Max.: 300%
P6-14	Torque Limit Integral Time Constant	Sets the integral time constant for the torque limit. Set shorter time for faster torque limit	Default: 200 ms Min.: 5 ms Max.: 10000 ms
P6-15	Torque Limit Control Selection during Acc./Dec	0 : Proportional Control (Integral Control at constant speed) 1 : Integral Control	Default: 0 Range: 0, 1
P7: Drive Protection			
P7-00	Input Phase Loss Protection	Enables or disables the input phase loss detection. 0 : Disabled 1 : Enabled	Default: 0 Range: 0, 1
P7-01	Output Phase Loss Protection	Sets the output phase loss detection. 0 : Disabled 1 : Enabled when One Phase is Lost 2 : Enabled when Two Phases are Lost	Default: 0 Range: 0, 1, 2
P7-02	Output Ground Fault Detection	Enables or disables the output ground fault detection. 0 : Disabled 1 : Enabled	Default: 0 Range: 0, 1
P7-03	Heatsink Cooling Fan Operation <6>	Sets the heatsink cooling fan operation. 0 : Enabled when drive is running 1 : Enabled when power supply is On	Default: 0 Range: 0, 1
P7-04	Heatsink Cooling Fan Off-Delay Time	When P7-04=0, sets the cooling fan off-delay time that the drive waits to disabled the cooling fan after run command is released.	Default: 60 s Min.: 0 s Max.: 300 s
P7-05	Ambient Temperature	Sets the ambient temperature. Automatically decreases the drive rated current	Default: 40 °C Min.: -10 °C

Parameter	Name	Description	Setting Range
	Setting	when the ambient temperature is higher than the temperature specified in drive specifications.	Max.: 50 °C
P7-06	oL2 Detection Time Reduction at Low Speed	Determines whether to reduce the oL2 (Drive Overload) fault detection time at low speed (below 6 Hz) to prevent premature output transistor failures. 0 : Detection time is not reduced 1 : Detection time is reduced	Default: 0 Range: 0, 1
P7-11	High Current Alarm Setting	Sets the High Current Alarm (HCA) when the output current is too high 0 : Disabled (No Alarm) 1 : Enabled (Alarm)	Default: 0 Range: 0, 1
P7-12	Installation Method Selection	Selects the installation type. The drive overload detection limit will be changed according to the selection. 0 : IP20 Enclosure in a Cabinet 1 : Side-by-Side Mounting 2 : NEMA 1 Enclosure	Default: 0 Range: 0, 1, 2
P7-13	DC Braking Level Setting	Sets the DC braking transistor level.	Default: 395V Range: 360 to 400V <3>

Group n, Special Adjustments

n1: Hunting Prevention

Parameter	Name	Description	Setting Range
n1-00	Hunting Prevention Setting	0 : Disabled 1 : Enabled	Default: 0 Range: 0, 1
n1-01 <4>	Hunting Prevention Gain	If the motor oscillates during light load, gradually increase this value by units of 0.1. If the motor stalls, gradually decrease this value by units of 0.1.	Default: 1.00 Min.: 0.00 Max.: 2.50

n4 : Feed Forward Control <7>

Parameter	Name	Description	Setting Range
n4-00	Feed Forward Control Selection	0: Disabled 1: Enabled	Default: 0 Range: 0, 1
n4-02	Feed Forward Control Gain	0.00 ~ 100.00	Default: 0.00 Min.: 0.00 Max.: 100.00
n4-03	Motor inertia input	0.000 ~ 0.100	Default: 0.000 Min.: 0.000

Parameter	Name	Description	Setting Range
			Max.: 0.100
		n6: PM Motor Control	
n6-02	Initial Rotor Position Detection	Selects the method used to detect the rotor position at start. 0 : Pull In 1 : High Frequency Injection 2 : Pulse Injection	Default: 1 Range: 0, 1, 2
n6-03	Speed Feedback Detection Control Gain	Increase the gain if motor oscillates. Decrease the gain if drive response is too slow.	Default: 0.80 Min.: 0.00 Range: 10.00
n6-11	Output Voltage Limit	Sets the limit for output voltage to avoid voltage saturation. Set this value lower than the actual input voltage.	Default: 200.0 V Min.: 0.0 Max.: 230.0

Group o, Keypad Function Settings

Parameter	Name	Description	Setting Range
		o1: Display Setting	
o1-00	Frequency Command Setting/Display Unit	0 : Use units of 0.01 Hz 1 : Use units of 0.01% (100% as maximum output frequency) 2 : Use units of min-1 (automatically calculated by maximum output frequency and number of motor poles) 3 : Use user-defined units (defined by o1-02 and o1-03)	Default: 0 Range: 0 to 3
o1-01 <7>	V/f Frequency ParameterUint Setting	0 : Hz 1 : min -1(r/min)	Default: 0 Range: 0 to 1
o1-02	User-Defined Frequency Command Setting/Display	1 to 60000	Default: Determined by o1-00 Min.: 1 Max.: 60000
o1-03	Frequency Command Setting/Display Decimal Places	0 to 3	Default: Determined by o1-00 Min.: 0 Max.: 3
		o2: Multi-Function Selection	
o2-00	LO/RE (LOCAL/REMOTE)	Enables or disables LO/RE key on the keypad. 0 : Disabled	Default: 1 Range: 0, 1

Parameter	Name	Description	Setting Range
	Key Function Selection	1 : Enabled Switches between Local and Remote Operation	
o2-01	STOP Key Function Selection	Enables or disables the STOP key on the keypad when the drive is controlled from a remote source. 0 : Disabled 1 : Enabled The STOP key always stops drive operation even if the command source is not set to the keypad.	Default: 1 Range: 0, 1
o2-03 <2>	Drive Capacity Selection	Set this parameter after replacing the terminal block or drive modules.	Default: <2> Determined by drive capacity
o2-04	ENTER Key Function During Frequency Command Setting	0 : ENTER Key Required 1 : ENTER Key Not Required When entering a frequency command, the output frequency changes immediately by UP or DOWN key without pressing ENTER.	Default: 0 Range: 0, 1
o2-05 <7>	Action Select When LCM Keypad Disconnection	0 : Disabled 1 : Enabled	Default: 0 Range: 0, 1
o2-06	Operation Direction at Power Up when Using Keypad	0 : Forward 1 : Reverse This parameter is enabled only when the keypad is selected as the Run command source.	Default: 0 Range: 0, 1
		o4: Maintenance Settings	
o4-00	Cumulative Operation Time Setting	Sets the initial value by 10 hours to start keeping track of cumulative operation time.	Default: 0 h Min.: 0 h Max.: 6000 h

o4-01	Cumulative Operation Time Selection	Selects the conditions in which the drive keeps track of the cumulative operation time.
		0 : Time of Power On
		  Keeps track of time from the power up to power cutoff.
		1 : Time of Run
		  Keeps track of time when the output voltage is active.
			Default: 0
			Range: 0, 1

o4-02	Cooling Fan Operation Time	Sets the initial value to start keeping track of cumulative fan operation time. View the	Default: 0 h Min.: 0 h

Parameter	Name	Description	Setting Range
	Setting	cumulative fan operation time in U3-01.	Max.: 6000 h
o4-06	U2 Reset Setting	Resets the data for U2-□□ (Fault Information) as these data will not be reset by A1-03 (Reset). 0 : Disabled 1 : Enabled	Default: 0 Range: 0, 1
o4-07	kWh Monitor Initialization	0 : U3-08 and U3-09 monitor data is not reset when the drive is initialized. 1 : U3-08 and U3-09 monitor data is reset when the drive is initialized.	Default: 0 Range: 0, 1

