

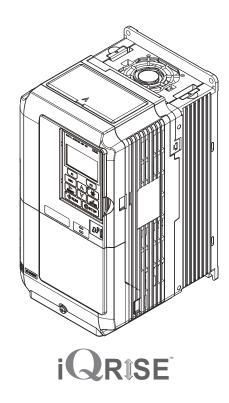
YASKAWA AC Drive-L1000A

AC Drive for Elevator Applications **Quick Start Guide**

Type: CIMR-LU□A .

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



MANUAL NO. TOEP C710616 38D

Receiving

Mechanical Installation

Electrical Installation

Start-Up Programming & Operation

Troubleshooting

Periodic Inspection & Maintenance

Option Card Installation

Specifications

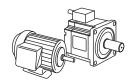
Parameter Table

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■ Quick Reference

Drive a Synchronous PM Motor

L1000A can operate synchronous PM motors. Refer to Flowchart C: Auto-Tuning for PM Motors on page 58.



Perform Auto-Tuning

Automatic tuning sets motor parameters. Refer to Types of Auto-Tuning on page 60.

Maintenance Check Using Drive Monitors

Use drive monitors to check fans, capacitors, and other components may require maintenance. Refer to Performance Life Monitors Maintenance Monitors on page 122.

Fault Display and Troubleshooting

Refer to Troubleshooting on page 109.

Standards Compliance

Refer to European Standards on page 185 and UL and CSA Standards on page 191.







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Preface & General Safety

♦ Preface

Yaskawa manufactures products used as components in a wide variety of industrial systems and equipment. The selection and application of Yaskawa products remain the responsibility of the equipment manufacturer or end user. Yaskawa accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any Yaskawa product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically and fail safely under all circumstances. All systems or equipment designed to incorporate a product manufactured by Yaskawa must be supplied to the end user with appropriate warnings and instructions as to the safe use and operation of that part. Any warnings provided by Yaskawa must be promptly provided to the end user. Yaskawa offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the Yaskawa manual. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED. Yaskawa assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.

This manual is designed to ensure correct and suitable application of L1000A-Series Drives. Read this manual before attempting to install, operate, maintain, or inspect a drive and keep it in a safe, convenient location for future reference. Be sure you understand all precautions and safety information before attempting application.

■ Applicable Documentation

The following manuals are available for L1000A series drives:



L1000A Series AC Drive Quick Start Guide (this book)

Read this manual first. This guide is packaged together with the product. It contains basic information required to install and wire the drive, in addition to an overview of fault diagnostics, maintenance, and parameter settings. Use the information in this book to prepare the drive for a trial run with the application and for basic operation.

L1000A Series AC Drive Technical Manual

This manual provides detailed information on parameter settings, drive functions, and MEMOBUS/Modbus specifications. Use this manual to expand drive functionality and to take advantage of higher performance features.

♦ 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.

A 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 result 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.

A 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

A 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.

Electrical Shock Hazard

Do not connect or disconnect wiring or service the drive while the power is on.

Failure to comply will result in death or serious injury.

Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components.

A WARNING

Sudden Movement Hazard

The drive system or elevator 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.

Ensure there are no short circuits between the main circuit terminals (R/L1, S/L2, and T/L3) or between the ground and main circuit terminals before restarting the drive.

Failure to comply may result in serious injury or death and will cause damage to equipment.

A WARNING

System may start unexpectedly upon application of power when the Auto-restart function is enabled resulting in death or serious injury.

Use care when enabling Auto-restart as this function may cause unintended start of the elevator.

Use parameter S1-12 to enable/disable automatic switching of the Motor Contactor Control output signal during Auto-Tuning.

When using S1-12 = 1, ensure that the multi-function output terminals are properly wired and in the correct state before setting parameter S1-12.

Failure to comply could result in damage to the drive, serious injury or death.

Electrical Shock Hazard

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

Yaskawa is not responsible for damage caused by modification of the product made by the user. Failure to comply could result in death or serious injury from operation of damaged equipment.

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.

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

- In applications where the machine can still rotate even though the drive has fully stopped a load, install a switch to the drive output side to disconnect the motor and the drive.
- Do not allow an external force to rotate the motor beyond the maximum allowable speed or to rotate the motor when the drive has been shut off.
- Wait for at least the time specified on the warning label after opening the load switch on the output side before inspecting the drive or performing any maintenance.
- Do not open and close the load switch while the motor is running, as this can damage the drive.

If the motor is coasting, make sure the power to the drive is turned on and the drive output has completely stopped before closing the load switch.

Do not connect or disconnect wiring to the drive or motor while the power is on.

Failure to comply will result in death or serious injury. Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait at least five minutes after all indicators are OFF and measure the DC bus voltage level to confirm safe level.

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

WARNING

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

Failure to comply could result in death or serious injury. Disconnect all power to the drive and check for unsafe voltages before servicing.

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

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), and 600 Vac maximum (600 V class) when protected by branch circuit protection devices specified in this manual.

Applications using a braking option should wire a thermal relay so that the output contactor opens when the thermal relay trips.

Inadequate braking circuit protection could result in death or serious injury by fire from overheating resistors.

Do not use improper combustible materials.

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

Attach the drive to metal or other noncombustible material.

NOTICE

Equipment Hazard

Do not modify the drive circuitry.

Failure to comply could result in damage to the drive and will void warranty.

Yaskawa is not responsible for any modification of the product made by the user. This product must not be modified. Failure to comply could result in damage to the drive or braking circuit.

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

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

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.

Do not lift the drive up while the cover is removed.

This can damage the terminal board and other components.

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.

■ General Application Precautions

Motor Selection

Drive Capacity

The output current should not exceed 150% of the drive rated current. Select a drive that can output enough current when accelerating a load at 100%.

For specialized motors, make sure that the motor rated current is less than the rated output current for the drive.

Starting Torque

The startup and acceleration characteristics of the motor are restricted to the drive's overload current rating (150% rated current for 60 s).

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

Stopping

Fast Stop

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

Mechanical Brake

A mechanical brake is required to prevent the elevator from free falling during a drive fault condition.

Repetitive Starting/Stopping

Elevators and other applications with frequent starts and stops often approach 150% of their rated current values. Heat stress generated from repetitive high current will shorten the life span of the IGBTs.

Yaskawa recommends lowering the carrier frequency, particularly when audible noise is not a concern. It is beneficial to reduce the load, increase the acceleration and deceleration times, or switch to a larger drive to help keep peak current levels under 150%. Be sure to check the peak current levels when starting and stopping repeatedly during the initial test run, and make adjustments accordingly.

Installation

Enclosure Panels

Keep the drive in a clean environment by installing the drive in an enclosure panel or selecting an installation area free of airborne dust, lint, and oil mist. Be sure to leave the required space between drives to provide for cooling, and take proper measures so the ambient temperature remains within allowable limits and keep flammable materials away from the drive. Yaskawa offers protective designs for drives that must be used in areas subjected to oil mist and excessive vibration. Contact Yaskawa or your Yaskawa agent for details.

Installation Direction

NOTICE: Install the drive upright as specified in the manual. **Refer to Mechanical Installation on page 17** for more information on installation. Failure to comply may damage the drive due to improper cooling.

Settings

DC Injection Braking

NOTICE: Excessive current during DC Injection Braking and excessive duration of DC Injection Braking can cause motor overheating. Adjust DC Injection parameters to prevent motor overheating.

Acceleration/Deceleration Ramp

Acceleration and deceleration times are affected by the amount of torque generated by the motor, the load torque, and the inertia moment. Set a longer accel/decel time when Stall Prevention is enabled. The accel/decel times are lengthened for as long as the Stall Prevention function is in operation. Install one of the available braking options or increase the capacity of the drive for faster acceleration and deceleration.

General Handling

Selecting a Molded Case Circuit Breaker or Ground Fault Circuit Interrupter (GFCI)

Select an appropriate GFCI. This drive can cause a residual current with a DC component in the protective earthing conductor. Where a residual current operated protective or monitoring device is used for protection in case of direct or indirect contact, always use an GFCI of type B according to IEC 60755.

Select a MCCB (Molded Case Circuit Breaker) with a rated current that is 1.5 to 2 times higher than the rated current of the drive in order to avoid nuisance trips caused by harmonics in the drive input current.

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.

WARNING! Fire Hazard. Shut off the drive with a magnetic contactor (MC) when a fault occurs in any external equipment such as braking resistors. Failure to comply may cause resistor overheating, fire, and injury to personnel.

NOTICE: 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.

Inspection and Maintenance

WARNING! Electrical Shock Hazard. Capacitors in the drive do not immediately discharge after shutting off the power. Wait for at least the amount of time specified on the drive before touching any components after shutting off the power. Failure to comply may cause injury to personnel from electrical shock.

CAUTION! 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.

WARNING! Electrical Shock Hazard. When a drive is running a PM motor, voltage continues to be generated at the motor terminals after the drive is shut off while the motor coasts to stop. Take the precautions described below to prevent shock and injury:

- In applications where the machine can still rotate after the drive has fully stopped a load, install a load disconnect switch on the drive output side to disconnect the motor and the drive.
- Do not allow an external force to rotate the motor beyond the maximum allowable speed or to rotate the motor when the drive is powered off.
- Wait for at least the time specified on the warning label after opening the load switch on the output side before inspecting the drive or performing any maintenance.
- Do not open and close the load switch while the motor is running.
- If the motor is coasting, make sure the power to the drive is turned on and the drive output has completely stopped before closing the load switch to reconnect the drive to the motor.

Wiring

Yaskawa recommends using ring terminals on all drive models for UL/cUL compliance. Use only the tools recommended by the terminal manufacturer for crimping.

Transporting the Drive

NOTICE: 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. Failure to comply may damage the drive.

■ Motor Application Precautions

Standard Induction Motors Insulation Tolerance

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

NOTICE: Ensure that the motor is suitable for inverter duty and/or the motor service factor is adequate to accommodate the additional heating with the intended operating conditions. 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.

High-Speed Operation

NOTICE: Mechanical damage may occur with the motor bearings and dynamic balance of the machine when operating a motor beyond its rated speed. Operate the motor within specifications to prevent motor damage.

Low-Speed Range

The cooling fan of a standard motor should sufficiently cool the motor at the rated speed. As the self-cooling capability of such a motor reduces with the speed, applying full torque at low speed will possibly damage the motor. Reduce the load torque as the motor slows to prevent motor damage from overheat. Use a motor designed specifically for operation with a drive when 100% continuous torque is needed at low speeds.

Torque Characteristics

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

Vibration and Shock

The drive allows selection of high carrier PWM control and low carrier PWM control. Selecting high carrier PWM can help reduce motor oscillation.

If resonance occurs, install shock-absorbing rubber mounts around the base of the motor and utilize the Jump frequency selection to prevent continuous operation in the resonant frequency ranges.

Audible Noise

Noise created during run varies by the carrier frequency setting. When using a high carrier frequency, audible noise from the motor is comparable to the motor noise generated when running from line power. Operating above the rated r/min, however, can create unpleasant motor noise.

Precautions for PM Motors

NOTICE: Damage to Equipment. Improper sequencing of output motor circuits could result in damage to the drive. Do not connect electromagnetic switches or magnetic contactors to the output motor circuits without proper sequencing. Do not open the main circuit between the drive and the motor while the PM motor is rotating.

- Contact Yaskawa or your Yaskawa agent if you plan to use any PM motor not endorsed by Yaskawa.
- When using a holding brake, release the brake prior to starting the motor. Failure to set the proper timing can result in speed loss.

WARNING! Sudden Movement Hazard. Use the Initial Pole Search Status Signal (H2-\(\sigma\) = 61) to interlock the brake to ensure the brake is not released before the Initial Magnetic Pole Search is completed. Failure to comply may cause inadvertent elevator movement resulting in serious injury.

This safety message is applicable under these conditions:

• When applying a PM motor, with an external brake sequence, and the PG-F3 option is not being used.

WARNING! Electrical Shock Hazard. The motor must be at a complete stop before performing any maintenance, inspection, or wiring.

• With a PM motor, drive output must be fully interrupted when the power is shut off and the motor is still rotating. Failure to comply can result in personal injury from electrical shock.

■ Drive Label Warnings

Always heed the warning information listed in *Figure 1* in the position shown in *Figure 2*.





- Risk of electric shock.
 Read manual before installing.
- Wait 5 minutes for capacitor discharge after disconnecting power supply.
- To conform to **C** requirements, make sure to ground the supply neutral for 400V class.
- After opening the manual switch between the drive and motor, please wait 5 minutes before inspecting, performing maintenance or wiring the drive. Hot surfaces
- Top and Side surfaces may become hot. Do not touch.

Figure 1 Warning Information



Figure 2 Warning Information Position

■ 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.

1 Receiving

◆ Model Number and Nameplate Check

Please perform the following tasks after receiving the drive:

- Inspect the drive for damage.

 If the drive appears damaged upon receipt, contact the shipper immediately.
- Verify receipt of the correct model by checking the information on the nameplate.
- If you have received the wrong model or the drive does not function properly, contact your supplier.

Description	Drive	Controller Power Supply Cable for Rescue Operation	Quick Start Guide
			Chiel Starf Chiele
Quantity	1	1	1

■ Nameplate

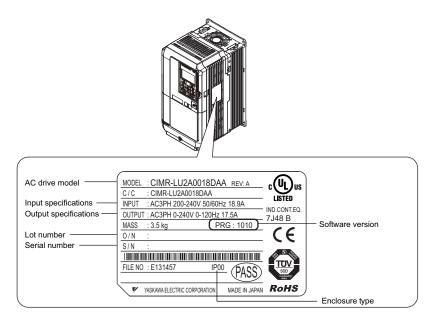
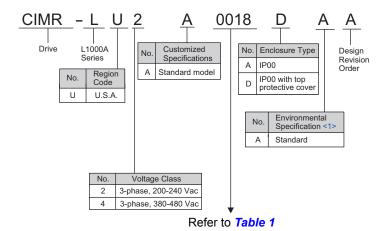


Figure 3 Nameplate Information

■ Model Number



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

Table 1 Model Number and Specifications

	Three-Phase 200 V		Three-Phase 400 V					
No.	No. Max. Motor Capacity kW(HP)		No.	Max. Motor Capacity kW(HP)	Rated Output Current A			
0018	3.7 (5)	17.5	0009	3.7 (5)	9.2			
0025	5.5 (7-1/2)	25	0015	5.5 (7-1/2)	14.8			
0033	7.5 (10)	33	0018	7.5 (10)	18			
0047	11 (15)	47	0024	11 (15)	24			
0060	15 (20)	60	0031	15 (20)	31			
0075	18.5 (25)	75	0039	18.5 (25)	39			
0085	22 (30)	85	0045	22 (30)	45			
0115	30 (40)	115	0060	30 (40)	60			
0145	37 (50)	145	0075	37 (50)	75			
0180	45 (60)	180	0091	45 (60)	91			
0215	55 (75)	215	0112	55 (75)	112			
0283	75 (100)	283	0150	75 (100)	150			
0346	90 (125)	346	0180	90 (125)	180			
0415	110 (150)	415	0216	110 (150)	216			
_	_	_	0260	132 (200)	260			

2 Mechanical Installation

♦ Mechanical Installation

This section outlines specifications, procedures, and the environment for proper mechanical installation of the drive.

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 2 Installation Environment

Environment	Conditions
Installation Area	Indoors
Ambient Temperature	-10°C to +40°C (IP00 with top protective cover: Enclosure type D) -10°C to +50°C (IP00 without top protective cover: Enclosure type A) 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
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 or lower, up to 3000 m with derating (Refer to <i>Altitude Derating on page 139</i>)
Vibration	10 to 20 Hz at 9.8 m/s ² 20 to 55 Hz at 5.9 m/s ² (2A0018 to 2A0180, 4A0009 to 4A0150) or 2.0 m/s ² (2A0215 to 2A0415, 4A0180 to 4A0260)
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 noise.

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 $^{\circ}$ C.

Installation Orientation

Install the drive upright as illustrated in *Figure 4* to maintain proper cooling. Refer to *Mechanical Installation on page 17* for details on installing the drive.

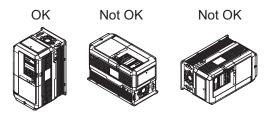


Figure 4 Correct Installation Orientation

Installation Spacing

Figure 5 shows the installation distance required to maintain sufficient space for airflow and wiring.

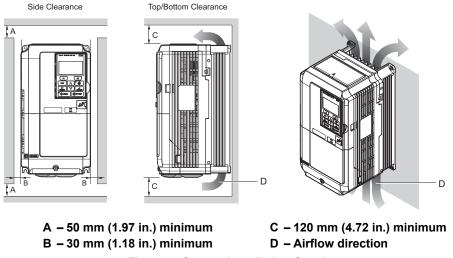


Figure 5 Correct Installation Spacing

■ Exterior and Mounting Dimensions

IP00 Enclosure Drive with Top Protective Cover

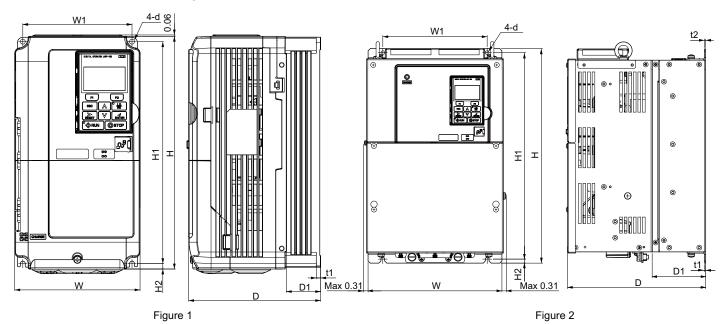


Table 3 Dimensions: 200 V Class

Drive Model	Figure	Dimensions (in)										Weight
CIMR-LU2A	riguie	W	Н	D	W1	H1	H2	D1	t1	t2	d	(lbs)
0018		5.5	10.2	6.5	4.8	9.8	0.2	2.2	0.2	_	M5	7.7
0025		5.5	10.2	6.6	4.8	9.8	0.2	2.2	0.2	_	M5	8.8
0033	1	5.5	10.2	6.6	4.8	9.8	0.2	2.2	0.2	_	M5	8.8
0047	1	7.1	11.8	7.4	6.3	11.2	0.3	3.0	0.2	_	M5	12.3
0060		8.7	13.8	7.8	7.6	13.2	0.3	3.1	0.2	_	M6	19.2
0075		8.7	13.8	7.8	7.6	13.2	0.3	3.1	0.2	_	M6	21.4
0085		9.8	15.7	10.2	7.7	15.2	0.3	3.9	0.1	0.1	M6	46.3
0115	2	10.8	17.7	10.2	8.7	17.1	0.3	3.9	0.1	0.1	M6	55.1
0145	2	12.8	21.7	11.1	10.2	21.1	0.3	4.3	0.1	0.1	M6	81.6
0180		12.8	21.7	11.1	10.2	21.1	0.3	4.3	0.1	0.1	M6	83.8

Table 4 Dimensions: 400 V Class

Drive Model	rive Model Figure Dimensions (in)							Weight				
CIMR-LU4A	Figure	W	Н	D	W1	H1	H2	D1	t1	t2	d	(lbs)
0009		5.5	10.2	6.5	4.8	9.8	0.2	2.2	0.2	_	M5	7.7
0015		5.5	10.2	6.6	4.8	9.8	0.2	2.2	0.2	_	M5	8.6
0018	1	5.5	10.2	6.6	4.8	9.8	0.2	2.2	0.2	_	M5	8.9
0024	1	7.1	11.8	6.6	6.3	11.2	0.3	2.2	0.2	_	M5	11.9
0031		7.1	11.8	7.4	6.3	11.2	0.3	3.0	0.2	_	M5	11.9
0039		8.7	13.8	7.8	7.6	13.2	0.3	3.1	0.2	_	M6	18.3
0045		9.8	15.7	10.2	7.7	15.2	0.3	3.9	0.1	0.1	M6	46.3
0060		10.8	17.7	10.2	8.7	17.1	0.3	3.9	0.1	0.1	M6	55.1
0075	2	12.8	510	10.2	10.2	19.5	0.3	4.1	0.1	0.1	M6	79.4
0091		12.8	510	10.2	10.2	19.5	0.3	4.1	0.1	0.1	M6	79.4
0112		12.8	21.7	11.1	10.2	21.1	0.3	4.3	0.1	0.1	M6	90.4
0150		12.8	21.7	11.1	10.2	21.1	0.3	4.3	0.1	0.1	M6	92.6

IP00 Enclosure Drive

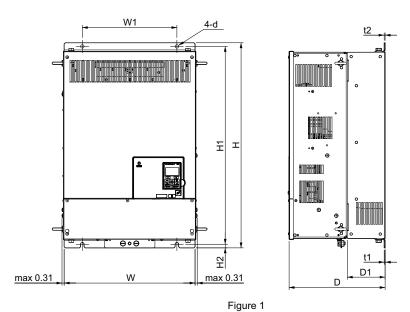


Table 5 Dimensions: 200 V Class

Drive Model	Figure					Dimens	ions (in)					Weight
CIMR-LU2A	rigure	W	Н	D	W1	H1	H2	D1	t1	t2	d	(lbs)
0215		17.7	27.8	13.0	12.8	26.8	0.5	5.1	0.1	0.1	M10	167.6
0283	1	17.7	27.8	13.0	12.8	26.8	0.5	5.1	0.1	0.1	M10	176.4
0346	1	19.7	31.5	13.8	14.6	30.4	0.5	5.1	0.2	0.2	M12	216.1
0415		19.7	31.5	13.8	14.6	30.4	0.5	5.1	0.2	0.2	M12	218.3

Table 6 Dimensions: 400 V Class

Drive Model	Figure	Dimensions (in)									Weight	
CIMR-LU4A	rigure	W	Н	D	W1	H1	H2	D1	t1	t2	d	(lbs)
0180		17.7	27.8	13.0	12.8	26.8	0.5	5.1	0.1	0.1	M10	174.2
0216	1	19.7	31.5	13.8	14.6	30.4	0.5	5.1	0.2	0.2	M12	211.6
0260		19.7	31.5	13.8	14.6	30.4	0.5	5.1	0.2	0.2	M12	224.9

3 Electrical Installation

◆ Standard Connection Diagram

Connect the drive and peripheral devices as shown in *Figure 6*. It is possible to set and run the drive via the digital operator without connecting digital I/O wiring. This section does not discuss drive operation; *Refer to Start-Up Programming & Operation on page 46* for instructions on operating the drive.

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.

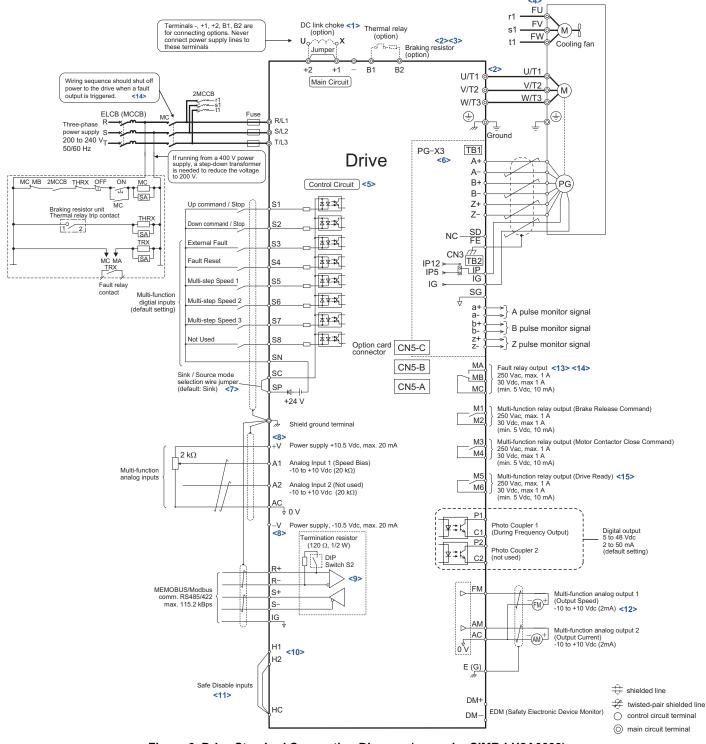


Figure 6 Drive Standard Connection Diagram (example: CIMR-LU2A0033)

- <1> Remove the jumper when installing a DC link choke. Models CIMR-LU2A0085 through 2A0415 and 4A0045 through 4A0260 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 *Sinking/Sourcing Mode Selection for Safe Disable Inputs on page 44* 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, L1000A 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.

