YASKAWA

YASKAWA AC DRIVE-L1000

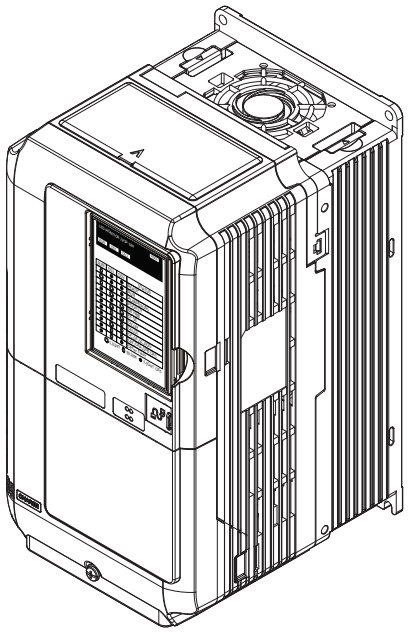
AC Drive for Elevator Applications

Quick Start Guide

Type: CIMR-LE□A □□□□

Models: 200 V Class: 3.7 to 110 kW (5 to 150 HP)
400 V Class: 4.0 to 132 kW (5 to 175 HP)

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.



iQRISE™

MANUAL NO. TOEP YAIL1E 02B

Table of Contents

This document provides basic installation and essential safety information for the L1000E series drive.
Refer to the CD-ROM packaged with the product for complete product instructions necessary for proper installation, set-up, troubleshooting and maintenance. CD part number CD.L1E.01.
The L1000E CD-ROM contains the L1000 Technical Manual No. SIEPYAIL1E01 and additional L1000E Series manuals.

1 Preface

◆ Applicable Models

This Quick Start Guide applies to the drive models in ***Table 1***.

Table 1 Applicable Models

Drive Series	Drive Model Number	Software Version
L1000	CIMR-LE2□□□□□	All
	CIMR-LE4□□□□□	

◆ Warranty Information

■ Restrictions

The drive is not designed or manufactured for use in devices or systems that may directly affect or threaten human lives or health.

Customers who intend to use the product described in this manual for devices or systems relating to transportation, health care, space aviation, atomic power, electric power, or in underwater applications must first contact their Yaskawa representatives or the nearest Yaskawa sales office.

WARNING! *Injury to Personnel. This product has been manufactured under strict quality-control guidelines. However, if this product is to be installed in any location where failure of this product could involve or result in a life-and-death situation or loss of human life or in a facility where failure may cause a serious accident or physical injury, safety devices must be installed to minimize the likelihood of any accident.*

2 General Safety

◆ Supplemental Safety Information

General Precautions
• The diagrams in this manual may be indicated without covers or safety shields to show details. Replace the covers or shields before operating the drive and run the drive according to the instructions described in this manual. • Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable. • The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual. • When ordering a new copy of the manual due to damage or loss, contact your Yaskawa representative or the nearest Yaskawa sales office and provide the manual number shown on the front cover. • If nameplate becomes worn or damaged, order a replacement from your Yaskawa representative or the nearest Yaskawa sales office.

⚠ WARNING

Read and understand this manual before installing, operating or servicing this drive. The drive must be installed according to this manual and local codes.

The following conventions are used to indicate safety messages in this manual. Failure to heed these messages could in serious or fatal injury or damage to the products or to related equipment and systems.

⚠ DANGER

Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

WARNING! *may also be indicated by a bold key word embedded in the text followed by an italicized safety message.*

⚠ CAUTION

Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

CAUTION! *may also be indicated by a bold key word embedded in the text followed by an italicized safety message.*

NOTICE

Indicates a property damage message.

NOTICE: *may also be indicated by a bold key word embedded in the text followed by an italicized safety message.*

◆ Safety Messages

⚠ DANGER

Heed the safety messages in this manual.

Failure to comply will result in death or serious injury.

The Operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

DANGER

Electrical Shock Hazard

Do not change wiring, remove covers, connectors or options cards, or attempt to service the drive with power applied to the drive.

Disconnect all power to the drive, and lock out the power source. After shutting off the power wait for at least the amount of time specified on the drive front cover safety label. Measure the DC bus voltage for unsafe voltages to confirm safe level before servicing to prevent electric shock. The internal capacitor remains charged even after the power supply is turned off. Failure to comply will result in serious injury or death from electric shock.

WARNING

Sudden Movement Hazard

System may start unexpectedly upon application of power, resulting in death or serious injury.

Clear all personnel from the drive, motor and machine area before applying power. Secure covers, couplings, shaft keys and machine loads before applying power to the drive.

Electrical Shock Hazard

Do not attempt to modify or alter the drive in any way not explained in this manual.

Failure to comply could result in death or serious injury.

Yaskawa is not responsible for any modification of the product made by the user. This product must not be modified.

Do not allow unqualified personnel to use the equipment.

Failure to comply could result in death or serious injury.

Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment and maintenance of AC drives.

Fire Hazard

Do not use an improper voltage source.

Failure to comply could result in death or serious injury by fire.

Verify that the rated voltage of the drive matches the voltage of the incoming power supply before applying power.

CAUTION

Always hold the case when carrying the drive.

Carrying the drive by the front cover may cause the main body of the drive to fall, resulting in minor or moderate injury.

NOTICE

Equipment Hazard

Do not perform a withstand voltage test on any part of the drive.

Failure to comply could result in damage to the sensitive devices within the drive.

Do not operate damaged equipment.

Failure to comply could result in further damage to the equipment.

Do not connect or operate any equipment with visible damage or missing parts.

NOTICE

Do not expose the drive to halogen group disinfectants.

Failure to comply may cause damage to the electrical components in the drive.

Do not pack the drive in wooden materials that have been fumigated or sterilized.

Do not sterilize the entire package after the product is packed.

Never steam clean the drive.

During transport, keep the drive from coming into contact with salts, fluorine, bromine, phthalate ester, and other such harmful chemicals.

◆ Periodic Maintenance Safety

DANGER! *Do not change wiring, remove covers, connectors or options cards, or attempt to service the drive with power applied to the drive. Disconnect all power to the drive, and lock out the power source. After shutting off the power wait for at least the amount of time specified on the drive front cover safety label. Measure the DC bus voltage for unsafe voltages to confirm safe level before servicing to prevent electric shock. The internal capacitor remains charged even after the power supply is turned off. Failure to comply will result in serious injury or death from electric shock.*

WARNING! *Burn Hazard. Because the heatsink can get very hot during operation, take proper precautions to prevent burns. When replacing the cooling fan, shut off the power and wait at least 15 minutes to be sure that the heatsink has cooled down. Failure to comply may cause burn injury to personnel.*

◆ Motor Application Safety

NOTICE: *Equipment Damage. A motor connected to a PWM drive may operate at a higher temperature than a utility-fed motor and the operating speed range may reduce motor cooling capacity. Ensure that the motor is suitable for drive duty and/or the motor service factor is adequate to accommodate the additional heating with the intended operating conditions.*

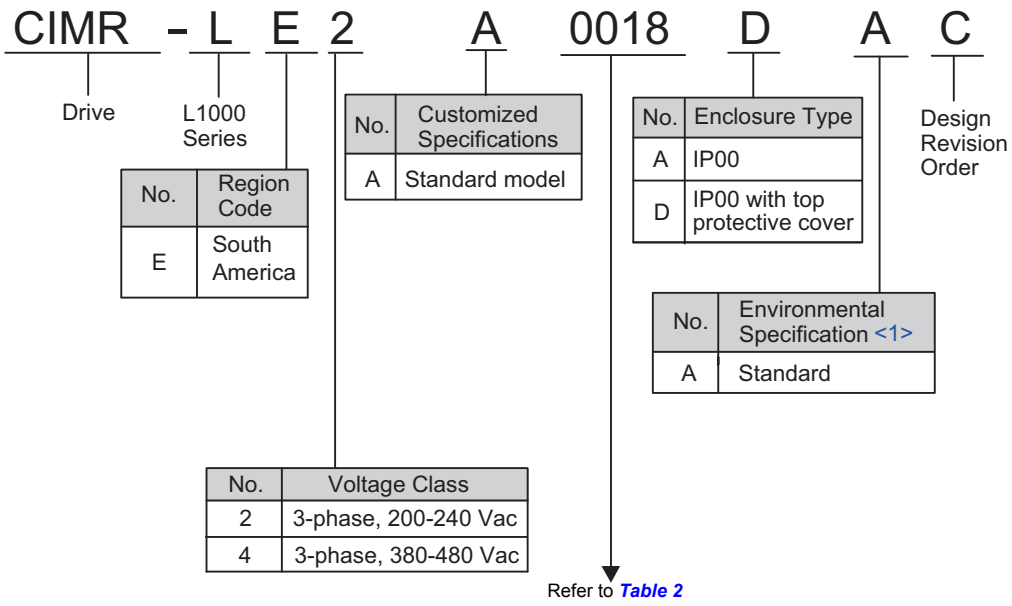
NOTICE: *Insulation Tolerance. Consider motor voltage tolerance levels and motor insulation in applications with an input voltage of over 440 V or particularly long wiring distances.*

■ Audible Noise

The audible noise of the motor varies based on the carrier frequency setting. However, drive current derating may be required. When using a high carrier frequency, audible noise from the motor is comparable to the motor noise generated when running from line power.

3 Receiving

◆ Model Number



<1> Drives with these specifications do not guarantee complete protection for the environmental conditions indicated.

The drive may need to be derated based on starting and carrier frequency selections. ***Refer to Selecting an L1000E AC Drive for Elevator Applications on page 9*** **for proper drive selection**.

Table 2 Model Number and Specifications

Three-Phase 200 V			Three-Phase 400 V		
Drive Model	**Max Motor Capacity kW (HP)**	**Rated Output Current A**	**Drive Model**	**Max Motor Capacity kW (HP)**	**Rated Output Current A**
2A0018	3.7 (5)	17.5	4A0009	3.7 (5)	9.0
2A0022	5.5 (7.5)	21.9	4A0012	5.5 (7.5)	11.5
2A0031	7.5 (10.0)	31.3	4A0019	7.5 (10.0)	18.5
2A0041	11.0 (15.0)	41.3	4A0023	11.0 (15.0)	22.5
2A0059	15.0 (20.0)	58.8	4A0030	15.0 (20.0)	30.0
2A0075	18.5 (25.0)	75.0	4A0039	18.5 (25.0)	38.8
2A0094	22.0 (30.0)	93.8	4A0049	22.0 (30.0)	48.8
2A0106	30.0 (40.0)	106	4A0056	30.0 (40.0)	56.3
2A0144	37.0 (50.0)	143	4A0075	37.0 (50.0)	75.0
2A0181	45.0 (60.0)	181	4A0094	45.0 (60.0)	93.8
2A0225	55.0 (75.0)	225	4A0114	55.0 (75.0)	113
2A0269	75.0 (100.0)	268	4A0140	75.0 (100.0)	140
2A0354	90.0 (125.0)	353	4A0188	90.0 (125.0)	187
2A0432	110.0 (150.0)	432	4A0225	110.0 (150.0)	225

4 Selecting an L1000E AC Drive for Elevator Applications

◆ Purpose and Intended Audience

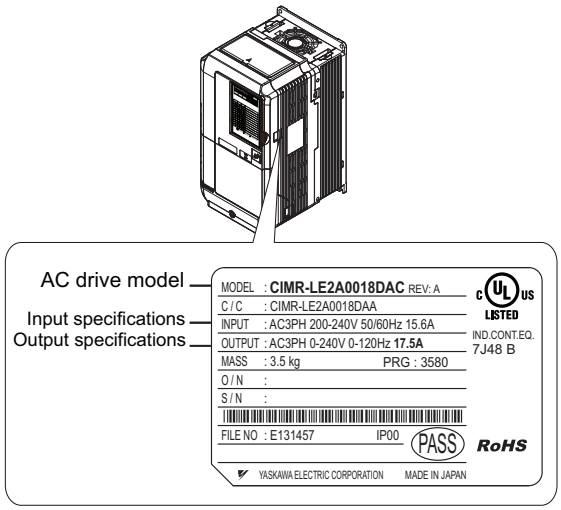
This document contains supplementary information to aid in selection and adjustment of the L1000E Series AC drive with these application criteria:

- Application: **Conventional gear-driven, traction drive elevator applications (counterweighted)**
- Motor type: 50 Hz or 60 Hz induction motors
- Near full speed, normal acceleration rates

Please refer to the *L1000E Technical Manual SIEPYAIL1E01* for complete information and instructions.

◆ Applicable Models

All L1000E series drives. Models CIMR-LE□□□□□□AC



◆ Overview

This document guides the user in selecting the optimum L1000E model for elevator applications while considering these specific needs;

- motor acceleration current
- motor audible noise
- overload capability and
- low speed operation.

◆ Definitions

■ What is Carrier Frequency?

Carrier frequency in PWM (pulse width modulation)-based VFD's, is the rate at which output transistors are gated, usually 2 to 15 kHz. Higher carrier frequencies yield a better current waveform, less audible motor noise, but more VFD thermal losses. Lower carrier frequencies yield a less optimum current waveform, increased audible noise, but less VFD losses. Audible motor noise in applications where the motor must operate quietly can be a concern with lower carrier frequencies.

■ Drive Nameplate Output Current

The L1000E nameplate current is the output current that the L1000E can supply at the default carrier frequency for a maximum run of 180 seconds and a motor electrical frequency above 6.0 Hz operating 50% of the time. Increasing the Carrier Frequency [C6-03] or operating below 6.0 Hz will reduce the allowable output current and available motor torque.

◆ The Effect of Carrier Frequency [C6-03] Adjustment on Output Current

Table 3 lists constant-speed output amps for L1000E models adjusted for carrier frequencies common to elevator applications. Select a higher Carrier Frequency [C6-03] to reduce audible motor noise when required by the application. Selecting a lower carrier frequency or a larger L1000E model, does not always result in increased current capacity.

Table 3 L1000E Current De-Rating Adjusted for Carrier Frequency by Model

Model CIMR-LE□□□□□□□DAC	L1000E Nameplate Output Amps RMS (50% ED, 180 s max.)	Parameter C6-03 Carrier Frequency Setting					
		2.0 kHz	5.0 kHz	8.0 kHz	10.0 kHz	12.5 kHz	15.0 kHz
		De-rated Output Amps RMS (50% ED, 180 s max.)					
		NOTE: The shaded cells represent the output amps at the highest carrier frequency setting (C6-03) that requires no nameplate output amps de-rating.					
200-240 Vac Models							
2A0018	17.5	17.5			16.5	15.3	14.0
2A0022	21.9	21.9			20.6	19.1	17.5
2A0031	31.3	31.3			29.5	27.2	25.0
2A0041	41.3	41.3			38.9	36.0	33.0
2A0059	58.8	58.8			55.4	51.2	47.0
2A0075	75.0	75.0			70.7	65.4	60.0
2A0094	93.8	93.8			85.7	75.7	65.6
2A0106	106.3	106.3			97.2	85.8	74.4
2A0144	143.8	143.8			131.5	116.1	100.6
2A0181	181.3	181.3		159.5	145.0	-	-
2A0225	225.0	225.1		198.0	180.0	-	-
2A0269	268.8	268.8		236.6	215.0	-	-
2A0354	353.8	353.8		311.4	283.1	-	-
2A0432	432.5	432.6		380.7	346.1	-	-
380-480 Vac Models							
4A0009	9.0	9.0			8.0	6.7	5.4
4A0012	11.5	11.5			10.2	8.5	6.9
4A0019	18.5	18.5			16.4	13.7	11.1
4A0023	22.5	22.5			19.9	16.7	13.5
4A0030	30.0	30.0			26.6	22.3	18.0
4A0039	38.8	38.8			34.3	28.8	23.3
4A0049	48.8	48.8			43.2	36.2	29.3
4A0056	56.3	56.3			49.8	41.8	33.8
4 A0075	75.0	75.0			66.4	55.7	45.0
4A0094	93.8	93.8			83.1	69.7	56.3
4A0114	113.8	113.8			100.8	84.5	68.3
4A0140	140.0	140.0		114.8	98.0	-	-
4A0188	187.5	187.5		153.8	131.3	-	-
4A0225	225.0	225.1		184.5	157.5	-	-

■ 30-Second Overload Capacity

The overload capacity of the L1000E is 133% for 30 seconds. **Multiply the carrier de-rated output amps in *Table 3* by 1.33 to obtain the 30 second overload capacity.** Acceleration of the elevator and the counterweight to full speed generally requires output amps above the motor's nameplate rating.

Example: L1000E model CIMR-LE2A0075 operating at 15 kHz carrier has a de-rated current of 60.0 Amps, *Table 3*. The 30 second overload is 133% of 60.0 Amps (80.0 Amps) for 30 seconds.

■ 5-Second Overload Capacity

Table 4 lists the maximum 5.0 second overload current capacity of L1000E models at carrier frequencies common to elevator applications. Most elevators will reach full speed in less than 5.0 seconds.

NOTICE: Prevent overload/overcurrent faults by not exceeding the 5.0 second overload capacity.

Table 4 Maximum 5.0-Second Overload Capacity (RMS Amps)

Model CIMR-LE□□□□□□DAC	L1000E Nameplate Output Amps RMS	Parameter C6-03 Carrier Frequency Setting					
		2.0 kHz	5.0 kHz	8.0 kHz	10.0 kHz	12.5 kHz	15.0 kHz
		De-rated Output Amps RMS (5.0 s or less @ > 6.0 Hz output freq)					
200-240 Vac Models							
LE2A0018	17.5	27.6			26.8	25.8	24.8
LE2A0022	21.9	31.9			30.9	27.7	24.9
LE2A0031	31.3	45.6			44.2	42.4	40.6
LE2A0041	41.3	67.6			65.7	63.4	61.0
LE2A0059	58.8	94.7			92.0	88.7	85.3
LE2A0075	75.0	113.7			110.3	106.0	101.7
LE2A0094	93.8	153.2			146.7	138.7	127.9
LE2A0106	106.3	185.6			178.3	167.2	145.0
LE2A0144	143.8	222.7		218.1	203.3	186.3	171.0
LE2A0181	181.3	301.6		274.6	257.9	-	-
LE2A0225	225.0	371.2		349.6	335.2	-	-
LE2A0269	268.8	424.6		376.3	339.2	-	-
LE2A0354	353.8	519.7		460.4	412.7	-	-
LE2A0432	432.5	696.2		654.7	627.0	-	-
380-480 Vac Models							
LE4A0009	9.0	15.2			14.4	13.0	10.5
LE4A0012	11.5	16.7			15.7	14.4	13.1
LE4A0019	18.5	26.9			25.2	23.1	21.0
LE4A0023	22.5	35.0			32.9	30.3	26.3
LE4A0030	30.0	48.7			46.0	42.6	35.1
LE4A0039	38.8	62.6			59.1	54.7	45.3
LE4A0049	48.8	78.9			70.8	62.4	55.5
LE4A0056	56.3	97.5			92.3	81.4	65.8
LE4A0075	75.0	120.7			113.8	105.3	87.7
LE4A0094	93.8	150.8		137.0	121.7	105.8	92.8
LE4A0114	113.8	185.6		156.0	134.3	112.7	95.7
LE4A0140	140.0	225.0	209.9	168.3	148.3	-	-
LE4A0188	187.5	297.0	281.4	222.0	193.7	-	-
LE4A0225	225.0	382.8	379.5	298.8	261.5	-	-

■ Low Speed Operation

Table 3 and *Table 4* pertain to motor operation above 6.0 Hz. Elevators applications make use of the L1000E's S-curve function to limit the rate of change of acceleration ('jerk') to provide an comfortable ride. Acceleration current increases linearly over the S-curve interval (about 0.5 seconds) while speed and frequency increase simultaneously. A typical 50/60 Hz geared elevator motor will be near or above 6.0 Hz before full acceleration current is required. The 5.0 second overload capacities in *Table 4* assume the drive is operating near or above 6.0 Hz before it achieves full acceleration.