Group t, Auto-Tuning

t1: IM Motor Auto-Tuning

Parameter	Name	Description	Setting Range

t1-00	Motor 1/2 Selection	1 : Motor 1
		  Set details in d1-00 to d1-11, d2-00 to d2-10.
		2 : Motor 2
		  Set details in d1-12 to d1-22, d2-11 to d2-22.
			Default: 1
			Range: 1, 2

t1-01	Auto-Tuning Method Selection	0 : Rotational Auto-Tuning 1 : Stationary Auto-Tuning 2 : Stationary Auto-Tuning for Line-to-Line Resistance	Default: 0 Range: 0, 1, 2
t1-02	Motor Output Power	Sets the motor rated output power in kW units. Note: 1HP (Horse Power) = 0.746kW	Default: <2> Min.: 0.00 kW Max.: 650.00 kW
t1-03	Motor Rated Voltage	Sets the motor rated voltage according to the motor nameplate.	Default: 200.0 V Min.: 0.0 V Max.: 255.0 V <3>
t1-04	Motor Rated Current	Sets the motor rated current according to the motor nameplate.	Default: <2> Min.: 10% of drive rated current Max.:200% of drive rated current
t1-05	Motor Base Frequency	Sets the motor base frequency according to the motor nameplate.	Default: 50.0 Hz Min.: 0.0 Hz Max.: 400.0 Hz
t1-06	Number of Motor Poles	Sets the number of motor poles according to the motor nameplate.	Default: 4 Min.: 2 Max.: 48
t1-07	Motor Base Speed	Sets the motor base speed according to the motor nameplate.	Default: 1450 rpm Min.: 0 rpm Max.: 24000 rpm

Parameter	Name	Description	Setting Range
t1-08	PG Number of Pulses Per Revolution	Sets the number of pulses per revolution for the PG (pulse generator or encoder).	Default: 1024 ppr Min.: 0 ppr Max.: 60000 ppr
t1-09	Motor No-Load Current (Stationary Auto-Tuning)	Sets the no-load current for the motor. After the motor output power and rated current are set in t1-02 and t1-04, this parameter will automatically display the no-load current of a standard motor. The no-load current must be entered according to the motor test report.	Default: - Min.: 0 A Max.: t1-04
t1-12	Motor Auto-Tuning Setting	Enables or disables Auto-Tuning when A1-02=0 to 3 0 : Disabled 1 : Enabled	Default: 0 Range: 0, 1
t2: PM Motor Auto-Tuning			
t2-00	PM Motor Auto-Tuning Method Selection	0 : PM Initial Position Stationary Auto-Tuning 1 : PM Rotor Resistance Stationary Auto-Tuning 2 : PM Synchronous Inductor Stationary Auto-Tuning 3 : PM Back EMF Rotational Auto-Tuning To ensure the torque accuracy, perform one of the following before selecting. · Perform Auto-Tuning. · Set the correct value according to the test report or motor nameplate.	Default: 0 Range: 0, 1, 2, 3
t2-02	PM Motor Type Selection	0 : IPM Motor 1 : SPM Motor	Default: 1 Range: 0, 1
t2-03	PM Motor Output Power	Sets the PM motor rated output power in kW units. Note: 1HP (Horse Power) = 0.746kW	Default: <2> Min.: 0.00 kW Max.: 650.00 kW
t2-04	PM Motor Rated Voltage	Sets the PM motor rated voltage according to the motor nameplate.	Default: 200.0 V Min.: 0.0 V Max.: 255.0 V <3>
t2-05	PM Motor Rated Current	Sets the PM motor rated current according to the motor nameplate.	Default: 50% of drive rated current Min.: 10% of drive rated current Max.: 200% of drive rated current
t2-06	PM Motor Base Frequency	Sets the PM motor base frequency according to the motor nameplate.	Default: 87.5 Hz Min.: 0.0 Hz

Parameter	Name	Description	Setting Range
			Max.: 400.0 Hz
t2-07	Number of PM Motor Poles	Sets the number of PM motor poles according to the motor nameplate.	Default: 6 Min.: 2 Max.: 48
t2-08	PM Motor Base Speed	Sets the PM motor base speed according to the motor nameplate.	Default: 1750 rpm Min.: 0 rpm Max.: 24000 rpm
t2-09	PM Motor Rotor Resistance	Sets the PM motor rotor resistance per phase according to the motor nameplate.	Default: 0.000 Ω Min.: 0.000 Ω Max.: 65.000 Ω
t2-10	PM Motor d-Axis Inductance	Sets the PM motor d-axis inductance according to the motor nameplate.	Default: 0.00 mH Min.: 0.00 mH Max.: 600.00 mH
t2-11	PM Motor q-Axis Inductance	Sets the PM motor d-axis inductance according to the motor nameplate.	Default: 0.00 mH Min.: 0.00 mH Max.: 600.00 mH

t2-12	PM Motor Induced Voltage Constant Unit Selection	0 : mV/(r/min)
		  d3-09 will be used, and d3-07 will automatically be set to 0.
		1 : mV/ (rad/s)
		  d3-07 will be used, and d3-09 will automatically be set to 0.
			Default: 1
			Range: 0, 1

t2-13	PM Motor Induced Voltage Constant (Ke)	Sets the PM motor induced voltage constant according to the motor nameplate.	Default: <2> Min.: 0.1 Max.: 2000.0
t2-14	PM Motor Auto-Tuning Current	Sets the amount of current for Auto-Tuning as a percentage of the motor rated current. Increase this value when inertia is high.	Default: 30% Min.: 0% Max.: 120%
t2-15 <7>	PM Motor PG Number of Pulses Per Revolution	Sets the number of pulses per revolution for the PG (pulse generator or encoder).	Default: 1024 ppr Min.: 0 ppr Max.: 60000 ppr
t2-17	PM Motor Auto-Tuning Setting	0 : Disabled 1 : Enabled	Default: 0 Range: 0, 1

Group F, Option Settings

F1: PG Card Settings

| F1-00 | PG Pulse Number | Sets the number of pulses (pulse generator and encoder) per resolution for PG. | Default: 1024 ppr
Min.: 1 ppr |

Parameter	Name	Description	Setting Range
			Max.: 60000 ppr
F1-01	PG Rotation Setting	Selects the direction indicated by the PG pulses. 0 : A pulse leads with Forward fun command. 1 : B pulse leads with Forward fun command.	Default: Determined by A1-02 Range: 0, 1
F1-02	PG Output Division Ratio	Sets the division ratio of pulse output for a PG card. Set X for a ratio of 1/X. When only A pulse is set, monitor pulse output will be 1:1 regardless of the setting in F1-02.	Default: 1 Min.: 1 Max.: 255
F1-03	PG Signal Selection	0 : Channel A Only 1 : Channels A and B	Default: 1 Range: 0, 1
F1-04	PG Disconnection Detection	0 : Disabled 1 : Enabled	Default: 1 Range: 0, 1
F1-06	PG Open (PGo) Operation Setting	Sets the operation for a PGo fault. 0: Ramp to Stop (Active Deceleration)) 1: Coast to Stop 2: Alarm Only	Default: 1 Range: 0, 1, 2
F1-07	PG Open (PGo) Detection Time	Sets the time to detect the signal before triggering PGo fault.	Default: 2.0 sec Min.: 0.0 s Max.: 10.0 s
F1-08	Overspeed (oS) Operation Setting	Sets the operation for an oS fault. 0: Ramp to Stop (Active Deceleration) 1: Coast to Stop 2: Alarm Only	Default: 1 Range: 0, 1, 2
F1-09	Overspeed (oS) Detection Level	Sets the Overspeed (oS) detection level as a percentage of the maximum output frequency (d1-02). An oS fault will be triggered if the motor speed feedback is greater than the level set in F1-09 for longer than the delay time set in F1-10. Motor speed feedback = F1-09 *d1-02.	Default: 115% Min.: 0 % Max.: 120 %
F1-10	Overspeed (oS) Detection Delay Time		Default: 0.5 sec Min.: 0.0 sec Max.: 2.0 sec
F1-11	Speed Deviation (dEv) Operation Setting	Sets the operation for a dEv fault. 0: Ramp to Stop (Active Deceleration) 1: Coast to Stop 2: Alarm Only	Default: 2 Range: 0, 1, 2
F1-12	Speed Deviation (dEv) Detection Level	Sets the speed deviation (dEv) detection level as a percentage of the maximum output frequency (d1-02). A dEv fault will be triggered if the difference between the motor speed feedback and frequency command is greater than the level set in F1-12 for longer than the delay time set in F1-13.	Default: 10% Min.: 0 % Max.: 50 %
F1-13	Speed Deviation (dEv) Detection Delay Time		Default: 0.5 sec Min.: 0.0 sec Max.: 10.0 sec