WARNING! Sudden Movement Hazard. Ensure start/stop and safety circuits are wired properly and in the correct state before energizing the drive. Failure to comply could result in death or serious injury from moving equipment.

NOTICE: When using the automatic fault reset function with wiring designed to shut off the power supply upon drive fault, make sure the drive does not trigger a fault output during fault reset (L5-02 = 0, default). Failure to comply will prevent the automatic fault reset function from working properly.

◆ Main Circuit Connection Diagram

Refer to the *Figure 7* when wiring the main circuit of the drive. Connections may vary based on drive capacity. The DC power supply for the main circuit also provides power to the control circuit.

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.

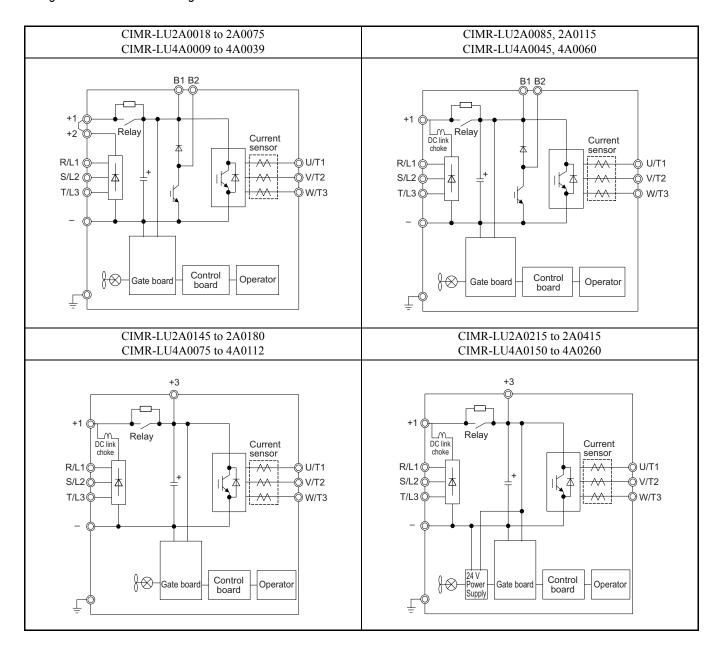


Figure 7 Drive main circuit configurations

♦ Terminal Cover

Follow the procedure below to remove the terminal cover for wiring and to reattach the terminal cover after wiring is complete.

■ Removing/Reattaching the Terminal Cover

Removing the Terminal Cover

Models CIMR- L□2A0018 to 2A0075 and 4A0009 to 4A0039

1. Loosen the terminal cover screw using a #2 Phillips screwdriver. Screw sizes vary by drive model.

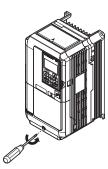


Figure 8 Removing the Terminal Cover

2. Push in on the tab located on the bottom of the terminal cover and gently pull forward to remove the terminal cover.

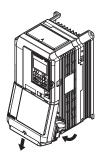


Figure 9 Removing the Terminal Cover

Models CIMR- LU2A0085 to 2A0415 and 4A0045 to 4A0260

1. Loosen the screws on the terminal cover, then pull down on the cover.

CAUTION! Do not completely remove the cover screws, just loosen them. If the cover screws are removed completely, the terminal cover may fall off causing an injury.

Note: The shape of the terminal covers and the numbers of screws differ depending on the drive models.

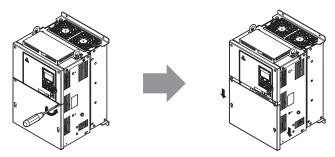


Figure 10 Removing the Terminal Cover

2. Pull forward on the terminal cover to free it from the drive.

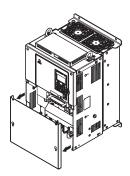


Figure 11 Removing the Terminal Cover

Reattaching the Terminal Cover Models CIMR- L□2A0018 to 2A0075 and 4A0009 to 4A0039

Power lines and signal wiring should pass through the opening provided. *Refer to Wiring the Main Circuit Terminal on page 36* and *Wiring the Control Circuit Terminal on page 40* for details on wiring.

Reattach the terminal cover after completing the wiring to the drive and other devices.

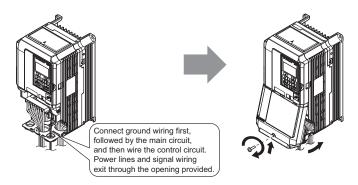


Figure 12 Reattaching the Terminal Cover

Models CIMR- LU2A0085 to 2A0415 and 4A0045 to 4A0260

After wiring the terminal board and other devices, double-check connections and reattach the terminal cover. *Refer to Wiring the Main Circuit Terminal on page 36* and *Wiring the Control Circuit Terminal on page 40* for details on wiring.

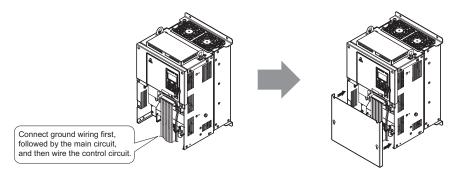


Figure 13 Reattaching the Terminal Cover

♦ Digital Operator and Front Cover

Detach the digital operator from the drive for remote operation or when opening the front cover to install an option card.

Note: Be sure to remove the digital operator prior to opening or reattaching the front cover. Leaving the digital operator plugged into the drive when removing the front cover can result in erroneous operation caused by a poor connection. Firmly fasten the front cover back into place before reattaching the digital operator.

■ Removing/Reattaching the Digital Operator

Removing the Digital Operator

While pressing on the tab located on the right side of the digital operator, pull the digital operator forward to remove it from the drive.

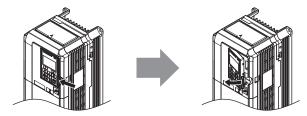


Figure 14 Removing the Digital Operator

Reattaching the Digital Operator

Insert the digital operator into the opening in the top cover while aligning it with the notches on the left side of the opening.

Next, press gently on the right side of the operator until it clicks into place.

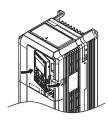


Figure 15 Reattaching the Digital Operator

■ Removing/Reattaching the Front Cover

Removing the Front Cover

Models CIMR- L□2A0018 to 2A0075 and 4A0009 to 4A0039

After removing the terminal cover and the digital operator, loosen the screw that affixes the front cover (model CIMR- $L\Box 2A0047$, 4A0024, and 4A0031 does not use a screw to affix the front cover). Pinch inwards on the tabs found on each side of the front cover, then pull forward to remove it from the drive.

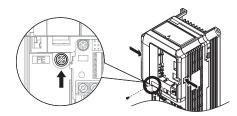


Figure 16 Remove the Front Cover (Models CIMR-L□2A0018 to 2A0075 and 4A0009 to 4A0039)

Models CIMR-L□2A0085 to 2A0415 and 4A0045 to 4A0260

- **1.** Remove the terminal cover and the digital operator.
- **2.** Loosen the installation screw on the front cover.
- 3. Use a straight-edge screwdriver to loosen the hooks on each side of the cover that hold it in place.

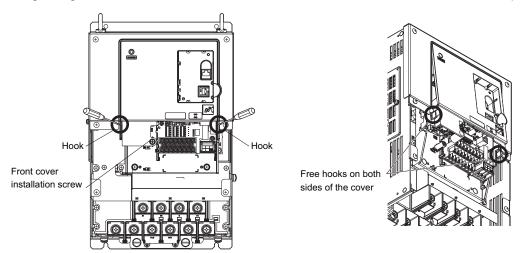


Figure 17 Remove the Front Cover (Models CIMR-L□2A0085 to 2A0415 and 4A0045 to 4A0260)

4. Unhook the left side of the front cover then swing the left side towards you as shown in *Figure 18* until the cover comes off.

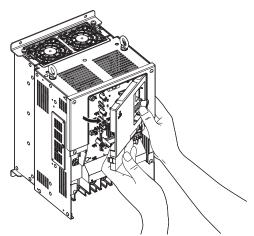


Figure 18 Remove the Front Cover (Models CIMR-L□2A0085 to 2A0415 and 4A0045 to 4A0260)

Reattaching the Front Cover

Models CIMR-L□2A0018 to 2A0075 and 4A0009 to 4A0039

Reverse the instructions given in *Remove the Front Cover (Models CIMR-Lo2A0018 to 2A0075 and 4A0009 to 4A0039) on page 27* to reattach the front cover. Pinch inwards on the hooks found on each side of the front cover while guiding it back into the drive. Make sure it clicks firmly into place.

Models CIMR-L□2A0085 to 2A0415 and 4A0045 to 4A0260

1. Slide the front cover so the hooks on the top connect to the drive.

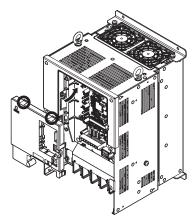


Figure 19 Reattach the Front Cover (CIMR-L□2A0085 to 2A0415 and 4A0045 to 4A0260)

2. After connecting the hooks to the drive, press firmly on the cover to lock it into place.

Main Circuit Wiring

This section describes the functions, specifications, and procedures required to safely and properly wire the main circuit in the drive.

NOTICE: Only connect recommended devices to the drives braking transistor terminals. Failure to comply could result in damage to the drive or braking circuit. Carefully review instruction manual TOBP C720600 00 when connecting a braking option to the drive.

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: Equipment Hazard. Comply with proper wiring practices. The motor may run in reverse if the phase order is backward, causing incorrect elevator direction movement. 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.

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.

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.

■ Main Circuit Terminal Functions

Table 7 Main Circuit Terminal Functions

Term	inal		Туре			
200 V Class	Model CIMR-	2A0018 to 2A0075	2A0085, 2A0115	2A0145 to 2A0415	Function	Page
400 V Class	LU	4A0009 to 4A0039	4A0045, 4A0060	4A0075 to 4A0260		
R/I	L 1					
S/L	L2	Mair	circuit power supply inp	out	Connects line power to the drive	22
T/I	L3					
U/I	Γ1					
V/T	Γ2		Drive output	Connects to the motor	22	
W /7	Т3					
B 1		Braking	resistor	Available for connecting a braking	_	
B2					resistor or a braking resistor unit option	
+2		• DC reactor connection	not ava	ilable		
+1	1	(+1, +2) (remove the			For connection	
-		shorting bar between +1 and +2) • DC power supply input (+1, -)	• DC power supply input (+1, –)	• DC power supply input (+1, -) • Braking unit connection (+3, -)	 of the drive to a DC power supply (terminals +1 and – are not EU or UL approved) of dynamic braking options 	-
+3	3	not available				
=		For 200 V class: 100Ω c For 400 V class: 10Ω or			Grounding terminal	35

Note: Use terminal B1 and - when installing the braking unit (CDBR type) to the drives with built-in braking transistor (2A0018 to 2A0115, 4A0009 to 4A0060).

■ Wire Gauges and Tightening Torque

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 600 Vac vinyl-sheathed wire assuming ambient temperature within 40°C 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 (Ω/km) × wire length (m) × current (A) × 10-3
- Refer to instruction manual TOBP C720600 00 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 2A0115, 4A0009 to 4A0060).
- Refer to UL Standards Compliance on page 191 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 CIMR-L\(\pi\)2A0085 to 2A0415 and 4A0045 to 4A0260. Use only the tools recommended by the terminal manufacturer for crimping. Refer to *Closed-Loop Crimp Terminal Size on page 195* 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.

Three-Phase 200 V Class

Table 8 Wire Gauge and Torque Specifications (Three-Phase 200 V Class)

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)	
	R/L1, S/L2, T/L3	10	18 to 10			
	U/T1, V/T2, W/T3	10	18 to 10	1	10.15	
2A0018	-, +1, +2	-	12 to 10	M4	1.2 to 1.5 (10.6 to 13.3)	
	B1, B2	_	14 to 10	1	(10.0 to 15.5)	
	(4)	10	12 to 10	1		
	R/L1, S/L2, T/L3	8	12 to 6			
	U/T1, V/T2, W/T3	8	12 to 6	J	1.2 to 1.5	
2A0025	-, +1, +2	-	10 to 6	M4	(10.6 to 13.3)	
2A0023	B1, B2	-	12 to 10			
	(a)	8	10 to 8	M5	2 to 2.5 (17.7 to 22.1)	
	R/L1, S/L2, T/L3	6	12 to 6			
	U/T1, V/T2, W/T3	8	12 to 6	1 ,,,	1.2 to 1.5	
2A0033	-, +1, +2	_	6	M4	(10.6 to 13.3)	
2A0033	B1, B2	_	12 to 10	1		
	(b)	8	10 to 8	M5	2 to 2.5 (17.7 to 22.1)	
	R/L1, S/L2, T/L3	4	6 to 4			
	U/T1, V/T2, W/T3	4	6 to 4	M6	4 to 6	
	-, +1, +2	_	6 to 4		(35.4 to 53.1)	
2A0047	B1, B2	-	10 to 6	M5	2 to 2.5 (17.7 to 22.1)	
	(a)	6	8 to 6	M6	4 to 6 (35.4 to 53.1)	
	R/L1, S/L2, T/L3	3	10 to 2			
	U/T1, V/T2, W/T3	3	10 to 2	M8	9 to 11	
	-, +1, +2	_	4 to 3	1	(79.7 to 97.4)	
2A0060	B1, B2	-	8 to 6	M5	2 to 2.5 (17.7 to 22.1)	
	a	6	6 to 4	M6	4 to 6 (35.4 to 53.1)	
	R/L1, S/L2, T/L3	2	10 to 2		0.4.11	
	U/T1, V/T2, W/T3	2	10 to 2	M8	9 to 11 (79.7 to 97.4)	
	-, +1, +2	-	3 to 2		(7).7 to 77.4)	
2A0075	B1, B2	_	6	M5	2 to 2.5 (17.7 to 22.1)	
	\(\exists\)	6	6 to 4	M6	4 to 6 (35.4 to 53.1)	
	R/L1, S/L2, T/L3	1/0	10 to 1/0			
	U/T1, V/T2, W/T3	1/0	10 to 1/0		0.4- 11	
2A0085 <1>	-, +1	-	2 to 1/0	M8	9 to 11 (79.7 to 97.4)	
	B1, B2	_	6 to 1/0		(17.1 10 71.7)	
	=	6	6 to 4			
	R/L1, S/L2, T/L3	2/0	10 to 3/0			
	U/T1, V/T2, W/T3	2/0	10 to 3/0	M10	18 to 23	
2A0115	-, +1	_	1/0 to 3/0	IVITU	(159 to 204)	
2/10/13	B1, B2	_	4 to 2/0			
	(a)	4	4	M8	9 to 11 (79.7 to 97.4)	

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
	R/L1, S/L2, T/L3	4/0	1/0 to 4/0		
	U/T1, V/T2, W/T3	4/0	1/0 to 4/0		10 4 - 22
2A0145 <1>	-, +1	_	1 to 4/0	M10	18 to 23 (159 to 204)
	+3	_	1/0 to 4/0		(137 to 204)
	\(\begin{array}{c}\end{array}\)	4	4 to 2		
	R/L1, S/L2, T/L3	1/0 × 2P	1/0 to 4/0		
	U/T1, V/T2, W/T3	$1/0 \times 2P$	1/0 to 4/0	1	10 / 22
2A0180 <1>	-, +1	_	AWG, kcmil 1/0 to 4/0 1/0 to 4/0 1 to 4/0 1/0 to 4/0 4 to 2 1/0 to 4/0	M10	18 to 23 (159 to 204)
	+3	_	1/0 to 4/0		(137 to 204)
	\(\begin{array}{c} \\ \end{array} \end{array} \)	4	4 to 1/0		
	R/L1, S/L2, T/L3	$2/0 \times 2P$	3/0 to 300		32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	$2/0 \times 2P$	3/0 to 300	M12	
	-, +1	-	3/0 to 300		(283 10 334)
2A0215 </td <td>+3</td> <td>-</td> <td>2 to 300</td> <td>M10</td> <td>18 to 23 (159 to 204)</td>	+3	-	2 to 300	M10	18 to 23 (159 to 204)
	(4)	3	3 to 300	Size	32 to 40 (283 to 354)
	R/L1, S/L2, T/L3	$3/0 \times 2P$	3/0 to 300		22
	U/T1, V/T2, W/T3	$3/0 \times 2P$	AWG, kcmil 1/0 to 4/0 1/0 to 4/0 1 to 4/0 1/0 to 4/0 4 to 2 1/0 to 4/0 1/0 to 4/0 1/0 to 4/0 1 to 4/0 1/0 to 4/0 4 to 1/0 3/0 to 300 3/0 to 600 1 to 350 250 to 600 300 to 600 3/0 to 600 3/0 to 600 3/0 to 600 3/0 to 600	M12	32 to 40 (283 to 354)
	-, +1	_	3/0 to 300		(263 to 334)
2A0283 </td <td>+3</td> <td>-</td> <td>3/0 to 300</td> <td>M10</td> <td>18 to 23 (159 to 204)</td>	+3	-	3/0 to 300	M10	18 to 23 (159 to 204)
	(4)	2	2 to 300	M10 M10 M10 M12 M10 M12 M10 M12 M10 M12 M10 M12 M10 M12 M10	32 to 40 (283 to 354)
	R/L1, S/L2, T/L3	250 × 2P	4/0 to 600		22 4 - 40
	U/T1, V/T2, W/T3	$4/0 \times 2P$	4/0 to 600	M12	32 to 40 (283 to 354)
	-, +1	_	250 to 600		(203 to 33 1)
2A0346	+3	-	3/0 to 600	M10	18 to 23 (159 to 204)
	\(\oplus \)	1	1 to 350	M12	32 to 40 (283 to 354)
	R/L1, S/L2, T/L3	350 × 2P	250 to 600		22 / 40
	U/T1, V/T2, W/T3	300 × 2P	300 to 600	M12	32 to 40 (283 to 354)
	-, +1	_	300 to 600	7	(203 10 334)
2A0415	+3	-	AWG, kcmil 1/0 to 4/0 1/0 to 4/0 1 to 4/0 1/0 to 4/0 1/0 to 4/0 4 to 2 1/0 to 4/0 3/0 to 300 1/0 to 600 1/0 to 600 1/0 to 600 3/0 to 600	M10	18 to 23 (159 to 204)
	\(\bar{\pi} \)	1	1 to 350	M12	32 to 40 (283 to 354)

<1> After installing an EMC filter, take additional measures to comply with IEC61800-5-1. Refer to *EMC Filter Installation on page 186* for details.

Three-Phase 400 V Class

Table 9 Wire Gauge and Torque Specifications (Three-Phase 400 V Class)

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
	R/L1, S/L2, T/L3	12	18 to 10		
	U/T1, V/T2, W/T3	14	18 to 10		10
4A0009	-, +1, +2	_	AWG, kcmil Size 18 to 10 18 to 10 18 to 10 M4 14 to 10 M4 14 to 10 M4 12 to 6 M5 12 to 10 M5 10 to 6 M5 10 to 6 M5 10 to 8 M6 10 to 10 M6 6 to 4 M6 10 to 1/0 M6 10 to 1/0 M6 10 to 3/0 M8	M4	(10.6 to 13.3)
	B1, B2	_			(10.0 to 15.5)
	=	10	14 to 10	M4 M4 M4 M5 M5 M6 M6 M6 M8	
	R/L1, S/L2, T/L3	10		M4 M4 M5 M4 M5 M5 M6 M6 M6 M6	
	U/T1, V/T2, W/T3	10		M4	1.2 to 1.5
4A0015	-, +1, +2	_	18 to 10 18 to 10 18 to 10 14 to 10 14 to 10 12 to 6 10 to 6 10 to 6 10 to 8 10 to 3/0 10 to 3/0 10 to 3/0		(10.6 to 13.3)
	B1, B2	_	12 to 10		
		10	14 to 10	M4 M4 M5 M4 M5 M5 M6 M6 M6 M8	2 to 2.5 (17.7 to 22.1)
	R/L1, S/L2, T/L3	10	12 to 6		1.2 to 1.5
	U/T1, V/T2, W/T3	10	AWG, kcmil 18 to 10 18 to 10 14 to 10 14 to 10 14 to 10 12 to 6 12 to 6 12 to 6 12 to 10 14 to 10 12 to 6 10 to 6 10 to 6 10 to 8 10 to 8 10 to 8 10 to 6 10 to 6 10 to 8 10 to]	
4A0018	-, +1, +2	_		1014	(10.6 to 13.3)
4/10010	B1, B2	_	12 to 10		
	\(\big 	10	12 to 10	M5	2 to 2.5 (17.7 to 22.1)
	R/L1, S/L2, T/L3	8	10 to 6		225
	U/T1, V/T2, W/T3	8	10 to 6	M5	2 to 2.5 (17.7 to 22.1)
	-, +1, +2	_	AWG, kcmil 18 to 10 18 to 10 14 to 10 14 to 10 14 to 10 12 to 6 12 to 6 12 to 6 12 to 10 14 to 10 12 to 6 12 to 8 10 to 6 10 to 6 10 to 8 10 to 6 10 to 10 10 to 10 10 to 1/0 10 to 1/0 10 to 1/0 10 to 1/0 10 to 3/0		(17.7 to 22.1)
4A0024	B1, B2	10 12 to 6 - 12 to 6 - 12 to 10 10 12 to 10 10 10 to 6 3 8 10 to 6 - 10 to 8 8 10 to 8 8 10 to 8 - 10 to 8 8 10 to 8 10 to 8 10 to 6 10 to 6	M5	2 to 2.5 (17.7 to 22.1)	
	(b)	8	10 to 8	M4 M4 M4 M5 M4 M5 M5 M6 M6 M6 M8	4 to 6 (35.4 to 53.1)
	R/L1, S/L2, T/L3	6	10 to 6		
	U/T1, V/T2, W/T3	8	10 to 6	M5	2 to 2.5 (17.7 to 22.1)
	-, +1, +2	_	6		(17.7 to 22.1)
4A0031	B1, B2	-	AWG, kcmil 18 to 10 18 to 10 14 to 10 14 to 10 14 to 10 12 to 6 12 to 6 12 to 6 12 to 10 14 to 10 14 to 10 15 to 6 16 to 6 17 to 8 18 to 10 18 to 10 19 to 6 19 to 8 10 to 6 10 to 8 10 to 6 10 to 8 10 to 8 10 to 6 10 to 8 10 to 6 10 to 8 10 to 6 10 to 3/0	M5	2 to 2.5 (17.7 to 22.1)
	(a)	6	10 to 6	M4 M4 M4 M5 M4 M5 M5 M6 M6 M6 M8	4 to 6 (35.4 to 53.1)
	R/L1, S/L2, T/L3	6	6 to 4		4.1.6
	U/T1, V/T2, W/T3	6	6 to 4	M6	4 to 6 (35.4 to 53.1)
	-, +1, +2	_	6 to 4		(33.4 to 33.1)
4A0039	B1, B2	_	10 to 8	M5	2 to 2.5 (17.7 to 22.1)
	(a)	6	18 to 10 18 to 10 18 to 10 14 to 10 14 to 10 14 to 10 12 to 6 12 to 6 12 to 6 12 to 10 14 to 10 14 to 10 14 to 10 15 to 6 16 to 6 17 to 6 18 to 10 19 to 6 19 to 8 10 to 6 10 to 8	M6	4 to 6 (35.4 to 53.1)
	R/L1, S/L2, T/L3	4	10 to 1/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	4	10 to 1/0		
4A0045 <1>	-, +1	-	6 to 1		
	B1, B2	-	8 to 4		
	(a)	6	8 to 6		
	R/L1, S/L2, T/L3	3	10 to 3/0		
	U/T1, V/T2, W/T3	3	8 to 4 8 to 6 10 to 3/0 10 to 3/0		0.4- 11
U/T1, V/T2, W/T3 4A0060 < → −, +1	-	4 to 1	M8	9 to 11 (79.7 to 97.4)	
	B1, B2	-	6 to 3		(13.1 10 31.4)
	\(\begin{array}{c}\end{array}\)	6	6		

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
	R/L1, S/L2, T/L3	2	6 to 250		0.4. 11
	U/T1, V/T2, W/T3	2	6 to 250	M8 M8 M8 M10 M10 M10 M10 M10	
4A0075 <1>	-, +1	_	AWG, kcmil 6 to 250	M8	9 to 11 (79.7 to 97.4)
	+3	_	6 to 1/0		(17.1 10 71.1)
	⊕	4	6 to 4		
	R/L1, S/L2, T/L3	1/0	6 to 250		
	U/T1, V/T2, W/T3	1	6 to 250		9 to 11
4A0091 <1>	-, +1	_	3 to 1/0	M8	(79.7 to 97.4)
	+3	_	4 to 1/0		(17.1 10 71.4)
	\bigsilon	4	6 to 4		
	R/L1, S/L2, T/L3	3/0	1/0 to 4/0		
	U/T1, V/T2, W/T3	2/0	1/0 to 4/0		10 4 - 22
4A0112 <1>	-, +1	-	1/0 to 4/0	M10	18 to 23 (159 to 204)
	+3	-	3 to 4/0		(137 to 204)
	\(\begin{array}{c}\end{array}\)	4	4		
	R/L1, S/L2, T/L3	4/0	1/0 to 4/0		
	U/T1, V/T2, W/T3	4/0	1/0 to 4/0		
4A0150 <1>	R/L1, S/L2, T/L3 2 6 to 250	M10	18 to 23 (159 to 204)		
## A0075	1/0 to 4/0				
	+	4	4 to 2		
	R/L1, S/L2, T/L3	1 × 2P	2 to 300		
	U/T1, V/T2, W/T3	1 × 2P	2 to 300		
4A0180 <1>	-, +1	_	1 to 250	M10	18 to 23 (159 to 204)
	+3	_	3 to 3/0		(139 to 204)
	+	4	4 to 300	1	
	R/L1, S/L2, T/L3	2/0×2P	1 to 600		
	U/T1, V/T2, W/T3	2/0 × 2P	1/0 to 600		
4A0216 <1>	-, +1	_	3/0 to 600	M10	18 to 23
	+3	_	1 to 325		(159 to 204)
		2	2 to 350		
		3/0×2P	2/0 to 600		
			2/0 to 600	M12	32 to 40
		_	3/0 to 600	1	(283 to 354)
4A0260 <1>		-		M10	18 to 23 (159 to 204)
	(a)	2	2 to 350	M12	32 to 40 (283 to 354)

<1> After installing an EMC filter, take additional measures to comply with IEC61800-5-1. Refer to *EMC Filter Installation on page 186* for details.