Some elevator applications require the drive to spend a significant portion of the acceleration time below 6.0 Hz. L1000E current capacity must be de-rated below 6.0 Hz to maximize the life of its IGBTs. Consequently the L1000E current capacity is decreased from 100% at 6.0 Hz and above, to 50% at 0.0 Hz (DC). The de-rating is linear as depicted in the graph below.

The operating frequency at which the motor reaches full acceleration torque should be used as the basis for low-frequency de-rating.

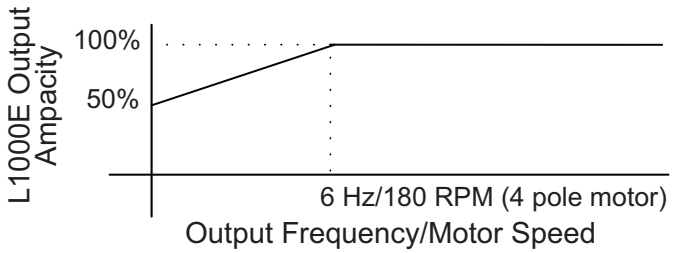


Figure 1 Low Speed Operation De-rating

◆ Using Torque Boost

■ Function Description

Automatic Torque Boost [L8-38] is useful in elevators that experience occasional high starting current due to overload. Enable the Automatic Torque Boost Function [L8-38=3] to boost motor torque during heavy load conditions. The L1000E automatically reduces the carrier frequency to 3.0 kHz to make increased current available when the starting current is about to exceed the current level as indicated in *Table 4*. The carrier frequency will return to the [C6-03] value as the heavy load condition subsides.

Note: Audible motor noise will increase when the Automatic Torque Boost function is operates.

Automatic Torque Boost Function Parameters	
Parameter Name	**Setting**
L8-38 (Automatic Torque Boost Selection)	0: Disabled (Default) 3: Enabled
L8-39 (Reduced Carrier Frequency)	3.0 kHz (Default) (Range: 1.0 to 15.0 kHz)

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5 Mechanical Installation

CAUTION! *Crush Hazard. Carrying the drive by the front cover may cause the main body of the drive to fall, resulting in minor or moderate injury. Always hold the case when carrying the drive.*

◆ Installation Environment

Install the drive in an environment matching the specifications below to help prolong the optimum performance life of the drive.

Table 5 Installation Environment

Environment	Conditions
Installation Area	Indoors
Ambient Temperature	IP00 enclosure with top protective cover: -10 to +40 °C (14 to 104 °F) IP00 enclosure: -10 to +50 °C (14 to 122 °F) Drive reliability improves in environments without wide temperature fluctuations. When using the drive in an enclosure panel, install a cooling fan or air conditioner in the area to ensure that the air temperature inside the enclosure does not exceed the specified levels. Do not allow ice to develop on the drive.
Humidity	95% RH or less and free of condensation
Storage Temperature	-20 to 60 °C (-4 to 140 °F)
Surrounding Area	Install the drive in an area free from: • oil mist and dust • metal shavings, oil, water or other foreign materials • radioactive materials • combustible materials (e.g., wood) • harmful gases and liquids • excessive vibration • chlorides • direct sunlight
Altitude	1000 m (3280 ft.) or lower, up to 3000 m (9842 ft.) with derating (Refer to ***Altitude Derating on page 59***)
Vibration	10 to 20 Hz at 9.8 m/s^2 20 to 55 Hz at 5.9 m/s^2 (2A0018 to 2A0225 and 4A0009 to 4A0188) or 2.0 m/s^2 (2A0269 to 2A0432 and 4A0225).
Orientation	Install the drive vertically to maintain maximum cooling effects.

NOTICE: *Avoid placing drive peripheral devices, transformers, or other electronics near the drive as the noise created can lead to erroneous operation. If such devices must be used in close proximity to the drive, take proper steps to shield the drive from electrical inteference.*

NOTICE: *Prevent foreign matter such as metal shavings and wire clippings from falling into the drive during installation. Failure to comply could result in damage to the drive. Place a temporary cover over the top of the drive during installation. Remove the temporary cover before startup, as the cover will reduce ventilation and cause the drive to overheat.*

◆ Installation Orientation and Spacing

WARNING! *Fire Hazard. Provide sufficient cooling when installing the drive inside an enclosed panel or cabinet. Failure to comply could result in overheating and fire. When drives are placed inside the same enclosure panel, install proper cooling to ensure air entering the enclosure does not exceed 40 °C (104 °F).*

■ Installation Orientation

Install the drive upright as illustrated in ***Figure 2*** to maintain proper cooling.

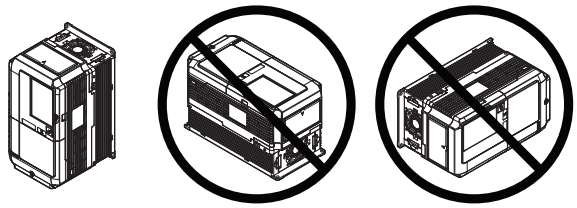
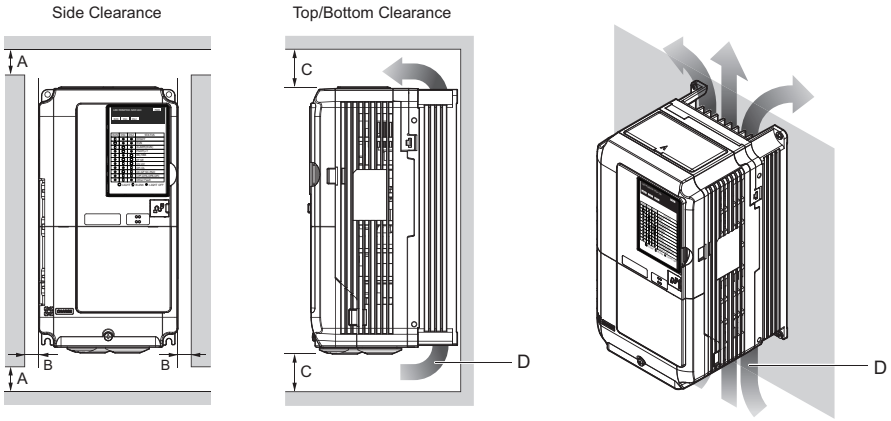


Figure 2 Correct Installation Orientation

■ Installation Spacing

Figure 3 shows the installation distance required to maintain sufficient space for airflow and wiring.



A – 50 mm (1.97 in.) minimum
B – 30 mm (1.18 in.) minimum
C – 120 mm (4.72 in.) minimum
D – Airflow direction

Figure 3 Correct Installation Spacing

◆ Instructions on Installation

Eye bolts are used to install the drive or to temporarily lift the drive when replacing it. The drive can be installed in an enclosure panel or on a wall. Do not leave the drive suspended by the wires in a horizontal or vertical position for long periods of time. Do not transport the drive over long distances. Read the following precautions and instructions before installing the drives.

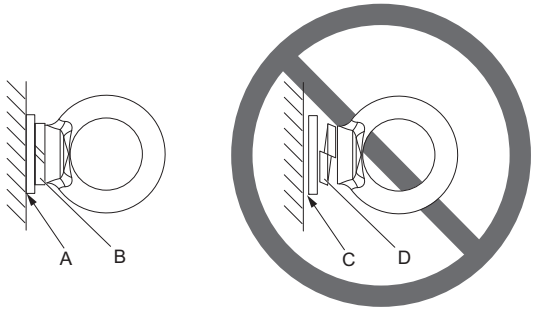
WARNING! *Crush Hazard. Be sure to observe the following instructions and precautions. Failure to comply could result in minor or moderate injury and damage to the drive from falling equipment.*

- *Before using wires to suspend the drive vertically and horizontally, make sure that the drive front cover, terminal blocks and other drive components are securely fixed with screws.*
- *Do not subject the drive to vibration or impact greater than 1.96 m/s^2 (0.2 G) while it is suspended by the wires.*
- *Do not overturn the drive while it is suspended by the wires.*
- *Do not leave the drive suspended by the wires for long periods of time.*
- *Only allow qualified personnel to operate a crane or hoist to transport the drive.*
- *Use a dedicated lifter when transporting the drive by a lifter.*
- *Only use vertical suspension to temporarily lift the drive during installation to an enclosure panel. Do not use vertical suspension to transport the drive.*

■ Horizontal Suspension of the Drive (Model 2A0432)

To make a wire hanger or frame for use when lifting the drive with a crane, lay the drive in a horizontal position and pass a wire through the holes of the four eye bolts.

When lifting the drive, confirm that the spring washer is fully closed. If not, the drive may become deformed or damaged when lifted.



A – No space between drive and washer
B – Spring washer: Fully closed
C – Space between drive and washer
D – Spring washer: Open

Figure 4 Details of Spring Washers

■ Vertical Suspension of the Drive (Model 2A0432)

When vertical suspension of the drive is required in an enclosure panel, the orientation of the eye bolts for these drive models can be easily changed by turning the eye bolts counterclockwise 90 degrees.

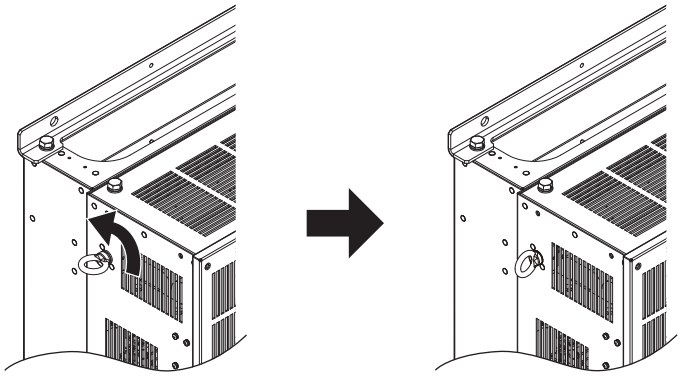


Figure 5 Adjusting Angle of Eye Bolts (Model 2A0432)

◆ Drive Dimensions

NOTICE

Refer to the L1000E Technical Manual SIEPYAIL1E01 for ***Drive Dimensions***.

The L1000E Series CD-ROM No. CD.L1E.01 packaged with the drive contains the L1000E Technical Manual No. SIEPYAIL1E01 and additional L1000E Series manuals.

6 Electrical Installation

NOTICE

Refer to the L1000E Technical Manual SIEPYAIL1E01 for more information regarding the ***Electrical Installation*** and for complete product instructions necessary for proper installation, set-up, troubleshooting and maintenance.

The L1000E Series CD-ROM No. CD.L1E.01 packaged with the drive contains the L1000E Technical Manual No. SIEPYAIL1E01 and additional L1000E Series manuals.

⚠ DANGER

Electrical Shock Hazard

Do not change wiring, remove covers, connectors or options cards, or attempt to service the drive with power applied to the drive.

Disconnect all power to the drive, and lock out the power source. After shutting off the power wait for at least the amount of time specified on the drive front cover safety label. Measure the DC bus voltage for unsafe voltages to confirm safe level before servicing to prevent electric shock. The internal capacitor remains charged even after the power supply is turned off. Failure to comply will result in serious injury or death from electric shock.

⚠ WARNING

Electrical Shock Hazard

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

The diagrams in this section may show drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating the drives and run the drives according to the instructions described in this manual.

Do not perform work on the drive while wearing loose clothing, jewelry or without eye protection.

Failure to comply could result in death or serious injury.

Remove all metal objects such as watches and rings, secure loose clothing, and wear eye protection before beginning work on the drive.

Fire Hazard

Drive Short-Circuit Current Rating

Install adequate branch circuit protection according to applicable local codes and this Installation Manual.

Failure to comply could result in fire and damage to the drive or injury to personnel.

The device is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, 240 Vac maximum (200 V class) and 480 Vac maximum (400 V class) when protected by branch circuit protection devices specified in this manual.

Do not use improper combustible materials in drive installation.

Failure to comply could result in death or serious injury by fire.

Attach the drive or braking resistors to metal or other noncombustible material.

Do not use an improper voltage source.

Failure to comply could result in death or serious injury by fire. Verify that the rated voltage of the drive matches the voltage of the incoming power supply before applying power.

The braking resistor connection terminals are B1 and B2. Do not connect a braking resistor directly to any other terminals.

Improper wiring connections could result in death or serious injury by fire.

⚠ WARNING

Sudden Movement Hazard

Install a properly controlled contactor on the input-side of the drive for applications where power should be removed from the drive during a fault condition.

Improper equipment sequencing could result in death or serious injury.

Comply with proper wiring practices.

The motor may run in reverse if the phase order is backward, causing incorrect elevator direction movement and injury to personnel.
Connect motor input terminals U, V and W to drive output terminals U/T1,V/T2, and W/T3. The phase order for the drive and motor should match.

NOTICE

Equipment Hazard

Observe proper electrostatic discharge procedures (ESD) when handling the drive and circuit boards.

Failure to comply may result in ESD damage to the drive circuitry.

Never connect or disconnect the motor from the drive while the drive is outputting voltage.

Improper equipment sequencing could result in damage to the drive.

Do not use unshielded cable for control wiring.

Failure to comply may cause electrical interference resulting in poor system performance. Use shielded, twisted-pair wires and ground the shield to the ground terminal of the drive.

Check all the wiring to ensure that all connections are correct after installing the drive and connecting any other devices.

Failure to comply could result in damage to the drive.

Do not check or test control circuit signals while the drive is running.

Improper use of test equipment could result in damage to the drive circuitry by short circuit.

Do not connect control circuit ground terminals to the drive enclosure.

Improper drive grounding can cause control circuit malfunction.

Before applying power to the drive, use power-off resistance checks to check for short-circuits between (R/L1, S/L2, and T/L3) or between main circuit terminals and ground.

Failure to comply may result in damage to the drive from short-circuit.

Prevent foreign matter such as metal shavings or wire clippings from falling into the drive during drive installation and project construction.

Failure to comply could result in damage to the drive. Place a temporary cover over the top during installation. Be sure to remove the temporary cover before start-up, as the cover will reduce ventilation and cause the unit to overheat.

Improper application of devices on drive output circuits can damage the drive.

Do not connect unapproved LC or RC interference suppression filters, capacitors, ground fault circuits, or overvoltage protection devices to the output of the drive.

To get the full performance life out of the electrolytic capacitors and circuit relays, refrain from switching the drive power supply off and on more than once every 30 minutes.

Frequent use can damage the drive. Use the drive to stop and start the motor.

◆ Standard Connection Diagram

WARNING! *Sudden Movement Hazard. Ensure holding brake circuits are properly configured, load equipment may fall or drop during power loss or drive fault, which could result in death or serious injury.*
・Provide a separate holding brake if necessary.
・Always construct the external sequence to confirm that the holding brake is activated in the event of an emergency, a power failure, or an abnormality in the drive.
・When using the drive with an elevator, provide safety measures on the elevator to prevent the elevator from dropping.

NOTICE: *Inadequate wiring could result in damage to the drive. Install adequate branch circuit short circuit protection per applicable codes. The drive is suitable for circuits capable of delivering not more than 100,000 RMS symmetrical amperes, 240 Vac maximum (200 V Class) and 480 Vac maximum (400 V Class).*

NOTICE: *When the input voltage is 440 V or higher or the wiring distance is greater than 100 meters (328 ft.), pay special attention to the motor insulation voltage or use a drive rated motor. Failure to comply could lead to motor insulation breakdown.*

Note: Do not connect AC control circuit ground to drive enclosure. Improper drive grounding can cause control circuit malfunction.

NOTICE: *The minimum load for the multi-function relay output MA-MB-MC is 10 mA. If a circuit requires less than 10 mA (reference value), connect it to a photocoupler output (P1-C1, P2-C2). Improper application of peripheral devices could result in damage to the photocoupler output of the drive.*

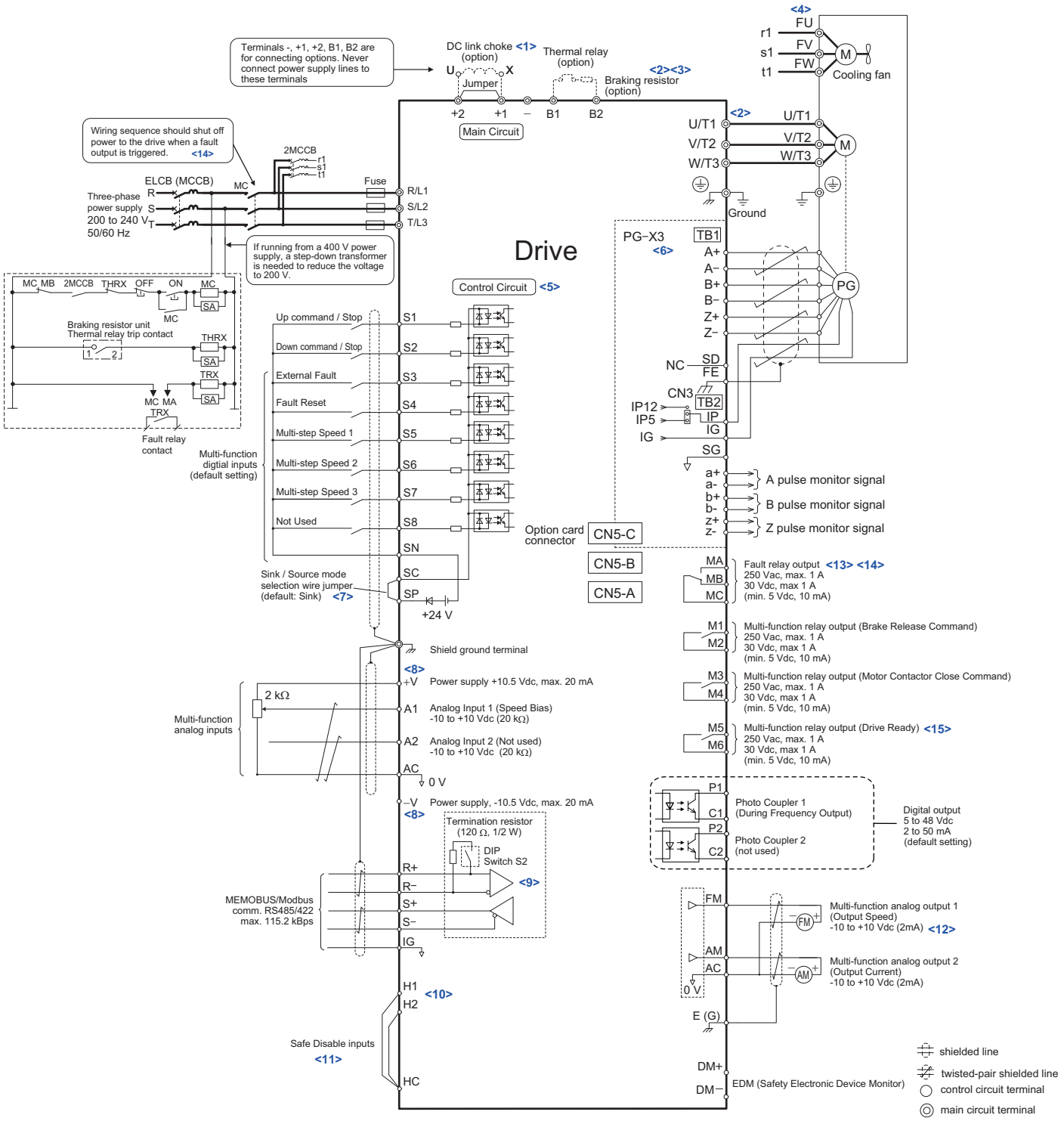


Figure 6 Drive Standard Connection Diagram (example: CIMR-LE2A0041)

■ Connection Diagram Notes

<1> Remove the jumper when installing a DC link choke. Models 2A0106 through 2A0432 and 4A0056 through 4A0225 come with a built-in DC link choke.