Parameter	Name	Description	Setting Range
F1-14	PG Number of Gear Teeth 1	Sets the number of the gear teeth (ratio) on the motor side between the motor shaft and PG encoder. When 0 is set to either F1-14 or F1-15, the ratio will be 1.	Default: 0 Min.: 0 Max.: 60000
F1-15	PG Number of Gear Teeth 2	Sets the number of the gear teeth (ratio) on the machinery side between the motor shaft and PG encoder. When 0 is set to either F1-14 or F1-15, the ratio will be 1.	Default: 0 Min.: 0 Max.: 60000
F1-16	PG dv3　(Inversion Detection) Detection Setting	0 :Disabled n :Sets the number of detection times to trigger dv3.	Default: 10 times Min.: 0 times Max.: 10 times
F1-17	PG dv4　(Inversion Prevention Detection) Detection Setting	0 :Disabled n : Sets the number of pulses to trigger dv4	Default: 128 Min.: 0 Max.: 5000

Parameter	Name	Description	Unit
**Group U, Monitor Settings**			

Parameter	Name	Description	Unit
U1: Status Monitors			
U1-00	Control Method	0: Open-Loop V/F Control 1: Closed-Loop V/F Control 2: Open-Loop Vector Control 3: Closed-Loop Vector Control 4: PM Open-Loop Vector Control 5: PM Closed-Loop Vector Control 6: Closed-Loop Torque Control	-
U1-01	Frequency Command	Displays the frequency command. (Display units are defined by o1-00)	-
U1-02	Output Frequency	Displays the output frequency. (Display units are defined by o1-00)	-
U1-03	Output Current	Displays output current.	0.01A
U1-04	Motor Speed	Displays the motor speed.	-
U1-05	Output Voltage Command	Displays the drive output voltage command.	0.1V
U1-06	Main circuit DC Voltage	Displays the main circuit DC voltage.	0.1V
U1-07	Output Power	Displays the internal output power calculated by the drive.	0.001kW
U1-08 <7>	Torque Command	Display the torque command value in vector control	0.1%
U1-09	Input Terminal Status	Displays the status of the input terminal. U1-09=C11111111: The following indicate each digit from right to left. 1:Digital Input 1 (S1 enabled) 1:Digital Input 2 (S2 enabled) 1:Digital Input 3 (S3 enabled) 1:Digital Input 4 (S4 enabled) 1:Digital Input 5 (S5 enabled) 1:Digital Input 6 (S6 enabled) 1:Digital Input 7 (S7 enabled) 1:Digital Input 8 (S8 enabled)	-
U1-10	Output Terminal Status	Displays the status of the output terminal. U1-10=o1111: The following indicate each digit from right to left. Multi-Function Terminal Output (terminal　R1A/R1B-R1C) Multi-Function Terminal Output (terminal R2A –R2C) Multi-Function Photocoupler Output 1 (terminal D1) Multi-Function Photocoupler Output 2 (terminal D2)	-
U1-11	Drive Operation	Displays the status of the drive operation.	-

Parameter	Name	Description	Unit
	Status	U1-11=11111111 The following indicate each digit from right to left. 1:During Run 1:During Zero Speed Holding 1:During Reverse 1:During Fault Reset Signal Input 1:During Speed Agree 1:Drive Ready 1:During Alarm Detection 1:During Fault Detection	
U1-12	Terminal A1 Input Voltage	Displays the terminal A1 input voltage.	0.1%
U1-13	Terminal A2 Input Voltage	Displays the terminal A2 input voltage.	0.1%
U1-14 <7>	Output Frequency After Soft Start	Display the output frequency after soft start	0.01Hz
U1-15	Input Pulse Monitor	Displays the frequency to pulse input.	1Hz
U1-16	Software Version	Displays the software version.	-
U1-18	PG Card Software Version	Displays the PG card software version.	
U2: Fault Information			
U2-00	Current Fault	Displays the current fault.	-
U2-01	1st Most Recent Fault	Displays the first most recent fault.	-
U2-02	2nd Most Recent Fault	Displays the second most recent fault.	-
U2-03	3rd Most Recent Fault	Displays the third most recent fault.	-
U2-04	4th Most Recent Fault	Displays the fourth most recent fault.	-
U2-05	Frequency Command at 1st Most Recent Fault	Displays the frequency command at the first most recent fault.	-
U2-06	Output Frequency at 1st Most Recent Fault	Displays the output frequency at the first most recent fault.	-
U2-07	Output Current at 1st Most Recent Fault	Displays the output current at the first most recent fault.	0.01A
U2-08	Motor Speed at 1st	Displays the motor speed at the first most recent fault.	-

Parameter	Name	Description	Unit
	Most Recent Fault		
U2-09	Output Voltage command at 1st Most Recent Fault	Displays the output voltage command at the first most recent fault.	0.1V
U2-10	Main Circuit DC Voltage at 1st Most Recent Fault	Displays the main circuit DC voltage at the first most recent fault.	0.1V
U2-13	Input Terminal Status at 1st Most Recent Fault	Displays the input terminal status at the first most recent fault. (Same status display as U1-09)	-
U2-14	Output Terminal Status at 1st Most Recent Fault	Displays the output terminal status at the first most recent fault. (Same status display as U1-10)	-
U2-15	Operation Status at 1st Most Recent Fault	Displays the operation status at the first most recent fault. (Same status display as U1-11)	-
U2-17 <7>	Cumulative Operating Time at 1st Most Recent Fault	Displays the cumulative operating time at the first most recent fault	1h
U2-19	Frequency Command at 2nd Most Recent Fault	Displays the frequency command at the second most recent fault.	-
U2-20	Output Frequency at 2nd Most Recent Fault	Displays the output frequency at the second most recent fault.	-
U2-21	Output Current at 2nd Most Recent Fault 2nd	Displays the output current at the second most recent fault.	0.01A
U2-22	Motor Speed at 2nd Most Recent Fault	Displays the motor speed at the second most recent fault.	-
U2-23	Output Voltage command at 2nd Most Recent Fault	Displays the output voltage command at the second most recent fault.	0.1V
U2-24	Main Circuit DC Voltage at 2nd Most Recent Fault	Displays the main circuit DC voltage at the second most recent fault.	0.1V
U2-27	Input Terminal Status at 2nd Most Recent Fault	Displays the input terminal status at the second most recent fault. (Same status display as U1-09)	-
U2-28	Output Terminal	Displays the output terminal status at the second most	-