■ Main Circuit Terminal and Motor Wiring

This section outlines the various steps, precautions, and checkpoints for wiring the main circuit terminals and motor terminals.

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! Electrical Shock Hazard. Verify motor wiring bare wire ends do not contact the drive chassis or enclosure when wiring drive terminals U/T1, V/T2, W/T3. Failure to comply may result in serious injury or death due to electrical shock.

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

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! 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.

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.

NOTICE: Equipment Hazard. 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/T1, V/T2, and W/T3 to drive output terminals U/T1, V/T2, and W/T3. The phase order for the drive and motor should match.

NOTICE: Equipment Hazard. Improper equipment sequencing could shorten useful life of the electrolytic capacitors and circuit relays of the drive. Refrain from switching an input contactor more often than once every 30 minutes. Normally the drive I/O should be used to stop and start the motor.

NOTICE: Equipment Hazard. Standard motors used with PWM drives may experience winding failures due to surge voltages, when input line voltage is greater than 480 V or motor wire distance is greater than 100 meters. Select a motor design with insulation tolerant of surge voltages and drive-rated motor for use with PWM drives. Failure to comply could lead to motor winding failure.

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: 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.

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.

NOTICE: Properly integrate auxiliary contacts into the control logic circuit to avoid unnecessary fault displays caused by contactors or output switches placed between drive and motor. Improper installation of input and output contactors could result in damage to the drive.

NOTICE: 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.

Cable Length Between Drive and Motor

Voltage drop along the motor cable may cause reduced motor torque when the wiring between the drive and the motor is too long, especially at low frequency output. This can also be a problem when motors are connected in parallel with a fairly long motor cable. Drive output current will increase as the leakage current from the cable increases. An increase in leakage current may trigger an overcurrent situation and weaken the accuracy of the current detection.

Adjust the drive carrier frequency according to *Table 10*. If the motor wiring distance exceeds 100 m (328 ft.) because of the system configuration, reduce the ground currents. *Refer to C6: Carrier Frequency on page 146*.

Table 10 Cable Length Between Drive and Motor

Cable Length	50 m (164 ft.) or less	100 m (328 ft.) or less	Greater than 100 m (328 ft.)
Carrier Frequency	15 kHz or less	5 kHz or less	2 kHz or less

Note: When setting carrier frequency for drives running multiple motors, calculate cable length as the total wiring distance to all connected motors.

Ground Wiring

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

WARNING! When using an EMC filter, the leakage current exceeds 3.5 mA. Therefore, according to IEC61800-5-1, at least one of the conditions below must be satisfied:

- a) The cross-section of the protective earthing conductor must be at least 10 mm2 (Cu) or 16 mm2 (Al).
- b) The power supply must be disconnected automatically in case of discontinuity of the protective earthing conductor.

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.

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 20* when using multiple drives. Do not loop the ground wire.

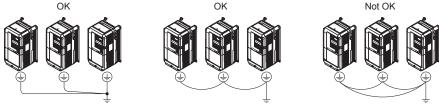


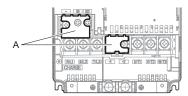
Figure 20 Multiple Drive Wiring

Wiring the Main Circuit Terminal

WARNING! Electrical Shock Hazard. Shut off the power supply to the drive before wiring the main circuit terminals. Failure to comply may result in death or serious injury.

Wire the main circuit terminals after the terminal board has been properly grounded.

Models CIMR-L□2A0018 through 2A0075 and 4A0009 through 4A0039 have a cover placed over the DC bus and braking circuit terminals prior to shipment to help prevent miswiring. Use wire cutters to cut away covers as needed for terminals



A - Protecting Cover

Figure 21 Protecting Cover to Prevent Miswiring (CIMR-L□2A0047)

Main Circuit Connection Diagram

Refer to Main Circuit Connection Diagram on page 24 when wiring terminals on the main power circuit of the drive.

WARNING! Fire Hazard. The braking resistor connection terminals are B1 and B2. Do not connect braking resistors to any other terminals. Improper wiring connections could cause the braking resistor to overheat and cause death or serious injury by fire. Failure to comply may result in damage to the braking circuit or drive.

Refer to Standard Connection Diagram on page 21 when wiring the drive control circuit terminals.

■ Control Circuit Terminal Block Functions

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 6* on page 22.

NOTICE: Equipment Hazard. Improper equipment sequencing could shorten useful life of the electrolytic capacitors and circuit relays of the drive. Refrain from switching an input contactor more often than once every 30 minutes. Normally the drive I/O should be used to stop and start the motor.

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

NOTICE: Frequently switching the drive power supply to stop and start the motor can damage the drive.

NOTICE: 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.

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.

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Input Terminals

Table 11 lists the input terminals on the drive. Text in parenthesis indicates the default setting for each multi-function input.

Table 11 Control Circuit Input Terminals

Туре	No.	Terminal Name (Function)	Function (Signal Level) Default Setting	Page	
	S1	Up Command (Closed: Up, Open: Stop)			
	S2	Down Command (Closed: Down, Open: Stop)			
	S3	Multi-function input 1 (External Fault)			
	S4	Multi-function input 2 (Fault Reset)	Photocoupler		
Digital Inputs	S5	Multi-function input 3 (Multi-Step Speed Reference 1)	24 Vdc, 8 mA Use the wire link between terminals SC and SN or between SC	156	
	S6	Multi-function input 4 (Multi-Step Speed Reference 2)	and SP to select sinking or sourcing, and to select the power supply.		
	S7	Multi-function input 5 (Multi-Step Speed Reference 3)			
	S8	Multi-function input 6 (Not used)			
	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.		
Digital Input	SN	0 V			
Power Supply	SP	+24 Vdc			
	H1	Safe Disable input 1	24 Vdc, 8 mA		
Safe Disable Inputs <1>	Н2	Safe Disable input 2	One or both open: Drive output disabled Both closed: Normal operation Internal impedance: $3.3~\mathrm{k}\Omega$ Off time of at least 1 ms Set the S3 jumper to select sinking or sourcing, and to select the power supply.	199	
	НС	Safe Disable function common	Common for the Safe Disable function		
	+V	Power supply for analog inputs	10.5 Vdc (max allowable current 20 mA)	<i>197</i>	
	-V	Power supply for analog inputs	-10.5 Vdc (max allowable current 20 mA)	-	
Analog Inputs	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.

Output Terminals

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

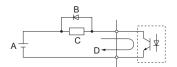
Note: Multi-function relay output terminals are rated at a minimum of 10 mA. If less than 10 mA is required, use the photocoupler outputs (P1-C1, P2-C2). Using the wrong current output level may cause the output to malfunction when the terminal is activated.

Table 12 Control Circuit Output Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting	
	MA	N.O.	20 1/1 10 4 1 1 250 1/1 10 4 1 1	
Fault Relay	MB	N.C. output	30 Vdc, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA	
	MC	Fault output common	Trimman 1944. 5 Yee, 19 mm	
	M1	Multi-function relay output 1 (Brake release		
Multi-Function	M2	command)	Contact relay output	
Relay Output	M3	Multi-function relay output 2 (Output contactor close	30 Vdc, 10 mA to 1 A	
	M4	command)	250 Vac, 10 mA to 1 A	
	M5	Multi-function relay output 3 (Drive ready)	Minimum load: 5 Vdc, 10 mA	
	M6	Water function relay output 5 (Brive ready)		
	P1	Photocoupler output 1 (During Frequency output)		
Multi-Function Photocoupler	C1	Thotocoupler output I (During Frequency output)	48 Vdc, 2 to 50 mA <>>	
Output	P2	Dhotocoupler output 2 (Not Head/Through Made)	46 Vuc, 2 to 30 mA <>	
F	C2	Photocoupler output 2 (Not Used/Through Mode)		
	FM	Analog monitor output 1 (Output speed)	-10 to +10 Vdc or 0 to +10 Vdc	
Monitor Output	AM	Analog monitor output 2 (Output current)	-10 to +10 vac of 0 to +10 vac	
	AC	Monitor common	0 V	
Safety Monitor	DM+	Safety monitor output	Outputs status of Safe Disable function. Closed when both Safe	
Output	DM-	Safety monitor output common	Disable channels are closed. Up to +48 Vdc 50 mA	

<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 22* 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 22 Connecting a Suppression Diode

Serial Communication Terminals

Table 13 Control Circuit Terminals: Serial Communications

Туре	No.	Signal Name	Function (Signal Level)	
	R+	Communications input (+)		RS-485/422
MEMOBUS/Modbus Communication	R- S+	Communications input (-)	MEMOBUS/Modbus communication: Use an RS-485 or RS-422 cable to connect the	MEMOBUS/Modbus communication
		Communications output (+)	drive.	protocol
	S-	Communications output (-)		115.2 kbps (max.)
	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.

■ Terminal Configuration

Control circuit terminals are arranged as shown in *Figure 23*.

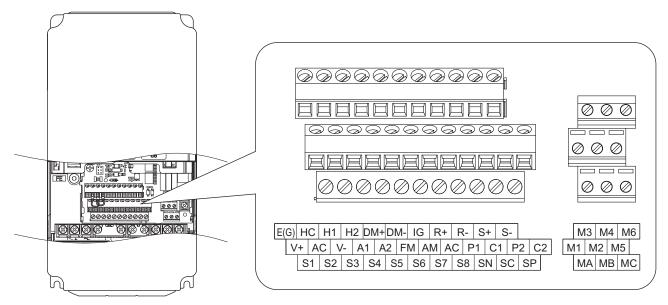


Figure 23 Control Circuit Terminal Arrangement

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 14*. For simpler and more reliable wiring, use crimp ferrules on the wire ends. Refer to *Table 15* for ferrule terminal types and sizes.

Table 14 Wire Gauges and Torque Specifications

	Terminal		Size Tightening Torque N·m (lb.in.)	Bare Wire	Terminal	Ferrule-Type Terminal		
Terminal Block		Size		Applicable wire size mm ² (AWG)	Recomm. mm² (AWG)	Applicable wire size mm ² (AWG)	Recomm. mm ² (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.

Ferrule-Type Wire Terminals

Yaskawa recommends using CRIMPFOX 6, a crimping tool manufactured by PHOENIX CONTACT, to prepare wire ends with insulated sleeves before connecting to the drive. Refer to *Table 15* for dimensions.

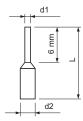


Figure 24 Ferrule Dimensions

Table 15 Ferrule Terminal Types and Sizes

Size mm ² (AWG)	Туре	L (mm)	d1 (mm)	d2 (mm)	Manufacturer
0.25 (24)	AI 0.25-6YE	10.5	0.8	2	
0.34 (22)	AI 0.34-6TQ	10.5	0.8	2	PHOENIX CONTACT
0.5 (20)	AI 0.5-6WH	14	1.1	2.5	

■ Wiring the Control Circuit Terminal

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

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

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.

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 fast stop circuits separately from the drive emergency circuits. Failure to comply may result in personal injury.

NOTICE: Equipment Hazard. Do not connect control circuit ground terminals to the drive enclosure. Improper drive grounding can cause control circuit malfunction.

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: 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.

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: 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: 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: 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: Do not exceed 50 meters (164 feet) 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.

NOTICE: 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.

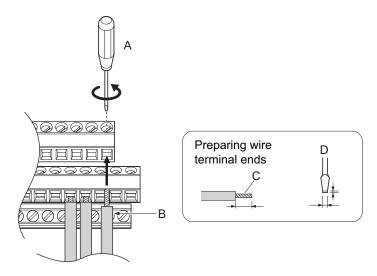
NOTICE: Insulate shields with tape or shrink tubing to prevent contact with other signal lines and equipment. Improper wiring practices could result in drive or equipment malfunction due to short circuit.

Wire the control circuit only after terminals have been properly grounded and main circuit wiring is complete. Refer to *Figure 25* for details. Prepare the ends of the control circuit wiring as shown in *Figure 26*. Refer to *Wire Size and Torque Specifications on page 39*.

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: Use shielded twisted-pair cables as indicated to prevent operating faults. Improper wiring practices could result in drive or equipment malfunction due to electrical interference.

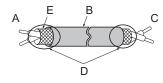
Connect control wires as shown in *Figure 25*:



- 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.
- D Blade depth of 0.4 mm or less Blade width of 2.5 mm or less

Figure 25 Terminal Board Wiring Guide

When connecting control wires to the terminals, use shielded twisted-pair wires (treating wire ends as shown in *Figure 26* and connect the shield to the ground terminal (E[G]) of the drive.



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

Figure 26 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 27* shows the location of these switches. Refer to *Control I/O Configuration on page 43* for setting instructions.

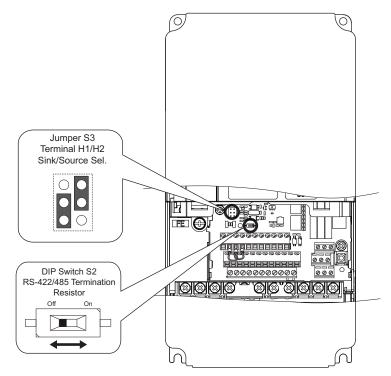


Figure 27 Locations of Jumpers and Switches on the Terminal Board

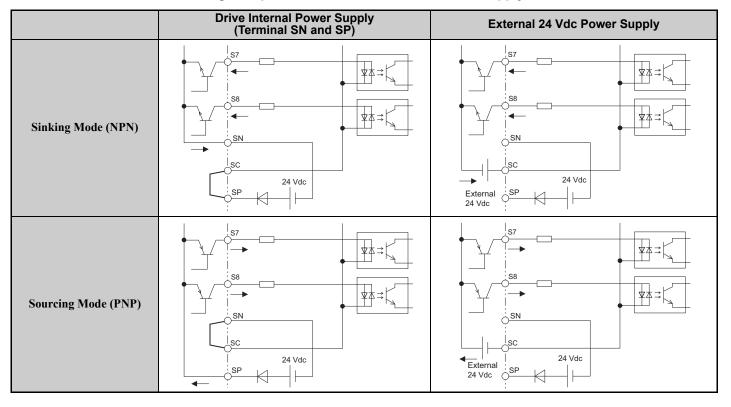
♦ Control I/O Configuration

■ Setting Sink/Source with 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



■ Sinking/Sourcing Mode Selection 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.)

Drive Internal Power Supply External 24 Vdc Power Supply Jumper S3 Jumper S3 24 Vdc 24 Vdc 9 HC **Sinking Mode** H2 Jumper S3 Jumper S3 24 Vdc 24 Vdc External 24 Vdc **Sourcing Mode** ± 4

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

◆ Connect to a PC

This drive is equipped with a USB port (type-B).

The drive can connect to a USB port on a PC using a USB 2.0, AB-type cable (sold separately). After connecting the drive to a PC, Yaskawa DriveWizard Plus software can be used to monitor drive performance and manage parameter settings. Contact Yaskawa for more information on DriveWizard Plus.

Download and install the USB driver before connecting L1000A to a PC with the USB cable.

To obtain the driver and software of USB Copy Unit, CopyUnitManager and DriveWizardPlus, access these sites: U.S.A: http://www.yaskawa.com

Other areas: contact a Yaskawa representative.

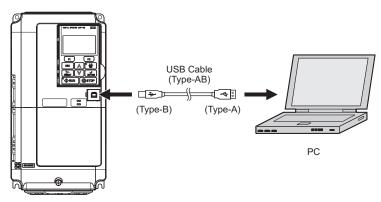


Figure 28 Connecting to a PC (USB)

♦ Wiring Checklist

凶	No.	Item	Page			
		Drive, peripherals, option cards				
	1	Check drive model number to ensure receipt of correct model.	_			
	2	Make sure you have the correct braking resistors, DC link choke, noise filters, and other peripheral devices installed.	-			
	3	Check the option card model number.	_			
		Installation area and physical setup				
	4	Ensure that the area surrounding the drive complies with specifications.	17			
Power supply voltage, output voltage						
	5	The voltage from the power supply should be within the input voltage specification range of the drive.	_			
	6	The voltage rating for the motor should match the drive output specifications.	15 175			
	7	Verify that the drive is properly sized to run the motor.	15 175			
	I	Main circuit wiring				
	8	Confirm proper branch circuit protection as specified by national and local codes.	21			
	9	Properly wire the power supply to drive terminals R/L1, S/L2, and T/L3.	24			
	10	Properly wire the drive and motor together. The motor lines and drive output terminals R/T1, V/T2, and W/T3 should match in order to produce the desired phase order. If the phase order is incorrect, the drive will rotate in the opposite direction.	34			
	11	Use 600 Vac vinyl-sheathed wire for the power supply and motor lines.	30			
		Use the correct wire gauges for the main circuit. Refer to Wire Gauges and Tightening Torque on page 30.	30			
	12	 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) = 3 × wire resistance (Ω/km) × wire length (m) × current (A) × 10⁻³ If the cable between the drive and motor exceeds 50 m (164 feet), adjust the carrier frequency set to C6-02 accordingly. 	30 35			
	13	Properly ground the drive. Review page 35.	35			
	14	Tightly fasten all terminal screws (control circuit terminals, grounding terminals). *Refer to Wire Gauges and Tightening Torque on page 30.	30			
	15	Install a magnetic contactor when using a dynamic braking option. Properly install the resistor and ensure that overload protection shuts off the power supply using the magnetic contactor.	_			
	16	Verify phase advancing capacitors, input noise filters, or ground fault circuit interrupters are NOT installed on the output side of the drive.	-			
		Control circuit wiring				
	17	Use twisted-pair line for all drive control circuit wiring.	36			
	18	Connect the shields of shielded wiring to the ground terminal (E [G]).	40			
	19	Properly wire any option cards.	39			
	20	Check for any other wiring mistakes. Only use a multimeter to check wiring.				
	21	Properly fasten the control circuit terminal screws in the drive. *Refer to Wire Gauges and Tightening Torque on page 30.	30			
	22	Pick up all wire clippings.	_			
	23	Ensure that no frayed wires on the terminal block are touching other terminals or connections.	_			
	24	Properly separate control circuit wiring and main circuit wiring.	_			
	25	Analog signal line wiring should not exceed 50 m (164 ft.).	_			
	26	Safe Disable input wiring should not exceed 30 m (98 ft.).	_			
_	l					

4 Start-Up Programming & Operation

◆ Using the Digital Operator

Use the digital operator to enter Run and Stop commands, edit parameters, and display data including fault and alarm information.

■ Keys and Displays

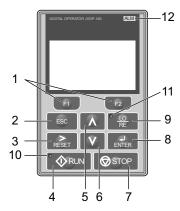


Figure 29 Keys and Displays on the Digital Operator

No.	Display	Name	Function
1	F1 F2	Function Key (F1, F2)	The functions assigned to F1 and F2 vary depending on the currently displayed menu. The name of each function appears in the lower half of the display window.
2	ESC	ESC Key	 Returns to the previous display. Moves the cursor one space to the left. Pressing and holding this button will return to the Speed Reference display.
3	RESET	RESET Key	 Moves the cursor to the right. Resets the drive to clear a fault situation.
4	• �RUN	RUN Key	Starts the drive in the LOCAL mode. The Run LED • is on, when the drive is operating the motor. • flashes during deceleration to stop or when the speed reference is 0. • flashes quickly, the drive is disabled by a DI, the drive was stopped using a fast stop DI, or an Up/Down command was active during power up.
5	[1]	Up Arrow Key	Scrolls up to display the next item, select parameter numbers, and increment setting values.
6	V	Down Arrow Key	Scrolls down to display the previous item, select parameter numbers, and decrements setting values.
7	⊘ STOP	STOP Key	Stops drive operation.
8	ENTER	ENTER Key	Enters parameter values and settings.Selects a menu item to move between displays.
9	• <u>LO</u> RE	LO/RE Selection Key <>>	Switches drive control between the operator (LOCAL) and the control circuit terminals (REMOTE) for the Run command and speed reference. The LED is on when the drive is in the LOCAL mode (operation from keypad).
10	♦ RUN	RUN Light	Lit while the drive is operating the motor. Refer to page 49 for details.
11	LORE	LO/RE Light	Lit while the operator is selected to run the drive (LOCAL mode). Refer to page 49 for details.

No.	Display	Name	Function
12	ALM	ALM LED Light	Refer to ALARM (ALM) LED Displays on page 49.

■ LCD Display

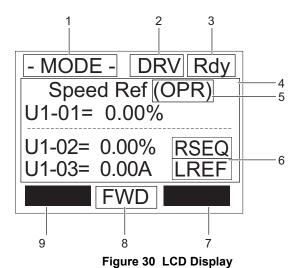


Table 18 Display and Contents

No.	Name	Display	Content
		MODE	Displayed when in Mode Selection.
		MONITR	Displayed when in Monitor Mode.
1	Operation Mode Menus	VERIFY	Indicates the Verify Menu.
1	Operation wode wienus	PRMSET	Displayed when in Parameter Setting Mode.
		A.TUNE	Displayed during Auto-Tuning.
		SETUP	Displayed when in Setup Mode.
2	Mode Display Area	DRV	Displayed when in Drive Mode.
	Wiode Display Area	PRG	Displayed when in Programming Mode.
3	Ready	Rdy	Indicates the drive is ready to run.
4	Data Display	-	Displays specific data and operation data.
		OPR	Displayed when the speed reference source is assigned to the LCD Operator.
5	Speed Reference Source Assignment	COM	Displayed when the speed reference source is assigned to MEMOBUS/Modbus Communication.
		OP	Displayed when the speed reference is assigned to an option card.
		RSEQ	Displayed when the Up/Down command is supplied from a remote source.
6	LO/RE	LSEQ	Displayed when the Up/Down command is supplied from the operator keypad.
	Display <2>	RREF	Displayed when the speed reference is supplied from a remote source.
		LREF	Displayed when the speed reference is supplied from the operator keypad.
		HELP	Pressing displays the Help menu.
7	Function Key 1	←	Pressing scrolls the cursor to the left.
,	(F1)	НОМЕ	Pressing returns to the top menu (Speed Reference).
		ESC	Pressing returns to the previous display.
8	FWD/REV	FWD	During Up command
Ŭ	T (I D) TEL	REV	During Down command

<1> The STOP key has highest priority. Pressing the STOP key will always cause the drive to stop the motor, even if an Up/Down command is active at any external Up/Down command source. To disable the STOP key priority, set parameter o2-02 to 0.
 The LO/RE key can only switch between LOCAL and REMOTE when the drive is stopped. By default settings the LO/RE key function is disabled. To allow using the LO/RE key for switching between LOCAL and REMOTE, set parameter o2-01 to 1.