<2> Set L8-55 to 0 to disable the protection function of the built-in braking transistor of the drive when using an optional regenerative converter or dynamic braking option.

<3> Set up a thermal relay sequence to disconnect drive main power in the event of an overheat condition on the dynamic braking option.

<4> Self-cooling motors do not require the same wiring necessary for motors with separate cooling fans.

<5> Supplying power to the control circuit separately from the main circuit requires a 24 V power supply (option).

<6> For control modes that do not use a motor speed feedback signal, PG option card wiring is not necessary.

<7> This figure illustrates an example of a sequence input to S1 through S8 using a non-powered relay or an NPN transistor. Install the wire link between terminals SC-SP for Sink mode, between SC-SN for Source mode, or leave the link out for external power supply. Never short terminals SP and SN, as it will damage the drive.

<8> The maximum output current capacity for the +V and -V terminals on the control circuit is 20 mA. Never short terminals +V, -V, and AC, as it can cause erroneous operation or damage the drive.

<9> Set DIP switch S2 to the ON position to enable the termination resistor in the last drive in a MEMOBUS/Modbus network.

<10> The sink/source setting for the Safe Disable input is the same as with the sequence input. Jumper S3 has the drive set for an external power supply. When not using the Safe Disable input feature, remove the jumper shorting the input and connect an external power supply. Refer to ***Setting Sink/Source for Safe Disable Inputs on page 39*** for instructions.

<11> Disconnect the wire jumper between H1 - HC and H2 - HC when utilizing the Safe Disable input.

<12> Monitor outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type of signal.

<13> When the drive is set to trigger a fault output upon activation of the fault reset function (L5-02 = 1), a sequence to interrupt power when a fault occurs will shut off the power to the drive when the drive attempts a reset. The default setting for L5-02 is 0 (fault output not active during reset attempt).

<14> Wire fault contact outputs MA, MB, and MC. Wire so that a fault will open the safety circuit and interrupt drive output.

<15> When using the Programming Mode to edit parameter settings, the drive will not accept an Up/Down command. If the drive still will not run when an Up/Down command has been entered and no fault is present, then use the "Drive ready" signal (the default setting for terminal M5-M6) to interlock components.

◆ Main Circuit Wiring

WARNING! *Do not connect the AC power line to the output motor terminals of the drive. Failure to comply could result in death or serious injury by fire as a result of drive damage from line voltage application to output terminals. Do not connect AC line power to output terminals U, V, and W. Make sure that the power supply lines are connected to main circuit input terminals R/L1, S/L2, T/L3 (or R/L1 and S/L2 for single-phase power).*

NOTICE: *Equipment Hazard. Separate motor and/or braking circuit wiring (terminals, U/T1, V/T2, W/T3, +3, +2, +1,(-), B1, B2, from all other wiring. Place motor wiring within its own conduit or cable tray with appropriate divider, and use shielded motor cable where appropriate. Improper wiring practices could result in malfunction of drive due to electrical interference.*

NOTICE: *Route motor leads U/T1, V/T2, and W/T3 separate from all other leads to reduce possible interference related issues. Failure to comply may result in abnormal operation of drive and nearby equipment.*

NOTICE: *Equipment Hazard. Separate motor and/or braking circuit wiring (terminals, U/T1, V/T2, W/T3, +3, +2, +1,(-), B1, B2, from all other wiring. Place motor wiring within its own conduit or cable tray with appropriate divider, and use shielded motor cable where appropriate. Improper wiring practices could result in malfunction of drive due to electrical interference.*

NOTICE: *Do not use the negative DC bus terminal "–" as a ground terminal. This terminal is at high DC voltage potential. Improper wiring connections could damage the drive.*

NOTICE: *Do not solder the ends of wire connections to the drive. Soldered wiring connections can loosen over time. Improper wiring practices could result in drive malfunction due to loose terminal connections.*

NOTICE: *Do not switch the drive input to start or stop the motor. Frequently switching the drive on and off shortens the life of the DC bus charge circuit and the DC bus capacitors, and can cause premature drive failures. For the full performance life, refrain from switching the drive on and off more than once every 30 minutes.*

NOTICE: *When connecting the motor to the drive output terminals U/T1, V/T2, and W/T3, the phase order for the drive and motor should match. Failure to comply with proper wiring practices may cause the motor to run in reverse if the phase order is backward.*

NOTICE: *Do not connect phase-advancing capacitors or LC/RC noise filters to the output circuits. Failure to comply could result in damage to the drive, phase-advancing capacitors, LC/RC noise filters or ground fault circuit interrupters.*

■ Main Circuit Terminal Functions

Table 6 Main Circuit Terminal Functions

<table>
<tr><th colspan="2" rowspan="2">Terminal</th><th colspan="3">Type</th><th rowspan="3">Function</th><th rowspan="3">Page</th></tr>
<tr><th rowspan="2">200 V Class
400 V Class</th><th rowspan="2">Drive Model</th><th>2A0018 to 2A0094</th><th>2A0106, 2A0144</th><th>2A0181 to 2A0432</th></tr>
<tr><th>4A0009 to 4A0049</th><th>4A0056, 4A0075</th><th>4A0094 to 4A0225</th></tr>
<tr><td colspan="2">R/L1
S/L2
T/L3</td><td colspan="3">Main circuit power supply input</td><td>Connects line power to the drive</td><td>22</td></tr>
<tr><td colspan="2">U/T1
V/T2
W/T3</td><td colspan="3">Drive output</td><td>Connects to the motor</td><td>22</td></tr>
<tr><td colspan="2">B1
B2</td><td colspan="2">Braking resistor</td><td>Not available</td><td>Available for connecting a braking resistor or a braking resistor unit option</td><td>–</td></tr>
<tr><td colspan="2">+2</td><td rowspan="3">• DC link choke connection (+1, +2) (remove the shorting bar between +1 and +2)
• DC power supply input (+1, –)</td><td colspan="2">not available</td><td rowspan="4">For connection
• of the drive to a DC power supply (terminals +1 and – are not UL approved)
• of dynamic braking options</td><td rowspan="4">–</td></tr>
<tr><td colspan="2">+1</td><td rowspan="2">• DC power supply input (+1, –)</td><td rowspan="3">• DC power supply input (+1, –)
• Braking unit connection (+3, –)</td></tr>
<tr><td colspan="2">–</td></tr>
<tr><td colspan="2">+3</td><td colspan="2">not available</td></tr>
<tr><td colspan="2">⏚</td><td colspan="3">For 200 V class: 100 Ω or less
For 400 V class: 10 Ω or less</td><td>Grounding terminal</td><td>30</td></tr>
</table>

Note: Use terminal B1 and - when installing the braking unit (CDBR type) to the drives with built-in braking transistor (2A0018 to 2A0144, 4A0009 to 4A0075).

■ Wire Gauges and Tightening Torque

WARNING! *Fire hazard. Tighten all terminal screws to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections. Improperly tightened terminal screws can also cause erroneous equipment operation.*

WARNING! *Do not tighten screws beyond the specified tightening torque. Failure to comply may result in erroneous operation, damage the terminal block, or cause injury due to fire from overheating of loose electrical connections.*

Use the tables in this section to select the appropriate wires and crimp terminals.

Gauges listed in the tables are for use in the United States.

Note: **1.** Wire gauge recommendations based on drive continuous current ratings using 75 °C (167 °F) 600 Vac vinyl-sheathed wire assuming ambient temperature within 40 °C (104 °F) and wiring distance less than 100 m (328 ft.).
2. Terminals B1, B2, -, +1, +2, and +3, are for connecting a DC link choke, braking resistor or DC power supply. Do not connect other nonspecific devices to these terminals.

- Consider the amount of voltage drop when selecting wire gauges. Increase the wire gauge when the voltage drop is greater than 2% of motor rated voltage. Ensure the wire gauge is suitable for the terminal block. Use the following formula to calculate the amount of voltage drop:
  Line drop voltage (V) = $\sqrt{3}$ × wire resistance (Ωkm) × wire length (m) × current (A) × 10^{-3}
- Refer to instruction manual TOBP C720600 0☐ for braking transistor option or braking resistor option wire gauges.
- Use terminal +1 and the negative terminal when connecting a regenerative converter or a regen unit.
- Use terminal B1 and - when installing the braking unit to the drives with built-in braking transistor (2A0018 to 2A0144, 4A0009 to 4A0075).
- ***Refer to UL Standards Compliance on page 48*** for information on UL compliance.

Yaskawa recommends using closed-loop crimp terminals on all drive models. UL/cUL approval requires the use of closed-loop crimp terminals when wiring the drive main circuit terminals on models 2A0106 to 2A0432 and 4A0056 to 4A0225. Use only the tools recommended by the terminal manufacturer for crimping. Refer to ***Closed-Loop Crimp Terminal Size on page 30*** for closed-loop crimp terminal recommendations.

The wire gauges listed in the following tables are Yaskawa recommendations. Refer to local codes for proper wire gauge selections.

Note: The mark ⏚ indicates the terminals for protective ground connection. (as defined in IEC60417-5019)
Grounding impedance;
200 V: 100 Ω or less
400 V: 10 Ω or less

Three-Phase 200 V Class

Table 7 Wire Gauge and Torque Specifications (Three-Phase 200 V Class)

Drive Model	Terminal	Recommended Wire Size mm² (AWG, kcmil)	Wire Range mm² (AWG, kcmil)	Screw Size	Tightening Torque N•m (lb.in.)
2A0018	R/L1, S/L2, T/L3	6.0 (10)	2.5 to 6.0 (14 to 10)	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	6.0 (10)	2.5 to 6.0 (14 to 10)		
	–, +1, +2	–	2.5 to 6.0 (14 to 10)		
	B1, B2	–	2.5 to 6.0 (14 to 10)		
	⏚	6.0 (10)	2.5 to 6.0 (14 to 10)		
2A0022	R/L1, S/L2, T/L3	6.0 (10)	2.5 to 6.0 (14 to 10)	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	6.0 (10)	2.5 to 6.0 (14 to 10)		
	–, +1, +2	–	4.0 to 6.0 (12 to 10)		
	B1, B2	–	2.5 to 6.0 (14 to 10)		
	⏚	6.0 (10)	4.0 to 6.0 (12 to 10)		
2A0031	R/L1, S/L2, T/L3	10 (8)	2.5 to 16 (12 to 6)	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	10 (8)	2.5 to 16 (12 to 6)		
	–, +1, +2	–	6.0 to 16 (10 to 6)		
	B1, B2	–	4.0 to 6.0 (12 to 10)		
	⏚	10 (8)	6.0 to 10 (10 to 8)	M5	2 to 2.5 (17.7 to 22.1)
2A0041	R/L1, S/L2, T/L3	16 (6)	2.5 to 16 (12 to 6)	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	16 (6)	2.5 to 16 (12 to 6)		
	–, +1, +2	–	16 (6)		
	B1, B2	–	4.0 to 6.0 (12 to 10)		
	⏚	10 (8)	6.0 to 10 (10 to 8)	M5	2 to 2.5 (17.7 to 22.1)
2A0059	R/L1, S/L2, T/L3	25 (4)	16 to 25 (6 to 4)	M6	4 to 6 (35.4 to 53.1)
	U/T1, V/T2, W/T3	25 (4)	16 to 25 (6 to 4)		
	–, +1, +2	–	16 to 25 (6 to 4)		
	B1, B2	–	6.0 to 10 (10 to 6)	M5	2 to 2.5 (17.7 to 22.1)
	⏚	16 (6)	10 to 16 (8 to 6)	M6	4 to 6 (35.4 to 53.1)

Drive Model	Terminal	Recommended Wire Size mm² (AWG, kcmil)	Wire Range mm² (AWG, kcmil)	Screw Size	Tightening Torque N•m (lb.in.)
2A0075	R/L1, S/L2, T/L3	35 (3)	6.0 to 35 (10 to 2)	M8	9 to11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	35 (3)	6.0 to 35 (10 to 2)		
	–, +1, +2	–	16 to 25 (4 to 3)		
	B1, B2	–	10 to 16 (8 to 6)	M5	2 to 2.5 (17.7 to 22.1)
	⏚	16 (6)	16 to 25 (6 to 4)	M6	4 to 6 (35.4 to 53.1)
2A0094	R/L1, S/L2, T/L3	35 (2)	6.0 to 35 (10 to 2)	M8	9 to11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	16 × 2P (6 × 2P)	6.0 to 35 (10 to 2)		
	–, +1, +2	–	25 to 35 (3 to 2)		
	B1, B2	–	16 (6)	M5	2 to 2.5 (17.7 to 22.1)
	⏚	16 (6)	16 to 25 (6 to 4)	M6	4 to 6 (35.4 to 53.1)
2A0106	R/L1, S/L2, T/L3	70 (1/0)	6.0 to 50 (10 to 1/0)	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	70 (1/0)	6.0 to 50 (10 to 1/0)		
	–, +1	–	35 to 50 (2 to 1/0)		
	B1, B2	–	16 to 50 (6 to 1/0)		
	⏚	16 (6)	16 to 25 (6 to 4)		
2A0144	R/L1, S/L2, T/L3	70 (2/0)	6.0 to 95 (10 to 3/0)	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	95 (3/0)	6.0 to 95 (10 to 3/0)		
	–, +1	–	50 to 70 (1/0 to 3/0)		
	B1, B2	–	25 to 70 (4 to 2/0)		
	⏚	25 (4)	25 (4)	M8	9 to 11 (79.7 to 97.4)
2A0181	R/L1, S/L2, T/L3	95 (4/0)	70 to 95 (1/0 to 4/0)	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	95 (4/0)	70 to 95 (1/0 to 4/0)		
	–, +1	–	50 to 95 (1 to 4/0)		
	+3	–	70 to 95 (1/0 to 4/0)		
	⏚	25 (4)	25 to 35 (4 to 2)		

Drive Model	Terminal	Recommended Wire Size mm² (AWG, kcmil)	Wire Range mm² (AWG, kcmil)	Screw Size	Tightening Torque N•m (lb.in.)
2A0225	R/L1, S/L2, T/L3	70 × 2P (1/0 × 2P)	70 to 95 (1/0 to 4/0)	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	70 × 2P (1/0 × 2P)	70 to 95 (1/0 to 4/0)		
	–, +1	–	50 to 95 (1 to 4/0)		
	+3	–	70 to 95 (1/0 to 4/0)		
	⏚	25 (4)	25 to 50 (4 to 1/0)		
2A0269	R/L1, S/L2, T/L3	95 × 2P (3/0 × 2P)	95 to 150 (3/0 to 300)	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	95 × 2P (3/0 × 2P)	95 to 150 (3/0 to 300)		
	–, +1	–	95 to 150 (3/0 to 300)		
	+3	–	35 to 150 (2 to 300)	M10	18 to 23 (159 to 204)
	⏚	35 (3)	35 to 150 (2 to 300)	M12	32 to 40 (283 to 354)
2A0354	R/L1, S/L2, T/L3	120 × 2P (4/0 × 2P)	95 to 150 (3/0 to 300)	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	120 × 2P (4/0 × 2P)	95 to 150 (3/0 to 300)		
	–, +1	–	95 to 150 (3/0 to 300)		
	+3	–	95 to 150 (3/0 to 300)	M10	18 to 23 (159 to 204)
	⏚	35 (2)	35 to 150 (2 to 300)	M12	32 to 40 (283 to 354)
2A0432	R/L1, S/L2, T/L3	150 × 2P (250 × 2P)	95 to 300 (4/0 to 600)	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	185 × 2P (300 × 2P)	95 to 300 (4/0 to 600)		
	–, +1	–	120 to 300 (250 to 600)		
	+3	–	70 to 300 (3/0 to 600)	M10	18 to 23 (159 to 204)
	⏚	50 (1)	120 to 240 (1 to 350)	M12	32 to 40 (283 to 354)

Note: When connecting peripheral devices and options to the terminals –, +1, +3, B1, and B2, refer to the instruction manuals for each device. For more information, contact Yaskawa or your nearest sales representative.

Three-Phase 400 V Class

Table 8 Wire Gauge and Torque Specifications (Three-Phase 400 V Class)

Drive Model	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N•m (lb.in.)
4A0009	R/L1, S/L2, T/L3	2.5 (14)	2.5 to 6.0 (14 to 10)	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	2.5 (14)	2.5 to 6.0 (14 to 10)		
	–, +1, +2	–	2.5 to 6.0 (14 to 10)		
	B1, B2	–	2.5 to 6.0 (14 to 10)		
	⏚	6.0 (10)	2.5 to 6.0 (14 to 10)		
4A0012	R/L1, S/L2, T/L3	4.0 (12)	2.5 to 6.0 (14 to 10)	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	2.5 (14)	2.5 to 6.0 (14 to 10)		
	–, +1, +2	–	2.5 to 6.0 (14 to 10)		
	B1, B2	–	2.5 to 6.0 (14 to 10)		
	⏚	6.0 (10)	2.5 to 6.0 (14 to 10)		
4A0019	R/L1, S/L2, T/L3	6.0 (10)	2.5 to 16 (12 to 6)	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	6.0 (10)	2.5 to 16 (12 to 6)		
	–, +1, +2	–	4.0 to 16 (12 to 6)		
	B1, B2	–	4.0 to 6.0 (12 to 10)		
	⏚	6.0 (10)	2.5 to 6.0 (14 to 10)	M5	2 to 2.5 (17.7 to 22.1)
4A0023	R/L1, S/L2, T/L3	6.0 (10)	2.5 to 16 (12 to 6)	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	6.0 (10)	2.5 to 16 (12 to 6)		
	–, +1, +2	–	4.0 to 16 (12 to 6)		
	B1, B2	–	4.0 to 6.0 (12 to 10)		
	⏚	6.0 (10)	4.0 to 6.0 (12 to 10)	M5	2 to 2.5 (17.7 to 22.1)
4A0030	R/L1, S/L2, T/L3	10 (8)	6.0 to 16 (10 to 6)	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	10 (8)	6.0 to 16 (10 to 6)		
	–, +1, +2	–	6.0 to 16 (10 to 6)		
	B1, B2	–	6.0 to 10 (10 to 8)	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	10 (8)	6.0 to 10 (10 to 8)	M6	4 to 6 (35.4 to 53.1)

Drive Model	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N•m (lb.in.)
4A0039	R/L1, S/L2, T/L3	16 (6)	6.0 to 16 (10 to 6)	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	10 (8)	6.0 to 16 (10 to 6)		
	–, +1, +2	–	16 (6)		
	B1, B2	–	6.0 to 10 (10 to 8)	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	16 (6)	6.0 to 16 (10 to 6)	M6	4 to 6 (35.4 to 53.1)
4A0049	R/L1, S/L2, T/L3	16 (6)	16 to 25 (6 to 4)	M6	4 to 6 (35.4 to 53.1)
	U/T1, V/T2, W/T3	16 (6)	16 to 25 (6 to 4)		
	–, +1, +2	–	16 to 25 (6 to 4)		
	B1, B2	–	6.0 to 10 (10 to 8)	M5	2 to 2.5 (17.7 to 22.1)
	⏚	16 (6)	10 to 16 (8 to 6)	M6	4 to 6 (35.4 to 53.1)
4A0056	R/L1, S/L2, T/L3	25 (4)	6.0 to 50 (10 to 1/0)	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	25 (4)	6.0 to 50 (10 to 1/0)		
	–, +1	–	16 to 35 (6 to 1)		
	B1, B2	–	10 to 16 (8 to 4)		
	⏚	16 (6)	10 to 16 (8 to 6)		
4A0075	R/L1, S/L2, T/L3	35 (3)	6.0 to 70 (10 to 3/0)	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	35 (3)	6.0 to 70 (10 to 3/0)		
	–, +1	–	25 to 35 (4 to 1)		
	B1, B2	–	16 to 25 (6 to 3)		
	⏚	16 (6)	16 to 25 (6)		
4A0094	R/L1, S/L2, T/L3	35 (2)	16 to 120 (6 to 250)	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	50 (1)	16 to 120 (6 to 250)		
	–, +1	–	25 to 50 (3 to 1/0)		
	+3	–	16 to 50 (6 to 1/0)		
	⏚	25 (4)	16 to 25 (6 to 4)		

Drive Model	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N•m (lb.in.)
4A0114	R/L1, S/L2, T/L3	70 (1/0)	16 to 120 (6 to 250)	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	70 (1/0)	16 to 120 (6 to 250)		
	–, +1	–	25 to 50 (3 to 1/0)		
	+3	–	25 to 50 (4 to 1/0)		
	⏚	25 (4)	16 to 25 (6 to 4)		
4A0140	R/L1, S/L2, T/L3	95 (3/0)	50 to 95 (1/0 to 4/0)	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	70 (2/0)	50 to 95 (1/0 to 4/0)		
	–, +1	–	50 to 95 (1/0 to 4/0)		
	+3	–	25 to 95 (3 to 4/0)		
	⏚	25 (4)	25 (4)		
4A0188	R/L1, S/L2, T/L3	95 (4/0)	50 to 95 (1/0 to 4/0)	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	95 (4/0)	50 to 95 (1/0 to 4/0)		
	–, +1	–	35 to 95 (1 to 4/0)		
	+3	–	50 to 95 (1/0 to 4/0)		
	⏚	25 (4)	25 to 35 (4 to 2)		
4A0225	R/L1, S/L2, T/L3	50 × 2P (1 × 2P)	35 to 150 (2 to 300)	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	70 × 2P (1/0 × 2P)	35 to 150 (2 to 300)		
	–, +1	–	50 to 150 (1 to 250)		
	+3	–	25 to 70 (3 to 3/0)		
	⏚	25 (4)	25 to 150 (4 to 300)		

Note: When connecting peripheral devices and options to the terminals –, +1, +3, B1, and B2, refer to the instruction manuals for each device. For more information, contact Yaskawa or your nearest sales representative.