Parameter	Name	Description	Unit
	Status at 2nd Most Recent Fault	recent fault. (Same status display as U1-10)	
U2-29	Operation Status at 2nd Most Recent Fault	Displays the operation status at the second most recent fault. (Same status display as U1-11)	-
U2-31 <7>	Cumulative Operating Time at 2nd Most Recent Fault	Displays the cumulative operating time at the second most recent fault	1h
U2-33	Current Alarm	Displays the current alarm.	-
U2-34	1st Most Recent Alarm	Displays the first most recent alarm.	-
U2-35	2nd Most Recent Alarm	Displays the second most recent alarm.	-
U2-36	3rd Most Recent Alarm	Displays the third most recent alarm.	-
U2-37	4th Most Recent Alarm	Displays the fourth most recent alarm.	-
U3: Maintenance Monitors			
U3-00	Cumulative Drive Operation Time	Displays the cumulative operation time for the drive. The initial value is determined by o4-00. Keeping track of time from run or power up is determined by o4-01. The maximum number displayed is 60000, after which the value will be counted from 0.	1h
U3-01	Cumulative Cooling Fan Operation Time	Displays the cumulative operation time for the cooling fan. The initial value is determined by o4-02. The maximum number displayed is 60000, after which the value will be counted from 0.	1h
U3-06	Heatsink Temperature	Displays the heatsink temperature.	1℃
U3-07 <7>	LED Detection	Detects LED keypad working properly.	-
U3-08 <7>	kWh, Lower 4 Digits	Monitors the drive output power. The value is shown as a 9-digit number displayed across two monitor parameters, U3-8 and U3-09. Example: 12345678.9 kWh is displayed as: U3-08: 678.9 kWh U3-09: 12345 MWh	-

Parameter	Name	Description	Unit
U3-09 <7>	kWh, Upper 5 Digits	Monitors the drive output power. The value is shown as a 9-digit number displayed across two monitor parameters, U3-8 and U3-09. Example: 12345678.9 kWh is displayed as: U3-08: 678.9 kWh U3-09: 12345 MWh	-
U3-10	Peak Hold Current	Displays the peak current value during operation	0.01A
U3-11	Peak Hold Output Frequency	Displays the output frequency when the peak current displayed in U3-10 occurred.	-
U3-12	Motor Overload Estimate (oL1)	Displays the value of the motor overload detection accumulator. An oL1 will be triggered when reaching 100%.	1%
U3-13	Frequency Command Source Selection	Displays the source for the frequency command as XY-nn. X: Command Used 　1: Command 1 　2: Command 2 Y-nn: Frequency Command Source 　0-01: Keypad 　1-01: Analog input (Terminal AI 1) 　1-02: Analog input (Terminal AI 2) 　2-02 to 2-16: Multi-step speed command 　2-17: Jog frequency command 　3-01: PID frequency command 　4-01: Terminal UP/ DOWN 　5-01: Modbus communication 　6-01: Pulse train command	-
U3-14	Run Command Source Selection	Displays the source for the frequency command as XY-nn. XY-nn=00-00: Local X: Command Used 　1: Command 1 　2: Command 2 Y-nn: Command Source 　0-00: Keypad 　0-01: Control Circuit Terminal (Sequence Control Input) 　0-02: Modbus communication	-
U3-17	Drive Overload Estimate (oL2)	Displays the value of the drive overload detection accumulator. An oL2 will be triggered when reaching 100%.	1%
U4: PID Monitors			
U4-00	PID Feedback	Displays the PID feedback value as a percentage of the	0.01%

Parameter	Name	Description	Unit
		maximum output frequency.	
U4-01	PID Input	Displays the PID input value as a percentage of the maximum output frequency.	0.01%
U4-02	PID Output	Displays the PID output value as a percentage of the maximum output frequency.	0.01%
U4-03	PID Target	Displays the PID target value as a percentage of the maximum output frequency.	0.01%
U4-04	PID Differential Feedback	Displays the difference of both feedback values when 10 is set to both E3-01 and E3-07.	0.01%
U4-05	PID Feedback 2	Displays the adjusted feedback value if differential feedback is used (U4-00 to U4-04) The value in U4-00 and U4-05 will be the same if differential feedback is not used.	0.01%
U4-06	PG Rotating Direction	0: Correct PG wiring 1: The speed command is opposite to the PG feedback direction. Please check the wiring.	-
U4-08 <7>	PID Output 2	Displays the PID output 2 value as a percentage of the maximum output frequency.	0.01%
	U5: Control Monitors		
U5-00	Motor Speed Feedback	Displays the motor speed feedback with a positive or negative sign that PG receives.	1rpm
U5-01	Number of PG Pulse Train	Displays the PG pulse train feedback without positive or negative sign.	1pulse
U5-02 <7>	D – Axis Current Command	Displays the D – axis current command value.	0.01A
U5-03 <7>	Q – Axis Current Command	Displays the Q – axis current command value.	0.01A
U5-04 <7>	D – Axis Current Feedback	Displays the D – axis current feedback value.	0.01A
U5-05 <7>	Q – Axis Current Feedback	Displays the Q – axis current feedback value.	0.01A
U5-06 <7>	D – Axis Voltage Output	Displays the D – axis voltage output value.	0.1V
U5-07 <7>	Q – Axis Voltage Output	Displays the Q – axis voltage output value.	0.1V
U5-08	Control Mode	0 : Speed control 1 : Torque control	-
U5-14	ASR Input	Displays the ASR input.	0.01%
U5-16	Zero Servo Pulse Movement	Displays how far the rotor has moved from its last position in PG pulses	pulse

<1> The default is determined by the drive capacity, control method and ND/HD mode.

<2> Refer to user manual for details. http://www.liteon-ia.com.tw/ENG/download.php

<3> Double the value for 440V class AC drives.

<4> The parameter can be set during run.

<6> Contact the local distributor for any malfunction.

<7> This functional software version V1.40 open.

* The content of parameters will make some adjustments. Please refer to the manual on the website. http://www.liteon-ia.com/ENG/download.php

Chapter 6 | Troubleshooting

6.1 Alarm and Fault Displays

Table 6.1 Alarm and Fault Displays, Causes, and Possible Solutions

Keypad Display	Fault Name	Cause	Possible Solution
EF0	Retain		
EF1 to EF8	External Fault（Input Terminal S1 to S8）	1. An external device tripped an alarm 2. Incorrect wiring 3. Multi-function input wiring is not correct	1. Remove the cause of the external fault then reset the multi-function input. 2. Confirm if the signal lines is properly connected to the terminals assigned for external fault detection (E1-□□= 23 to 38) 3. Confirm if E1-□□=23 to 38 is set to the unused terminals.
dEv	Speed Deviation (for Closed-Loop Control Methods) The deviation between the pulse input speed feedback and speed command is greater than then level set to F1-12 for longer than the time set to F1-13.	1. Over loaded 2. The load is locked up 3. Motor is being braked	1. Increase the deceleration and acceleration times (C1-00 to C1-07) 2. Check if F1-12 and F1-13 are set correctly. 3. Check the motor brake and make sure it is released
FbH	PID Feedback High PID feedback input is greater than the detection level set to b5-22 for longer than the detection time set to b5-23	1. b5-22 andb5-23 inappropriate setting 2. PID feedback wiring incorrect 3. Feedback sensor malfunction 4. Feedback input circuit malfunction	1. Confirm b5-22 and b5-23 settings 2. Correct the wiring 3. Replace the sensor if it is damaged 4. Replace the PCB or drive. Contact the local distributor.
FbL	PID Feedback Low	1. Inappropriate setting in	1. Correct b5-12 and b5-13

Keypad Display	Fault Name	Cause	Possible Solution
	When the PID feedback detection is enabled in b5-11, a FbL will be triggered while the PID feedback falls below the level set to b5-12 for longer than the time set to b5-13.	b5-12 and b5-13 2. Incorrect PID feedback wiring 3. Feedback sensor malfunction 4. Incorrect feedback input circuit	settings 2. Correct the wiring 3. Replace the sensor if it is damaged 4. Contact the local distributor to replace the board or the drive.
oH	Heatsink Overheat Heatsink temperature over 90 to 100°C (Overheat level is determined by rating of the drive)	1. Ambient temperature is too high 2. Internal cooling fan stopped operating 3. Bad air flow due to insufficient room.	1.Check the temperature surrounding the drive a. Improve the air flow inside the enclosure panel b. Install an air conditioner or fan to cool the environment c. Remove any possible source of heat 2. Measure the output current a. Reduce the load b. Lower setting in C6-00 (Carrier Frequency Option) 3.Replace the cooling fan
oH1	Motor Overheat The temperature signal from motor temperature sensor via the terminal MT exceeded the overheat detection level of the drive.	1. Incorrect motor temperature input (terminal MT) wiring 2. Fault on the machinery (e.g., machinery is locked up) 3. Motor overheat	1. Correct the wiring for terminal MT. 2. Check the machinery status 3. Check the load, acceleration / deceleration time and cycle time a. Reduce the load. b. Increase the C1-00 to C1-07 (Acc./Dec. Time) settings c. Adjust d1-02 to d1-11 (V/F Characteristics)
ot1	Overtorque Detection 1 The current has exceeded the torque level set to P6-01 for longer than the time set to P6-02	1. Incorrect parameter settings 2. Malfunction on machinery	1. Reset P6-01 and P6-02 2. Check machinery and load status
ot2	Overtorque Detection 2	1. Incorrect parameter settings	1. Reset P6-04 and P6-05 2. Check machinery and load