4 Start-Up Programming & Operation

No.	Name	Display	Content
		FWD/REV	Pressing switches between Up and Down when the Up/Down command is set from the digital operator.
9	Function Key 2	DATA	Pressing scrolls to the next display.
	(F2)	\rightarrow	Pressing scrolls the cursor to the right.
		RESET	Pressing resets the existing drive fault or error.

<1> Displayed when in Drive Mode.

■ Powering Up the Drive and Operation Status Display

Powering Up the Drive

Perform the following power-off checks before applying main power to the drive.

WARNING! Electrical Shock Hazard. Do not contact live electrical parts. Failure to comply could result in death or serious injury. Never touch the output terminals directly with your hands or allow the output lines to come into contact with the drive case.

WARNING! Sudden Movement Hazard. Operating a drive with untested emergency circuits could result in death or serious injury. Always check the operation of any fast stop circuits after they are wired. Fast stop circuits are required to provide safe and quick shutdown of the drive.

WARNING! Sudden Movement Hazard. Ensure start/stop and safety circuits are wired properly and in the correct state before energizing the drive. Failure to comply could result in death or serious injury from moving equipment.

Power-off Checks	Description
Power supply voltage	Ensure the power supply voltage is correct on the supply side of the disconnect, before applying power to the drive. 200 V class: 3-phase 200 to 240 Vac 50/60 Hz 400 V class: 3-phase 380 to 480 Vac 50/60 Hz
	Properly wire the power supply input terminals (R/L1, S/L2, T/L3). Check for correct wiring, terminals are tightened, and there are no loose wire strands.
	Check for proper grounding of drive and motor.
Drive output terminals and motor terminals	Properly wire drive output terminals U/T1, V/T2, and W/T3 with motor terminals U/T1, V/T2, and W/T3. Check for correct wiring, terminals are tightened, and there are no loose wire strands.
Control circuit terminals	Check control circuit terminal connections. Check that control circuit terminals are correctly wired, terminals are tightened, and there are no loose wire strands.
Drive control terminal status	Open all control circuits to the drive I/O terminal block.

Status Display

When the power supply to the drive is turned on, the digital operator lights will appear as follows:

No.	Name	Description
Normal Operation	DRV Rdy DRV Rdy Speed Ref (OPR) U1-11 = 0.00% U1-12 = 0.00% U1-13 = 0.00% U1-13 = 0.00% U1-13 = 0.00% U1-13 = 0.00A U1-13	The data display area in the upper half of the display, displays the speed reference. DRV is displayed.
Fault	-MODE - DRV EF3 Ext Fault S3 External fault (example)	Data displayed varies by the type of fault. Refer to <i>Fault Displays, Causes, and Possible Solutions on page 109</i> for more information and possible solutions. ALM LED is lit and DRV displayed.

<2> Displayed when in Drive Mode and Monitor Mode.

■ ALARM (ALM) LED Displays

Table 19 ALARM (ALM) LED Status and Contents

State	Content	Display
Illuminated	When the drive detects an alarm or error.	[ALM]
Flashing	 When an alarm occurs. When oPE is detected. When a fault or error occurs during Auto-Tuning. 	ALM
Off	Normal operation (no fault or alarm).	[ALM]

■ LO/RE LED and RUN LED Indications

Table 20 LO/RE LED and RUN LED Indications

LED	Lit	Flashing	Flashing Quickly	Off
● <u>Lo</u> RE	When source of the Up/ Down command is assigned to the digital operator (LOCAL).	_	-	Up/Down command to be given from a device other than the digital operator (REMOTE).
* Q RUN	During run	 During deceleration to stop. When an Up/Down command is input and speed reference is 0%. 	 While the drive is set for LOCAL, an Up/Down command was entered to the input terminals after which the drive was then switched to REMOTE. An Up/Down command was entered via the input terminals while not in the Drive Mode. During deceleration when a Fast Stop command was entered. The drive output is shut off by the Safe Disable function. While the drive was running in the REMOTE mode, the STOP key was pushed. 	During stop
Examples	• RUN	 ♦ RUN	♦ RUN	 ♦ RUN

■ Menu Structure for Digital Operator

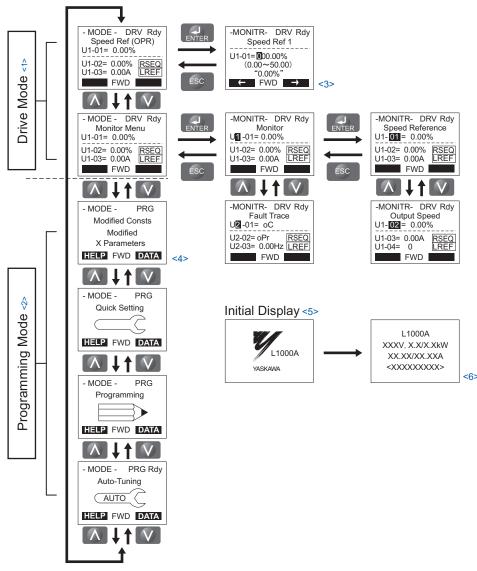


Figure 31 Digital Operator Menu and Screen Structure

- <1> Pressing **ORUN will start the motor.
- <2> Drive cannot operate the motor.
- <3> Flashing characters are shown as **o**.
- <4> An "X" character is used as a placeholder for illustration purposes in this manual. The LCD Operator will display the actual setting values.
- <5> The Speed Reference appears after the initial display which shows the product name.
- <6> The information that appears on the display will vary depending on the drive.

♦ The Drive and Programming Modes

The drive has a Drive Mode to operate the motor and a Programming Mode to edit parameter settings.

Drive Mode: In Drive Mode the user can operate the motor and observe U Monitor parameters. Parameter settings cannot be edited or changed when in Drive Mode.

Programming Mode: In Programming Mode the user can edit and verify parameter settings and perform Auto-Tuning. The drive will not accept an Up/down command when the digital operator is in the Programming Mode unless parameter b1-08 is set to 1 to allow an Up/down command.

■ Changing Parameter Settings or Values

This example explains changing C1-02 (Deceleration Ramp 1) from 1.50 seconds (default) to 2.50 seconds.

	Step		Display/Result
1.	Turn on the power to the drive. The initial display appears.	→	- MODE - DRV Rdy Speed Ref (OPR) U1-01= 0.00% U1-02= 0.00% RSEO U1-03= 0.00A LREF FWD
2.	Press or until the Parameter Setting Mode screen appears.	→	- MODE - PRG Programming HELP FWD DATA
3.	Press to enter the parameter menu tree.	→	-PRMSET- PRG Initialization M1-00= 0 Select Language ← FWD →
4.	Press or v to select the C parameter group.	→	-PRMSET- PRG Basic Setup ☐1-01 = 1.50 sec Accel Ramp 1 ← FWD →
5.	Press two times.	→	-PRMSET- PRG
6.	Press or v to select the parameter C1-02.	→	-PRMSET- PRG Decel Ramp 1 C1-002= 1.50 sec (0.0~600.00) 1.50 sec*
7.	Press to view the current setting value (1.5 s). The left most digit flashes.	→	-PRMSET- PRG Decel Ramp 1 C1-02=001.50 sec (0.0~600.00) "1.50 sec" — FWD —
8.	Press F1, F2 or RESEI until the desired number is selected. "1" flashes.	→	-PRMSET- PRG Decel Ramp 1
9.	Press and enter 0020.0.	→	-PRMSET- PRG Decel Ramp 1 C1-02=00 2 50 sec (0.0-600.00) "1.50 sec" FWD FWD

	Step		Display/Result
10.	Press to confirm the change.	+	Entry Accepted
11.	The display automatically returns to the screen shown in Step 4.	→	-PRMSET- PRG
12.	Press as many times as necessary to return to the initial display.	+	- MODE - DRV Rdy Speed Ref (OPR) U1-01= 0.00% U1-02= 0.00% RSEQ U1-03= 0.00A LREF FWD

■ Simplified Setup Using the Setup Group

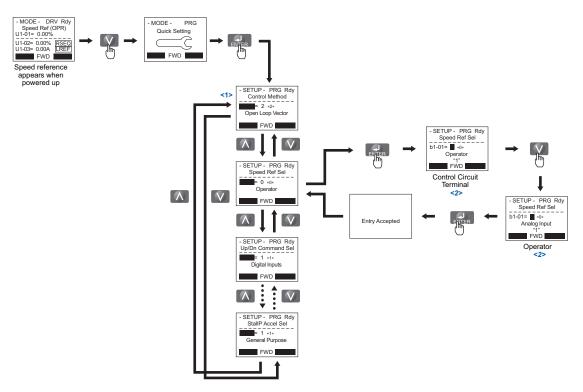
In the Setup Group, the drive lists the basic parameters needed to set up the drive for an elevator application. This group expedites the startup process for an elevator application by showing only the most important parameters for the application.

Using the Setup Group

Figure 32 illustrates how to enter and how to change parameters in the Setup Group.

The first display shown when entering the Setup Group is the Control Method menu. Skipping this display will keep the current Setup Group parameter selection. The default setting for the Setup Group is a group of parameters most commonly use in control methods.

In this example, the Setup Group is accessed to change b1-01 from 0 to 1. This changes the source of the speed reference from the digital operator to the control circuit terminals.



<1> Use the up and down arrow keys to scroll through the Setup Group. Press the ENTER key to view or change parameter settings.

Figure 32 Setup Group Example

<2> To return to the previous menu without saving changes, press the ESC key.

■ Switching Between LOCAL and REMOTE

LOCAL mode is when the drive is set to accept the Up/Down command from the digital operator keypad. REMOTE mode is when the drive is set to accept the Up/Down command from an external device (via the input terminals or serial communications, etc.).

Switch the operation between LOCAL and REMOTE using the LO/RE key on the digital operator or via a digital input. This key is disabled with default settings, but can be enabled by setting parameter o2-01 to 1.

- Note: 1. After selecting LOCAL, the LO/RE light will remain lit.
 - 2. The drive will not allow the user to switch between LOCAL and REMOTE during run.

Using the LO/RE Key on the Digital Operator

	Step	Display/Result	
1.	Turn on the power to the drive. The initial display appears.	→	- MODE - DRV Rdy Speed Ref(A1/A2) U1-01= 0.00% U1-02= 0.00% [SSEQ] U1-03= 0.00A [RREF]
2.	Press The LO/RE light will light up. The drive is now in LOCAL. To set the drive for REMOTE operation, press again.	→	MODEL GOVERNMENT OF THE PARTY O

♦ Start-Up Flowcharts

This section covers basic setup for the drive, including Auto-Tuning procedures and corresponding flowcharts. Follow the flowchart that matches the motor used in your application. Refer to *Types of Auto-Tuning on page 60* for details on the types of Auto-Tuning.

Flowchart	Purpose	Page
A	Installation, wiring, and basic steps required to setup the motor and elevator for operation.	54
В	Auto-Tuning for induction motors.	57
С	Auto-Tuning for PM motors.	58
D	Encoder Offset Auto-Tuning	59

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

The flowchart below covers the basic procedure required to install the drive, motor, and elevator.

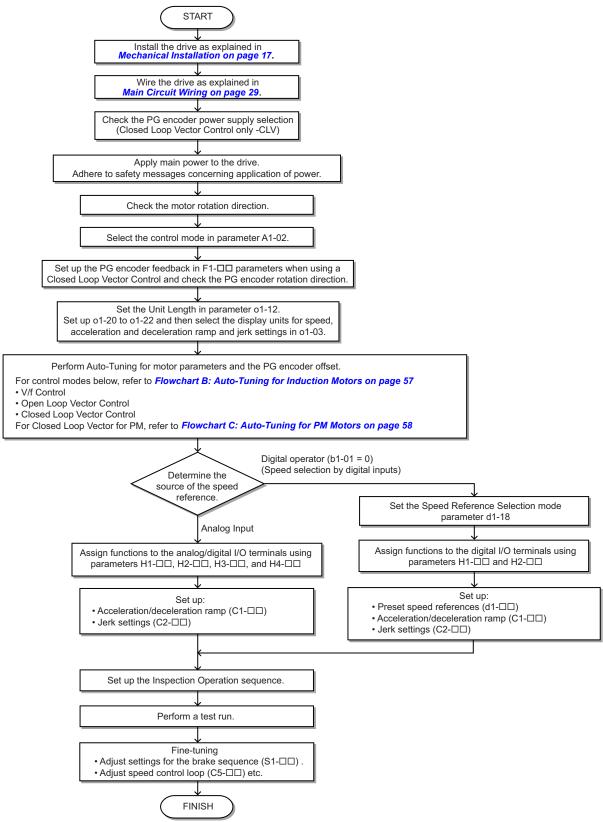


Figure 33 Installation, Wiring, Basic Setup for Motor and Elevator

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

■ Power On

Take the following precautions before applying main power to the drive:

WARNING! Sudden Movement Hazard. Ensure start/stop, I/O and safety circuits are wired properly and in the correct state before energizing or running the drive. Failure to comply could result in death or serious injury from moving equipment.

WARNING! 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.

WARNING! Fire Hazard. Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections. Tighten all terminal screws to the specified tightening torque.

WARNING! Fire Hazard. 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/T1, V/T2, and W/T3.
- Make sure that the power supply lines are connected to main circuit input terminals R/L1, S/L2, and T/L3 (or R/L1 and S/L2 for single-phase power).

WARNING! Sudden Movement Hazard. Clear personnel, secure equipment and check sequence and safety circuitry before starting the drive. Failure to comply could result in death or serious injury from moving equipment.

- Clear all personnel from the drive, motor, and machine area.
- Secure covers, couplings, shaft keys, and machine loads.
- Ensure start/stop and safety circuits are wired properly and in the correct state.

WARNING! Sudden Movement Hazard. Operating a drive with untested emergency circuits could result in death or serious injury. Always check the operation of any fast circuits after they are wired. Fast circuits are required to provide safe and quick shutdown of the drive.

NOTICE: Equipment Hazard. Comply with proper wiring practices. The motor may run in reverse if the phase order is backward. Connect motor input terminals U/T1, V/T2, and W/T3 to drive output terminals U/T1, V/T2, and W/T3. The phase order for the drive and motor should match.

NOTICE: Equipment Hazard. Check all the wiring including the PG encoder wiring and PG option jumper settings, 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.

After applying the power, the drive mode display should appear and no fault or alarm should be displayed. In the event of a drive fault or error code, refer to *Troubleshooting on page 109*.

■ Control Mode Selection

Select one of the four motor control modes after applying power to the drive. Note that Closed Loop Vector modes require PG encoder feedback cards. The table below indicates possible control modes depending on the motor type and shows the required encoder feedback card.

Machine Type	Control Mode	A1-02 setting	Encoder Option Card
Induction motor without encoder	V/f Control	0	No card required
induction motor without encoder	Open Loop Vector Control	2	No card required
Induction motor with incremental encoder	Closed Loop Vector Control	3	PG-B3 / PG-X3
Permanent magnet motor with EnDat 2.1/01 or EnDat 2.2/01 encoder	Closed Loop Vector Control for PM motors	7	PG-F3
Permanent magnet motor with ERN1387 or ERN487 encoder	Closed Loop Vector Control for PM motors	7	PG-E3
Yaskawa IPM motor with incremental encoder	Closed Loop Vector Control for PM motors	7	PG-X3

■ Motor Rotation Direction Setup

Check the direction of motor rotation to verify the Up command causes the elevator to move in the upward direction. Perform the following checks to confirm proper motor and load direction:

- The drive outputs motor voltage in U/T1-V/T2-W/T3 phase sequence when an Up command is issued. Check the motor rotation with this phase sequence (for most motors clockwise is seen from the shaft side).
- If the motor drives the elevator in up direction with a U/T1-V/T2-W/T3 sequence, make sure parameter b1-14 is set to 0.
- If the motor drives the elevator in down direction with a U/T1-V/T2-W/T3 sequence, make sure parameter b1-14 is set to 1. Motor direction may also be changed by reversing two motor leads connected to U/T1, V/T2, W/T3 on the drive terminal block.

DANGER! Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Failure to comply will result in death or serious injury. Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait at least five minutes after all indicators are OFF and measure the DC bus voltage level to confirm safe level.

Note: Always perform motor rotation direction setup prior to setting the encoder rotation direction.

■ PG Encoder Setup

PG Encoder Resolution Setup

Set the encoder resolution (incremental signal in the case of absolute encoders with Sin/Cos channels) in parameter F1-01.

PG Encoder Rotation Direction Setup

Perform the following steps to make sure the PG encoder rotation direction is set up correctly in the drive:

If information about the signal sequence of the PG encoder is available:

- 1. Check the seguence of PG encoder phases A and B when the motor drives the elevator in up direction.
- 2. If the PG encoder A phase leads phase B, make sure F1-05 is set to 0.
- **3.** If the PG encoder B phase leads phase A, make sure F1-05 is set to 1.

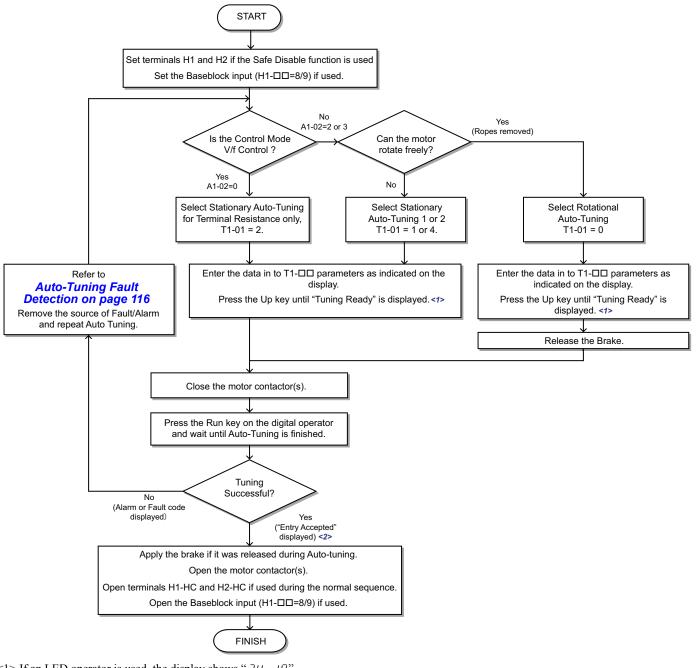
If no information about the signal sequence of the PG encoder is available:

- 1. Turn the motor manually in elevator up direction while checking the value of monitor U1-05.
- 2. If the value in U1-05 is positive, the set PG encoder direction is correct.
- **3.** If the value in U1-05 is negative, alter the setting of parameter F1-05.

Note: Always set the motor rotation direction prior to the encoder rotation direction. Refer to *Motor Rotation Direction Setup on page 56*.

■ Flowchart B: Auto-Tuning for Induction Motors

The flowchart below covers Auto-Tuning for induction motors operating with V/f Control, Open Loop Vector Control, or Closed Loop Vector Control.



<1> If an LED operator is used, the display shows " 747 10".

Figure 34 Auto-Tuning for Induction Motors

<2> If an LED operator is used, the display shows " $\mathcal{E} \cap \mathcal{E}$ ".

■ Flowchart C: Auto-Tuning for PM Motors

The flowchart below covers Auto-Tuning for permanent magnetic (PM) motors operating with Closed Loop Vector Control for PM motors.

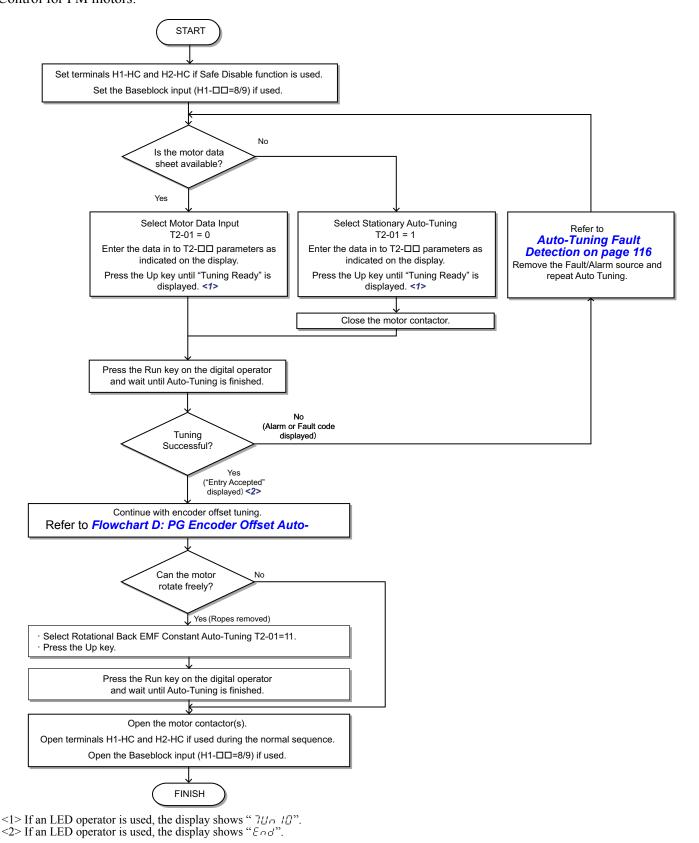
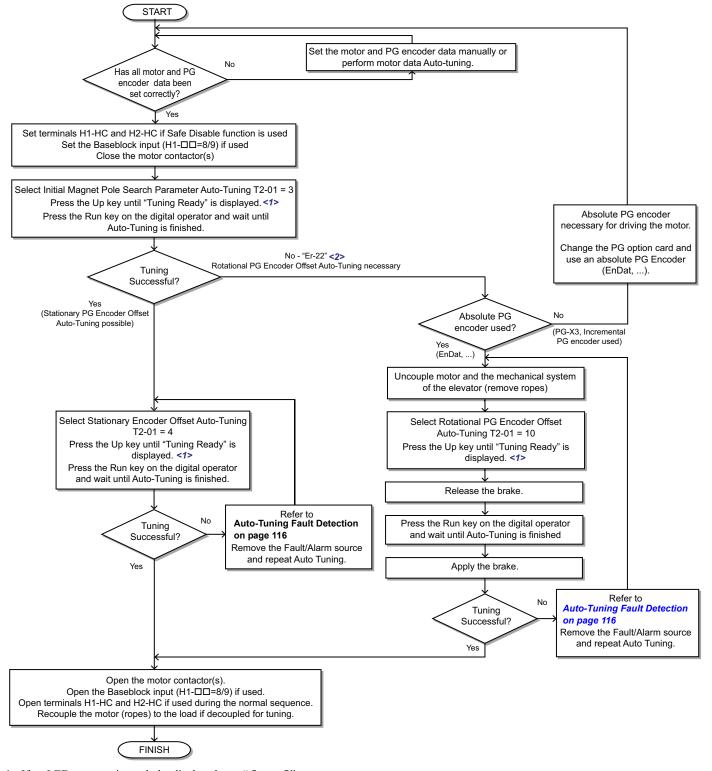


Figure 35 Auto-Tuning for PM Motors

■ Flowchart D: PG Encoder Offset Auto-Tuning

The flowchart below covers Rotational and Stationary Auto-Tuning procedures used to automatically set up the PG encoder offset. PG encoder Offset Tuning should be performed when the PG encoder offset (T2-17) is unknown, when a PG encoder offset value has been set but problems with the speed feedback occur, or when the PG encoder is replaced.



<1> If an LED operator is used, the display shows "74 10".

Figure 36 PG Encoder Offset Auto-Tuning

<2> If an LED operator is used, the display shows "Er =??".

■ Types of Auto-Tuning

The drive offers different types of Auto-Tuning for induction motors and permanent magnet motors. The type of Auto-Tuning used differs further based on the control mode and other operating conditions. Refer to the tables below to select the type of Auto-Tuning that bests suits the application. Directions for performing Auto-Tuning are listed in *Start-Up Flowcharts on page 53*.