■ Closed-Loop Crimp Terminal Recommendations

Yaskawa recommends using closed-loop crimp terminals on all drive models. UL approval requires the use of UL Listed crimp terminals when wiring the drive main circuit terminals on models 2A0106 to 2A0432 and 4A0056 to 4A0225. Use only crimping tools as specified by the crimp terminal manufacturer. Yaskawa recommends crimp terminals made by JST and Tokyo DIP (or equivalent) for the insulation cap.

Table 9 matches the wire gauges and terminal screw sizes with Yaskawa - recommended crimp terminals, tools, and insulation caps. Refer to the appropriate Wire Gauge and Torque Specifications table for the wire gauge and screw size for your drive model. Place orders with a Yaskawa representatives the Yaskawa sales department.

Table 9 Closed-Loop Crimp Terminal Size

Wire Gauge	Terminal Screws	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code <1>
			Machine No.	Die Jaw		
14 AWG	M4	R2-4	YA-4	AD-900	TP-003	100-054-028
12 / 10 AWG	M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	M5	R5.5-5	YA-4	AD-900	TP-005	100-054-030
8 AWG	M4	8-4	YA-4	AD-901	TP-008	100-054-031
	M5	R8-5	YA-4	AD-901	TP-008	100-054-032
6 AWG	M4	14-NK4	YA-4	AD-902	TP-014	100-054-033
	M5	R14-5	YA-4	AD-902	TP-014	100-054-034
	M6	R14-6	YA-5	AD-952	TP-014	100-051-261
	M8	R14-8	YA-5	AD-952	TP-014	100-054-035
4 AWG	M6	R22-6	YA-5	AD-953	TP-022	100-051-262
	M8	R22-8	YA-5	AD-953	TP-022	100-051-263
3/2/1 AWG	M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	M10	R38-10	YA-5	AD-954	TP-038	100-061-114
1/0 AWG 1/0 AWG × 2P	M8	R60-8	YA-5	AD-955	TP-060	100-051-265
	M10	R60-10	YF-1, YET-300-1	TD-321, TD-311	TP-060	100-051-266
2/0 AWG 2/0 AWG × 2P	M10	70-10	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-054-036
1 AWG × 2P 2 AWG × 2P	M10	38-L10	YF-1, YET-150-1	TD-224, TD-212	TP-038	100-051-556
3/0 AWG	M10	80-10	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-051-267
3/0 AWG × 2P	M10	80-L10	YF-1, YET-150-1	TD-227, TD-214	TP-080	100-051-557
	M12	80-L12	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-051-558
4/0 AWG	M10	R100-10	YF-1, YET-300-1 YF-1, YET-150-1	TD-324, TD-312 TD-228, TD-214	TP-100	100-051-269
4/0 AWG × 2P	M10	100-L10	YF-1, YET-150-1	TD-228, TD-214	TP-100	100-051-559
	M12	100-L12	YF-1, YET-300-1	TD-324, TD-312	TP-100	100-051-560
250 / 300 kcmil	M10	R150-10	YF-1. YET-150-1	TD-229, TD-215	TP-150	100-051-272
	M12	R150-12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-273
250 kcmil × 2P 300 kcmil × 2P	M10	150-L10	YF-1, YET-150-1	TD-229, TD-215	TP-150	100-051-561
	M12	150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562
350 kcmil	M10	180-10	YF-1, YET-300-1	TD-326, TD-313	TP-200	100-066-687
400 kcmil	M10	200-10	YF-1, YET-300-1	TD-327, TD-314	TP-200	100-051-563
350 kcmil × 2P	M12	180-L12	YF-1, YET-300-1	TD-326, TD-313	TP-200	100-066-688
400 kcmil × 2P	M12	200-L12	YF-1, YET-300-1	TD-327, TD-314	TP-200	100-051-564
500 kcmil 600 / 650 kcmil 500 kcmil × 2P 600 kcmil × 2P	M10	325-10	YF-1, YET-300-1	TD-328, TD-315	TP-325	100-051-565
	M12	325-12	YF-1, YET-300-1	TD-328, TD-315	TP-325	100-051-277

<1> Codes refer to a set of three crimp terminals and three insulation caps. Prepare input and output wiring using two sets for each connection.
Example 1: Models with 300 kcmil for both input and output require one set for input terminals and one set for output terminals, so the user should order two sets of [100-051-272].
Example 2: Models with 4/0 AWG × 2P for both input and output require two sets for input terminals and two sets for output terminals, so the user should order four sets of [100-051-560].

Note: Use crimp insulated terminals or insulated shrink tubing for wiring connections. Wires should have a continuous maximum allowable temperature of 75 °C 600 Vac UL-approved vinyl-sheathed insulation.

■ Ground Wiring

Follow the precautions to wire the ground for one drive or a series of drives.

WARNING! *Electrical Shock Hazard. Always use appropriate equipment for Ground Fault Circuit Interrupters (GFCI). Minimize the length of the ground wire. The drive can cause a residual current with a DC component in the protective earthing conductor. Where a*

residual current power operated protective or monitoring device is used for protection in case of direct or indirect contact, always use a type B GFCI according to IEC/EN 60755.

WARNING! *Electrical Shock Hazard. Always use a ground wire that complies with technical standards on electrical equipment and local installation regulations. Minimize the length of the ground wire. Improper equipment grounding may cause dangerous electrical potentials on equipment chassis, which could result in death or serious injury.*

WARNING! *Electrical Shock Hazard. Be sure to ground the drive ground terminal (200 V class: Ground to 100 Ω or less, 400 V class: Ground to 10 Ω or less). Improper equipment grounding may cause dangerous electrical potentials on equipment chassis, which could result in death or serious injury.*

WARNING! *Electrical Shock Hazard. Always ground the motor-side grounding terminal. Improper equipment grounding could result in death or serious injury by contacting the motor case.*

NOTICE: *Do not share the ground wire with other devices such as welding machines or large-current electrical equipment. Improper equipment grounding could result in drive or equipment malfunction due to electrical interference.*

NOTICE: *When using more than one drive, ground multiple drives according to instructions. Improper equipment grounding could result in abnormal operation of drive or equipment.*

Refer to ***Figure 7*** when using multiple drives. Do not loop the ground wire.

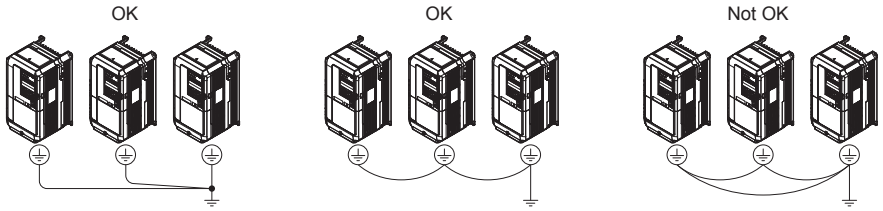


Figure 7 Multiple Drive Wiring

◆ Control Circuit Connections

Drive parameters determine which functions apply to the multi-function digital inputs (S3 to S8), multi-function digital outputs (M1 to M6), multi-function photocoupler outputs (P1-C1, P2-C2), multi-function analog inputs (A1, A2), and multi-function analog monitor output (FM, AM). The default setting is listed next to each terminal in ***Figure 8*** on page ***32***.

WARNING! *Sudden Movement Hazard. Always check the operation and wiring of control circuits after being wired. Operating a drive with untested control circuits could result in death or serious injury.*

WARNING! *Sudden Movement Hazard. Verify all drive fast-stop wiring and additional emergency circuits before operating the drive. Operating a drive with untested emergency circuits could result in death or serious injury.*

WARNING! *Sudden Movement Hazard. Confirm the drive I/O signals and external sequence before starting test run. Failure to comply may result in death or serious injury.*

Note: Do not solder the ends of wire connections to the drive. Soldered wiring connections can loosen over time. Improper wiring practices could result in drive malfunction due to loose terminal connections.

■ Terminal Configuration

Control circuit terminals are arranged as shown in ***Figure 8***.

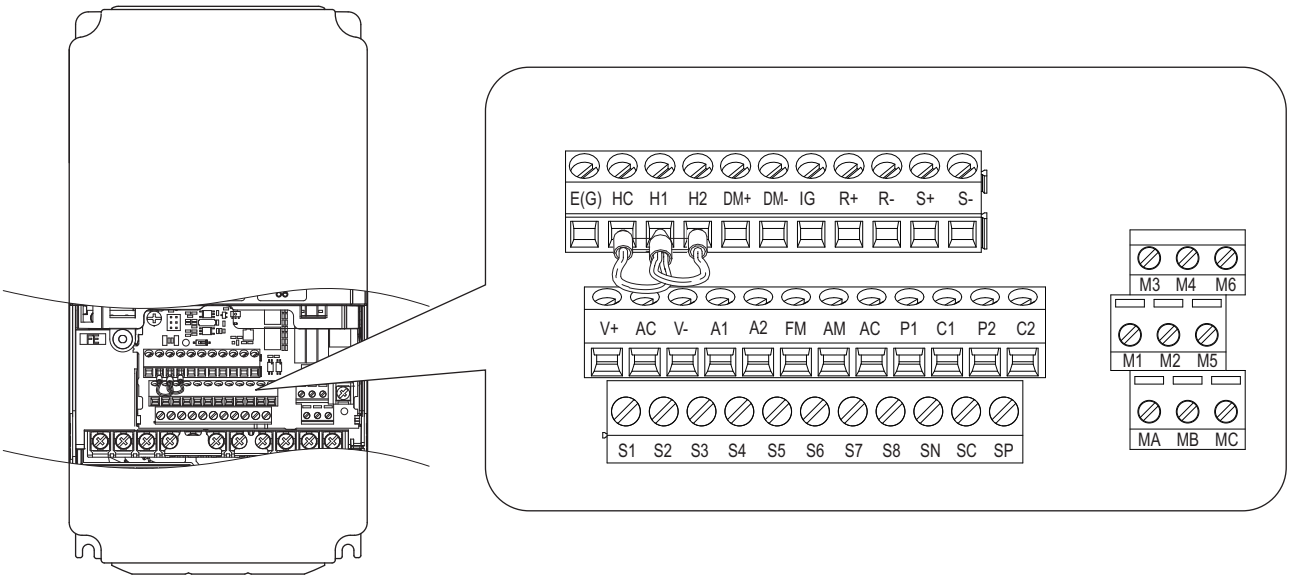


Figure 8 Control Circuit Terminal Arrangement

■ Control Circuit Input Terminals

Table 10 lists the input terminals on the drive. Text in parenthesis indicates the default setting for each multi-function input.

Table 10 Control Circuit Input Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting	Page
Digital Inputs	S1	Up Command (Closed: Up, Open: Stop)	Photocoupler 24 Vdc, 8 mA Use the wire link between terminals SC and SN or between SC and SP to select sinking or sourcing, and to select the power supply.	*39*
	S2	Down Command (Closed: Down, Open: Stop)		
	S3	Multi-function input 1 (External Fault)		
	S4	Multi-function input 2 (Fault Reset)		
	S5	Multi-function input 3 (Multi-Step Speed Reference 1)		
	S6	Multi-function input 4 (Multi-Step Speed Reference 2)		
	S7	Multi-function input 5 (Multi-Step Speed Reference 3)		
	S8	Multi-function input 6 (Not used)		
Digital Input Power Supply	SC	Multi-function input common	24 Vdc, 150 mA (only when DI-A3 is not used) Use the wire jumper between terminals SC and SN or between SC and SP to select sinking or sourcing, and to select the power supply.	*39*
	SN	0 V		
	SP	+24 Vdc		
Safe Disable Inputs <1>	H1	Safe Disable input 1	24 Vdc, 8 mA One or both open: Drive output disabled Both closed: Normal operation Internal impedance: 3.3 kΩ Off time of at least 1 ms Set the S3 jumper to select sinking or sourcing, and to select the power supply.	*39*
	H2	Safe Disable input 2		
	HC	Safe Disable function common	Common for the Safe Disable function	
Analog Inputs	+V	Power supply for analog inputs	10.5 Vdc (max allowable current 20 mA)	*39*
	-V	Power supply for analog inputs	-10.5 Vdc (max allowable current 20 mA)	–
	A1	Multi-function analog input 1 (Speed reference bias)	-10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ)	–
	A2	Multi-function analog input 2 (Not used)	-10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ)	–
	AC	Analog input common	0 V	–
	E (G)	Ground for shielded lines and option cards	–	–

<1> Setting jumper S3 for an external power supply makes the wire jumper between terminals H1, H2, and HC ineffective. Remove the wire jumper and connect an external power supply that can supply terminals H1, H2, and HC continuously.

Terminals A1 and A2 can accept a voltage signal to supply the speed reference to the drive. *Table 11* shows the parameter settings and voltage levels required for each terminal.

Table 11 Analog Input Settings for Speed Reference Using Voltage Signals

Terminal	Signal Level	Parameter Settings				Notes
		Signal Level Selection	Function Selection	Gain	Bias	
A1	0 to 10 Vdc	H3-01 = 0	H3-02 = 0 (speed reference bias)	H3-03	H3-04	–
	-10 to +10 Vdc	H3-01 = 1				
A2	0 to 10 Vdc	H3-09 = 0	H3-10 = 0 (speed reference bias)	H3-11	H3-12	–
	-10 to +10 Vdc	H3-09 = 1				

Motor Protection Using a Positive Temperature Coefficient (PTC thermistor)

A motor PTC thermistor can be connected to an analog input of the drive. This input is used by the drive for motor overheat protection.

When the PTC thermistor input signal reaches the motor overheat alarm level, an oH3 alarm will be triggered and the drive will continue operation according to the setting of L1-03. When the PTC thermistor input signal reaches the overheat fault level, an oH4 fault will be triggered, a fault signal will be output, and the drive will stop the motor using the stop method setting in L1-04.

Connect the PTC thermistor between terminals AC and A2 as shown in ***Figure 9***. Set parameter H3-09 to 0 and parameter H3-10 to E

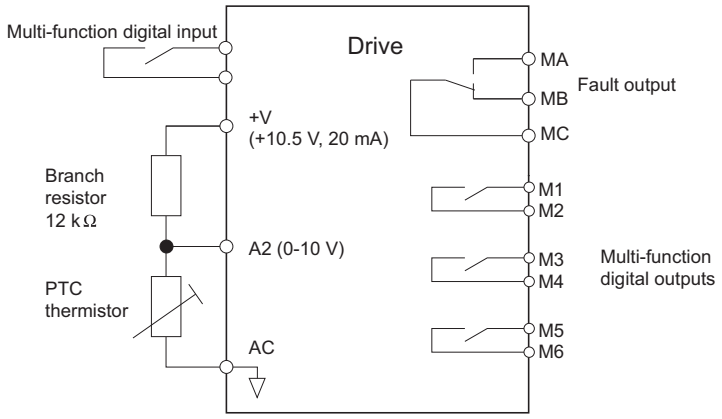


Figure 9 Connection of a Motor PTC Thermistor

The PTC thermistor must have the characteristics shown in ***Figure 10*** for one motor phase. The drives motor overload detection requires three PTC thermistors to be connected in series.

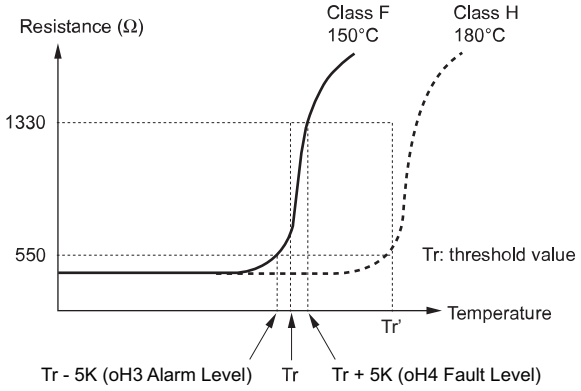


Figure 10 Motor PTC Thermistor Characteristics

Overheat detection using a PTC thermistor is configured with parameters L1-03, L1-04, and L1-05 as explained below.

■ Output Terminals

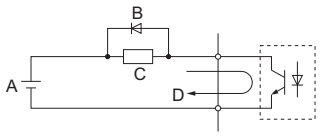
Table 12 lists the output terminals on the drive. Text in parenthesis indicates the default setting for each multi-function output.

Note: Multi-function relay output terminals are rated at a minimum of 10 mA. If less than 10 mA is required, use the photocoupler outputs (P1-C1, P2-C2). Using the wrong current output level may cause the output to malfunction when the terminal is activated.

Table 12 Control Circuit Output Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting
Fault Relay	MA	N.O.	30 Vdc, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA
	MB	N.C. output	
	MC	Fault output common	
Multi-Function Relay Output <1>	M1	Multi-function relay output 1 (Brake release command)	Contact relay output 30 Vdc, 10 mA to 1 A 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA
	M2		
	M3	Multi-function relay output 2 (Output contactor close command)	
	M4		
	M5	Multi-function relay output 3 (Drive ready)	
	M6		
Multi-Function Photocoupler Output	P1	Photocoupler output 1 (During Frequency output)	48 Vdc, 2 to 50 mA <2>
	C1		
	P2	Photocoupler output 2 (Not Used/Through Mode)	
	C2		
Monitor Output	FM	Analog monitor output 1 (Output speed)	-10 to +10 Vdc or 0 to +10 Vdc
	AM	Analog monitor output 2 (Output current)	
	AC	Monitor common	0 V
Safety Monitor Output	DM+	Safety monitor output	Outputs status of Safe Disable function. Closed when both Safe Disable channels are closed. Up to +48 Vdc 50 mA
	DM-	Safety monitor output common	

<1> Refrain from assigning functions to terminals M1 thru M6 that involve frequent switching, as doing so may shorten relay performance life. Switching life is estimated at 200,000 times (assumes 1 A, resistive load).
<2> Connect a suppression diode as shown in *Figure 11* when driving a reactive load such as a relay coil. Make sure the diode rating is greater than the circuit voltage.