Keypad Display	Fault Name	Cause	Possible Solution
	The current has exceeded the torque level set to P6-04 for longer than the time set to P6-05	2. Malfunction on machinery	status
ov	Overvoltage Voltage in the DC bus exceeded the overvoltage detection level 1.200 V class: 410 V 2.400 V class: 820 V	1. Drive input power has surge voltage entering 2. Machinery output short circuit 3. Ground fault in the output circuit causes the DC bus capacitor to overcharge 4. Electrical signal interference causes drive malfunction 5. PG cable is disconnected 6. Incorrect PG cable wiring 7. PG encoder wiring is interference by electrical signal	1. Install a DC link choke Voltage surge can result from a thyristor convertor and phase advancing capacitor using the same input power supply 2. Check the motor power cable, relay terminals and motor terminal box 3. Correct grounding shorts and reapply power 4. Check the solutions for interference suppression »Check the control circuit lines, main circuit lines and grounding wiring. »If the MC is the source of interference, connect a suppressor to it. 5. Reconnect the cable 6. Correct the wiring 7. Separate the wiring from the source of the electrical signal interference. It is usually the output lines from the drive
Uv	Undervoltage 1.Voltage in the DC bus fell below the undervoltage detection level (P2-03) 2.200 V class: 190 V 3.400 V class: 380 V	1. Input power phase loss 2. Loose wiring terminals of drive input power 3. Problem with the voltage from the drive input power 4. The drive main circuit capacitors are weakened. 5. The contactor or relay on the soft-charge bypass circuit is damaged	1. Correct the drive input power wiring 2. Tighten the terminals 3. Check the voltage a. Adjust the voltage according to the drive input power specifications b. Check the main circuit magnetic contactor if there is no problem with the power supply 4&5. Turn on and turn off the power to see if any problem

Keypad Display	Fault Name	Cause	Possible Solution
			occurs Replace either the entire drive or the control board if the problem continues to occur. Contact the local distributor for more information.
Ut1	Undertorque Detection 1 The current has dropped below the torque detection level set to P6-01 for longer than the time set to P6-02	1. Incorrect parameter settings 2.Malfunction on machinery side	1. Reset P6-01 and P6-02 2. Ensure there is no problem on the machinery side.
Ut2	Undertorque Detection 2 The current has dropped below the torque detection level set to P6-04 for longer than the time set to P6-05	1. Incorrect parameter settings 2.Malfunction on machinery side	1. Reset P6-04 and P6-05 2. Ensure there is no problem on the machinery side.
UL	Mechanical Weakening Detection for Undertorque Undertorque in the conditions set to P6-06	Undertorque in the conditions set to P6-06	Check the condition of mechanical weakening
oL	Mechanical Weakening Detection for Overtorque Overtorque in the conditions set to P6-06	Overtorque in the conditions set to P6-06	Check the condition of mechanical weakening
oS	Overspeed The motor speed feedback exceeded the	1. Overshoot occurs 2. Incorrect PG pulse train settings	1. Increase setting of C4-00 (ASR Proportional Gain 1) and C4-01(ASR Integral Time 1) 2. Reset F1-09 (Overspeed

Keypad Display	Fault Name	Cause	Possible Solution
	level set to F1-09		Detection Level) and F1-10 (Overspeed Detection Delay Time)
Bb	Baseblock Drive output interrupted by an external baseblock signal	An external baseblock signal was input via one of the multi-function input terminals (S1 to S8)	Check baseblock signal input timing and external sequence
oH2	Drive Overheat Warning Drive Overheat Warning input via a multi-function input terminal (S1to S8) when E1-□□= 40	An overheat warning in the drive was triggered by an external device	1. Search the device which caused the overheat warning. Remove the cause of the problem. 2. Reset Drive Overheat Warning input at the assigned multi-function input terminal (S1to S8)
HCA	Current Alarm Drive current exceeded the level of over current warning (150% of the rated current)	1. The load is too heavy 2. Deceleration and acceleration times are too short 3.The drive is attempting to run a motor greater than the maximum allowable capacity, or a special-purpose motor is being used 4.The current level went up because of Speed Search while attempting to perform a fault restart or after a momentary power loss	1. Reduce the load or use a drive of higher rating 2. Calculate the torque required during acceleration and the inertia »Take the following steps if the torque level is not right for the load · Increase the settings for acceleration and deceleration time (C1-00 to C1-07) · Use a drive of higher rating 3. Check the motor capacity · Make sure the motor capacity is right for the drive rating. 4. During a momentary power loss or an attempt to reset a fault, the alarm is displayed. However, there is no need to take any action because the fault display will disappear shortly

6.2 Fault Detection

Table 6.2 Fault Displays, Causes, and Possible Solution

Keypad Display	Fault Name	Cause	Possible Solution
GF	Ground Fault	Output power cable is damaged	Check and replace output power cable
oVA, oVd, oVC	Overvoltage (Acceleration, Deceleration and Constant Speed) The main circuit DC voltage exceeded the overvoltage detection level 200V class: 410V 400 V class: 820 V	1. Regenerative energy is flowing from the motor into the drive because the deceleration time is too short 2. The motor overshoot the speed reference because the acceleration time is too short 3. Excessive braking load 4. Surge voltage entering from the drive input power 5. Motor short-circuited Ground fault current charges the drive main circuit capacitor. 6. Improper parameter settings for Speed Search (including Speed Search after a fault restart and after a momentary power loss) 7. Drive input voltage is too high 8. The braking transistor or braking resistor are wired incorrectly 9. PG cable is disconnected 10. PG cable wiring is incorrect 11. PG encoder wiring has interference of electrical signal 12. Electrical signal interference causes the drive malfunction 13. Incorrect inertia setting of the load 14.Motor hunting occurs	1. Increase the deceleration time settings (C1-01, C1-03, C1-05, C1-07) »Install a braking unit or a dynamic braking resistor »Set P3-03 (Stall Prevention during Deceleration) to 1 (Enabled)(default is 1) 2. Confirm if overvoltage alarm oVA or oVC was triggered during sudden drive acceleration. »Increase the acceleration time »Use S-curve deceleration and acceleration times and increase the value set to C2-01 (S-curve at acceleration end) 3. Install a braking unit or a braking resistor 4. Install a DC reactor »Thyristor convertor and phase advancing capacitor using the same input power supply might cause a voltage surge 5. Check the motor power cable, relay terminals and motor terminal box » Correct grounding shorts and reapply power 6. Adjust parameter settings for Speed Search (group b3) »Proceed Auto-Tuning for line-to-line resistance 7. Check the voltage »Lower drive input power voltage within the range listed in the drive specifications 8. Check the wiring of the braking resistor and braking unit »Correct the wiring

Keypad Display	Fault Name	Cause	Possible Solution
			9. Tighten the terminal or replace the damaged cable 10. Correct the wiring 11. Separate the PG wiring from the source of the electrical signal interference (drive output cable) 12. Check the solutions for interference suppression »Check the wiring of control circuit l, main circuit and grounding. 13.Check the load inertia settings when using KEB, or Stall Prevention during deceleration 14. Adjust the parameters to suppress hunting »Adjust n1-01 (Hunting Prevention Gain)
oCA, oCd, oCC	Overcurrent (Acceleration, Deceleration and Constant Speed)	1. The motor insulation is damaged or the motor is overheated 2. Grounding problem caused by damaged motor cable 3.The drive is damaged 4.The load is too heavy 5. Settings for acceleration or deceleration time is too short 6.The drive is running a special purpose motor or a motor larger than the drive rated capacity 7. A magnetic contactor (MC) on the output side of the drive has turned on or off 8. V/F set incorrectly 9. Excessive torque compensation 10. Electrical signal	1. Check the insulation resistance 2. Check the motor power cable 3. Check the resistance between the cable and the terminal. 4. Short circuit on drive output side or grounding causes register damage. 5. Measure the current flowing into the motor 5. Check the motor capacity 6. Calculate the torque required during acceleration according to the load inertia and acceleration time. If the required torque is insufficient, check the motor capacity. 7. Install a sequence controller to ensure the MC does not open or close when the drive is outputting voltage. 8. Check the ratios between the frequency and voltage set by V/F.