Note: The drive will only show Auto-Tuning parameters that are valid for the control mode that has been set in A1-02. If the control mode is for an induction motor, the Auto-Tuning parameters for PM motors will not be available. If the control mode is for a PM motor, the Auto-Tuning parameters for induction motors will not be available. Inertia Tuning and ASR Gain Tuning parameters and setting options will be visible only when the drive is set for operation with CLV or CLV/PM.

Auto-Tuning for Induction Motors

Table 21 Types of Auto-Tuning for Induction Motors

Type	Setting	Requirements and Benefits	Control Mode (A1-02)			
Туре	Setting	Requirements and benefits	V/f (0)	OLV (2)	CLV (3)	
Rotational Auto- Tuning	T1-01 = 0	 Rotational Auto-Tuning gives the most accurate results, and is recommended if possible. Motor must run freely or with light load (<30%), i.e. ropes have to be removed. 	No	Yes	Yes	
Stationary Auto- Tuning 1	T1-01 = 1	 A motor test report listing motor data is not available. Automatically calculates motor parameters needed for vector control. Use if ropes can not be removed. Note that the accuracy is less then with Rotational Auto-Tuning. 	No	Yes	Yes	
Stationary Auto- Tuning for Line-to- Line Resistance	T1-01 = 2	 Used for V/f Control or in vector control modes when the drive was previously set up properly and now the motor cable has changed. Used in V/f control if drive and motor capacities differ. Should not be used for any vector control modes unless the motor cable has changed. 	Yes	Yes	Yes	
Stationary Auto- Tuning 2	T1-01 = 4	 A motor test report is available. Once the no-load current and the rated slip have been entered, the drive calculates and sets all other motor-related parameters. Use if ropes can not be removed and if slip and no-load current data are available. 	No	Yes	Yes	

Auto-Tuning for Permanent Magnet Motors

Automatically sets the V/f pattern and motor parameters E1- $\square\square$, E5- $\square\square$, and some F1- $\square\square$ parameters for speed feedback detection.

Table 22 Types of Auto-Tuning for Permanent Magnet Motors

Туре	Setting	Requirements and Benefits
Motor Data Input	T2-01 = 0	 Use if a motor test report is available Input motor data from the motor test report. Convert data into the correct unit before inputting data if necessary. Motor does not rotate during Auto-Tuning
Stationary Auto-Tuning	T2-01 = 1	 Use if a motor test report is not available Input motor data from the motor name plate. Make sure to convert data into the correct units. The drive automatically calculates the motor data.
Stationary Stator Resistance Auto-Tuning	T2-01 = 2	 Tunes stator resistance only. Should be performed if the motor cabling has changed.
Rotational Back EMF Constant Auto-Tuning	T2-01 = 11	 Use if a motor test is not available Tunes the Motor Induction Voltage only Should be performed after Motor data are set and the encoder offset is adjusted. The motor must be uncoupled from the mechanical system (remove ropes).

			Tuning Type (T2-01)						
Input Value	Input Parameter	unit	0 Motor Parameter Settings	1 Stationary	2 Stationary Stator Resistance	3 Initial magnet pole search parameters Auto- Tuning	4 Encoder offset stationary Auto- Tuning	10 Encoder offset rotational Auto- Tuning	11 Back EMF Constant
Control Mode	A1-02	-	7	7	7	7	7	7	7
Motor rated power	T2-04	kW	Yes	Yes	N/A	N/A	N/A	N/A	N/A
Motor rated voltage	T2-05	V	Yes	Yes	N/A	N/A	N/A	N/A	N/A
Motor rated current	T2-06	A	Yes	Yes	Yes	N/A	N/A	N/A	N/A
Number of motor poles	T2-08	N/A	Yes	Yes	N/A	N/A	N/A	N/A	N/A
Motor rated Speed	T2-09	min-1	Yes	Yes	N/A	N/A	N/A	N/A	N/A
Stator 1 Phase resistance	T2-10	Ω	Yes	N/A	N/A	N/A	N/A	N/A	N/A
d-axis inductance	T2-11	mН	Yes	N/A	N/A	N/A	N/A	N/A	N/A
q-axis inductance	T2-12	mН	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Induced Voltage constant Unit Selection	T2-13	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Voltage constant	T2-14	<1>	Yes	N/A	N/A	N/A	N/A	N/A	N/A
PG Number of pulses per revolution	T2-16	N/A	Yes	Yes	N/A	N/A	N/A	N/A	N/A
Z Pulse Offset	T2-17	deg (mech.)	Yes	N/A	N/A	N/A	N/A	N/A	N/A

<1> Depends on T2-13 setting.

Properly set the motor and PG encoder data before performing PG Encoder Offset Tuning.

Table 23 Types of Auto-Tuning for PG Encoder Offset

Туре	Setting	Requirements and Benefits
Initial Magnet Pole Search Parameters Auto-Tuning	T2-01 = 3	 Should be performed after motor Auto-Tuning in order to determine the PG encoder tuning method. Attempts to detect the motor rotor position, determines whether PG encoder offset can be tuned using Stationary Encoder Offset Tuning and sets parameters needed for Initial Magnet Pole Search (n8-36, n8-37). When using the Rescue Operation mode, perform this tuning to let the drive automatically set the parameters needed for Initial Magnet Pole Search with power supply from a battery or UPS (n8-81, n8-82). Must be performed when using an incremental PG encoder. Important: If this tuning fails when using a PG-X3 card with an incremental PG encoder the motor cannot be driven using an incremental PG encoder. Change the PG encoder to an absolute PG encoder.
Stationary PG Encoder Offset Auto-Tuning	T2-01 = 4	 Tunes the PG encoder offset without rotating the motor. If the PG encoder offset cannot be tuned properly by this method, try Rotating PG Encoder Offset Tuning.
Rotational PG Encoder Offset Auto-Tuning	T2-01 = 10	 Tunes the PG encoder offset while rotating the motor. Motor and mechanical system must be uncoupled (ropes must be removed from traction sheave).

■ Auto-Tuning Interruption and Fault Codes

If tuning results are abnormal or the STOP key is pressed before completion, Auto-Tuning will be interrupted and a fault code will appear on the digital operator.



Figure 37 Auto-Tuning Aborted Display

■ Auto-Tuning Operation Example

The following example demonstrates Rotational Auto-Tuning when using OLV (A1-02 = 2).

Selecting the Type of Auto-Tuning

	Step		Display/Result
1.	Turn on the power to the drive. The initial display appears.	→	- MODE - DRV Rdy Speed Ref (OPR) U1-01= 0.00% U1-02= 0.00% RSEQ U1-03= 0.00A LREF FWD
2.	Press or until the Auto-Tuning display appears.	→	- MODE - PRG Auto-Tuning AUTO HELP FWD DATA
3.	Press to begin setting parameters.	→	- A.TUNE - PRG Tuning Mode T1-11= 0 0 0 Standard Tuning ESC FWD DATA
4.	Press to select the value for T1-01.	→	- A.TUNE - PRG Tuning Mode
5.	Save the setting by pressing ENTER.	→	Entry Accepted
6.	The display automatically returns to the display shown in Step 3.	→	- A.TUNE - PRG Tuning Mode T1-01 = 0 +0+ Standard Tuning ESC FWD DATA

Enter Data from the Motor Nameplate

After selecting the type of Auto-Tuning, enter the data required from the motor nameplate.

Note: These instructions continue from Step 6 in "Selecting the Type of Auto-Tuning".

	Step		Display/Result	
1.	Press to access the motor output power parameter T1-02.	→	-A.TUNE - PRG Mtr Rated Power -T1-02= 3.70kW (0.00 - 650.00) "3.70kW" ESC FWD DATA	

	Step		Display/Result
2.	Press to view the default setting.	→	- A.TUNE - PRG Mir Rated Power
3.	Press F1, F2, RESET, A and V to enter the motor power nameplate data in kW.	→	- A.TUNE - PRG Mtr Rated Power
4.	Press to save the setting.	→	Entry Accepted
5.	The display automatically returns to the display in Step 1.	→	- A.TUNE - PRG Mtr Rated Power
6.	Repeat Steps 1 through 5 to set the following parameters: • T1-03, Motor Rated Voltage • T1-04, Motor Rated Current • T1-05, Motor Base Frequency • T1-06, Number of Motor Poles • T1-07, Motor Base Speed	→	-A.TUNE - PRG Mtr Rated Power -T1-12 = 4.00kW (0.00 ~ 650.00) "3.70kW" ESC FWD DATA -A.TUNE - PRG Rated Speed -T1-17 = 1450RPM (0 ~ 24000) "1450RPM" ESC FWD DATA

Starting Auto-Tuning

WARNING! Sudden Movement Hazard. The drive and motor may start unexpectedly during Auto-Tuning, which could result in death or serious injury. Ensure the areas surrounding the drive, motor and load are clear before proceeding with Auto-Tuning.

WARNING! Electrical Shock Hazard. High voltage will be supplied to the motor when Stationary Auto-Tuning is performed even with the motor stopped, which could result in death or serious injury. Do not touch the motor until Auto-Tuning has been completed.

WARNING! When performing Rotational Auto-Tuning for motor data or PG encoder offset, always uncouple the motor from the mechanical system (remove ropes from traction sheave). Performing Rotational Auto-Tuning with the mechanical system connected to the motor can cause hazardous situations, injury to personnel and damage to the equipment.

NOTICE: Rotational Auto-Tuning will not function properly if a holding brake is applied on the load. Ensure the motor can freely spin before beginning Auto-Tuning. Failure to comply could result in improper operation of the drive.

Enter the required information from the motor nameplate. Press \(\text{\text{A}} \) to proceed to the Auto-Tuning start display.

Note: These instructions continue from Step 6 in "Enter Data from the Motor Nameplate".

	Step		Display/Result
1.	After entering the data listed on the motor nameplate, press to confirm.	→	- A.TUNE - DRV Auto-Tuning
2.	Press Fun to activate Auto-Tuning. The drive begins by injecting current into the motor for about 1 min, and then starts to rotate the motor. Note: The first digit on the display indicates which motor is undergoing Auto-Tuning (motor 1 or motor 2). The second digit indicates the type of Auto-Tuning being performed.	→	- A.TUNE - DRV Rdy Tune Proceeding X.XX Hz/ X.XXA <
3.	Auto-Tuning finishes in approximately one to two minutes.	→	- MODE - DRV End Tune Successful FWD RESET

■ Parameter Settings during Induction Motor Auto-Tuning: T1

The T1-□□ parameters are used to set the Auto-Tuning input data for induction motor tuning.

Note: For motors operating in the field weakening range, first perform the Auto-Tuning with the base data. After Auto-Tuning is complete, change E1-04, Maximum Output Frequency, to the desired value.

T1-01: Auto-Tuning Mode Selection

Sets the type of Auto-Tuning to be used. *Refer to Auto-Tuning for Induction Motors on page 60* for details on the different types of Auto-Tuning.

No.	Name	Setting Range	Default
T1-01	Auto-Tuning Mode Selection	2 (V/f) 0 to 2, 4 (OLV, CLV)	2 (V/f) 1 (OLV, CLV)

Setting 0: Rotational Auto-Tuning Setting 1: Stationary Auto-Tuning 1

Setting 2: Stationary Auto-Tuning for Line-to-Line Resistance

Setting 4: Stationary Auto-Tuning 2

T1-02: Motor Rated Power

Sets the motor rated power according to the motor nameplate value.

No.	Name	Setting Range	Default
T1-02	Motor Rated Power	0.00 to 650.00 kW	Determined by o2-04

T1-03: Motor Rated Voltage

Sets the motor rated voltage according to the motor nameplate value. Enter the motor voltage at base speed here if the motor is operating above base speed.

Enter the voltage needed to operate the motor under no-load conditions at rated speed to T1-03 for better control precision around rated speed when using a vector control mode. The no-load voltage can usually be found in the motor test report available from the manufacturer. If the motor test report is not available, enter approximately 90% of the rated voltage printed on the motor nameplate. This may increase the output current and reduce the overload margin.

No.	Name	Setting Range	Default
T1-03	Motor Rated Voltage	0.0 to 255.5 V <1>	200.0 V <1>

<1> Values shown are specific to 200 V class drives. Double value for 400 V class drives.

T1-04: Motor Rated Current

Sets the motor rated current according to the motor nameplate value. Set the motor rated current between 50% and 100% of the drive rated current for optimal performance in OLV or CLV. Enter the current at the motor base speed.

No.	Name	Setting Range	Default
T1-04	Motor Rated Current	10 to 200% of drive rated current	Depending on o2-04

T1-05: Motor Base Frequency

Sets the motor rated frequency according to the motor nameplate value. If a motor with an extended speed range is used or if the motor is used in the field weakening area, enter the maximum frequency to E1-04 (E3-04 for motor 2) after Auto-Tuning is complete.

No.	Name	Setting Range	Default
T1-05	Motor Base Frequency	0.0 to 120.0 Hz	60.0 Hz

T1-06: Number of Motor Poles

Sets the number of motor poles according to the motor nameplate value.

No.	Name	Setting Range	Default
T1-06	Number of Motor Poles	2 to 48	4

T1-07: Motor Base Speed

Sets the motor rated speed according to the motor nameplate value. If a motor with an extended speed range is used or if the motor is used in the field weakening area, enter the speed at base frequency to T1-07.

No.	Name	Setting Range	Default
T1-07	Motor Base Speed	0 to 24000 r/min	1750 r/min

T1-08: PG Number of Pulses Per Revolution

Sets the number of pulses from the PG encoder. Set the actual number of pulses for one full motor rotation.

No.	Name	Setting Range	Default
T1-08	PG Number of Pulses Per Revolution	0 to 60000 ppr	1024 ppr

Note: T1-08 will only be displayed in CLV.

T1-09: Motor No-Load Current

Sets the no-load current for the motor. The default setting displayed is no-load current automatically calculated from the output power set in T1-02 and the motor rated current set to T1-04. Enter the data listed on the motor test report. Leave this data at the default setting if the motor test report is not available.

No.	Name	Setting Range	Default
T1-09	Motor No-Load Current	0 to [T1-04] A Max: 0 to 2999.9)	-

T1-10: Motor Rated Slip

Sets the rated slip for the motor.

The default setting displayed is the motor rated slip for a Yaskawa motor calculated from the output power set in T1-02. Enter the data listed on the motor test report.

No.	Name	Setting Range	Default
T1-10	Motor Rated Slip	0.00 to 20.00 Hz	_

■ Parameter Settings during PM Motor Auto-Tuning: T2

The T2- $\Box\Box$ parameters are used to set the Auto-Tuning input data for PM motor tuning.

T2-01: PM Auto-Tuning Mode Selection

Selects the type of Auto-Tuning to be performed. *Refer to Auto-Tuning for Permanent Magnet Motors on page 60* for details on different types of Auto-Tuning.

No.	Name	Setting Range	Default
T2-01	PM Auto-Tuning Mode Selection	0 to 4, 10, 11	0

0: Motor Data Input

1: PM Stationary Auto-Tuning

2: PM Stationary Stator Resistance Auto-Tuning

3: Initial Magnet Pole Search Parameters Auto-Tuning

4: Stationary PG Encoder Offset Auto-Tuning

10: Rotational PG Encoder Offset Auto-Tuning

11: Rotational Back EMF Constant Auto-Tuning

T2-04: PM Motor Rated Power

Specifies the PM motor rated power in kilowatts.

No.	Name	Setting Range	Default
T2-04	PM Motor Rated Power	0.00 to 650.00 kW	Depending on o2-04

T2-05: PM Motor Rated Voltage

Sets the PM motor rated voltage.

No.	Name	Setting Range	Default
T2-05	PM Motor Rated Voltage	0.0 to 255.0 V <1>	200.0 V <1>

<1> Values shown are specific to 200 V class drives. Double value for 400 V class drives.

T2-06: PM Motor Rated Current

Enter the PM motor rated current in amps.

No.	Name	Setting Range	Default
T2-06	PM Motor Rated Current	10% to 200% of the drive rated current.	Depending on o2-04

T2-08: Number of PM Motor Poles

Enter the number of motor poles.

No.	Name	Setting Range	Default
T2-08	Number of PM Motor Poles	2 to 48	6

T2-09: PM Motor Base Speed

Enter the motor rated speed in r/min.

Note: T2-09 will be displayed when in CLV/PM.

No.	Name	Setting Range	Default
T2-09	PM Motor Base Speed	0 to 24000 r/min	150 r/min

T2-10: PM Motor Stator Resistance

Enter the motor stator resistance per motor phase.

No.	Name	Setting Range	Default
T2-10	PM Motor Stator Resistance	0.000 to $65.000~\Omega$	_

T2-11: PM Motor d-Axis Inductance

Enter the d axis inductance per motor phase.

No.	Name	Setting Range	Default
T2-11	PM Motor d-Axis Inductance	0.00 to 600.00 mH	

T2-12: PM Motor q-Axis Inductance

Enter the q axis inductance per motor phase.

No.	Name	Setting Range	Default
T2-12	PM Motor q-Axis Inductance	0.00 to 600.00 mH	_

T2-13: Induced Voltage Constant Unit Selection

Selects the units used for setting the induced voltage coefficient.

No.	Name	Setting Range	Default
T2-13	Induced Voltage Constant Unit Selection	0, 1	1

0: mV (r/min)

1: mV (rad/sec)

Note: If T2-13 is set to 0, then the drive will use E5-24 (Motor Induction Voltage Constant 2), and will automatically set E5-09 (Motor Induction Voltage Constant 1) to 0.0. If T2-13 is set to 1, then the drive will use E5-09 and will automatically set E5-24 to 0.0.

T2-14: PM Motor Induced Voltage Constant

Enter the motor induced voltage constant.

No.	Name	Setting Range	Default
T2-14	PM Motor Induced Voltage Constant	0.0 to 2000.0	Depending on T2-02

T2-16: PG Number of Pulses Per Revolution for PM Motor Tuning

Enter the number of pulses from the PG encoder per motor rotation.

No.	Name	Setting Range	Default	
T2-16	Encoder Resolution (Pulses Per Revolution)	1 to 15000 ppr	1024 ppr	

T2-17: PG Encoder Z-pulse Offset

Sets the offset between the rotor magnet axis and the PG encoder zero position. If the PG encoder offset value is unknown or if the PG encoder is replaced, perform PG Encoder Offset Auto-Tuning.

No.	Name	Setting Range	Default	
T2-17	PG Encoder Z-pulse Offset	-180.0 to 180.0 deg	0.0 deg	

Setup Procedure for Elevator Applications

■ Up and Down Commands and Speed Reference Selection

WARNING! Sudden Movement Hazard. Remove the Up/Down Command before resetting alarms and faults. Failure to comply can result in death or serious injury.

WARNING! Sudden Movement Hazard. Verify drive parameter b1-03 Stopping Method is set to 0:Ramp to Stop before starting the drive. Failure to comply may cause the elevator to free-fall when the Up/Down command is removed.

WARNING! Sudden Movement Hazard. The drive is capable of running the motor at high speed. Verify the maximum drive output frequency before starting the drive. Failure to comply may cause injury or death due to inadvertent high speed operation.

WARNING! Sudden Movement Hazard. Use the Initial Pole Search Status Signal (H2- $\square\square$ = 61) to interlock the brake to ensure the brake is not released before the Initial Magnetic Pole Search is completed. Failure to comply may cause inadvertent elevator movement resulting in serious injury.

NOTICE: Always turn off the RUN command before changing the setting of parameters d1-18 (Speed Reference Selection Mode), b1-01 (Speed Reference Selection), or H1- $\Box\Box$ (Multi-Function Digital Inputs). If the RUN command is on when changing any of these settings, the motor may unexpectedly start running, and could result in injury.

Speed Reference Selection

Parameter b1-01 determines the source of the speed reference.

b1-01	Reference source	Speed reference input				
0 (default)	Digital operator keypad	Set the speed references in the d1- $\square\square$ parameters and use digital inputs to switch between different reference values.				
1	Analog input	Apply the speed reference signal to terminal A1 or A2.				
2	Serial Communication <>>	Serial Communications using the RS422/485 port				
3	Option Board <>>	Communications option card				

<1> If source of the speed reference is assigned to the control terminals (b1-01 = 1), then d1-18 will automatically be set to 0 (so that the drive uses multi-speed references d1-01 to d1-08).

Up/Down Command Source Selection

The input source for the Up and Down command can be selected using parameter b1-02.

b1-02	Up/Down source	Up / Down command input
0	Operator keypad	RUN and STOP keys on the operator
1 (default)	Digital inputs	Terminal S1: Run in Up direction Terminal S2: Run in Down direction
2	Serial Communication	Serial Communications using the RS422/485 port
3	Option Board	Communications option card

Travel Start and Stop

Travel Start

To start the elevator in up or down direction, the following conditions must be fulfilled:

- A speed reference greater than zero must be provided.
- The Safe Disable signals at terminals H1 and H2 must both be closed (drive output enabled).
- If a multi-function digital input is programmed for Baseblock (H1-□□=8 or 9), this input must be set so the drive is not in a baseblock condition.
- An Up or Down Signal must be set at the source specified in b1-02.
- If a multifunction input is programmed for output contactor feedback (H1-□□=56), then the output contactor must be closed.

<2> If the speed reference selection in d1-18 is set so that either the high speed reference has priority (d1-18=1), or so that the leveling speed has priority (d1-18=2), then the drive will look to the multi-function input terminals for the speed reference.

Travel Stop

The drive stops under the following conditions:

- The Up or Down command is removed.
- d1-18 is set to 1 or 2 and the Up/Down or Leveling Speed signal (H1- $\square\square$ = 53) is removed.
- d1-18 is set to 3 and all speed inputs are removed.
- A fault occurs. The stopping method depends on the specific fault that occurred, in combination with certain parameter settings.
- The Safe Disable inputs are opened or a Base Block signal is input. In this case, the brake is applied immediately and the drive output shuts off.

■ Speed Selection Using Digital Inputs (b1-01 = 0)

Set parameter b1-01 = 0 to enable the speed selection using the drive digital inputs. Use parameter d1-18 to determine different travel speeds selected by the digital inputs.

NOTICE: Always turn off the RUN command before changing the setting of parameters d1-18 (Speed Reference Selection Mode), b1-01 (Speed Reference Selection), or H1- $\Box\Box$ (Multi-Function Digital Inputs). If the RUN command is on when changing any of these settings, the motor may unexpectedly start running, and could result in injury.

d1-18	Speed Selection
0 (default)	Multi-speed inputs 1, Speed references are set in d1-01 to d1-08
1	Separate speed inputs, Speed references are set in d1-19 to d1-24 and d1-26, Higher speed has priority
2	Separate speed inputs, Speed references are set in d1-19 to d1-24 and d1-26, Leveling speed has priority
3	Multi speed inputs 2, Speed references are set in d1-02 to d1-08, Stop if no speed selection input is enabled

Multi-Speed Inputs 1, 2 (d1-18 = 0 or 3) Speed Selection

When d1-18 = 0 or 3, multi-function digital inputs are preset as shown below.

Terminal Parameter Number		Set Value	Details
S5	H1-05	3	Multi-Speed Reference 1
S6	H1-06	4	Multi-Speed Reference 2
S7 H1-07		5	Multi-Speed Reference 3

Different speed reference settings can be selected by combining the three digital inputs as shown in the table below.

Note: Parameters d1-19 through d1-26 are displayed only if d1-18 is set to 1 or 2.

Digital Inputs			Selected Speed				
Multi-Speed Reference 1	Multi-Speed Reference 2	Multi-Speed Reference 3	d1-18 = 0	d1-18 = 3			
0	0	0	Speed reference 1 (d1-01)	Stop			
1	0	0	Speed reference 2 (d1-02 or terminal A1, A2 input value if H3-02 or H3-10 is set to 2)				
0	1	0	Speed reference 3 (d1-03 or terminal A1, A2 input value if H3-02 or H3-10 is set to 3)				
1	1	0	Speed reference 4 (d1-04)				
0	0	1	Speed reference 5 (d1-05)				
1	0	1	Speed reference 6 (d1-06)				
0	1	1	Speed reference 7 (d1-07)				
1	1	1	Speed reference 8 (d1-08)				

0 = Off, 1 = On

Setting d1-18 = 0

Up to eight speed references can be set using parameters d1-01 to d1-08. The drive starts with an Up or Down command, and stops when the Up or Down command is removed. When d1-18=0, parameters d1-19 through d1-23 will not be displayed.