A – External power, 48 V max. **C – Coil**
B – Suppression diode **D – 50 mA or less**

Figure 11 Connecting a Suppression Diode

H4-07, H4-08: Terminal FM, AM Signal Level Selection

Sets the voltage output level of U parameter (monitor parameter) data to terminal FM and terminal AM using parameters H4-07 and H4-08.

No.	Parameter Name	Setting Range	Default
H4-07	Terminal FM Signal Level Selection	0 or 1	0
H4-08	Terminal AM Signal Level Selection	0 or 1	0

Setting 0: 0 to 10 V

Setting 1: -10 V to 10 V

■ Serial Communication Terminals

Table 13 Control Circuit Terminals: Serial Communications

Type	No.	Signal Name	Function (Signal Level)	
MEMOBUS/Modbus Communication <1>	R+	Communications input (+)	MEMOBUS/Modbus communication: Use an RS-485 or RS-422 cable to connect the drive.	RS-485/422 MEMOBUS/Modbus communication protocol 115.2 kbps (max.)
	R-	Communications input (-)		
	S+	Communications output (+)		
	S-	Communications output (-)		
	IG	Shield ground	0 V	

<1> Enable the termination resistor in the last drive in a MEMOBUS network by setting DIP switch S2 to the ON position.

MEMOBUS/Modbus Termination

This drive is equipped with a built-in termination resistor for the RS-422/485 communication port. DIP switch S2 enables or disables the termination resistor as shown in ***Figure 12***. The OFF position is the default. The termination resistor should be placed to the ON position when the drive is the last in a series of slave drives.

Table 14 MEMOBUS/Modbus Switch Settings

S2 Position	Description
ON	Internal termination resistor ON
OFF	Internal termination resistor OFF (default setting)

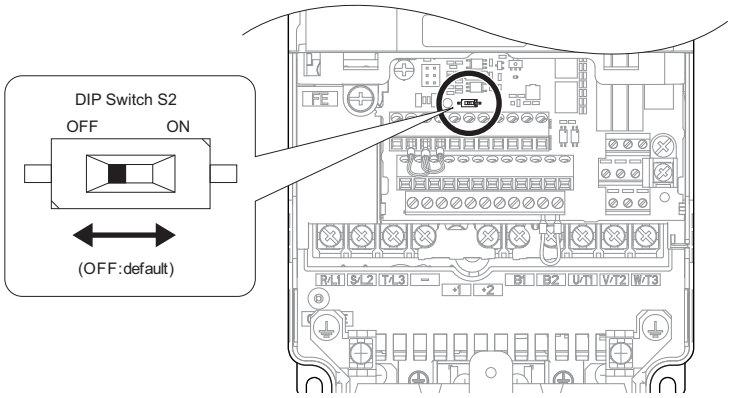


Figure 12 DIP Switch S2

■ Control Circuit Wire Size and Torque Specifications

WARNING! *Fire hazard. Tighten all terminal screws to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections. Improperly tightened terminal screws can also cause erroneous equipment operation.*

Select appropriate wire type and gauges from ***Table 15***. For simpler and more reliable wiring, use crimp ferrules on the wire ends.

Table 15 Wire Gauges and Torque Specifications

Terminal Block	Terminal	Size	Tightening Torque N•m (lb.in.)	Bare Wire Terminal		Ferrule-Type Terminal		
				Applicable Wire Size mm² (AWG)	Recomm. mm² (AWG)	Applicable Wire Size mm² (AWG)	Recomm. mm² (AWG)	Wire Type
TB1, TB2, TB4, TB5, TB6	FM, AC, AM, P1, P2, PC, SC, A1, A2, A3, +V, -V, S1-S8, MA, MB, MC, M1, M2, HC, H1, H2, DM+, DM-, IG, R+, R-, S+, S-, RP, MP, E (G)	M2	0.22 to 0.25 (1.9 to 2.2)	Standard wire: 0.25 to 1.0 (24 to 17) Solid wire: 0.25 to 1.5 (24 to 16)	0.75 (18)	0.25 to 0.5 (24 to 20)	0.5 (20)	Shielded wire, etc.

■ Wiring the Control Circuit Terminal

This section describes the proper procedures and preparations for wiring the control terminals.

DANGER! *Do not change wiring, remove covers, connectors or options cards, or attempt to service the drive with power applied to the drive. Disconnect all power to the drive, and lock out the power source. After shutting off the power wait for at least the amount of time specified on the drive front cover safety label. Measure the DC bus voltage for unsafe voltages to confirm safe level before servicing to prevent electric shock. The internal capacitor remains charged even after the power supply is turned off. Failure to comply will result in serious injury or death from electric shock.*

WARNING! *Electrical Shock Hazard. Do not remove covers or touch the circuit boards while the power is on. Failure to comply could result in death or serious injury.*

WARNING! *Electrical Shock Hazard. Before servicing, disconnect all power to the equipment and lock out the power source. Failure to comply may result in injury from electrical shock. Wait at least five minutes after all indicators are OFF and measure the DC bus voltage level and main circuit terminals to confirm the circuit is safe before wiring.*

WARNING! *Sudden Movement and Hazard. Install additional emergency circuits separately from the drive fast stop circuits. Failure to comply may result in personal injury.*

WARNING! *Do not tighten screws beyond the specified tightening torque. Failure to comply may result in erroneous operation, damage the terminal block, or cause injury due to fire from overheating of loose electrical connections.*

NOTICE: *Separate control circuit wiring from main circuit wiring (terminals R/L1, S/L2, T/L3, B1, B2, U/T1, V/T2, W/T3, -, +1, +2) and other high-power lines. Improper wiring practices could result in drive malfunction due to electrical interference.*

NOTICE: *Separate wiring for output terminals MA, MB, MC, M1 and M2 from wiring to other control circuit lines. Improper wiring practices could result in drive or equipment malfunction or nuisance trips.*

NOTICE: *Use a class 2 power supply (UL standard) when connecting to the control terminals. Improper application of peripheral devices could result in drive performance degradation due to improper power supply.*

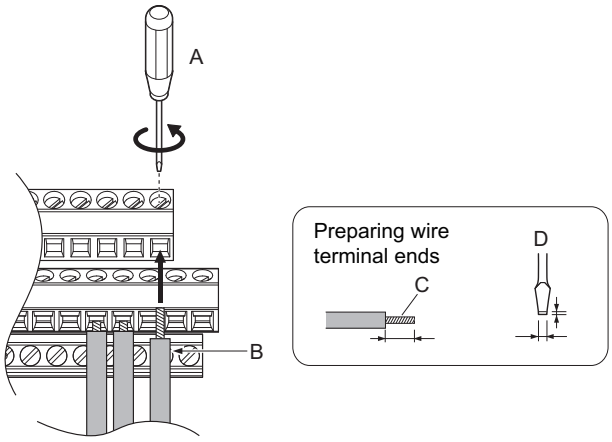
NOTICE: *Equipment Hazard. Insulate shields with heat shrink tubing or tape to prevent contact with other signal lines and equipment. Improper wiring practices could result in drive or equipment malfunction due to short circuit.*

NOTICE: *Connect the shield of shielded cable to the appropriate ground terminal. Improper equipment grounding could result in drive or equipment malfunction or nuisance trips.*

NOTICE: *Equipment Hazard. Use twisted-pair or shielded twisted-pair cables for control circuits. Improper wiring practices could result in drive or equipment malfunction or nuisance trips.*

Wire the control circuit only after terminals have been properly grounded and main circuit wiring is complete. Refer to ***Figure 13*** for details. Prepare the ends of the control circuit wiring as shown in ***Figure 14***. Refer to ***Control Circuit Wire Size and Torque Specifications on page 36***.

Connect control wires as shown in ***Figure 13***.



A – Loosen screw to insert wire

B – Single wire or stranded wire

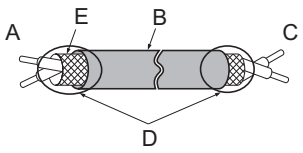
C – Avoid fraying wire strands when stripping insulation from wire. Strip length 5.5 mm (0.22 in.)

D – Blade depth of 0.4 mm (0.02 in.) or less Blade width of 2.5 mm (0.10 in.) or less

Figure 13 Terminal Board Wiring Guide

When connecting control wires to the terminals, use shielded twisted-pair wires (treating wire ends as shown in ***Figure 14*** and connect the shield to the ground terminal (E [G]) of the drive.

NOTICE: *Equipment Hazard. Insulate shields with heat shrink tubing or tape to prevent contact with other signal lines and equipment. Improper wiring practices could result in drive or equipment damage due to short circuit*



A – Drive side
B – Insulation
C – Control device side
D – Shield sheath (insulate with tape or heat-shrink tubing)
E – Shield

Figure 14 Preparing the Ends of Shielded Cables

NOTICE: *Do not exceed 50 meters (164 ft.) for the control line between the drive and the operator when using an analog signal from a remote source to supply the frequency reference. Failure to comply could result in poor system performance.*

■ Switches and Jumpers on the Terminal Board

The terminal board is equipped with several switches used to adapt the drive I/Os to the external control signals. ***Figure 15*** shows the location of these switches.

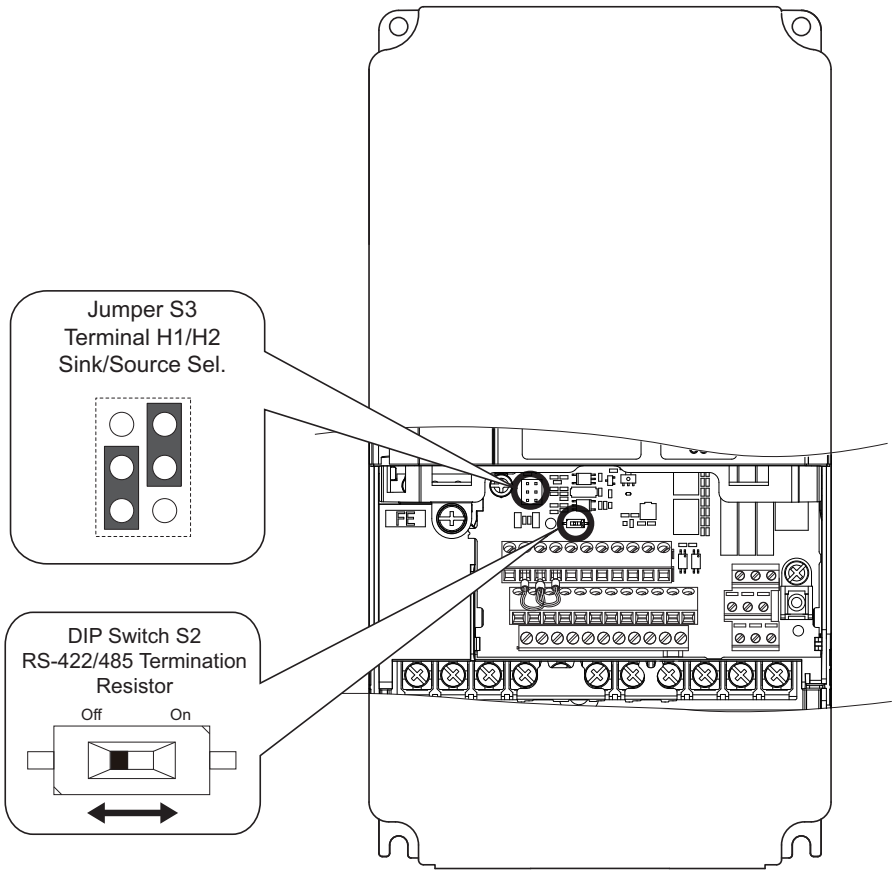


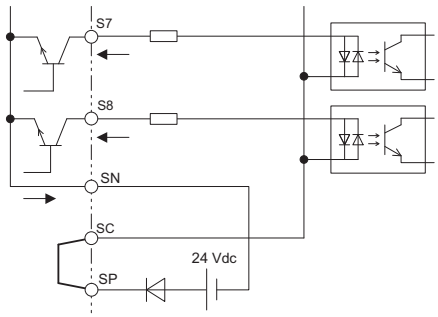
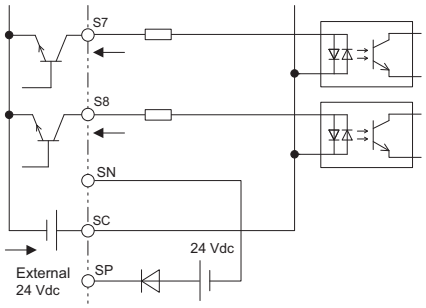
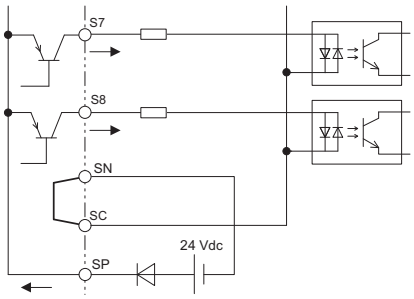
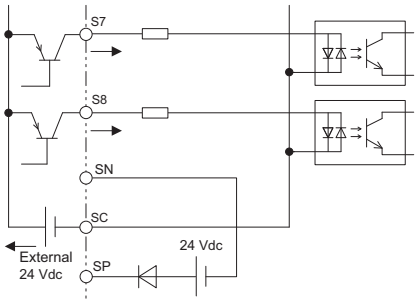
Figure 15 Locations of Jumpers and Switches on the Terminal Board

■ Setting Sink/Source for Input Terminals SN and SP

Use the wire jumper between terminals SC and SP or SC and SN to select between Sink mode, Source mode or external power supply for the digital inputs S1 to S8 as shown in ***Table 16*** (Default: Sink mode, internal power supply).

NOTICE: *Damage to Equipment. Do not short terminals SP and SN. Failure to comply will damage the drive.*

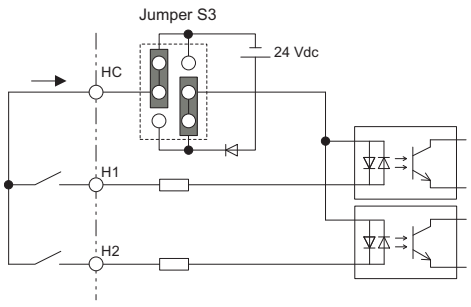
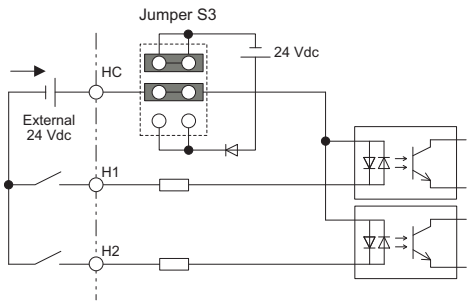
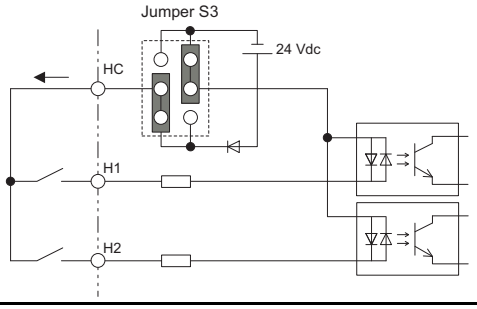
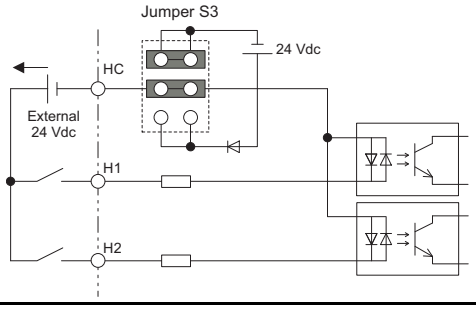
Table 16 Digital Input Sink / Source / External Power Supply Selection

	Drive Internal Power Supply (Terminal SN and SP)	External 24 Vdc Power Supply
Sinking Mode (NPN)		
Sourcing Mode (PNP)		

■ Setting Sink/Source for Safe Disable Inputs

Use jumper S3 on the terminal board to select between Sink mode, Source mode or external power supply for the Safe Disable inputs H1 and H2 as shown in ***Table 17*** (Default: Sink mode, internal power supply).

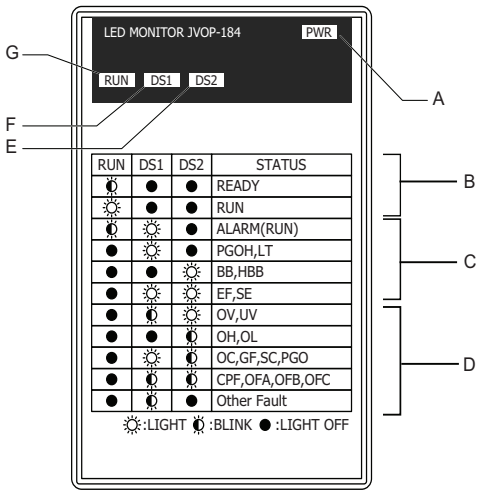
Table 17 Safe Disable Input Sink / Source / External Power Supply Selection

	Drive Internal Power Supply	External 24 Vdc Power Supply
Sinking Mode		
Sourcing Mode		

7 LED Indicator Operation

◆ LED Monitor JVOP-184

The LED monitor indicates operation status by combinations of the LEDs (LIGHT/BLINK/OFF) at RUN, DS1, and DS2.



A – PWR LED (Red)
B – Drive Status Indications
C – Alarm Indications
D – Fault Indications
E – DS2 LED (Green)
F – DS1 LED (Green)
G – RUN LED (Green)

Figure 16 LED Monitor Component Names

■ LED Display Examples

Normal Operation

Figure 17 shows the LED display when the drive is ready and no FWD/REV signal is active.

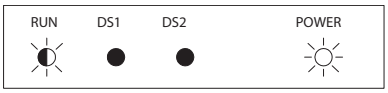


Figure 17 Normal Operation LED

Alarm

Figure 18 shows the LED display when a minor fault occurs. *Refer to Troubleshooting on page 42* and take appropriate countermeasures.

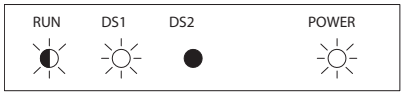


Figure 18 Alarm LED

Fault

Figure 19 shows the LED display when an oV or UV fault has occurred.

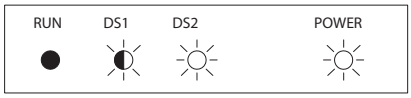


Figure 19 Fault LED

8 Start Up

L1000E parameter configuration is not possible with the supplied JVOP-184. This Start-up procedure may not be required if your L1000E is part of a pre-configured OEM supplied system.
An optional (Digital Operator JVOP-180) is required to perform the following Start-up procedure or additional L1000E configuration. Contact your OEM or local Yaskawa representative if the JVOP-180 Digital Operator is required for your application. Refer to the L1000E Technical Manual SIEPYAIL1E01for complete L1000E technical information.