Keypad Display	Fault Name	Cause	Possible Solution
		interference causes drive malfunction 11. Overexcitation gain is set too high 12. Run command was applied while motor was coasting 13. Incorrect motor code 14. The motor does not match the drive control method 15. The motor cable is too long	9. Adjust d1-02 to d1-11 (or d1-13 to d1-22 for motor 2) 10.Check the amount of torque compensation 11. Find out possible solutions to suppress the electrical signal interference 11. Check if the fault occurs frequently with overexcitation function operation 12. Enable Speed Search via multi-function input terminal 14. Check the control method (A1-02) 15. Use a larger drive
SC	IGBT Fault or Output Short Circuit	1. Motor has been damaged due to the motor insulation weakened or overheat 2. The cable is damaged 3. Hardware fault 4. The drive is damaged	1. Replace the motor or check the motor insulation resistance 2. Repair any short circuits and check the motor power cable
EF0	Retain		
EF1to EF8 (Input Terminal S1 to S8)	External Fault	1. An external device tripped an alarm 2. Incorrect wiring 3. Multi-function input wiring is not correct	1. Remove the cause of the external fault then reset the multi-function input. 2. Confirm if the signal lines is properly connected to the terminals assigned for external fault detection (E1-□□= 23 to 38) 3. Confirm if E1-□□=23 to 38 is set to the unused terminals.
oH	Heatsink Overheat Heatsink temperature over 90 to 100°C (Overheat level is determined by rating of the drive)	1. Ambient temperature is too high 2. Internal cooling fan stopped operating 3. Bad air flow due to insufficient room.	1. Check the temperature surrounding the drive a. Improve the air flow inside the enclosure panel b. Install an air conditioner or fan to cool the environment c. Remove any possible source of heat 2. Measure the output current a. Reduce the load

Keypad Display	Fault Name	Cause	Possible Solution
			b. Lower setting in C6-00 (Carrier Frequency Option) 3.Replace the cooling fan
oH1	Motor Overheat The temperature signal from motor temperature sensor via the terminal MT exceeded the overheat detection level of the drive.	1. Incorrect motor temperature input (terminal MT) wiring 2. Fault on the machinery (e.g., machinery is locked up) 3. Motor overheat	1. Correct the wiring for terminal MT. 2. Check the machinery status 3. Check the load, acceleration / deceleration time and cycle time a. Reduce the load. b. Increase C1-00 to C1-07 (Acc./Dec. Time) settings c. Adjust d1-02 to d1-11 (V/F Characteristics)
oL	Mechanical Weakening Detection for Overtorque Overtorque in the conditions set to P6-06	Overtorque in the conditions set to P6-06	Check the condition of mechanical weakening
oL1	Motor Overload	1. The load is too heavy 2. The acceleration and deceleration times are too short 3. The motor is driven below the rated speed with a high load 4. Incorrect setting in P1-00 (Motor Protection Function Selection) when running a special motor 5. The voltage determined by the V/F is too high 6. d2-00 (Motor Rated Current) setting incorrect 7. The base frequency is set too low 8. Use one drive to run multiple motors 9. The electrical thermal protection characteristics do	1. Check loading capacity » Reduce the load 2. Confirm acceleration and deceleration times »Increase C1-00 to C1-07 parameter settings 3. »Reduce the load » Increase the speed » Either increase the motor capacity or use a special-purpose motor if the motor needs to operate at low speeds 4. Set P1-00 to 2. 5. Adjust d1-02 to d1-11 settings (V/F Characteristics) Note: If d1-02 to d1-11 settings are too low, load tolerance at low speeds will be reduced 6.Confirm the motor rated current » Set d2-00 (Motor Rated

Keypad Display	Fault Name	Cause	Possible Solution
		not match the motor overload characteristics. 10. The electrical thermal relay operates at the wrong level 11. Motor overheated by overexcitation operations 12. Speed Search related parameters are set incorrectly 13. Power supply phase loss causes output current oscillation.	Current) according to the motor nameplate 7. Confirm the rated frequency showed on the motor nameplate »Set d1-04 (Base Frequency) according to the motor nameplate 8. Set P1-00 (Motor Protection Function Selection) to 0 (Disabled) and install a thermal relay to each motor 9. Confirm characteristics of the motor »Set P1-00 (Motor Protection Function Selection) correctly »Install an external thermal relay 10. Overexcitation increases the motor loss 11. Adjust parameters related to Speed Search »Adjust the b3-01 (Speed Search Operation Current) setting 12. Check the power supply for phase loss
oL2	Drive Overload	1. The load is too heavy 2. The acceleration and deceleration times are too short 3. The voltage determined by the V/F is too high 4. The drive capacity is too small 5. The motor is driven below the rated speed with a high load 6. Torque compensation is too high 7. Speed Search related parameters are set incorrectly 8. Power supply phase loss	1. Check loading capacity » Reduce the load 2. Confirm acceleration and deceleration times »Increase C1-00 to C1-07 parameter settings 3. Adjust d1-02 to d1-11 settings (V/F Characteristics) Note: If d1-02 to d1-11 settings are too low, load tolerance at low speeds will be reduced 4. Use a larger drive 5. »Reduce the load at low speed » Use a larger drive » Set a lower value to C6-00 (Carrier Frequency) 6. Check the torque

Keypad Display	Fault Name	Cause	Possible Solution
		causes output current oscillation	compensation » Set a lower value to C3-00 (Torque Compensation Gain) until the current is decreased and the motor does not stall. 7. Adjust parameters related to Speed Search » Adjust b3-01 (Speed Search Operation Current) 8. Check the power supply for phase loss
ot1	Overtorque Detection 1 The current has exceeded the torque level set to P6-01 for longer than the time set to P6-02	1. Incorrect parameter settings 2. Malfunction on the machinery side	1. Reset P6-01 and P6-02 2. Check machinery and load status
ot2	Overtorque Detection 2 The current has exceeded the torque level set to P6-04 for longer than the time set to P6-05	1. Incorrect parameter settings 2. Malfunction on the machinery side	1. Reset P6-04 and P6-05 2. Check machinery and load status
Ut1	Undertorque Detection 1 The current has dropped below the torque detection level set to P6-01 for longer than the time set to P6-02	1. Incorrect parameter settings 2.Malfunction on the machinery side	1. Reset P6-01 and P6-02 2. Ensure there is no problem on the machinery side.
Ut2	Undertorque Detection 2 The current has dropped below the	1. Incorrect parameter settings 2.Malfunction on the machinery side	1. Reset P6-04 and P6-05 2. Ensure there is no problem on the machinery side.