Setting d1-18 = 3

Allows seven speed references to be set using parameters d1-02 to d1-08. The drive starts with an Up or Down command, and stops either when all three input terminals that set the speed reference are released, or when the Up/Down command is released. When d1-18=0, parameters d1-19 through d1-23 will not be displayed.

Separate Speed Inputs (d1-18 = 1 or 2)

Six different speed settings (defined in the parameters d1-19 to d1-24 and d1-26) can be set and selected using four digital inputs.

Speed Selection

When d1-18 = 1 or 2, multi-function digital inputs are preset as shown below:

Terminal	Parameter Number	Set Value	Details
S3	H1-03	50	Nominal speed (d1-19)
S5	H1-05	51	Intermediate speed
S6	H1-06	53	Leveling speed (d1-26)

Different speed settings can be selected depending on the assignment of the speed selection digital inputs (H1- $\Box\Box$) as shown in the table below.

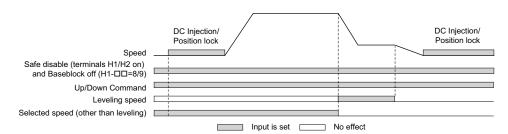
Note: Parameters d1-19 through d1-26 are displayed only if d1-18 is set to 1 or 2.

Selected Speed	Leveling and Nominal Speed assigned (H1-□□ = 50 and H1-□□ = 53)			Leveling speed not assigned (H1-□□ ≠ 53)			Nominal Speed not assigned (H1-□□ ≠ 50)			
	50	51	52	53	50	51	52	51	52	53
Nominal Speed (d1-19)	1	0	0	A	1	0	0	0	0	0
Intermediate Speed 1 (d1-20)	0	1	0	A	0	1	0	1	0	0
Intermediate Speed 2 (d1-21)	1	1	1	A	1	1	1	N/A	N/A	N/A
Intermediate Speed 3 (d1-22)	0	1	1	A	0	1	1	1	1	0
Releveling Speed (d1-23)	0	0	1	A	0	0	1	0	1	0
Leveling Speed (d1-26)	0	0	0	1	0	0	0	В	В	В
Zero Speed	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A

0 = Off, 1 = On, A = 0 when d1-18 = 2 and no influence when d1-18=1, B = no influence, N/A = Not available

Higher Speed has Priority and the Leveling Speed Input is Assigned (d1-18 = 1 and H1- $\square\square$ = 53) (Default)

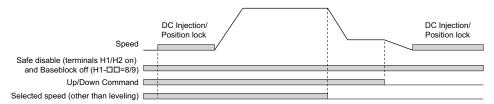
The higher speed has priority over the leveling speed. The leveling signal is disregarded as long as any other speed selection input is active. The drive decelerates to the leveling speed (d1-26) when the selected speed reference signal is removed.



Higher Speed Priority is Selected and the Leveling Speed Input is Not Assigned (d1-18 = 1 and H1-□□ ≠ 53)

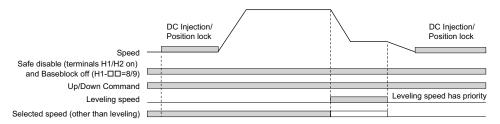
The drive decelerates to the leveling speed (d1-26) when the selected speed reference signal is removed.

If no speed reference is selected at start, the drive will trigger an "FrL" fault. Set parameter S6-15 to 0 to disable Speed Reference Missing (FrL) detection. With this setting the drive starts using leveling speed if no other speed reference is selected.



Leveling Speed has Priority and the Leveling Speed Input is Assigned (d1-18 = 2, H1-□□ = 53)

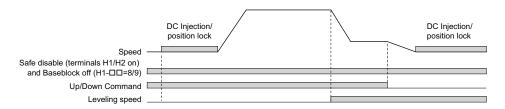
The leveling signal has priority over other speed references. The drive decelerates to the leveling speed (d1-26) when the leveling speed selection input is activated. The drive stops when either the leveling input or the Up/Down command is released.



Leveling Speed Priority is Selected and the Nominal Speed Input is Not Assigned (d1-18 = 2, H1-□□ ≠ 50)

The drive runs at nominal speed (d1-19) when no speed selection input is set. When the leveling speed signal is set, the drive decelerates to the leveling speed. The leveling speed signal has priority over all other speed signals.

NOTICE: Equipment Hazard. This function may not work properly if a broken wire connection to the drive I/O causes improper elevator speed selection. Properly tighten wire connections at the drive terminals before enabling this function.



■ Multi-Function Terminal Setup

Multi-Function Digital Input (Terminals S3 to S8)

The H1 parameters assign functions to digital input terminals S3 to S8 digital input terminal functions, refer to *H1: Multi-Function Digital Inputs on page 156*.

Multi-Function Digital Outputs

The H2 parameters assign functions to digital output terminals M1-M2, M3-M4, M5-M6, P1-C1, and P2-PC digital input terminal functions, refer to *H2: Multi-Function Digital Outputs on page 157*.

Multi-Function Analog Inputs

The H3 parameters assign functions to analog input terminals A1 and A2 analog input functions, refer to *H3: Multi- Function Analog Inputs on page 159*.

Multi-Function Analog Outputs

The H4 parameters assign functions to analog output terminals FM and AM. Select the function for these terminals by entering the last three digits of the desired U monitor. For a list of analog output functions, refer to *U: Monitors on page 177*.

Accel/Decel Ramp and Jerk Settings

Acceleration and deceleration ramps are set using the C1- $\square\square$ parameters. Use the C2- $\square\square$ parameters to adjust the jerk at the start of acceleration or deceleration.

Figure 38 explains how accel/decel ride and jerk settings can be used to adjust the ride profile.

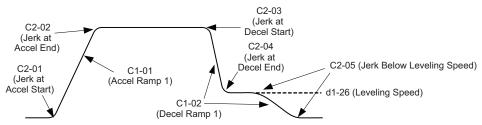


Figure 38 Accel/Decel Ramp and the Jerk Function

Units used to set the acceleration and deceleration ramp as well as the Jerk function change with the setting of parameter o1-03.

■ Inspection Operation

Start Condition in Inspection Operation

NOTICE: Always turn off the RUN command before changing the setting of parameters d1-18 (Speed Reference Selection Mode), b1-01 (Speed Reference Selection), or H1- $\square\square$ (Multi-Function Digital Inputs). If the RUN command is on when changing any of these settings, the motor may unexpectedly start running, and could result in injury.

Inspection operation is performed when an Up or Down signal is input while one of the following conditions is true:

- Parameter d1-18 is set to 0 or 3 and the selected speed is higher than d1-28 but lower than d1-29.
- Parameter d1-18 is set to 1 or 2 and a digital input programmed for Inspection Operation Speed (H1- $\square\square$ = 54) is enabled.

Inspection Operation uses the same acceleration characteristics and brake sequence at start as normal operation.

The carrier frequency is set to 2 kHz during Inspection Operation, but can be changed using parameter C6-21.

Stop Condition in Inspection Operation

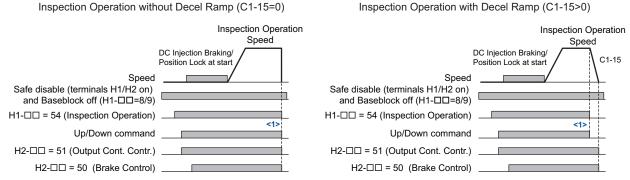
To stop the drive during Inspection Operation, either remove the Up or Down command or reset the input terminal for Inspection Operation.

A deceleration ramp can be set for Inspection Operation using parameter C1-15.

- If C1-15 = 0.00, the drive immediately applies the brake, shuts off the drive output, and opens the motor contactor, i.e., the multi-function output terminals set for "Brake Control" (H2- $\square\square$ = 50) and "Output Contactor Control" (H2- $\square\square$ = 51) are cleared.
- If C1-15 > 0.00, the drive decelerates to stop at the rate set to C1-15, then applies the brake, shuts the output off, and opens the motor contactor.

Inspection Operation Timing Chart

A timing chart for Inspection Operation appears in *Figure 39*.



<1> The drive stops if either the Up/Down command or Inspection Operation signals are removed.

Figure 39 Inspection Operation Sequence

■ Brake Sequence

WARNING! Sudden Movement Hazard. Rapid deceleration may cause the drive to fault on an overvoltage condition, resulting in death or serious injury due to an uncontrolled motor state. Be sure to set an acceptable deceleration time in parameter C1-09, Fast Stop Ramp, when using the fast-stop feature.

NOTICE: Always turn off the RUN command before changing the setting of parameters d1-18 (Speed Reference Selection Mode), b1-01 (Speed Reference Selection), or H1- $\Box\Box$ (Multi-Function Digital Inputs). If the RUN command is on when changing any of these settings, the motor may unexpectedly start running, and could result in injury.

The drive supports two types of brake sequences, one with torque compensation at start using an analog input terminal $(H3-\Box\Box=14)$ and the other without torque compensation at start.

Brake Sequence without Torque Compensation

To configure the brake sequence operation without torque compensation, do not set any analog input terminals for "Torque compensation" (H3- \square = 14).

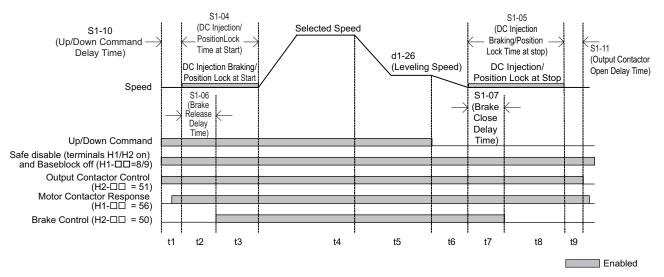


Figure 40 Brake Sequence without Torque Compensation at Start

Figure 40 is divided into time zones. Table 24 explains the sequence in each time zone.

Table 24 Time Zones for Brake Sequence without Torque Compensation at Start

Time Zone	Description
	Up or Down command is issued.
	Safe Disable terminals H1-HC and H2-HC must be set and Baseblock must be disabled (digital inputs set to H1- \square = 8/9).
	Speed reference must be selected by multi-function input terminals.
t1	Output contactor control signal is set (H2- $\square\square$ = 51) by the drive.
	Drive waits for the "Motor Contactor Feedback" signal ($H1-\Box\Box=56$) to be issued. If the motor contactor feedback is not received within t1, or if the feedback signal is on before the contactor control command has been issued, an SE1 fault is triggered. If the motor contactor feedback signal is not used, then the drive waits for the operation start delay time set in S1-10 to pass, then proceeds to the next step.
t2	After the delay time set in S1-10 has passed, the drive outputs current to the motor. DC Injection Braking or Position Lock begins.
t∠	After the brake release delay time set in S1-06 has passed, the drive sets the "Brake Control" output (H2- $\square\square$ = 50) in order to release the brake.
t3	DC Injection Braking or Position Lock will continue until: the time S1-04 has elapsed, or the time S1-06 has elapsed if S1-06 > S1-04 (this setting should be avoided since the motor could be driven against the applied brake).
t4	The drive accelerates up to the selected speed. The speed is kept constant until the leveling speed is selected.
t5	Leveling speed is selected. The drive decelerates to the leveling speed and maintains that speed until the Up or Down command is removed.
t6	The Up or Down signal is cleared. The drive decelerates to zero speed.
t7	The motor speed reaches the zero speed level (S1-01). DC Injection Braking or Position Lock is then executed for the time set in S1-05.
t/	After the delay time to close the brake set in S1-07 has passed, the drive clears the "Brake Control" output (H2- $\Box\Box$ = 50). The brake applies.
t8	The drive continues DC Injection or Position Lock until the time S1-05 has passed. When S1-05 has passed the drive output is shut off.
t9	After the delay for the magnetic contactor set in S1-11 has passed, the drive resets the output terminal set for "Output Contactor Control" (H2- $\square\square$ = 51). The Safe Disable Inputs can be cleared and Baseblock can be enabled.

Brake Sequence Using Torque Compensation

If a load measuring device is installed in the elevator, an analog input can be used to input a torque compensation value to the drive. This function requires one of the closed loop control modes (CLV or CLV/PM). To use torque compensation, one of the analog input terminals must be configured to provide the torque compensation signal (H3- $\Box\Box$ = 14).

Figure 41 is a timing chart for a brake sequence using torque compensation.

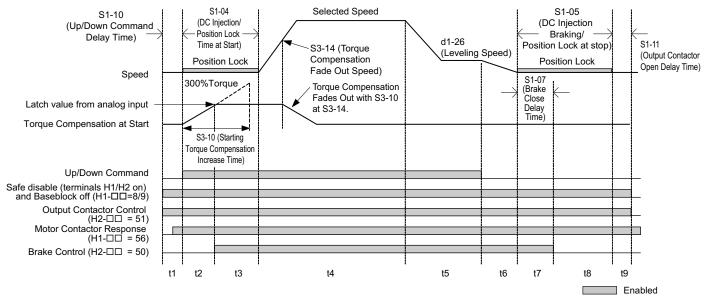


Figure 41 Brake Sequence Using Torque Compensation at Start

Figure 41 is divided into time zones. *Table 25* explains the sequence in each time zone.

Table 25 Time Zones for Brake Sequence Using Torque Compensation at Start

Time Zone	Description
	Up or Down command is issued.
	Safe Disable terminals H1-HC and H2-HC must be set and Baseblock must be disabled (digital inputs set to H1- \square = 8/9).
	Speed reference must be selected by multi-function input terminals.
41	Output contactor control signal is set (H2- $\square\square$ = 51) by the drive.
t1	Drive waits for the "Motor Contactor Feedback" signal ($H1-\Box\Box=56$) to be issued. If the motor contactor feedback is not received within t1, or if the feedback signal is on before the contactor control command has been issued, an SE1 fault is triggered. If the motor contactor feedback signal is not used, then the drive waits for the operation start delay time set in S1-10 to pass, then proceeds to the next step.
	The drive reads the torque value from the analog input (load cell).
	After the delay time set in S1-10 has passed, the drive outputs current to the motor. Position Lock begins.
t2	The torque value from the analog input is latched and internal torque compensation value is increased from zero to the latched value using the time constant set in S3-10.
	After the internal torque compensation level reaches the latched value, the drive sets the "Brake Control" output (H2- $\square\square$ = 50) in order to release the brake.
t3	The brake is released and the drive executes Position Lock until the time set in S1-04 has passed.
t4	The drive accelerates up to the selected speed. After the torque compensation fade-out speed level (S3-14) is reached during acceleration, the internal torque compensation value is reduced in accordance with the time constant set in S3-10.
t5	Leveling speed is selected. The drive decelerates to the leveling speed and maintains that speed until the Up or Down command is removed.
t6	The Up or Down signal is cleared. The drive decelerates to zero speed.
t7	The motor speed reaches the zero speed level (S1-01). DC Injection Braking or Position Lock is then executed for the time set in S1-05.
t/	After the delay time to close the brake set in S1-07 has passed, the drive clears the "Brake Control" output (H2- $\square\square$ = 50). The brake applies.
t8	The drive continues DC Injection or Position Lock until the time S1-05 has passed. When S1-05 has passed the drive output is shut off.
t9	After the delay for the magnetic contactor set in S1-11 has passed, the drive resets the output terminal set for "Output Contactor Control" (H2- \square = 51). The Safe Disable Inputs can be cleared and Baseblock can be enabled.

Adjusting the Torque Compensation at Start

CAUTION! Set all motor-related parameters (the E□-□□ parameters) and perform a test run before fine-tuning the torque compensation at start. Adjusting the torque compensation prematurely may result in faulty performance.

To use torque compensation at start, apply at least 50% of the maximum weight to the elevator car and set the drive according to the Load Condition 2 procedure below. If using a voltage signal to the analog input terminals as a load sensor, then that input signal will determine the rate of torque compensation applied according to S3-27 and S3-28.

Before the torque compensation function can be used, the analog input scaling must be adjusted to the load sensor output. This can be done by bringing the elevator into two different load conditions and teaching the corresponding analog input value and torque reference value to the drive.

- Note: 1. This torque compensation requires a closed loop control mode (CLV, CLV/PM).
 - 2. The torque compensation value is limited to 120%.

Set an analog input terminal for torque compensation (H3- $\square\square$ = 14) and proceed with the steps below.

Procedure for Load Condition 1 (S3-27, S3-29)

- 1. Make sure the drive is wired properly. For instructions, refer to Standard Connection Diagram on page 21.
- **2.** Set the speed reference to 0%.
- **3.** Apply no weight to the elevator car.
- **4.** Note the value of the analog input monitor for the load signal input is connected to (U1-13 for terminal A1, U1-14 for terminal A2).
- **5.** Provide an elevator Up or Down command, using Inspection Operation or normal operation mode. The car should be held in place when the brake releases.
- 6. Note the drives internal torque reference monitor U1-09.
- **7.** Stop the drive.
- 8. Set the value noted in step 4 to parameter S3-29. Set the value noted in step 6 to parameter S3-27.

Procedure for Load Condition 2 (S3-28, S3-30)

- **1.** Set the speed reference to 0%.
- 2. Apply load to the car has much as possible (at least 50% of the maximum weight).
- 3. Note the value of the analog input monitor for the load signal input connected to (U1-13 for terminal A1, U1-14 for terminal A2)
- **4.** Provide an elevator Up or Down command, using Inspection Operation or normal operation mode. The car should be held in place when the brake releases.
- **5.** Note the drives internal torque reference monitor U1-09.
- **6.** Stop the drive.
- 7. Set the value noted in step 3 to parameter S3-30. Set the value noted in step 5 to parameter S3-28.

Figure 42 shows the Torque Compensation at Start settings with parameters S3-27 to S3-30.

The solid line in *Figure 42* indicates the torque compensation at start when the elevator moves up or down.

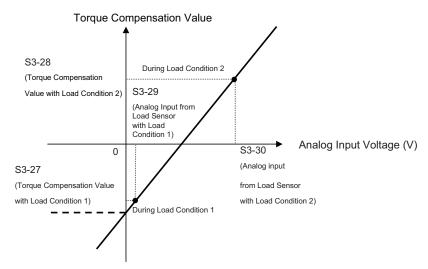


Figure 42 Torque Compensation at start for the Elevator in Up and Down Direction

Note: PRG: 7015 or earlier will apply a limit at 0 V torque compensation input value.

PRG: 7016 and later have no torque compensation limit when adding negative voltage to analog input voltage (see *Figure 42*).

After setting load conditions 1 and 2, perform a trial run. If required, parameter S3-12 can be set up to add a bias to the load sensor input when riding in a Down direction (default: 0.0%, same torque compensation characteristics in up and down direction). *Figure 43* illustrates the effect of torque compensation on the settings of S3-12 and S3-27 through S3-30.

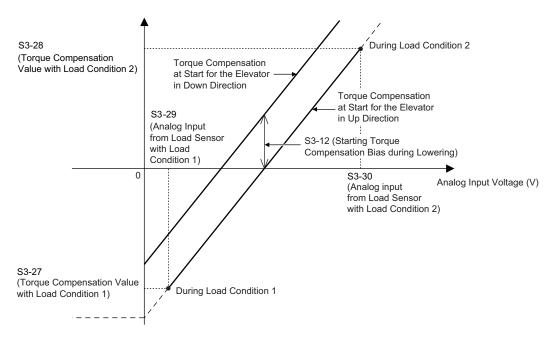


Figure 43 Torque Compensation at start for the Elevator in Up and Down Direction

♦ S: Elevator Parameters

This section describes various functions and faults needed to operate an elevator application: braking sequence, slip compensation, optimal adjustments at start and stop, Rescue Operation, and elevator-related faults.

■ S1-01: Zero Speed Level at Stop

Determines the speed to begin applying DC Injection (or Position Lock) when the drive is ramping to stop (b1-03 = 0). Set as a percentage of the maximum output frequency (E1-04).

No.	Parameter Name	Setting Range	Default
S1-01	Zero Speed Level at Stop	0.000 to 9.999%	Determined by A1-02

The function set by S1-01 changes depending on the control mode:

- V/f Control or OLV Control (A1-02 = 0, 2)
 For these control modes, parameter S1-01 sets the starting speed for DC Injection Braking at stop. Once the output speed falls below the setting of S1-01, the amount of DC Injection Braking current set in S1-03 is injected into the motor for the time set in parameter S1-05.
- CLV Control or CLV/PM Control (A1-02 = 3, 7)
 For these control modes, parameter S1-01 sets the starting speed for Position Lock at stop. Once the motor speed falls below the setting of S1-01, Position Lock is enabled for the time set in parameter S1-05.

■ S1-02: DC Injection Current at Start

Determines the amount of current to use for DC Injection at start. Set as a percentage of the drive rated current.

No.	Parameter Name	Setting Range	Default
S1-02	DC Injection Current at Start	0 to 100%	50%

■ S1-03: DC Injection Current at Stop

Determines the amount of current to use for DC Injection at stop. Set as a percentage of the drive rated current. When using OLV Control, the DC injection current is determined by multiplying S1-03 by S3-25 or S3-26.

No.	Parameter Name	Setting Range	Default
S1-03	DC Injection Current at Stop	0 to 100%	50%

■ S1-04: DC Injection / Position Lock Time at Start

Determines how long the drive should perform DC Injection at start. In CLV and CLV/PM, S1-04 determines how long Position Lock should be performed. During this time, the drive allows motor flux to develop, which is essential for applying torque quickly once the brake is released. A setting of 0.00 disables S1-04.

No.	Parameter Name	Setting Range	Default
S1-04	DC Injection / Position Lock Time at Start	0.00 to 10.00 s	0.40 s

■ S1-05: DC Injection / Position Lock Time at Stop

Determines how long the drive should perform DC Injection at stop. In CLV and CLV/PM, S1-05 determines how long Position Lock should be performed. A setting of 0.00 disables S1-05.

No.	Parameter Name	Setting Range	Default
S1-05	DC Injection / Position Lock Time at Stop	0.00 to 10.00 s	0.60 s

■ S1-06: Brake Release Delay Time

Determines the time that must pass after an Up/Down command is entered before the output terminal set for "Brake control" (H2- $\Box\Box$ = 50) is triggered.

Adjusting this delay time can help when there is not enough time to develop the appropriate amount of motor flux. Be sure to also increase the time S1-04 when setting S1-06 to relatively long delay time.

No.	Parameter Name	Setting Range	Default
S1-06	Brake Release Delay Time	0.00 to 10.00 s	0.20 s

■ S1-07: Brake Close Delay Time

Determines the time that must pass after zero speed is reached before the output terminal set for "Brake control" $(H2-\Box\Box=50)$ is released.

No.	Parameter Name	Setting Range	Default
S1-07	Brake Close Delay Time	0.00 to [S1-05]	0.10 s

■ S1-10: Run Command Delay Time

Sets the time the drive waits after receiving an Up/Down command before starting operation. The time set should give the motor contactor enough time to close.

No.	Parameter Name	Setting Range	Default
S1-10	Run Command Delay Time	0.00 to 1.00 s	0.10 s

■ S1-11: Output Contactor Open Delay Time

Determines the time that must pass for an output terminal set for "Output contactor control" (H2- $\Box\Box$ = 51) to be released after the drive has stopped and drive output has been shut off.

No.	Parameter Name	Setting Range	Default
S1-11	Output Contactor Open Delay Time	0.00 to 1.00 s	0.10 s

■ S1-12: Motor Contactor Control During Auto-Tuning Selection

Note: Available in drive software PRG: 7016 and later.

Determines the state of the output contactor control command (H2- $\Box\Box$ = 51) during Auto-Tuning. The contactor closes as soon as the Enter key is pressed in the Auto-Tuning start menu.

No.	Parameter Name	Setting Range	Default
S1-12	Motor Contactor Control during Auto-Tuning	0, 1	0

0: Disabled

1: Enabled

WARNING! Sudden Movement Hazard. Use parameter S1-12 to enable/disable automatic switching of the Motor Contactor Control output signal during Auto-Tuning. When using setting S1-12 = 1, ensure that the multi-function output terminals are properly wired and in the correct state before setting parameter S1-12. Failure to comply could result in damage to the drive, serious injury or death.

■ S2-01: Motor Rated Speed

Sets the rated speed of the motor.