◆ Flowchart A: Installation, Wiring, Basic Setup for Motor and Elevator

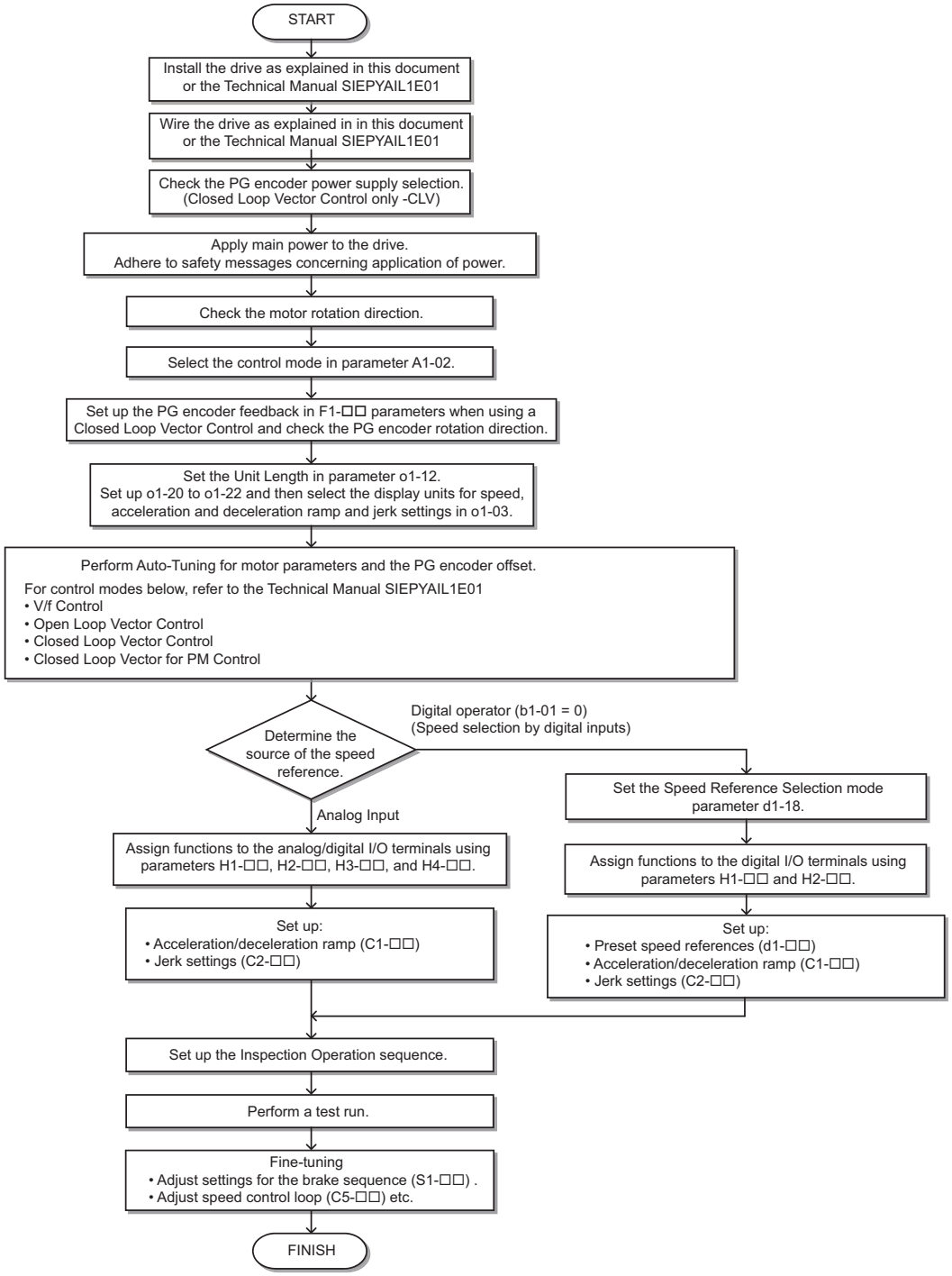


Figure 20 Installation, Wiring, Basic Setup for Motor and Elevator

Note: Set parameter H5-11 to 1 when setting parameters using MEMOBUS/Modbus communications.

9 Troubleshooting

◆ Causes and Possible Solutions for Faults and Alarms

■ Alarm Codes

Alarms are drive protection functions that do not necessarily cause the drive to stop. Once the cause of an alarm is removed, the drive will return to the same status as before the alarm occurred.

If a multi-function output is set for an alarm (H2-☐☐ = 10), that output terminal will be triggered for certain alarms.

Note: If a multi-function output is set to close when an alarm occurs (H2-☐☐ = 10), it will also close when maintenance periods are reached, triggering alarms LT-1 through LT-4 (triggered only if H2-☐☐ = 2F).

■ Fault Codes

Faults are detected for drive protection, and cause the drive to stop while triggering the fault output terminal MA-MB-MC. Remove the cause of the fault and manually clear the fault before attempting to run the drive again.

Table 18 JVOP-184 Alarm and Fault Codes, Indicators and Possible Solutions

JVOP-184 Status Text ALARM *FAULT*	Fault/Alarm Code <1>	ALM	FLT	Fault Name/Cause
ALARM(RUN)	AEr	O		Communication Option Node ID Setting Error (CANopen)
				Option card node address is outside the acceptable setting range.
	CALL	O		Serial Communication Stand By
				Communication has not yet been established.
	CrST	O		Cannot Reset
	HCA	O		High Current Alarm
				Drive current exceeded overcurrent warning level (133% of the rated current).
	PASS	O		MEMOBUS/Modbus Communication Test Mode Complete
	Uv	O		Undervoltage
				One of the following conditions was true when the drive was stopped and a Up/Down command was entered: • DC bus voltage dropped below the level specified in L2-05. • Contactor to suppress inrush current in the drive was opened. • Low voltage in the control drive input power. This alarm outputs only if L2-01 is not 0 and DC bus voltage is under L2-05.
PGOH,LT	LT-1	O		Cooling Fan Maintenance Time
				The cooling fan has reached its expected maintenance period and may need to be replaced. **Note:** An alarm output (H2-☐☐ = 10) will only be triggered if H2-☐☐ = 2F.
	LT-2	O		Capacitor Maintenance Time
				The main circuit and control circuit capacitors are nearing the end of their expected performance life. **Note:** An alarm output (H2-☐☐ = 10) will only be triggered if H2-☐☐ = 2F.
	LT-3	O		Soft Charge Bypass Relay Maintenance Time
				The DC bus soft charge relay is nearing the end of its expected performance life. **Note:** An alarm output (H2-☐☐ = 10) will only be triggered if H2-☐☐ = 2F.
	LT-4	O		IGBT Maintenance Time (90%)
				IGBTs have reached 90% of their expected performance life. **Note:** An alarm output (H2-☐☐ = 10) will only be triggered if H2-☐☐ = 2F.
PGOH,LT	TrPC	O		IGBT Maintenance Time (90%)
				IGBTs have reached 90% of their expected performance life. **Note:** This alarm will not trigger a multi-function output terminal that is set for alarm output (H2-☐☐ = 10).

JVOP-184 Status Text ALARM *FAULT*	Fault/Alarm Code <1>	ALM	FLT	Fault Name/Cause
BB,HBB	bb	O		Baseblock
				Drive output interrupted as indicated by an external baseblock signal.
	Hbb	O		Safe Disable Circuit Fault Signal (H1-HC, H2-HC) Release
				Both Safe Disable Input channels are open.
	HbbF	O		Safe Disable Circuit Fault Signal (H1-HC, H2-HC) Release
				One Safe Disable channel is open while the other one is closed.
ALARM(RUN) ***OV,UV***	ov	O	O	DC Bus Overvoltage
				Voltage in the DC bus has exceeded the overvoltage detection level. • For 200 V class: approximately 410 V • For 400 V class: approximately 820 V
	Uv1		O	DC Bus Undervoltage
				One of the following conditions occurred while the drive was running: • Voltage in the DC bus fell below the undervoltage detection level (L2-05) • For 200 V class: approximately 190 V • For 400 V class: approximately 380 V (350 V when E1-01 is less than 400)
	Uv2		O	Control Power Supply Voltage Fault
				Voltage is too low for the control drive input power.
	Uv3		O	Soft-Charge Bypass Circuit Fault
				The soft-charge bypass circuit failed.
ALARM(RUN) ***OH,OL***	oH	O	O	Heatsink Overheat
				The temperature of the heatsink exceeded the overheat pre-alarm level set to L8-02 (90-100 °C). Default value for L8-02 is determined by drive capacity (o2-04).
OH,OL	oH1		O	Heatsink Overheat
				The temperature of the heatsink exceeded the drive overheat level. The overheat level is determined by drive capacity (o2-04).
ALARM(RUN) ***OH,OL***	oH3	O	O	Motor Overheat Alarm (PTC thermistor input)
				• The motor overheat signal to analog input terminal A1 or A2 exceeded the alarm detection level. • Detection requires multi-function analog input H3-02 or H3-10 be set to “E”.
OH,OL	oH4		O	Motor Overheat Fault (PTC thermistor input)
				• The motor overheat signal to analog input terminal A1 or A2 exceeded the fault detection level. • Detection requires that multi-function analog input H3-02 or H3-10 = “E”.
	oL1		O	Motor Overload
				The electronic motor overload protection tripped.
	oL2		O	Drive Overload
				The thermal sensor of the drive triggered overload protection.
ALARM(RUN) ***OH,OL***	oL3	O	O	Overtorque Detection 1
				Drive output current (or torque in OLV, CLV, CLV/PM) was greater than L6-02 for longer than the time set in L6-03.
	oL4	O	O	Overtorque Detection 2
				Drive output current (or torque in OLV, CLV, CLV/PM) was greater than L6-05 for longer than the time set in L6-06.
OC,GF,SC,PGO	GF		O	Ground Fault
				A current short to ground exceeded 50% of rated current on the output side of the drive.
	oC		O	Overcurrent
				Drive sensors have detected an output current greater than the specified overcurrent level.
PGOH,LT ***OC,GF,SC,PGO***	PGo	O	O	Encoder Disconnected (for Control Mode with Encoder)
				Detected when no encoder signal is received for a time longer than setting in F1-14.
	PGoH	O	O	Encoder Disconnected (detected when using an encoder)
				Encoder cable has become disconnected.

JVOP-184 Status Text ALARM *FAULT*	Fault/Alarm Code <1>	ALM	FLT	Fault Name/Cause
OC,GF,SC,PGO	SC		O	IGBT Short Circuit
				Short Circuit or Ground Fault is detected
CPF,OFA,OFB,OFC	CPF00 or CPF01		O	Control Circuit Error
	CPF02		O	A/D Conversion Error
				An A/D conversion error or control circuit error occurred.
	CPF03		O	Control Board Connection Error
				Connection error between the control board and the drive
	CPF06		O	EEPROM Memory Data Error
				An error in the data saved to EEPROM
	CPF07		O	Terminal Board Connection Error
	CPF08			
	CPF11 to CPF14, CPF16 to CPF21		O	Control Circuit Error
	CPF22		O	Hybrid IC Failure
	CPF23		O	Control Board Connection Error
				Connection error between the control board and the drive
	CPF24		O	Drive Unit Signal Fault
				The drive capacity cannot be detected correctly (drive capacity is checked when the drive is powered up).
	CPF25		O	Terminal Board not Connected
	CPF26 to CPF34		O	Control Circuit Error
				CPU error
	CPF35		O	A/D Conversion Error
				An A/D conversion error or control circuit error occurred.
	oFA00		O	Option Card Connection Error at Option Connector CN5-A, Option Card Fault at Option Connector CN5-A
				Option compatibility error
	oFA01		O	Option Card Fault at Option Connector CN5-A
				Option not properly connected
	oFA05, oFA06		O	Option card error occurred at option port CN5-A
	oFA10, oFA11		O	
	oFA12 to oFA17		O	
	oFA30 to oFA43		O	
	oFb00		O	Option Card Fault at Option Port CN5-B
				Option compatibility error
	oFb01		O	Option Card Fault at Option Port CN5-B
				Option not properly connected
	oFb02		O	Option Card Fault at Option Port CN5-B
				Same type of option card already connected
	oFb03 to oFb11		O	Option card error occurred at Option Port CN5-B
	oFb12 to oFb17		O	
	oFC00		O	Option Card Connection Error at Option Port CN5-C
				Option compatibility error
	oFC01		O	Option Card Fault at Option Port CN5-C
				Option not properly connected
	oFC02		O	Option Card Fault at Option Port CN5-C
				A maximum of two PG option boards can be used simultaneously. Remove the PG option board installed into option port CN5-A.

JVOP-184 Status Text ALARM *FAULT*	Fault/Alarm Code <1>	ALM	FLT	Fault Name/Cause
CPF,OFA,OFB,OFC	oFC03 to oFC11		O	Option card error occurred at option port CN5-C
	oFC12 to oFC17		O	
	oFC50		O	Encoder Option AD Conversion Error
				Error with the A/D conversion level (VCC level), or A/D conversion timed out.
	oFC51		O	Encoder Option Analog Circuit Error
				Incorrect signal level (+2.5 V signal)
	oFC52		O	Encoder Communication Timeout
				Signal encoder timed out waiting to receive data
	oFC53		O	Encoder Communication Data Error
				Serial encoder CRC checksum error
	oFC54		O	Encoder Error
				Alarm reading EnDat absolute position data from encoder (OR flag from EnDat error for overvoltage, undervoltage, etc.)
-	oPr		O	External Digital Operator Connection Fault
				• The external operator has been disconnected from the drive. **Note:** An oPr fault will occur when all of the following conditions are true: • Output is interrupted when the operator is disconnected (o2-06 = 1). • The Up/Down command is assigned to the operator (b1-02 = 0 and LOCAL has been selected).
BB,HBB	bb	O		Baseblock
				Drive output interrupted as indicated by an external baseblock signal.
	Hbb	O		Safe Disable Circuit Fault Signal (H1-HC, H2-HC) Release
				Both Safe Disable Input channels are open.
	HbbF	O		Safe Disable Circuit Fault Signal (H1-HC, H2-HC) Release
				One Safe Disable channel is open while the other one is closed.
EF,SE	EF	O		Up/Down Command Error
				Both forward run and reverse run closed simultaneously for over 0.5 s.
	EF0	O	O	Option Card External Fault
				An external fault condition is present.
	EF3	O	O	External fault (input terminal S3)
				External fault at multi-function input terminal S3.
	EF4	O	O	External fault (input terminal S4)
				External fault at multi-function input terminal S4.
	EF5	O	O	External fault (input terminal S5)
				External fault at multi-function input terminal S5.
	EF6	O	O	External fault (input terminal S6)
				External fault at multi-function input terminal S6.
	EF7	O	O	External fault (input terminal S7)
				External fault at multi-function input terminal S7.
	EF8	O	O	External fault (input terminal S8)
				External fault at multi-function input terminal S8.
EF,SE	SE	O		MEMOBUS/Modbus Self Test Failed
	SE1		O	Motor Contactor Response Error
				Motor contactor does not respond within the time set to S1-10 (Run Command Delay Time).
EF,SE	SE2		O	Starting Current Error
				The output current was lower than 25% of the motor no-load current at start.

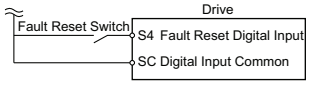
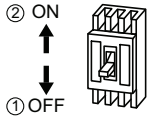
JVOP-184 Status Text ALARM *FAULT*	Fault/Alarm Code <1>	ALM	FLT	Fault Name/Cause
EF,SE	SE3		O	Output Current Error The output current was lower than 25% of the motor no-load current during operation.
	SE4		O	Brake Feedback Error The input terminal set for "Brake feedback" (H1-□□ = 79) or "Brake feedback 2" (H1-□□ = 5B) did not respond within the SE4 error time set to S6-05 after an output terminal set for "Brake release" (H2-□□ = 50) closed.
ALARM(RUN) ***Other Fault***	voF	O	O	Output Voltage Detection Error Problem detected with the voltage on the output side of the drive.
	boL	O	O	Braking Transistor Overload The braking transistor in the drive has been overloaded.
	bUS	O	O	Option Communication Error • The connection was lost after establishing initial communication. • Only detected when the Up/Down command speed reference is assigned to an option card.
	CE	O	O	MEMOBUS/Modbus Communication Error Control data was not received correctly for two seconds or for the amount of time set in parameter, H5-09 Communication Fault Detection Time
Other Fault	CF		O	Control Fault The torque limit was reached continuously for three seconds or longer while ramping to stop in OLV Control.
Other Fault	CoF		O	Current Offset Fault The current sensor is damaged or there was residual induction current in the motor (e.g., during sudden deceleration or when coasting) when the drive attempted to start the motor.
ALARM(RUN) ***Other Fault***	dEv	O	O	Speed Deviation (when using a PG option card) The deviation between the speed reference and speed feedback is greater than the setting in F1-10 for longer than the time in F1-11.
Other Fault	dv1		O	Encoder Z Pulse Fault The motor turned one full rotation without the Z Pulse being detected.
	dv2		O	Z Pulse Noise Fault Detection The Z pulse is out of phase by more than 5 degrees for the number of times specified in parameter F1-17.
	dv3		O	Inversion Detection The torque reference and acceleration are in opposite directions and the speed reference and actual motor speed differ by over 30% for the number of times set to F1-18.
	dv4		O	Inversion Prevention Detection Pulses indicate that the motor is rotating in the opposite direction of the speed reference. Set the number of pulses to trigger inverse detection to F1-19. **Note:** Set F1-19 to 0 to disable inverse detection in applications where the motor may rotate in the opposite direction of the speed reference.
	dv6		O	Overacceleration Detection The acceleration of the elevator car exceeds the overacceleration detection level (S6-10)
	dv7		O	Rotor Polarity Detection Timeover Unable to detect the magnetic poles within the designated time.
	dv8		O	PM Rotor Position Estimation Error An invalid value resulted from Initial Pole Search. **Note:** Reset the fault and try Initial Pole Search again.
	Err		O	EEPROM Write Error Data cannot be written to the EEPROM.
Other Fault	FrL		O	Speed Reference Missing Parameter d1-18 is set to 1, leveling speed detection is not assigned to a digital input (H1-□□ ≠ 53) and no speed was selected while an Up or Down command was entered.

JVOP-184 Status Text ALARM *FAULT*	Fault/Alarm Code <1>	ALM	FLT	Fault Name/Cause
Other Fault	LF		O	Output Phase Loss • Phase loss on the output side of the drive. • Setting L8-07 to 1 or 2 enables Phase Loss Detection.
	LF2		O	Output Current Imbalance (detected when L8-29 = 1) One or more of the phases in the output current is lost.
ALARM(RUN) ***Other Fault***	oS	O	O	Overspeed (for Control Mode with Encoder) The motor speed feedback exceeded the F1-08 setting.
Other Fault	PF		O	Input Phase Loss Drive input power has an open phase or has a large imbalance of voltage between phases. Detected when L8-05 = 1 (enabled).
	PF5		O	Rescue Operation Power Supply Deterioration Error
	rF		O	Braking Resistor Fault The resistance of the braking resistor being used is too low.
	rr		O	Dynamic Braking Transistor Fault The built-in dynamic braking transistor failed.
	SvE		O	Position Lock Error Position deviation during Position Lock.
	STo		O	Motor Pull Out or Step Out Detection Motor pull out or step out has occurred. Motor has exceeded its pull out torque.
ALARM(RUN) ***Other Fault***	UL3	O	O	Undertorque Detection 1 Drive output current (or torque in OLV, CLV, CLV/PM) less than L6-02 for longer than L6-03 time.
	UL4	O	O	Undertorque Detection 2 Drive output current (or torque in OLV, CLV, CLV/PM) less than L6-05 for longer than L6-06 time.

<1> The Fault/Alarm Code is only visible with the optional JVOP -180 digital operator.

◆ Fault Reset Methods

When a fault occurs, the cause of the fault must be removed and the drive must be restarted. The table below lists the different ways to restart the drive.