Keypad Display	Fault Name	Cause	Possible Solution
	torque detection level set to P6-04 for longer than the time set to P6-05		
UL	Mechanical Weakening Detection for Undertorque Undertorque in the conditions set to P6-06	Undertorque in the conditions set to P6-06	Check the condition of mechanical weakening
Uv1	Undervoltage Detection 1 Voltage in the DC bus fell below the undervoltage detection level (P2-03) during run. · 200 V class: 190 V · 400 V class: 380 V	1. Input power phase loss 2. Loose wiring terminals of drive input power 3. Problem with the voltage from the drive input power 4. The drive main circuit capacitors are weakened. 5. The contactor or relay on the soft-charge bypass circuit is damaged	1. Correct the drive input power wiring 2. Tighten the terminals 3. Check the voltage a. Adjust the voltage according to the drive input power specifications b. Check the main circuit magnetic contactor if there is no problem with the power supply 4. Turn on and turn off the power to see if any problem occurs a. Replace either the entire drive or the control board if the problem continues to occur. Contact the local distributor for more information.
Uv2	Retain		
PF	Input Phase Loss Drive input power has a large imbalance of voltage between phases or has an open phase (Detected when P7-00=1)	1. Phase loss in the drive input power 2. Drive input power terminals has a loose wiring 3. Drive input power voltage has an excessive fluctuation 4. The main circuit capacitors are impaired	1. Check wiring for errors in the main circuit drive input power »Correct wiring 2. Make sure the terminals are tightened correctly »Apply the tightening torque as showed in the manual 3. Confirm the voltage from the drive input power

Keypad Display	Fault Name	Cause	Possible Solution
			»Apply possible solutions for drive input power stabilization 4. Check drive input power. If drive input power seems normal but the alarm continues to occur, replace either the entire drive or the control board. Contact the local distributor for more information.
LF1	Output Phase Loss Phase loss on the drive output side	1. The output cable is not connected 2. The motor winding is impaired 3. The output terminal is loose 4. The rated current of the motor being used is 5% less than the drive rated current 5. An output transistor is impaired 6. A single phase motor is activating	1.Check the errors for wiring then properly connect the output cable »Correct the wiring 2.Check the resistance which located between motor lines »If the winding is impaired, replace the motor 3.Use tightening torque which showed in the manual in order to fasten the terminal 4.Check motor capacities and the drive 5.The drive cannot run a single phase motor
LF2	Retain		
dEv	Speed Deviation (for closed-loop control method) The deviation between the speed feedback and speed reference is longer than the time set to F1-13 and greater than the setting in F1-12	1. The load is too heavy 2. The deceleration and acceleration times are too short 3. The load is locked up 4. Inappropriate parameter settings 5. Motor is being braked by a mechanical brake	1. Reduce the load 2. Increase the deceleration and acceleration times C1-00 to C1-07 3. Check the machinery 4. Check the F1-12 (Speed Deviation Detection Level) and F1-13 (Speed Deviation Detection Delay Time) settings 5. Check the motor brake and make sure it is released
dv1	Retain		
dv2	Retain		

Keypad Display	Fault Name	Cause	Possible Solution
dv3	Retain		
dv4	Retain		
FbH	PID Feedback High	1. Incorrect parameter settings 2. Incorrect PID feedback wiring 3. Feedback sensor malfunction	1. Reset b5-22 and b5-23 2. Correct the wiring 3. Check the sensor
FbL	PID Feedback Low	1. Incorrect parameter settings 2. Incorrect PID feedback wiring 3. Feedback sensor malfunction	1. Reset b5-12 and b5-13 2. Correct the wiring 3. Check the sensor
bUS	Retain		
CE	Modbus Communication Error	1. Incorrect wiring 2. Communication data error caused by noise	1. Correct the wiring »Check short circuits and disconnected cables, repair if necessary 2. Check possible solution to suppress the noise
CF	Retain		
Err	Retain		
oS	Overspeed The motor speed exceeded F1-09 setting	1. Overshoot 2. Incorrect speed feedback scaling if terminal RP is used as speed feedback input in V/F control 3. Incorrect PG pulse number settings 4. Incorrect parameter settings	1. Increase the C4-00 (ASR Proportional Gain 1) and C4-01(ASR Integral Time 1) 2. Reset F1-09 (Overspeed Detection Level) and F1-10 (Overspeed Detection Delay Time)
PGo	PG Open (for closed-loop control method) No PG pulses are received within the	1. The PG cable is opened 2. The PG cable wiring is wrong 3. The PG has no power supply 4. PG is being braked	1. Connect the cable 2. Correct the wiring 3. Check the power cable wiring 4. Ensure the mechanical brake is released when the motor is operating

Keypad Display	Fault Name	Cause	Possible Solution
	time set to F1-07		
Sto	Retain		
FAnEr	Internal Fan Fault Fan or magnetic contactor failure	1. Cooling fan malfunction 2. Fault detected in the magnetic contactor or the internal cooling fan	1. Cycle power to the drive » Check the fan operation » Verify the cumulative operation time of the fan with monitor U3-01 »If the cooling fan is damaged in any other way or has exceed its expected performance life, follow the instruction for replacement 2. Cycle power to the drive » If the problem continues, replace either the entire drive or the power board. For more information, please contact the local distributor
JoGEr	FJOG/ RJOG Input Error	A FJOG and RJOG Run commands are received at the same time	Check the Run command from the external source for Fjog/Rjog

6.3 Operation Errors

Table 6.3 Error Displays, Causes, and Possible Solutions

Keypad Display	Error Name	Cause	Possible Solution
oPE02	Parameter Range Setting Error	Parameters are set outside of the possible setting range	1. Set the parameters to the proper values 2. Reset the drive
oPE03	Multi-Function Input Selection Error	1. Either of Up command and Down command is not set (E1-□□= 10 or 11) 2. Either of Up command 2 and Down command 2 is not set (E1-□□=12 or 13)	Properly assign both of the UP and Down commands to the multi-function input terminal.
oPE04	3-Wire Sequence Control Setting Error	Multi-Function input terminals S1 and S2 are assigned to E1-□□= 2 (3-Wire Sequence)	Do not assign multi-function input terminals S1 and S2 to E1-□□= 2 (3-Wire Sequence)
oPE05	Communication Error		
oPE06	Control Method Selection Error	A control method that requires a PG option card (A1-02 = 1, 3, or 5) is selected, but no PG card is installed	Install a PG option card or correct the value set to A1-02
oPE07	Multi-Function Analog Input Selection Error	E3-01 and E3-07 are set to the same value	Set different values to E3-01 and E3-07
oPE09	PID Control Selection Fault (When b5-00 (PID Control Setting)= 1 to 4)	1. Contradictory settings · b5-14 (PID Sleep Start Level) is not set to 0.0 · b1-02 (Stopping Method Selection) is set to 2 (DC Braking to Stop) or 3 (Coast to Stop with Timer) 2. L2-01 (Frequency Command Lower Limit)≠0 when b5-00 = 1 or 2 (PID Control Enabled) 3. b5-10 (PID Output Reverse Selection) = 1 (Reverse	1. Correct the parameter setting. 2. Correct the parameter setting. 3. Correct the parameter setting. 4. Correct the parameter setting.

Keypad Display	Error Name	Cause	Possible Solution
		Enabled) when b5-00 = 1 or 2 4. L2-01 ≠ 0 when b5-00 = 3 or 4	
oPE10	V/F Data Setting Error Incorrect d1-02, d1-04, d1-06, d1-08, d1-10 (or d1-13, d1-15, d1-17, d1-19, d1-21) settings	V/F parameters setting incorrect	Correct the setting in d1-02, d1-04, d1-06, d1-08 and d1-10 (or d1-13, d1-15, d1-17, d1-19 and d1-21).
oPE11	Carrier Frequency Setting Error	1. Contradictory settings · C6-03 (Carrier Frequency Proportional Gain) > 6 · C6-02 (Minimum Carrier Frequency) > C6-01 (Maximum Carrier Frequency) Note: If C6-03 ≤ 6 , the drive operates at C6-01 2. The limit set in C6-00 to C6-03 are contradictory	Correct the parameter setting.
oPE12	Analog Frequency Command Hold Error	When E1-□□=61, there is another E1-□□ is set to 10 to 13, 18 or 53 to 55.	Correct the setting.
oPE13	Main and Alternative Frequency Command Error	When b1-00 and b1-07 are setting the same supply source.	Correct the setting.
oPE14	Incorrect Jump Frequency Setting	The setting does not follow L3-00<=L3-01<=L3-02	Correct the setting.
oPE15	Torque Control Setting Error	The following are set when A1-02 = 3 or 5 (Closed-Loop Vector Control) · L5-00 = 1 and E1-□□ = 70 · L5-00 = 1 or E1-□□ = 70, and E1-□□= 58 or 59 · L5-00 = 1 or E1-□□ = 70	Correct the parameter setting.