No.	Parameter Name	Setting Range	Default
S2-01	Motor Rated Speed	300 to 1800 rpm	1380 rpm

■ S2-02/S2-03: Slip Compensation Gain in Motoring Mode / Regenerative Mode

Slip compensation for leveling speed can be set separately for motoring and regenerative states to help improve the accuracy of leveling.

No.	Parameter Name	Setting Range	Default
S2-02	Slip Compensation Gain in Motoring Mode	0.0 to 5.0	0.7
S2-03	Slip Compensation Gain in Regenerative Mode	0.0 to 5.0	1.0

■ S2-05: Slip Compensation Torque Detection Delay Time

Sets a delay time before detecting torque for slip compensation.

No.	Parameter Name	Setting Range	Default
S2-05	Slip Compensation Torque Detection Delay Time	0 to 10000 ms	1000 ms

■ S2-06: Slip Compensation Torque Detection Filter Time Constant

Sets the filter time constant applied to the torque signal used for the slip compensation value calculation.

No.	Parameter Name	Setting Range	Default
S2-06	Slip Compensation Torque Detection Filter Time Constant	0 to 2000 ms	500 ms

■ S3-01 / S3-02: Position Lock Gain at Start 1 / 2

Sets gain levels 1 and 2 for the Position Lock at start function. Position Lock at start adjusts the internal torque reference value depending on the position deviation to hold the car in place when the brake is released. S3-01 sets the gain used to adjust the speed reference During Position Lock. S3-02 sets gain to adjust the internal torque reference directly (Anti-Rollback function).

Increase S3-01 and S3-02 if there is a problem with rollback when the brake is released. Decrease S3-01 and S3-02 if motor oscillation occurs during Position Lock.

No.	Parameter Name	Setting Range	Default
S3-01	Position Lock Gain at Start 1	0 to 100	5
S3-02	Position Lock Gain at Start 2 (Anti-Rollback Gain)	0.00 to 100.00	0.00

Note: 1. Check the C5-□□ parameters to make sure the speed control loop settings are correct before making any adjustments to the Position Lock gain.

2. Sometimes a fault may occur with detecting the direction of motor rotation (dv4) when using Closed Loop Vector for PM motors. To correct this, either increase the settings of S3-01 and S3-02, or increase the number of pulses needed to trigger dv4 (F1-19).

■ S3-03: Position Lock Gain at Stop

Sets the gain used by the Position Lock control loop at stop to hold the car in place while the brake is applied.

Setting S3-03 to a high value will increase the ability of the drive to hold the car in place. Setting S3-03 too high can cause motor oscillation and car vibration.

No.	Parameter Name	Setting Range	Default
S3-03	Position Lock Gain at Stop	0 to 100	5

Note: 1. Check the C5-□□ parameters to make sure the speed control loop settings are correct before making any adjustments to the Position Lock gain.

2. Faults may occur when detecting the direction of motor rotation (dv4) when using CLV/PM. To correct this, either increase the settings of S3-01 and S3-02, or increase the number of pulses required to trigger dv4 (F1-19).

■ S3-04: Position Lock Bandwidth

Determines the bandwidth around the locked position to enable a digital output set for $H2-\Box\Box=33$ (within position lock bandwidth). The output will be triggered when the car moves from the Position Lock start point to plus or minus the number of pulses set to S3-04.

No.	Parameter Name	Setting Range	Default
S3-04	Position Lock Bandwidth	0 to 16383	10

■ S3-10: Starting Torque Compensation Increase Time

Sets a time constant for the torque reference to reach 300%. Enabled by setting an analog input terminal for torque compensation (H3- \square = 14).

No.	Parameter Name	Setting Range	Default
S3-10	Starting Torque Compensation Increase Time	0 to 5000 ms	500 ms

■ S3-12: Starting Torque Compensation Bias in Down Direction

Adds a bias to torque compensation in Down direction.

Refer to Adjusting the Torque Compensation at Start on page 75 for details.

No.	Parameter Name	Setting Range	Default
S3-12	Starting Torque Compensation Bias in Down Direction	-40.0 to 40.0%	0.00%

■ S3-14: Torque Compensation Fade Out Speed

Sets the speed level for torque compensation to fade out during the time determined by S3-15. Set as a percentage of the maximum output frequency (E1-04). A setting of 0.0% disables this function.

No.	Parameter Name	Setting Range	Default
S3-14	Torque Compensation Fade Out Speed	0.0 to 100.0%	0.0%

■ S3-15: Torque Compensation Fade Out Time

Sets the time for torque compensation to fade out when motor speed reaches the level set in S3-14.

No.	Parameter Name	Setting Range	Default
S3-15	Torque Compensation Fade Out Time	0 to 5000 ms	1000 ms

■ S3-16: Torque Limit Reduction Time

After Position Lock at stop, S3-16 determines the length of time to reduce the torque limit rate = $\frac{\text{Torque } 300\%}{\text{S3-}16}$

No.	Parameter Name	Setting Range	Default
S3-16	Torque Limit Reduction Time	0 to 10000 ms	100 ms

■ S3-20: Dwell 2 Speed Reference

Sets the speed reference for the Dwell 2 function.

Note: Setting this parameter to 0.00 disables the Dwell 2 function.

No.	Parameter Name	Setting Range	Default
S3-20	Dwell 2 Speed Reference	0.00 to 100.00	0.00%

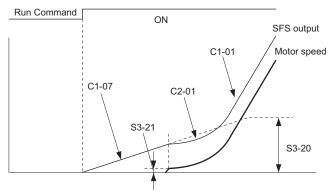


Figure 44 Dwell Speed Reference at Start

■ S3-21: Dwell 2 End Speed

The Dwell 2 function will end when the drive reaches this speed. A setting of 0.00 will disable the acceleration rate switch that occurs at the end of Dwell 2.

No.	Parameter Name	Setting Range	Default
S3-21	Dwell 2 End Speed	0.00 to 100.00%	0.00%

■ S3-25: DC Injection Gain in Regenerative Operation

In OLV Control, S3-25 sets a gain level for DC Injection at stop (S1-03) for when the regenerative load reaches 100%. At that time, the current applied during DC Injection at stop is determined as S1-03 \times S3-25.

No.	Parameter Name	Setting Range	Default
S3-25	DC Injection Gain in Regenerative Operation	0 to 400%	100%

■ S3-26: DC Injection Gain in Motoring Operation

In OLV Control, S3-26 sets a gain level for DC Injection at stop (S1-03) when the motoring load reaches 100%. At that time, the current applied during DC Injection at stop is determined as $S1-03 \times S3-26$.

No.	Parameter Name	Setting Range	Default
S3-26	DC Injection Gain in Motoring Operation	0 to 400%	20%

■ S3-27: Torque Compensation Value with Load Condition 1

Adjusts the analog signal from a load sensor for torque compensation. Refer to *Adjusting the Torque Compensation at Start on page 75* for details.

No.	Parameter Name	Setting Range	Default
S3-27	Torque Compensation Value with Load Condition 1	-100.0 to 100.0%	-50.0%

■ S3-28: Torque Compensation Value with Load Condition 2

Adjusts the analog signal from a load sensor for torque compensation. Refer to *Adjusting the Torque Compensation at Start on page 75* for details.

No.	Parameter Name	Setting Range	Default
S3-28	Torque Compensation Value with Load Condition 2	-100.0 to 100.0%	50.0%

■ S3-29: Analog Input from Load Sensor with Load Condition 1

Adjusts the analog signal from a load sensor for torque compensation. Refer to *Adjusting the Torque Compensation at Start on page 75* for details.

No.	Parameter Name	Setting Range	Default
S3-29	Analog Input from Load Sensor with Load Condition 1	-100.0 to 100.0%	0.0%

■ S3-30: Analog Input from Load Sensor with Load Condition 2

Adjusts the analog signal from a load sensor for torque compensation. Refer to *Adjusting the Torque Compensation at Start on page 75* for details.

No.	Parameter Name	Setting Range	Default
S3-30	Analog Input from Load Sensor with Load Condition 2	-100.0 to 100.0%	100.0%

■ S3-34: Anti-Rollback Torque Bias 1

Sets an intermediary value for the torque bias used for Anti-Rollback when Position Lock at start is performed. This setting rarely needs to be changed.

No.	Parameter Name	Setting Range	Default
S3-34	Anti-Rollback Torque Bias 1	0.0 to 100.0%	0.0%

■ S3-35: Anti-Rollback Torque Bias 2

Sets a maximum value for the torque bias used for Anti-Rollback when Position Lock at start is performed. This setting rarely needs to be changed.

No.	Parameter Name	Setting Range	Default
S3-35	Anti-Rollback Torque Bias 2	0.0 to 100.0%	0.0%

■ S3-37: Position Deviation Level to Apply Anti-Rollback Torque Bias 1

Sets the position deviation level to activate at Anti-Rollback Torque Bias 1 (S3-34). This setting rarely needs to be changed.

No.	Parameter Name	Setting Range	Default
S3-37	Position Deviation Level to Apply Anti-Rollback Torque Bias 1	0 to 32767	0

■ S3-38: Position Deviation Level to Apply Anti-Rollback Torque Bias 2

Determines the position deviation level when the drive should switch from the Anti-Rollback torque bias set in S3-34 to the torque bias set in S3-35. This setting rarely needs to be changed.

No.	Parameter Name	Setting Range	Default
S3-38	Position Deviation Level to Apply Anti-Rollback Torque Bias 2	0 to 32767	0

■ S3-39: Anti-Rollback Integral Gain

Determines the drive responsiveness for Anti-Rollback during Position Lock.

Increasing the value set to S3-39 may help if there is still too much deviation from the Position Lock start position after Position Lock gain 1 and gain 2 have already been adjusted. Lower S3-39 if oscillation occurs. This parameter rarely needs to be changed.

No.	Parameter Name	Setting Range	Default
S3-39	Anti-Rollback Integral Gain	-30.00 to 30.00	0.00

■ S3-40: Anti-Rollback Movement Detection

Sets the amount of speed feedback signal pulses to detect a movement of the rotor.

No.	Parameter Name	Setting Range	Default
S3-40	Anti-Rollback Movement Detection	0 to 100 pulses	1 pulse

■ S3-41: Position Lock Gain at Start 2 Reduction

Sets a reduction factor for the Position Lock Gain at Start 2 (Anti Rollback Gain) set in parameter S3-02.

If the motor rotation (i.e., car movement) is below the movement detection level set to S3-40, the drive will reduce the Anti-Rollback gain according to the gain reduction level set in S3-41.

No.	Parameter Name	Setting Range	Default
S3-41	Position Lock Gain at Start 2 Reduction	0.00 to 1.00	0.50

■ S4-01: Light Load Direction Search Selection

Enables and disables the Light Load Direction Search.

No.	Parameter Name	Setting Range	Default
S4-01	Light Load Direction Search Selection	0 to 2	0

0: Disabled

1: Enabled

2: Enabled for motor 1 only

■ S4-02: Light Load Direction Search Method

Determines the method used to perform Light Load Direction Search.

No.	Parameter Name	Setting Range	Default
S4-02	Light Load Direction Search Method	0 or 1	1

0: Output current

1: Detect direction of regeneration

■ S4-03: Light Load Direction Search Time

Sets the time to perform Light Load Direction Search.

No.	Parameter Name	Setting Range	Default
S4-03	Light Load Direction Search Time	0.0 to 5.0 s	1.0 s

■ S4-04: Light Load Direction Search Speed Reference

Sets the speed reference to use during Light Load Direction Search.

No.	Parameter Name	Setting Range	Default
S4-04	Light Load Direction Search Speed Reference	0.00 to 20.00%	Determined by A-02

■ S4-05: Rescue Operation Torque Limit

Sets the torque limit used during Rescue Operation.

No.	Parameter Name	Setting Range	Default
S4-05	Rescue Operation Torque Limit	0 to 300%	100%

■ S4-06: Rescue Operation Power Supply Selection

Specifies the type of backup power supply the drive should switch to when the power goes out.

No.	Parameter Name	Setting Range	Default
S4-06	Rescue Operation Power Supply Selection	0 to 2	0

0: Battery

1: UPS (single-phase)

2: UPS (three-phase)

■ S4-07: UPS Power

Sets the capacity of the UPS.

No.	Parameter Name	Setting Range	Default
S4-07	UPS Power	0.0 to 100.0 kVA	0.0 kVA

■ S4-08: UPS Operation Speed Limit Selection

Determines how a speed limit should be applied to the Rescue Operation speed (d1-25) when operating from a UPS. The drive calculates the appropriate speed limit based on the UPS capacity set in S4-07. This speed limit helps prevent voltage saturation and motor stall during Rescue Operation.

No.	Parameter Name	Setting Range	Default
S4-08	UPS Operation Speed Limit Selection	0 to 2	2

- 0: Disabled
- 1: Enabled until Light Load Direction Search is complete
- 2: Enabled until stop

■ S4-12: DC Bus Voltage during Rescue Operation

Sets the DC bus voltage during Rescue Operation.

No.	Parameter Name	Setting Range	Default
S4-12	DC Bus Voltage during Rescue Operation	0 to 800 V	0 V

■ S4-13: Rescue Operation Power Supply Deterioration Detection Level

Determines at which level of backup power supply deterioration a PF5 fault is triggered. The following conditions will trigger PF5:

- During Rescue Operation, DC bus voltage < [S4-12 × (S4-13 10%)]
- 100 ms after Rescue Operation has been triggered, the DC bus voltage does not rise above S4-12 × S4-13 before the motor starts

No.	Parameter Name	Setting Range	Default
S4-13	Rescue Operation Power Supply Deterioration Detection Level	10 to 100%	80%

■ S4-15: Speed Reference Selection at Rescue Operation

Note: Available in drive software PRG: 7016 and later.

Selects the speed reference used for Rescue Operation.

No.	Parameter Name	Setting Range	Default
S4-15	Speed Reference Selection for Rescue Operation	0, 1	0

- 0: The setting of parameter d1-25 is used as speed reference for Rescue Operation
- 1: The speed selected by digital inputs is used as speed reference

■ Short Floor Function

Short Floor automatically adjusts the speed in order to reduce the leveling time if leveling speed was activated before the selected speed was reached. Short Floor is enabled setting S5-01 = 1. The drive calculates the distance to decelerate from rated speed to the leveling speed, then controls the stop so that the stopping time is shortened. In *Figure 45* below, area S indicates the distance for a stop from nominal speed.

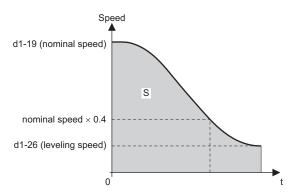


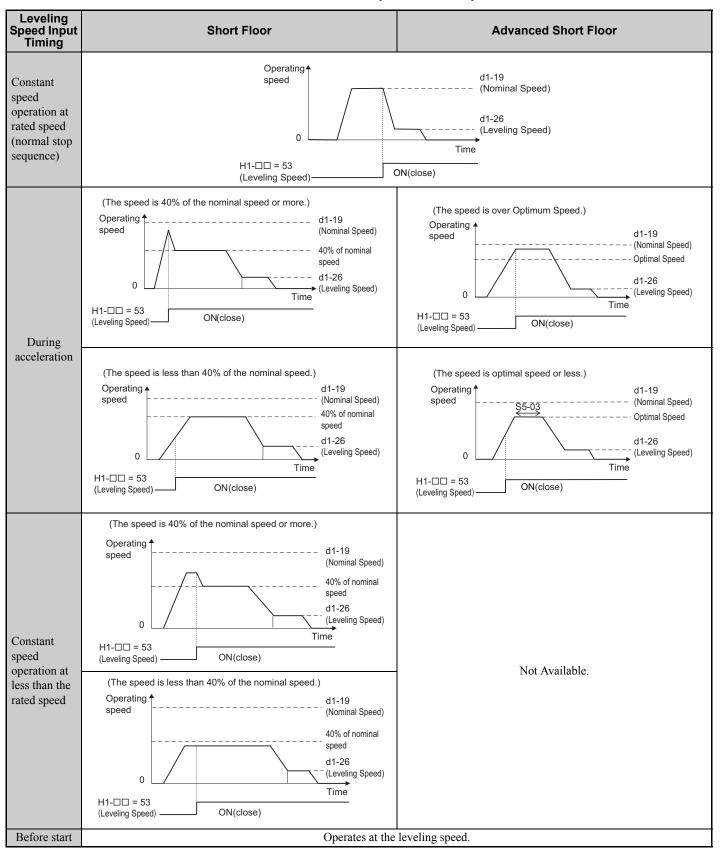
Figure 45 Speed During Normal Operation

Advance Short Floor

Advanced Short Floor minimizes the operation time to arrive at a designated floor. It uses the leveling speed once the leveling speed command is entered via one of the multi-function inputs (H1- $\Box\Box$ = 53). Advance Short Floor calculates optimal speed based on the Short Floor Minimum Constant Speed Time (S5-03) and the currently selected deceleration rate.

Table 26 explains the Short Floor and Advance Short Floor functions.

Table 26 Short Floor Operation Example



■ S5-01: Short Floor Operation Selection

Enables and disables the Short Floor function.

Note: 1. The Short Floor and Advanced Short Floor functions cannot be used during Rescue Operation.

- 2. Do not use Short Floor or Advanced Short Floor when the analog input terminals are configured to supply the speed reference.
- 3. The drive will accelerate or decelerate to the specified speed reference at the specified Accel/Decel rate if the speed priority is set for multi-step speed reference (d1-18 = 0 or 3) and the leveling speed reference is selected during Short Floor or Advanced Short Floor.

No.	Parameter Name	Setting Range	Default
S5-01	Short Floor Operation Selection	0 to 2	0

0: Disabled

1: Enabled (Short Floor Operation)

2: Enabled (Advanced Short Floor Operation)

■ S5-02: Nominal Speed for Short Floor Calculation

Determines the rated speed used to calculate the distance for the Short Floor function when speed priority is set for Multistep Speed Reference (d1-18=0 or 3).

No.	Parameter Name	Setting Range	Default
S5-02	Nominal Speed for Short Floor Calculation	0.0 to 100.0%	0.0%

■ S5-03: Short Floor Minimum Constant Speed Time

Sets the minimum time of the constant speed operation when the Advanced Short Floor function is enabled (S5-01 = 2).

No.	Parameter Name	Setting Range	Default
S5-03	Short Floor Minimum Constant Speed Time	0 to 2.0 s	0.0 s

■ S5-04: Distance Calculation Acceleration Time Gain

Sets the gain used to adjust the jerk at acceleration for an optimum speed calculation when Short Floor Operation Selection (S5-01) is set to 2.

- Increase the gain level set to S5-04 and S5-05 if the leveling time is too short or if the optimum speed calculated by the drive is too fast.
- Decrease the gain level set to S5-04 and S5-05 if the leveling time is too long or if the optimum speed calculated by the drive is too slow.

No.	Parameter Name	Setting Range	Default
S5-04	Distance Calculation Acceleration Time Gain	50.0 to 200.0%	150.0%

Note: Setting S5-04 too low may trigger an overrun due to faster optimum speeds and shortened leveling times. Avoid setting this gain less than 100%.

■ S5-05: Distance Calculation Deceleration Time Gain

Sets the gain used to adjust the jerk at deceleration and optimum speed calculation when Short Floor Operation Selection (S5-01) is set to 2.

- Increase the gain level set to S5-04 and S5-05 if the leveling time is too short or if the optimum speed calculated by the drive is too fast.
- Decrease the gain level set to S5-04 and S5-05 if the leveling time is too long or if the optimum speed calculated by the drive is too slow.

No.	Parameter Name	Setting Range	Default
S5-05	Distance Calculation Deceleration Time Gain	50.0 to 200.0%	150.0%

Note: Setting S5-05 too low may trigger an overrun due to faster optimum speeds and shortened leveling times. Avoid setting this gain less than 100%.

■ Leveling Distance Control

Leveling Distance Control uses the accel/decel rate, jerk settings, and stopping distance to automatically calculate a speed sequence and arrive at the designated floor with increased accuracy. Two types of Leveling Distance Control are available that allow the user to select the Stopping Method (S5-10).

WARNING! Inadvertent Movement Hazard. The elevator will not stop at the designated location and an overrun will occur which may cause injury to personnel if parameters o1-20, S5-11, and S5-12 are set incorrectly. Before using Leveling Distance Control, make sure that parameters for Traction Sheave Diameter (o1-20), Deceleration Distance (S5-11) and the Stop Distance (S5-12) are set to the correct units.

Note: Leveling Distance Control should be used only for elevators with a constant stopping distance. Do not use Leveling Distance Control in elevators where the stopping distance changes frequently.

The following functions are disabled when Leveling Distance Control is selected:

- Switching between deceleration times
- Droop Control (b7 parameters)
- Shoot Floor, Advanced Short Floor (S5-01 = 1, 2)

Leveling Distance Control is disabled when any one of the following functions are selected:

- Analog frequency reference
- Rescue Operation
- Inspection Operation
- During Motor 2 selection

Direct Landing

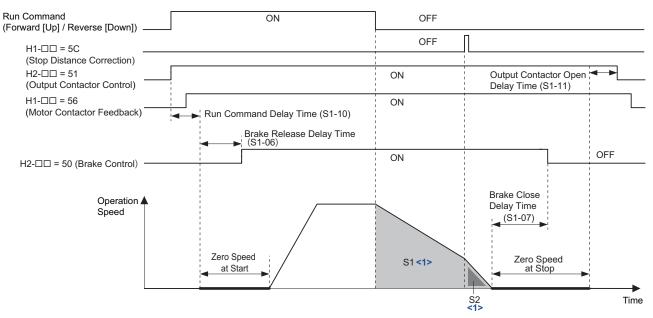
Direct Landing (S5-10 = 1) is activated at the start of deceleration, and brings the elevator car to the designated floor without the use of the leveling speed.

Direct Landing disables Leveling Distance Control, and uses a speed reference calculated by multiplying E1-04 times S5-13. If a Stop distance correction command (H1- $\Box\Box$ = 5C) is triggered during Direct Landing, then the drive will switch to the stop distance set in S5-12 for the remaining distance. Direct Landing will end once data from the encoder indicates that the stopping distance is 0.

Figure 46 illustrates a Direct Landing Operation example.

Table 27 Conditions for Direct Landing

Speed Priority	Direct Landing Start Conditions
Multi-step speed sequence $(d1-18 = 0, 3)$	Speed reference \geq E1-04 \times S5-13 and the Up/Down command is not active or the speed reference is 0.
High speed reference has priority (d1-18 = 1)	The Up/Down command is not active, the speed reference is 0, or the leveling speed reference has
Leveling speed reference has priority (d1-18 = 2)	been selected by one of the multi-function input terminals (H1-□□).



<1> Area S1 is the deceleration distance (S5-11) from the start of deceleration to stop. Area S2 is the stopping distance (S5-12) from the point at which the stopping distance compensation signal is entered to when the car arrives at the designated floor.

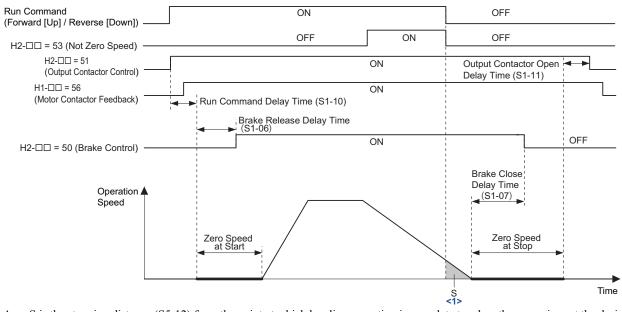
Figure 46 Direct Landing Operation Example

Leveling Distance Control

Leveling Distance Control (S5-10 = 2) uses the leveling speed reference for the remaining distance to arrive at the designated floor. Leveling Distance Control is activated when the conditions listed in *Table 28* are met.

Speed Priority Selection Multi-Function Input Terminal Settings Leveling Distance Control Start Conditions The Up/Down command is not active or the speed Multi-step speed sequence (d1-18 = 0,3)reference is 0. The Up/Down command is not active, or all input Leveling speed reference is selected terminals set for $(H1-\Box\Box = 53)$ High speed reference has priority $H1-\Box\Box = 50$ to 53 are open (d1-18=1)Leveling speed reference is not selected Up/Down command is not active. $(H1-\square\square\neq 53)$ The Up/Down command is not active, or all input Rated speed reference is selected terminals set for $(H1-\square\square=50)$ Multi-step speed sequence H1- \square = 50 to 53 are open. (d1-18=2)Rated speed reference is not selected Up/Down command is not active. $(H1-\square\square\neq 50)$

Table 28 Leveling Distance Control Operation



<1> Area S is the stopping distance (S5-12) from the point at which leveling operation is complete to when the car arrives at the designated floor.