After the Fault Occurs	Procedure	
Fix the cause of the fault, restart the drive, and reset the fault. Resetting via Fault Reset Digital Input S4	Close then open the fault signal digital input via terminal S4. S4 is set for “Fault Reset” as default (H1-04 = 14).	
If the above methods do not reset the fault, turn off the drive main power supply. Reapply power after the digital operator display is out.		

Note: If the Up/Down command is present, the drive will disregard any attempts to reset the fault. Remove the Up/Down command before attempting to clear a fault situation.

10 Standards Compliance

◆ UL Standards

■ UL Standards Compliance

The UL/cUL mark applies to products in the United States and Canada. It indicates that UL has performed product testing and evaluation, and determined that their stringent standards for product safety have been met. For a product to receive UL certification, all components inside that product must also receive UL certification.

Figure 21 UL/cUL Mark

This drive is tested in accordance with UL standard UL508C and complies with UL requirements. To ensure continued compliance when using this drive in combination with other equipment, meet the following conditions:

Installation Area

Do not install the drive to an area greater than pollution severity degree 2 (UL standard).

Ambient Temperature

IP00 enclosure with top protective cover: -10 to +40 °C

IP00 enclosure: -10 to +50 °C

Main Circuit Terminal Wiring

- *Refer to Wire Gauges and Tightening Torque on page 23* for terminal tightening torque and selecting wire gauge. Refer to local codes for proper wire gauge selections.
- *Refer to Closed-Loop Crimp Terminal Recommendations on page 29* for selecting closed-loop crimp terminals.

Yaskawa recommends using closed-loop crimp terminals on all drive models. UL/cUL approval requires the use of UL Listed closed-loop crimp terminals when wiring the drive main circuit terminals on models 2A0106 to 2A0432 and 4A0056 to 4A0225. Use only the tools recommended by the terminal manufacturer for crimping.

Note: Use crimp insulated terminals or insulated tubing for wiring these connections. Wires should have a continuous maximum allowable temperature of 75 °C 600 V UL approved vinyl sheathed insulation. Ambient temperature should not exceed 40 °C.

Branch Circuit Protection Devices and Drive Short Circuit Rating

Yaskawa recommends installing one of the following types of branch circuit protection to maintain compliance with UL508C.Semiconductor protective type fuses are preferred. Alternate branch circuit protection devices are also listed in the tables below.

This drive is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, 480 Vac maximum (Up to 240 V in 200 V class drives, up to 480 V for 400 V class drives), when protected by fuses or circuit breakers as specified in *Table 19*.

NOTICE: *Equipment Hazard. Do not restart the drive or immediately operate the peripheral devices if a fuse is blown or a (GFCI) is tripped. Check the wiring and the selection of peripheral devices to identify the cause. Contact your supplier before restarting the drive or the peripheral devices if the cause cannot be identified.*

Table 19 Recommended Input Fuse Selection

Drive Model CIMR-LE	L1000E					
	Nominal Output Power HP	AC Drive Input Amps	MCCB Rating Amps <1>	Time Delay Fuse Rating Amps <2>	Non-time Delay Fuse Rating Amps <3>	Bussmann Semi-conductor Fuse Rating (Fuse Ampere) <4>
240 V Models						
2A0018	5	15.6	25	25	40	FWH-90B (90)
2A0022	7.5	18.9	35	30	50	FWH-90B (90)
2A0031	10	28	50	40	75	FWH-100B (100)
2A0041	15	37	60	60	100	FWH-200B (200)
2A0059	20	52	100	90	150	FWH-200B (200)
2A0075	25	68	125	110	200	FWH-200B (200)
2A0094	30	80	150	125	225	FWH-300A (300)
2A0106	40	82	150	125	225	FWH-300A (300)
2A0144	50	111	200	175	250	FWH-350A (350)
2A0181	60	136	250	225	350	FWH-400A (400)
2A0225	75	164	300	250	450	FWH-400A (400)
2A0269	100	200	400	350	600	FWH-600A (600)
2A0354	125	271	500	450	800	FWH-700A (700)
2A0432	150	324	600	500	900 <5>	FWH-800A (800)
480 V Models						
4A0009	5	8.2	15	12	20	FWH-90B (90)
4A0012	7.5	10.4	20	17.5	30	FWH-90B (90)
4A0019	10	15	30	25	40	FWH-80B (80)
4A0023	15	20	40	35	60	FWH-100B (100)
4A0030	20	29	50	50	80	FWH-125B (125)
4A0039	25	39	75	60	110	FWH-200B (200)
4A0049	30	44	75	75	125	FWH-250A (250)
4A0056	40	43	75	75	125	FWH-250A (250)
4A0075	50	58	100	100	150	FWH-250A (250)
4A0094	60	71	125	110	200	FWH-250A (250)
4A0114	75	86	150	150	250	FWH-250A (250)
4A0140	100	105	175	175	300	FWH-350A (350)
4A0188	125	142	225	225	400	FWH-400A (400)
4A0225	150	170	250	250	500	FWH-500A (500)

<1> Maximum MCCB Rating is 15 A, or 200% of drive input current rating, whichever is larger. MCCB voltage rating must be 600 VAC or greater.
<2> Maximum Time Delay fuse is 175% of drive input current rating. This covers any Class CC, J or T class fuse.
<3> Maximum Non-time Delay fuse is 300% of drive input current rating. This covers any CC, J or T class fuse.
<4> When using semiconductor fuses, Bussmann FWH is required for UL compliance.
<5> Class L fuse is also approved for this rating.

Grounding

The drive is designed to be used in T-N (grounded neutral point) networks. If installing the drive in other types of grounded systems, contact your Yaskawa representative for instructions.

Guarding Against Harmful Materials

When installing IP00 enclosure drives, use an enclosure that prevents foreign material from entering the drive from above or below.

Low Voltage Wiring for Control Circuit Terminals

Wire low voltage wires with NEC Class 1 circuit conductors. Refer to national state or local codes for wiring. If external power supply used, it shall be UL Listed Class 2 power source only or equivalent. Refer to NEC Article 725 Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power Limited Circuits for requirements concerning class 1 circuit conductors and class 2 power supplies.

Table 20 Control Circuit Terminal Power Supply

Input / Output	Terminal Signal	Power Supply Specifications
Open Collector Outputs	P1, C1, P2, C2, DM+, DM-	Requires class 2 power supply
Digital inputs	S1-S8, SN, SC, SP, HC, H1, H2	Use the internal LVLC power supply of the drive. Use class 2 for external power supply.
Analog inputs / outputs	+V, -V, A1, A2, AC, AM, FM	

■ Drive Motor Overload Protection

Set parameter E2-01/E5-03 (motor rated current) to the appropriate value to enable motor overload protection. The internal motor overload protection is UL listed and in accordance with the NEC and CEC.

E2-01/E5-03: Motor Rated Current (IM Motor/PM Motor)

Default Setting and Range: Model Dependent

Parameter E2-01/E5-03 (motor rated current) protects the motor if parameter L1-01 is not set to 0 (default is 1, enabling protection for standard induction motors).

If Auto-Tuning has been performed successfully, the motor data entered to T1-04/T2-04 is automatically written into parameter E2-01/E5-03. If Auto-Tuning has not been performed, manually enter the correct motor rated current to parameter E2-01/E5-03.

L1-01: Motor Overload Protection Selection

The drive has an electronic overload protection function (oL1) based on time, output current, and output speed, which protects the motor from overheating. The electronic thermal overload function is UL-recognized, so it does not require an external thermal relay for single motor operation.

Table 21 L1-01 Motor Overload Protection Settings

Setting	Description	
0	Disabled	Disabled the internal motor overload protection of the drive.
1	Standard fan-cooled motor (default)	Selects protection characteristics for a standard self cooled motor with limited cooling capabilities when running below the rated speed. The motor overload detection level (oL1) is automatically reduced when running below the motor rated speed.
2	Drive duty motor with a speed range of 1:10	Selects protection characteristics for a motor with self-cooling capability within a speed range of 10:1. The motor overload detection level (oL1) is automatically reduced when running below 1/10 of the motor rated speed.
3	Vector motor with a speed range of 1:100	Selects protection characteristics for a motor capable of cooling itself at any speed — including zero speed (externally cooled motor). The motor overload detection level (oL1) is constant over the entire speed range.
5	Permanent Magnet motor with constant torque	Selects protection characteristics for a constant torque PM motor. The motor overload detection level (oL1) is constant over the whole speed range.
6	Standard fan cooled motor (50 Hz)	Selects protection characteristics for a standard self cooled motor with limited cooling capabilities when running below the rated speed. The motor overload detection level (oL1) is automatically reduces when running below the motor rated speed.

When connecting the drive to more than one motor for simultaneous operation, disable the electronic overload protection (L1-01 = 0) and wire each motor with its own motor thermal overload relay.

Enable the motor overload protection (L1-01 = 1 to 3, 5) when connecting the drive to a single motor, unless another motor overload preventing device is installed. The drive electronic thermal overload function causes an oL1 fault, which shuts off the output of the drive and prevents additional overheating of the motor. The motor temperature is continually calculated while the drive is powered up.

L1-02: Motor Overload Protection Time

Setting Range: 0.1 to 5.0 min

Factory Default: 1.0 min

Parameter L1-02 determines how long the motor is allowed to operate before the oL1 fault occurs when the drive is running at 60 Hz and at 150% of the full load amp rating (E2-01/E5-03) of the motor. Adjusting the value of L1-02 can shift the set of oL1 curves up the y axis of the diagram below, but will not change the shape of the curves.

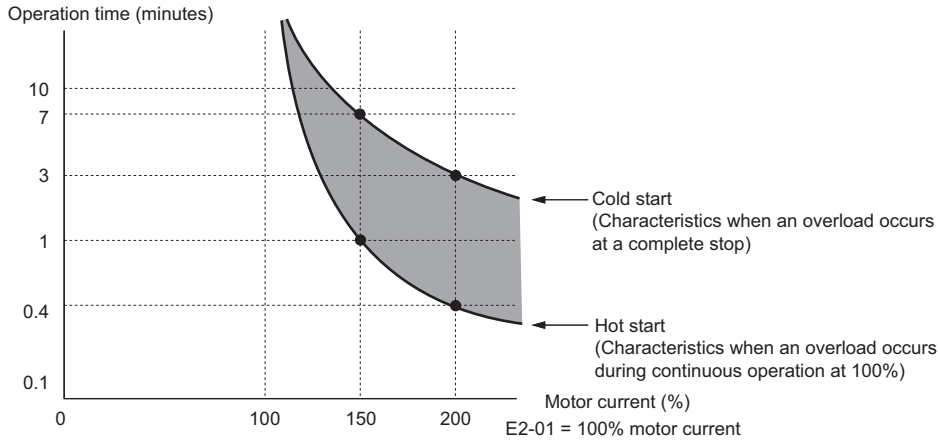


Figure 22 Protection Operation Time for General Purpose Motors at the Rated Output Frequency

◆ Precautionary Notes on External Heatsink (IP00/Open Type Enclosure)

An external attachment can be used to project the heatsink outside of an enclosure to ensure that there is sufficient air circulation around the heatsink. When using an external heatsink, UL compliance requires covering exposed capacitors in the main circuit to prevent injury to surrounding personnel. Contact a Yaskawa sales representative or Yaskawa directly for more information on this attachment.

◆ Safe Disable Input Function

This section explains the Safe Disable function and how to use it in an elevator installation. Contact Yaskawa if more information is required.

■ Specifications

The Safe Disable inputs provide a stop function in compliance with “Safe Torque Off” as defined in the IEC61800-5-2. Safe Disable inputs have been designed to meet the requirements of the ISO13849-1, Cat. 3 PLd and IEC61508, SIL2.

A Safe Disable Status Monitor for error detection in the safety circuit is also provided.

Inputs / Outputs		Two Safe Disable inputs and one EDM output according to ISO13849-1 Cat.3 PLd, IEC61508 SIL2.
Operation Time		Time from input open to drive output stop is less than 1 ms.
Failure Probability	**Demand Rate Low**	PFD = $5.15E^{-5}$
	Demand Rate High or Continuous	PFH = $1.2E^{-9}$
Performance Level		The Safe Disable inputs satisfy all requirements of Performance Level (PL) d according to ISO13849-1 (DC from EDM considered).

■ Safe Disable Precautions

DANGER! *Sudden Movement Hazard. Improper use of the Safe Disable function will result in serious injury or death. Make sure the entire system or machinery uses the Safe Disable function in compliance with safety requirements. When implementing the Safe Disable function into the safety system of a machine, a thorough risk assessment for the whole system must be carried out to ensure it complies with relevant safety norms (e.g., EN954/ISO13849, IEC61508, EN/IEC62061).*

DANGER! *Sudden Movement Hazard. When using a PM motor, even if the drive output is shut off by the Safe Disable function, a break down of two output transistors can cause current to flow through the motor winding, resulting in a rotor movement for a maximum angle of 180 degrees (electrically). Ensure this condition will not affect the safety of the application when using the Safe Disable function. Failure to comply will result in death or serious injury.*

DANGER! *Electrical Shock Hazard. The Safe Disable function can switch off the drive output, but does not cut the drive power supply and cannot electrically isolate the drive output from the input. Always shut off the drive power supply when performing maintenance or installations on the drive input side as well as the drive output side. Failure to comply will result in death or serious injury.*

DANGER! *Sudden Movement Hazard. When using the Safe Disable inputs, make sure to remove the wire links between terminals H1, H2, and HC that were installed prior to shipment. Failing to do so will keep the Safe Disable circuit from operating properly and can cause injury or even death.*

WARNING! *All safety features (including Safe Disable) should be inspected daily and periodically. If the system is not operating normally, there is a risk of serious personal injury.*

WARNING! *Only a qualified technician with a thorough understanding of the drive, the instruction manual, and safety standards should be permitted to wire, inspect, and maintain the Safe Disable input. Failure to comply may result in serious injury or death.*

NOTICE: *From the moment terminal inputs H1 and H2 have opened, it takes up to 1 ms for drive output to shut off completely. The sequence set up to trigger terminals H1 and H2 should make sure that both terminals remain open for at least 1 ms in order to properly interrupt drive output. This may result in the Safe Disable Input not activating.*

NOTICE: *The Safe Disable Monitor (output terminals DM+ and DM–) should not be used for any other purpose than to monitor the Safe Disable status or to discover a malfunction in the Safe Disable inputs. The monitor output is not considered a safe output.*

■ Using the Safe Disable Function

Safe Disable Circuit

The Safe Disable circuit consists of two independent input channels that can block the output transistors (terminals H1 and H2). The input can either use the drive internal power supply or an external power supply. Use jumper S3 on the terminal board to select between Sink or Source mode with either internal or external power supply.

A photocoupler output is available to monitor the status of the Safe Disable terminals. ***Refer to Output Terminals on page 35*** for signal specifications when using this output.

Additionally a Safe Disable monitor function can be assigned to one of the digital outputs (H2-☐☐ = 58).

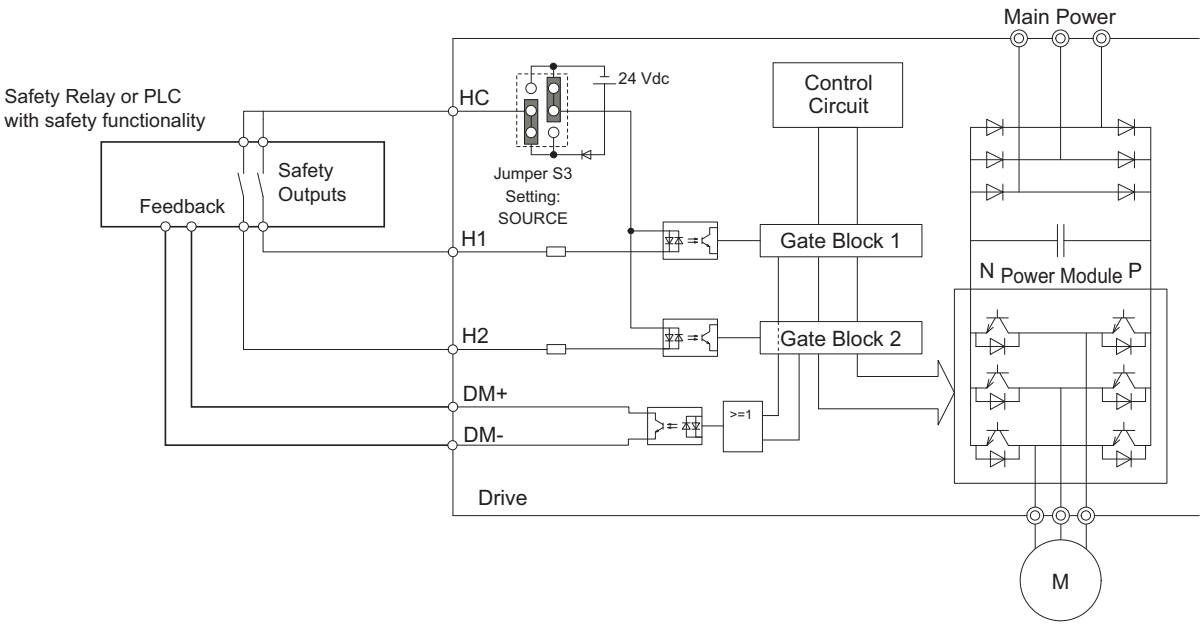


Figure 23 Safe Disable Function Wiring Example (Source Mode)

Disabling and Enabling the Drive Output ("Safe Torque Off")

Figure 24 illustrates a Safe Disable input operation example.

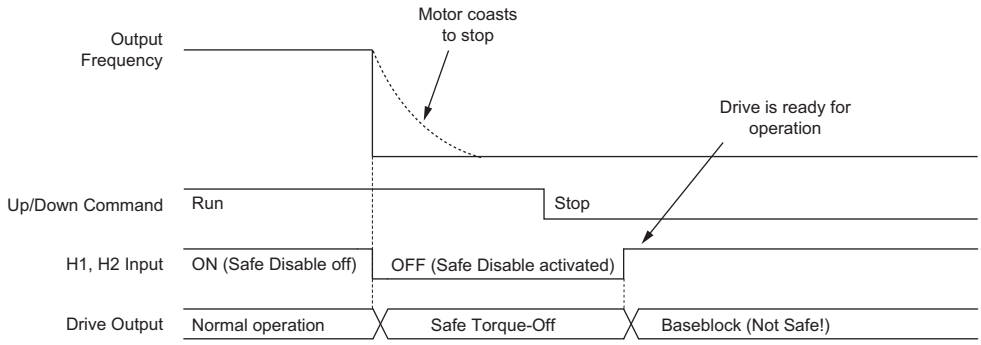


Figure 24 Safe Disable Operation

Entering the "Safe Torque Off" State

Whenever either one Safe Disable input or both inputs open, the motor torque is shut off by switching off the drive output. If the motor was running before the Safe Disable inputs opened, it will coast to stop, regardless of the stopping method set in parameter b1-03.

Notice that the "Safe Torque Off" state can only be achieved using the Safe Disable function. Removing the Up/Down command stops the drive and shuts the output off (baseblock), but does not create a "Safe Torque Off" status.

Note: To avoid an uncontrolled stop during normal operation, make sure that the Safe Disable inputs are opened first when the motor has completely stopped.

Returning to Normal Operation after Safe Disable

The Safe Torque-Off state can be left by simply closing both Safe-Disable inputs.
If the Up/Down command is issued before the Safe-Disable inputs are closed, then the drive operation depends on the setting of parameter L8-88.

- If L8-88 is set to 0, the Up/Down command needs to be cycled in order to start the motor.
- If L8-88 is set to 1 (default), the drive will start the motor immediately when the Safe Torque-Off mode is left, i.e., the Safe Disable inputs are enabled.