6.4 Auto-Tuning Fault Detection

Table 6.4 Auto-Tuning Codes, Causes, and Possible Solution

Keypad Display	Fault Name	Cause	Possible Solution
TnF00	Auto-Tuning Stop	User presses STOP key during Auto-Tuning	Do not press STOP key during Auto-Tuning
TnF01	Line-to Line Resistance Error	The line-to-line resistance in Auto-Tuning is negative or limited by the upper the lower limit	Check and correct motor wiring
TnF02	Stationary Auto-Tuning Error	The voltage or current is too large during stationary Auto-Tuning	Make sure the data entered in t1-03 to t1-05 is the same as the information showed on the motor nameplate Check and correct motor wiring
TnF03	Rotational Auto-Tuning Error	The voltage or current is too large during rotational Auto-Tuning	Make sure the data entered in t1-03 to t1-05 is the same as the information showed on the motor nameplate Check and correct motor wiring Perform Auto-Tuning after disconnect the motor from the machinery
TnF07	Motor Data Error	t5-05 and t1-07 setting incorrect	Make sure the data entered to t1-05 and t1-07 is the same as the information showed on the motor nameplate. Reset the parameters.
TnF09	PM Motor Inductance Error	The voltage or current is too large or the inductance value is error during inductance Auto-Tuning	Make sure the parameter is properly set according to the motor nameplate. Reset T2 parameters
TnF10	PM Motor Back EMF Error	The voltage or current is too large or the value is error during back EMF Auto-Tuning	Make sure the parameter is properly set according to the motor nameplate. Reset T2 parameters

Edit Date / Parameter			Edit Date / Parameter		
A1-00			b1-00		
A1-01			b1-01		
A1-02			b1-02		
A1-03			b1-03		
A1-04			b1-04		
A1-05			b1-05		
A1-06			b1-06		
A2-00			b1-07		
A2-01			b1-08		
A2-02			b1-09		
A2-03			b1-10		
A2-04			b2-00		
A2-05			b2-01		
A2-06			b2-02		
A2-07			b2-03		
A2-08			b2-04		
A2-09			b3-00		
A2-10			b3-01		
A2-11			b3-02		
A2-12			b3-03		
A2-13			b3-04		
A2-14			b3-05		
A2-15			b4-00		
A2-16			b4-01		
A2-17			b5-00		
A2-18			b5-01		
A2-19			b5-02		
A2-20			b5-03		
A2-21			b5-04		
A2-22			b5-05		
A2-23			b5-06		
A2-24			b5-07		
A2-25			b5-08		
A2-26			b5-09		
A2-27			b5-10		
A2-28			b5-11		
A2-29			b5-12		
A2-30			b5-13		
A2-31			b5-14		
A2-32			b5-15		

Edit Date / Parameter			Edit Date / Parameter		
b5-16			C4-01		
b5-17			C4-02		
b5-18			C4-03		
b5-19			C4-04		
b5-20			C4-05		
b5-21			C4-06		
b5-22			C4-07		
b5-23			C4-08		
b5-24			C4-09		
b5-25			C4-10		
b5-26			C4-11		
b5-27			C4-12		
b5-28			C4-13		
b6-00			C4-14		
b6-01			C4-15		
b6-02			C4-16		
b6-03			C4-17		
C1-00			C4-18		
C1-01			C4-19		
C1-02			C4-20		
C1-03			C4-21		
C1-04			C5-00		
C1-05			C5-01		
C1-06			C5-02		
C1-07			C5-03		
C1-08			C5-04		
C1-09			C5-05		
C1-10			C5-06		
C2-00			C5-07		
C2-01			C5-08		
C2-02			C5-09		
C2-03			C5-10		
C3-00			C6-00		
C3-01			C6-01		
C3-02			C6-02		
C3-03			C6-03		
C3-04			C6-04		
C3-05			L1-00		
C3-06			L1-01		
C4-00			L1-02		

Parameter / Edit Date			Parameter / Edit Date		
L1-03			d1-13		
L1-04			d1-14		
L1-05			d1-15		
L1-06			d1-16		
L1-07			d1-17		
L1-08			d1-18		
L1-09			d1-19		
L1-10			d1-20		
L1-11			d1-21		
L1-12			d1-22		
L1-13			d2-00		
L1-14			d2-01		
L1-15			d2-02		
L1-16			d2-03		
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L2-01			d2-05		
L3-00			d2-06		
L3-01			d2-07		
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L3-03			d2-09		
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L4-01			d2-11		
L4-02			d2-12		
L4-03			d2-13		
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d1-06			d3-01		
d1-07			d3-02		
d1-08			d3-03		
d1-09			d3-04		
d1-10			d3-05		
d1-11			d3-06		
d1-12			d3-07		

Parameter	Edit Date		Parameter	Edit Date	
d3-08			E5-03		
d3-09			E5-04		
E1-00			E5-05		
E1-01			E5-06		
E1-02			E5-07		
E1-03			E6-00		
E1-04			E6-01		
E1-05			E6-02		
E1-06			E6-03		
E1-07			E6-04		
E2-00			E6-05		
E2-01			E6-06		
E2-02			E6-07		
E2-03			E6-08		
E2-04			E6-09		
E2-05			E6-10		
E3-00			E6-11		
E3-01			P1-00		
E3-02			P1-01		
E3-03			P1-02		
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E3-05			P1-04		
E3-06			P1-05		
E3-07			P2-00		
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E4-03			P2-09		
E4-04			P2-10		
E4-05			P3-00		
E4-06			P3-01		
E4-07			P3-02		
E5-00			P3-03		
E5-01			P3-04		
E5-02			P3-05		

Parameter / Edit Date			Parameter / Edit Date		
P3-06			P7-06		
P3-07			P7-07		
P3-08			P7-08		
P3-09			P7-09		
P3-10			P7-10		
P3-11			P7-11		
P3-12			P7-12		
P3-13			P7-13		
P3-14			n1-00		
P3-15			n1-01		
P3-16			n1-02		
P4-00			n1-03		
P4-01			n6-00		
P4-02			n6-01		
P4-03			n6-02		
P5-00			n6-03		
P5-01			n6-04		
P5-02			n6-05		
P6-00			n6-06		
P6-01			n6-07		
P6-02			n6-08		
P6-03			n6-09		
P6-04			n6-10		
P6-05			n6-11		
P6-06			n6-12		
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P6-08			o2-01		
P6-09			o2-02		
P6-10			o2-03		
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P6-12			o2-05		
P6-13			o2-06		
P6-14			o4-00		
P6-15			o4-01		
P7-00			o4-02		
P7-01			o4-03		
P7-02			o4-04		
P7-03			o4-05		
P7-04			o4-06		
P7-05			o4-07		

Parameter \ Edit Date			Parameter \ Edit Date		
o4-08			F1-10		
t1-00			F1-11		
t1-01			F1-12		
t1-02			F1-13		
t1-03			F1-14		
t1-04			F1-15		
t1-05			F1-16		
t1-06			F1-17		
t1-07			F1-18		
t1-08					
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t1-10					
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F1-00					
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F1-09					

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