Additionally when L8-88 is set to 1, then parameter S6-16 (Restart after Baseblock Selection) can be used to determine how the drive behaves when the Safe-Disable inputs are opened and closed while the Up/Down command is kept active. When S6-16 is set to 0, the drive will not restart (default) and the Up/Down command needs to be cycled. When S6-16 is set to 1, then the drive will restart as soon as the Safe-Disable inputs are closed.

Safe Disable Monitor Output Function and Digital Operator Display

The table below explains the drive output and Safe Disable monitor state depending on the Safe Disable inputs.

Safe Disable Input Status		Safe Disable Status Monitor, DM+ - DM–	Safe Disable Status Monitor, H2-□□ = 58	Drive Output Status	Digital Operator Display
Input 1, H1-HC	Input 2, H2-HC				
Off	**Off**	Off	On	Safely disabled, "Safe Torque Off"	Hbb (flashes)
On	**Off**	On	On	Safely disabled, "Safe Torque Off"	HbbF (flashes)
Off	**On**	On	On	Safely disabled, "Safe Torque Off"	HbbF (flashes)
On	**On**	On	Off	Baseblock, ready for operation	Normal display

Safe Disable Status Monitor

With the Safe Disable monitor output (terminals DM+ and DM–), the drive provides a safety status feedback signal. This signal should be read by the device that controls the Safe Disable inputs (PLC or a safety relay) in order to prohibit leaving the "Safe Torque Off" status in case the safety circuit malfunctions. Refer to the instruction manual of the safety device for details on this function.

Digital Operator Display

In contrast to terminals DM+/DM-, the safe disable monitor function that can be programmed for a digital output (H2-☐☐ = 58) is a software function and can be used for EN81-1 conform one contactor solutions but not as an EDM signal according to EN61800-5-1.

When both Safe Disable inputs are open, "Hbb" will flash in the digital operator display.

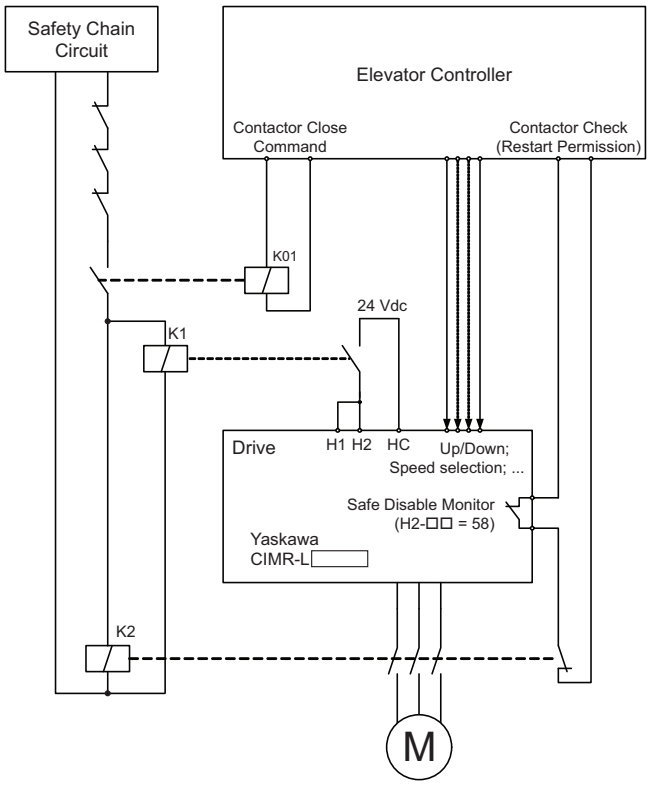
Should only one of the Safe Disable channels be on while the other is off, "HbbF" will flash in the display to indicate that there is a problem in the safety circuit or in the drive. This display should not appear under normal conditions if the Safe Disable circuit is utilized properly. ***Refer to Alarm Codes on page 42*** to resolve possible errors.

◆ EN81-1 Compliant Circuit with one Motor Contactor

The safe disable circuit can be utilized to install the drive in an elevator system using only one motor contactor instead of two. In such a system the following guidelines have to be followed for compliance to EN81-1:1998:

- The circuit must be designed so that the inputs H1 and H2 are opened and the drive output shuts off when the safety chain is interrupted.
- A drive digital output must be programmed as Safe Disable feedback (H2-☐☐ = 58). This feedback signal must be implemented in the contactor supervision circuit of the controller that prevents a restart in case of a fault in the Safe Disable circuit or the motor contactor.
- All contactors and wiring must be selected and installed in compliance with the EN81-1:1998.
- The safe disable inputs H1 and H2 must be used to enable/disable the drive. The input logic must be set to Source Mode. ***Refer to Setting Sink/Source for Safe Disable Inputs on page 39*** for details on setting jumper S3.

The figure below shows a wiring example.



Note: **1.** The drive output will immediately shut off when either of the inputs H1 or H2 is opened. In this case the brake should apply immediately in order to prevent uncontrolled movement of the elevator.

2. The drive output can only be activated when neither an Up nor a Down command is active, i.e., terminals H1 and H2 must be closed prior to setting the Up/Down command.

11 Drive Specifications

◆ Three-Phase 200 V Class Drives by Model

Table 22 Power Ratings (Three-Phase 200 V Class)

Item		Specification													
CIMR-LE2A		0018	0022	0031	0041	0059	0075	0094	0106	0144	0181	0225	0269	0354	0432
Maximum Applicable Motor Capacity kW (HP) <1>		3.7 (5)	5.5 (7.5)	7.5 (10)	11.0 (15)	15.0 (20)	18.5 (25)	22.0 (30)	30.0 (40)	37.0 (50)	45.0 (60)	55.0 (75)	75.0 (100)	90.0 (125)	110.0 (150)
Input	Input Current (A) <2>	15.6	18.9	28	37	52	68	80	82	111	136	164	200	271	324
	Rated Voltage Rated Frequency	Three-phase 200 to 240 Vac 50/60 Hz/270 to 340 Vdc <3>													
	Allowable Voltage Fluctuation	-15 to 10%													
	Allowable Frequency Fluctuation	±5%													
	Input Power (kVA)	7.8	9.5	14	18	27	36	44	37	51	62	75	91	124	148
Output	Rated Output Capacity (kVA) <4>	5.3 <5>	6.7 <5>	9.5 <5>	12.6 <5>	17.9 <5>	23 <5>	29 <5>	32 <5>	44 <5>	55 <6>	69 <6>	82 <6>	108 <6>	132 <7>
	Rated Output Current (3 minutes, 50% ED) (A)	17.5 <5>	21.9 <5>	31.3 <5>	41.3 <5>	58.8 <5>	75.0 <5>	93.8 <5>	106.3 <5>	143.8 <5>	181.3 <6>	225.0 <6>	268.8 <6>	353.8 <6>	432.5 <7>
	Overload Tolerance	133% of rated output current for 30 s													
	Carrier Frequency	User adjustable between 1 and 15 kHz									User adjustable between 1 and 10 kHz				
	Maximum Output Voltage (V)	Three-phase 200 to 240 V (proportional to input voltage)													
	Maximum Output Speed (Hz)	120 Hz (user-set)													

<1> The motor capacity (HP) refers to a NEC rated 4-pole motor. The rated output current of the drive output amps should be equal to or greater than the motor current. Select the appropriate capacity drive if operating the motor continuously above motor nameplate current.
<2> Assumes operation at the rated output current. Input current rating varies depending on the power supply transformer, input reactor, wiring connections, and power supply impedance.
<3> DC is not available for UL standards.
<4> Rated motor capacity is calculated with a rated output voltage of 220 V.
<5> Carrier frequency can be set up to 8 kHz while keeping this current rating. Higher carrier frequency settings require derating.
<6> Carrier frequency can be set up to 5 kHz while keeping this current rating. Higher carrier frequency settings require derating.
<7> Carrier frequency can be set up to 2 kHz while keeping this current rating. Higher carrier frequency settings require derating.

◆ Three-Phase 400 V Class Drives by Model

Table 23 Power Ratings (Three-Phase 400 V Class)

Item		Specification													
CIMR-LE4A		0009	0012	0019	0023	0030	0039	0049	0056	0075	0094	0114	0140	0188	0225
Maximum Applicable Motor Capacity kW (HP) <1>		3.7 (5)	5.5 (7.5)	7.5 (10)	11.0 (15)	15.0 (20)	18.5 (25)	22.0 (30)	30.0 (40)	37.0 (50)	45.0 (60)	55.0 (75)	75.0 (100)	90.0 (125)	110.0 (150)
Input	Input Current (A) <2>	8.2	10.4	15	20	29	39	44	43	58	71	86	105	142	170
	Rated Voltage Rated Frequency	Three-phase 380 to 480 Vac 50/60 Hz 510 to 680 Vdc <3>													
	Allowable Voltage Fluctuation	-15 to 10%													
	Allowable Frequency Fluctuation	±5%													
	Input Power (kVA)	8.1	10.0	14.6	19.2	28.4	37.5	46.6	39.3	53.0	64.9	78.6	96.0	129.9	155
Output	Rated Output Capacity (kVA) <4>	5.5 <5>	7 <5>	11.3 <5>	13.7 <5>	18.3 <5>	24 <5>	30 <5>	34 <5>	48 <5>	57 <6>	69 <6>	85 <6>	114 <6>	137 <7>
	Rated Output Current (3 minutes, 50% ED) (A)	9.0 <5>	11.5 <5>	18.5 <5>	22.5 <5>	30.0 <5>	38.8 <5>	48.8 <5>	56.3 <5>	75.0 <5>	93.8 <6>	113.8 <6>	140.0 <6>	187.5 <6>	225.0 <7>
	Overload Tolerance	133% of rated output current for 30 s													
	Carrier Frequency	User adjustable between 1 and 15 kHz											User adjustable between 1 and 10 kHz		
	Maximum Output Voltage (V)	Three-phase 380 to 480 V (proportional to input voltage)													
	Maximum Output Speed (Hz)	120 Hz (user-adjustable)													

<1> The motor capacity (HP) refers to a NEC rated 4-pole motor. The rated output current of the drive output amps should be equal to or greater than the motor current. Select the appropriate capacity drive if operating the motor continuously above motor nameplate current.
<2> Assumes operation at the rated output current. Input current rating varies depending on the power supply transformer, input reactor, wiring conditions, and power supply impedance.
<3> DC is not available for UL standards.
<4> Rated motor capacity is calculated with a rated output voltage of 440 V.
<5> Carrier frequency can be set up to 8 kHz while keeping this current rating. Higher carrier frequency settings require derating.
<6> Carrier frequency can be set up to 5 kHz while keeping this current rating. Higher carrier frequency settings require derating.
<7> Carrier frequency can be set up to 2 kHz while keeping this current rating. Higher carrier frequency settings require derating.

◆ Drive Specifications All Models

Note: Perform rotational Auto-Tuning to obtain the performance specifications given below.
Note: For optimum performance life of the drive, install the drive in an environment that meets the required specifications.

Item		Specification
Control Characteristics	Control Method	The following control methods can be set using drive parameters: • V/f Control (V/f) • Open Loop Vector Control (OLV) • Closed Loop Vector Control (CLV) • Closed Loop Vector Control for PM (CLV/PM)
	Frequency Control Range	0.01 to 120 Hz
	Frequency Accuracy (Temperature Fluctuation)	Digital input: within ±0.01% of the max output speed (-10 to +40 °C) Analog input: within ±0.1% of the max output speed (25 °C ±10 °C)
	Frequency Setting Resolution	Digital inputs: 0.01 Hz Analog inputs: 1/2048 of the maximum output speed setting (11 bit plus sign)
	Output Speed Resolution	0.001 Hz
	Frequency Setting Signal	Main speed frequency reference: DC -10 to +10 V (20 kΩ,) DC 0 to +10 V (20 kΩ), 4 to 20 mA (250 Ω,), 0 to 20 mA (250 Ω,)
	Starting Torque <1>	V/f: 150% at 3 Hz OLV: 200% at 0.3 Hz CLV, CLV/PM: 200% at 0 r/min
	Speed Control Range <1>	V/f: 1:40 OLV: 1:200 CLV, CLV/PM: 1:1500
	Speed Control Accuracy <1>	OLV: ±0.2% (25 °C ±10 °C) CLV: ±0.02% (25 °C ±10 °C)
	Speed Response <1>	OLV: 10 Hz (25 °C ±10 °C) CLV: 50 Hz (25 °C ±10 °C)
	Torque Limit	Parameters setting allow separate limits in four quadrants (available in OLV, CLV, CLV/PM)
Control Characteristics	Accel/Decel Ramp	0.0 to 6000.0 s (4 selectable combinations of independent acceleration and deceleration settings, unit changeable to m/s^2 or ft/s^2)
	Braking Transistor	Models CIMR-LE2A0018 to 2A0144, 4A0009 to 4A0075 have a built-in braking transistor.
	V/f Characteristics	Freely programmable
	Main Control Functions	Inertia Compensation, Position Lock at Start and Stop/Anti-Rollback Function, Overtorque/ Undertorque Detection, Torque Limit, Speed Reference, Accel/decel Switch, 5 Zone Jerk Settings, Auto-Tuning (Stationary and Rotational Motor/Encoder Offset Tuning), Dwell, Cooling Fan on/off Switch, Slip Compensation, Torque Compensation, DC Injection Braking at Start and Stop, MEMOBUS/Modbus Comm. (RS-422/485 max, 115.2 kbps), Fault Reset, Removable Terminal Block with Parameter Backup Function, Online Tuning, High Frequency Injection, Short Floor, Rescue Operation (Light Load Direction Search Function), Inspection Run, Brake Sequence, Speed related parameters with elevator units display, etc.
Protection Functions	Motor Protection	Electronic thermal overload relay
	Momentary Overcurrent Protection	Drive stops when output current exceeds 200% of rated output current
	Overload Protection	Drive stops after 30 s at 133% of rated output current <2>
	Overvoltage Protection	200 V class: Stops when DC bus voltage exceeds approx. 410 V 400 V class: Stops when DC bus voltage exceeds approx. 820 V
	Undervoltage Protection	200 V class: Stops when DC bus voltage falls below approx. 190 V 400 V class: Stops when DC bus voltage falls below approx. 380 V
	Heatsink Overheat Protection	Thermistor
	Stall Prevention	Stall Prevention is available during acceleration, and during run.
	Ground Protection	Electronic circuit protection <3>
	DC Bus Charge LED	Remains lit until DC bus voltage falls below 50 V

Item		Specification
Environment	Area of Use	Indoors
	Ambient Temperature	IP00 enclosure with top protective cover: -10 to +40 °C IP00 enclosure: -10 to +50 °C
	Humidity	95 RH% or less (no condensation)
	Storage Temperature	-20 to 60 °C (short-term temperature during transportation)
	Altitude	Up to 1000 meters without derating, up to 3000 m with output current and voltage derating
	Vibration/Shock	10 to 20 Hz: 9.8 m/s^2 20 to 55 Hz: 5.9 m/s^2 (2A0018 to 2A0225 and 4A0009 to 4A0188) or 2.0 m/s^2 (2A0269 to 2A0432 and 4A0225)
Standards		• UL Underwriters Laboratories Inc: UL508C Power Conversion Equipment
Protection Design		IP00 enclosure with top protective cover, IP00

<1> The accuracy of these values depends on motor characteristics, ambient conditions, and drive settings. Specifications may vary with different motors and with changing motor temperature. Contact Yaskawa for consultation.
<2> Overload protection may be triggered when operating with 133% of the rated output current if the output speed is less than 6 Hz.
<3> Ground protection cannot be provided when the impedance of the ground fault path is too low, or when the drive is powered up while a ground fault is present at the output.

◆ Drive Derating Data

■ Carrier Frequency Derating

The drive can be operated at above the default carrier frequency by derating the drive capacity.

NOTICE

Refer to the L1000E Technical Manual SIEPYAIL1E01 for more information regarding the ***Carrier Frequency Derating*** and for complete product instructions necessary for proper installation, set up, troubleshooting and maintenance. The L1000E Series CD-ROM No. CD.L1E.01 packaged with the drive contains the L1000E Technical Manual No. SIEPYAIL1E01 and additional L1000E Series manuals.

■ Temperature Derating

To ensure the maximum performance life, the drive output current must be derated as shown in ***Figure 25*** when the drive is installed in areas with high ambient temperature or if drives are mounted side-by-side in a cabinet. In order to ensure reliable drive overload protection, set parameters L8-12 and L8-35 according to the installation conditions.

Parameter Settings

No.	Name	Description	Range	Default
L8-12	Ambient Temperature Setting	Adjust the drive overload (oL2) protection level when the drive is installed in an environment that exceeds its ambient temperature rating.	-10 to 50	40 °C
L8-35	Installation Method Selection	0: IP00 Enclosure 2: IP00 Enclosure with Top Protective Cover	0 or 2	Determined by o2-04

IP00 Enclosure

Drive operation between -10 °C and 50 °C allows 100% continuous current without derating.

IP00 Enclosure with Top Protective Cover

Drive operation between -10 °C and 40 °C allows 100% continuous current without derating. Operation between 40 °C and 50 °C requires output current derating.

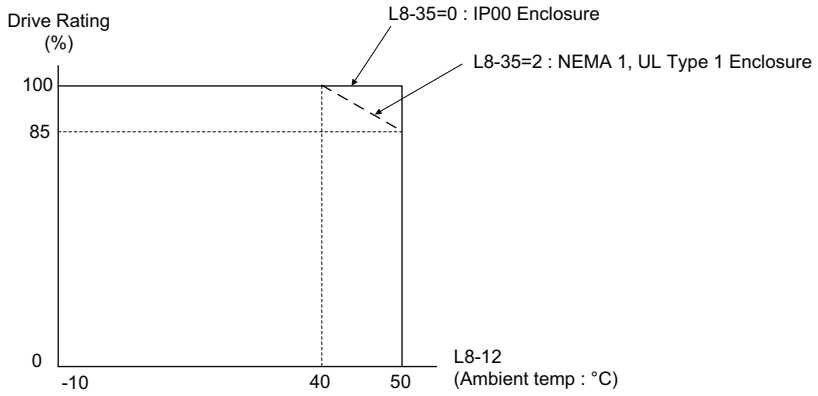


Figure 25 Ambient Temperature and Installation Method Derating

■ Altitude Derating

The drive standard ratings are valid for an installation altitude up to 1000 m. If the altitude exceeds 1000 m both the drive rated voltage and the rated output current must be derated for 1% per 100 m. The maximum altitude is 3000 m.

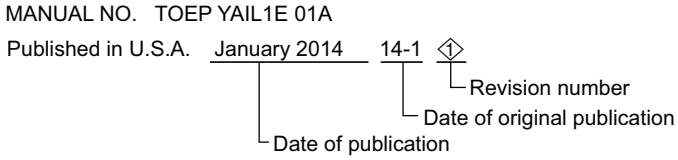
◆ Heat Loss

NOTICE

Refer to the L1000E Technical Manual SIEPYAIL1E01 for more information regarding ***Heat Loss*** and for complete product instructions necessary for proper installation, set up, troubleshooting and maintenance. The L1000E Series CD-ROM No. CD.L1E.01 packaged with the drive contains the L1000E Technical Manual No. SIEPYAIL1E01 and additional L1000E Series manuals.

12 Revision History

The revision dates and the numbers of the revised manuals appear on the bottom of the back cover.



Date of Publication	Revision Number	Section	Revised Content
December 2015	<1>	All	Corrected documentation and updated for drive software version PRG: 7601
February 2014	—	—	First edition.

YASKAWA AC Drive-L1000E

AC Drive for Elevator Applications

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

Specifications are subject to change without notice for ongoing product modifications and improvements.

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