Figure 47 Operation Sequence Example for Leveling Distance Control

■ S5-10: Stopping Method Selection

Selects the stopping method.

No.	Parameter Name	Setting Range	Default
S5-10	Stopping Method Selection	0 to 2	0

0: Disable

1: Direct Landing

2: Leveling Distance Control

■ S5-11: Deceleration Distance

Sets the deceleration distance when Stop Distance Control is enabled. *Refer to Direct Landing on page 89* for details.

No.	Parameter Name	Setting Range	Default
S5-11	Deceleration Distance	0 to 32767 mm < <i>I</i> >	0 mm

<1> The setting range becomes 0.00 to 650.00 inches when the length units are set for inches (o1-12 = 1).

■ S5-12: Stop Distance

Sets the stopping distance when Stop Distance Control is enabled. Refer to *Direct Landing on page 89* and *Leveling Distance Control on page 90* for details.

No.	Parameter Name	Setting Range	Default
S5-12	Stop Distance	0 to 10000 mm	0 mm

<1> The setting range becomes 0.00 to 393.00 inches when the length units are set for inches (01-12=1).

■ S5-13: Direct Landing Minimum Speed Level

Sets the speed level for the start of Direct Landing. Direct Landing is disabled if the starting speed for Direct Landing is less than the maximum output speed multiplied by this parameter ($E1-04 \times S5-13$).

No.	Parameter Name	Setting Range	Default
S5-13	Direct Landing Minimum Speed Level	0 to 100%	20%

■ S6-01: Motor Contactor Response Error (SE1) Detection/Reset Selection

Determines when the drive should detect a motor contactor response error (SE1). SE1 is triggered if there is no response from the motor contactor within the time set in S6-10 after the contactor control output has been set.

No.	Parameter Name	Setting Range	Default
S6-01	Motor Contactor Response Error (SE1) Detection/Reset Selection	0 to 2	0

0: Detect during stop, SE1 must be manually reset

1: Detect during stop, SE1 can be automatically reset

2: No SE1 detection

■ S6-02: Starting Current Error (SE2) Detection Delay Time

Sets a delay time for starting current error (SE2). SE2 is detected when the drive output current is below 25% after the Up/Down command has been entered and the brake release time and the time set to S6-02 have both passed. The brake control command will not be issued (brake stays applied).

No.	Parameter Name	Setting Range	Default
S6-02	Starting Current Error (SE2) Detection Delay Time	0.00 to [S1-04 - S1-06]	200 ms

■ S6-04: Output Current Error (SE3) Detection Delay Time

Sets a delay time for detecting an output current fault (SE3). SE3 is detected when the drive output current drops below 25% after the brake has released.

No.	Parameter Name	Setting Range	Default
S6-04	Output Current Error (SE3) Detection Delay Time	0 to 5000 ms	200 ms

■ S6-05: Brake Response Error (SE4) Detection Time

Sets a delay time for detecting a brake response error (SE4). SE4 is detected when an output terminal set for "Brake release" (H2- $\square\square$ = 50) and an input terminal set for "Brake feedback" (H1- $\square\square$ = 79) do not match for the time set to S6-05.

No.	Parameter Name	Setting Range	Default
S6-05	Brake Response Error (SE4) Detection Time	0 to 10000 ms	500 ms

■ S6-10: Overacceleration Detection Level

If the elevator car accelerates at an abnormal rate, the drive triggers an overacceleration fault (dv6) and the motor coasts to stop. Parameter S6-10 determines the acceleration rate that triggers the dv6 fault. A setting of 0.0 m/s² disables overacceleration detection.

No.	Parameter Name	Setting Range	Default
S6-10	Overacceleration Detection Level	0.0 to 20.0 m/s ²	1.5 m/s ² <1>

<1> Default setting is determined by parameter o1-03. If o1-03 is set to 0 through 5, the default is 1.5 m/s2. If o1-03 is set to 6, the default is 5.0 ft/s² (setting range: 0.0 to 50.0 ft/s²).

■ S6-11: Overacceleration Detection Time

Sets the time that the acceleration must exceed the overacceleration detection level before as fault is triggered.

No.	Parameter Name	Setting Range	Default
S6-11	Overacceleration Detection Time	0 to 5000 ms	50 ms

■ S6-12: Overacceleration Detection Selection

Determines the conditions for detecting an overacceleration situation.

No.	Parameter Name	Setting Range	Default
S6-12	Overacceleration Detection Selection	0 or 1	0

0: Always enabled

1: During run only

■ S6-15: Speed Reference Loss Detection

Enabled or disables detection for missing speed reference (FrL).

No.	Parameter Name	Setting Range	Default
S6-15	Speed Reference Loss Detection	0 or 1	1

0: Disabled

1: Enabled

■ S6-16: Restart after Baseblock Selection

Allows the drive to restart the motor after returning to normal operation from Baseblock state (H1- $\square\square$ = 8/9) or from Safe Torque-Off state (Safe Disable inputs H1 and H2 enabled) while the Up/Down command is still active.

No.	Parameter Name	Setting Range	Default
S6-16	Restart after Baseblock Selection	0 or 1	0

0: No restart after Baseblock or Safe Torque-Off

Do not restart the motor when leaving the Baseblock or Safe Torque-Off state even if an Up/Down command is still active.

1: Restart after Baseblock or Safe Torque-Off

Restart when the Up/Down command is still active while the Baseblock or Safe Torque-Off state is left. To use this function with the Safe Disable function, parameter L8-88 must be set to 1.

■ Rescue Operation

In the event of a power outage, Rescue Operation allows the elevator to travel to the nearest floor by switching to a backup battery or UPS (Uninterruptable Power Supply) for power.

An input terminal set for Rescue Operation (H1- $\Box\Box$ = 55) can be used to initiate Rescue Operation. During Rescue Operation, the drive uses the speed reference set in d1-25 to travel to the nearest floor.

NOTICE: Equipment Hazard. Do not use the Rescue Operation feature for extended periods. Failure to comply may result in drive heat sink overtemperature alarms (oH).

NOTICE: When changing parameters while the drive is supplied from the rescue operation power supply, wait at least 5 s after entering parameters before switching off the power supply. Instantly switching off the power can cause parameter settings corruption that can only be resolved by initializing the drive. This may cause erroneous drive performance.

NOTICE: Always turn off the RUN command before changing the setting of parameters d1-18 (Speed Reference Selection Mode), b1-01 (Speed Reference Selection), or H1- $\square\square$ (Multi-Function Digital Inputs). If the RUN command is on when changing any of these settings, the motor may unexpectedly start running, and could result in injury.

Drive Power Supply for Rescue Operation

There are various methods of supplying power to the drive for rescue operation. Independent of the chosen method, the voltage in the DC bus of the drive and the voltage supplied to the drive control circuit must meet the specifications provided in *Table 29*.

The DC bus voltage can either be supplied by a battery connected to the DC bus terminals of the drive or by a UPS connected to drive terminals L1 and L2. The control circuit voltage can be supplied directly from the drives DC bus (no external wiring required), from an external battery (connection to CN19), or by using an optional 24 Vdc control power backup unit.

When using a single-phase AC power supply for rescue operation such as a single-phase UPS, the ripple in the DC bus voltage will be higher than with a three-phase or battery supply. Make sure that the DC bus voltage never falls below the minimum value listed in *Table 29*.

When using a PM motor with an incremental PG encoder and a PG-X3 option card, always perform Initial Magnet Pole Search Parameters Auto-Tuning (T2-01=3) with the normal power supply connected. The tuning function will prepare the drive for Rescue Operation by automatically setting certain parameters. If the tuning ends with an "End8" to "End10" fault, then rescue operation will require a battery or UPS that supplies the drive DC bus with at least 280 Vdc for 200 V class drives and 560 Vdc for 400 V class drives. Alternatively utilize to an absolute PG encoder and a PG-E3 or PG-F3 option card.

Motor Type	Speed Feedback	DC Bus Voltage	Control Circuit Voltage
Induction Motor	Incremental PG Encoder with PG-X3 option card	200 V class drives: 48 to 340 Vdc 400 V class drives: 96 to 680 Vdc	
Darman ant Ma an at	Incremental PG Encoder with PG-X3 option card "End8" to "End10" error occurs during Initial Magnet Pole Search Auto-Tuning	200 V class drives: 280 to 340 Vdc 400 V class drives: 560 to 680 Vdc	When supplied from a battery or the drive DC bus: 200 V class drives: 250 to 340 Vdc 400 V class drives: 280 to 680 V (recommended: 500 to 680 Vdc)
Permanent Magnet Motor	Incremental PG Encoder with PG-X3 option card No error occurs during Initial Magnet Pole Search Auto-Tuning	200 V class drives: 72 to 340 Vdc 400 V class drives: 144 to 680 Vdc	When supplied via a 24 Vdc control power backup unit: 200 V and 400 V class drives: 24 Vdc
	Absolute PG Encoder with PG-F3 or PG-E3 option card	200 V class drives: 48 to 340 Vdc 400 V class drives: 96 to 680 Vdc	

Table 29 Power Supply Ratings for Rescue Operation

Parameter Setup

Adjust drive parameters as described below when using Rescue Operation.

- Select the type of Rescue Operation power supply for the drives main circuit in parameter S4-06.
- When using a UPS, set the UPS power value to parameter S4-07. Use parameter S4-08 to decide if the Rescue Operation speed shall be limited automatically depending on the UPS power.
- If deterioration of the battery or UPS shall be detected, also set up parameters S4-12 and S4-13. Measure the DC bus voltage during operation using the rescue power supply and set the measured value to parameter S4-12. Set the deterioration detection level to parameter S4-13.
- Set parameters S4-01 to S4-04 if light load direction search shall be automatically performed when Rescue Operation is started.

Wiring Examples

Switching the main power supply to a battery or UPS requires magnetic contactors that must be controlled by an external controller. Wiring methods and the sequence used for the magnetic contactors depend on the application. This instruction manual describes the following configurations:

- A single-phase, 230 V UPS is used as backup power supply for a 200 V or 400 V class drive.
- Two separate batteries for the main power and control power supplies. Main power battery voltage is below 250 Vdc for 200 V class drives or 500 Vdc for 400 V class drives.
- Two separate batteries. One is used for the main power supply, a second battery supplies the controller via an optional 24 V Backup Power Supply Unit.
- A single battery with minimum 250 Vdc for 200 V class drives or 500 Vdc for 400 V class drives is used for the main and control power supply.

Select the configuration that matches your application. Follow the corresponding instructions for wiring and drive settings. For configurations not covered in the list above, contact your Yaskawa representative or our sales office directly for consultation.

WARNING! Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Never remove or install option cards or attempt to replace the cooling fan while the drive is switched on. Make sure that the drive and all devices connected to the drive have been shut off prior to performing and type of maintenance or wiring. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components or perform wiring. The internal capacitor remains charged even after the power supply is turned off.

NOTICE: Be sure to thoroughly read the instructions for wiring and magnetic contactor sequence described in this section before setting up the drive for Rescue Operation. Failure to follow these instructions can damage the drive.

NOTICE: Refrain from using Rescue Operation for extend periods of time. Rescue Operation uses a low DC bus voltage, which can cause the cooling fan to shut off temporarily during Rescue Operation. Continuing to operate under these conditions can trigger an overheat fault and damage the drive.

Using a Single-Phase, 230 Vac UPS (Uninterruptable Power Supply)

Follow the instructions when using a single-phase 230 V UPS for Rescue Operation. A 230 V UPS can be used for both 200 V and 400 V class drives.

Wiring

Refer to *Figure 48* for a wiring diagram.

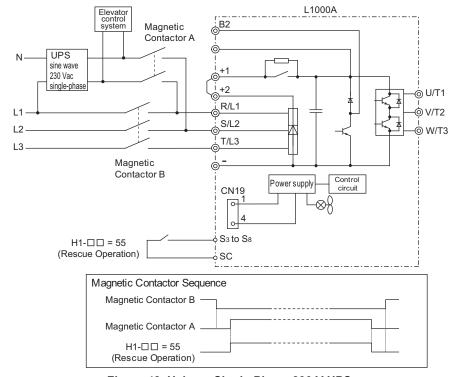


Figure 48 Using a Single-Phase 230 V UPS

4 Start-Up Programming & Operation

Operation Sequence

Starting Rescue Operation

- 1. Open contactor B.
- 2. Set the input terminal programmed for Rescue Operation (H1- \square = 55).
- 3. Close contactor A.
- 4. Set the Up/Down command.

Ending Rescue Operation

- 1. After the car has stopped open contactor A.
- 2. Clear the input terminal set for Rescue Operation (H1- $\square\square$ = 55).
- 3. Close contactor B to return to operation with normal power supply.

Application Precautions

The drive may fault on a control power supply fault (Uv2) if the UPS can't provide enough voltage, or if the Light Load Direction Search is not set properly. If this problem occurs, take the following corrective actions:

Corrective Action:

- Use a separate battery for the controller power supply.
- Use a battery with a voltage higher than 250 Vdc for 200 V class drives or 500 Vdc for 400 V class drives and connect it to the control power supply input (CN19). Alternatively use a 24 Vdc battery and an optional 24 V Backup Power Supply Unit.
- Enable Light Load Direction Search (S4-01 = 1).

Using Separate Batteries for DC Bus and Control Power Supply, DC Bus Battery under 250 Vdc (500 Vdc)

Follow these instructions when using separate batteries for Rescue Operation with the battery for the DC bus having a lower voltage than 250 Vdc for 200 V class drives and 500 Vdc for 400V class drives.

Wiring

Follow the wiring diagram shown in *Figure 49*. When connecting the battery for the control power supply to the L1000A, use the 1.1 m cable packaged with the product. The connector cover must first be removed in order to access connection port CN19 for the battery. Refer to *Connecting the Drive and Battery on page 100* for details.

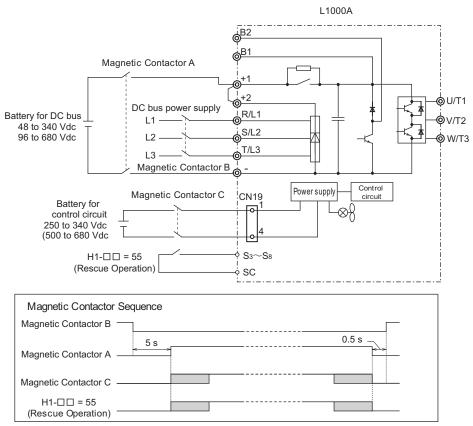


Figure 49 Wiring Two Batteries for DC Bus and Control Power Supply (DC Bus Battery is less than 250 V)

Operation Sequence

Starting Rescue Operation

- 1. Open contactor B and wait at least 5 seconds.
- 2. Set the input terminal programmed for Rescue Operation (H1- $\square\square$ = 55).
- 3. Close contactors A and C.
- 4. Set the Up/Down command.

Ending Rescue Operation

- 1. After the car has stopped, open contactors A and C.
- 2. Clear the input terminal set for Rescue Operation (H1- $\square\square$ = 55).
- 3. Wait at least 0.5 s and then close contactor B to return to operation with normal power supply.

Using a Battery for the DC Bus and 24 V Power Supply Unit Option for the Control Circuit

Follow the instructions when using a 24 V Power Supply Unit option for the control circuit and a battery for the main circuit. The main circuit battery voltage must be higher than 48 Vdc for 200 V class drives and 96 Vdc for 400 V class drives.

Wiring

Yaskawa offers a 24 V Power Supply Option for the control circuit that is useful in applications unable to connect to a backup battery greater than 250 V. Wiring instructions can be found in *Figure 50*. For a more detailed explanation of the 24 V Power Supply Option, refer to the manual provided with the option.

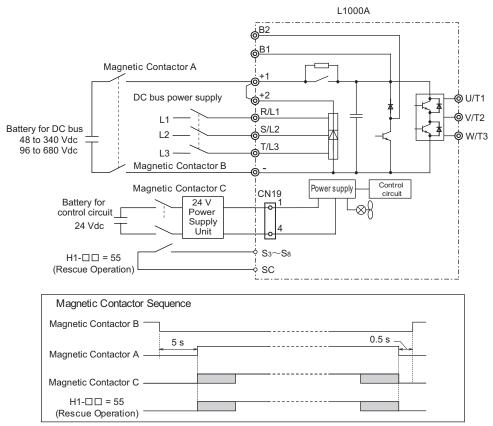


Figure 50 Using a Battery for the DC Bus and 24 V Power Supply Unit Option for the Control Circuit

Operation Sequence

Starting Rescued Operation

- 1. Open contactor B and wait at least 5 seconds.
- 2. Set the input terminal programmed for Rescue Operation (H1- \square = 55).
- 3. Close contactors A and C.
- 4. Set the Up/Down command.

Ending Rescue Operation

- 1. After the car has stopped, open contactors A and C.
- 2. Clear the input terminal set for Rescue Operation (H1- $\square\square$ = 55).
- 3. Wait at least 0.5 s and then close contactor B to return to operation with normal power supply.

Using a Single Battery with Minimum 250 Vdc (500 Vdc)

Follow the instructions when using one battery to supply both, main circuit and controller. The battery voltage must be at least 250 Vdc for 200 V class drives or 500 Vdc for 400 V class drives.

Wiring

Following the wiring diagram show in *Figure 51*.

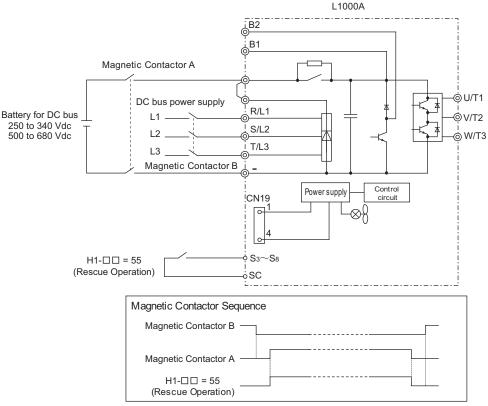


Figure 51 Using a Backup Battery With Minimum 250 Vdc (500 Vdc)

Operation Sequence

Starting Rescue Operation

- 1. Open contactor B.
- 2. Set the input terminal programmed for Rescue Operation (H1- $\Box\Box$ = 55).
- 3. Close contactor A.
- 4. Set the Up/Down command.

Ending Rescue Operation

- 1. After the car has stopped, open contactor A.
- 2. Clear the input terminal set for Rescue Operation (H1- \square = 55).
- 3. Close contactor B to return to operation with normal power supply.

Connecting the Drive and Battery

Use the 1.1 m cable packaged with the drive to connect the battery. Remove the connector covering port CN19 before connecting the cable to CN19.

Information on battery power ratings can be found in *Table 29*.

Note: The connector port location and angle vary by drive model.

DANGER! Switch off the power supply before wiring and connecting the battery cable. Failure to comply will lead to death or serious injury from electric shock.

Battery Connections for CIMR-L□2A0018 to 2A0075, CIMR-L□4A0009 to 4A0039

1. Insert the tip of a screwdriver into the opening on the edge of the CN19 connector cover. Slide the cover off the drive as indicated in *Figure 52*.

NOTICE: A straight-edge screwdriver should be inserted into the opening provided on the connector cover at the proper angle. Attempting to insert the screwdriver blade at a different angle could damage the drive.

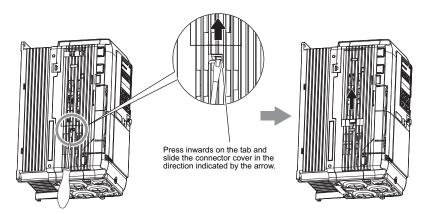


Figure 52 Removing the Connector Cover

2. Connect the cable provided to the CN19 port.

NOTICE: Be sure that the connector fastens at the correct angle to the drive port. The incorrect angle could damage the battery, cable, or connector.

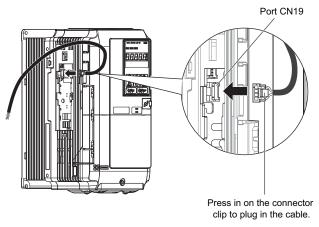


Figure 53 Connecting the Cable

3. Use a pair of diagonal cutters to cut an opening in the connector cover that allows the cable to pass through. The cable should pass through the connector cover with the cover fastened to the drive.

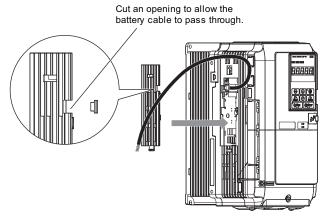


Figure 54 Reattaching the Connector Cover (1)

4. Slide the connector cover back into place as shown in *Figure 55*.

NOTICE: Make sure the cable does not get pinched between the drive and the connector cover, as this could damage the cable.

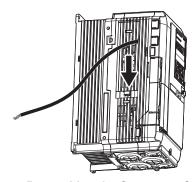


Figure 55 Reattaching the Connector Cover (2)

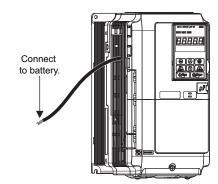


Figure 56 Drive and Battery Connection Complete

Models CIMR-L□2A0085 to 2A0415, CIMR-L□4A0045 to

1. Use a Phillips screwdriver (M4) to loosen the screw holding the CN19 connector cover in place.

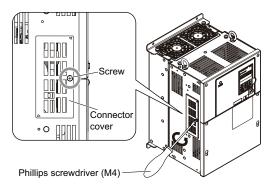


Figure 57 Removing the CN19 Connector Cover

2. Slide the CN19 connector cover from the drive as shown in Figure 58.

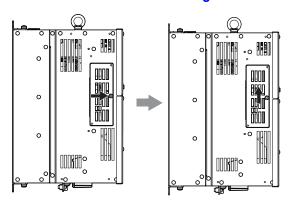


Figure 58 Sliding the CN19 Connector Cover

3. Insert a straight-edge screwdriver into the opening as shown in *Figure 59*, then remove the CN19 connector cover by sliding it as shown in *Figure 59*.

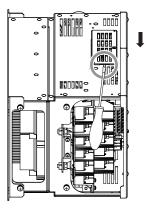


Figure 59 Removing the CN19 Connector Cover

4. Connect the cable to the CN19 connector port on the drive.

Note: The connector port location and angle vary by drive model.

NOTICE: Be sure that the connector fastens at the correct angle to the CN19 connector port. The incorrect angle could damage the battery, cable, or connector.

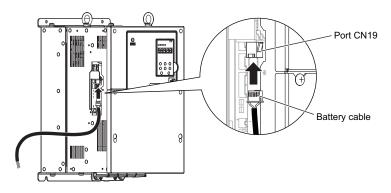


Figure 60 Connecting the Cable

5. The cable should pass through the connector cover with the cover fastened to the drive.

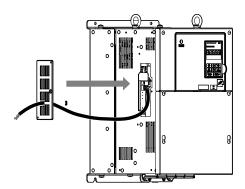


Figure 61 Reattaching the CN19 Connector Cover

6. Slide the CN19 connector cover back into place as shown in *Figure* 62.

NOTICE: Make sure the cable does not get pinched between the drive and the CN19 connector cover, as this could damage the cable.

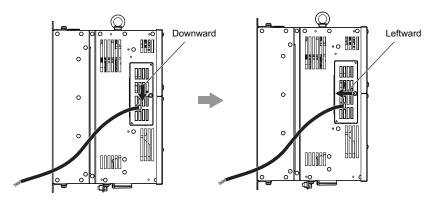


Figure 62 Sliding the CN19 Connector Cover into Place

7. Use a Phillips screwdriver (M4) to fasten the screw that holds the CN19 connector cover in place.

NOTICE: Use the screw provided to fasten the connector cover into place. Using a different screw may damage the internal drive components.

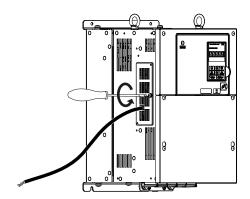


Figure 63 Reattaching the CN19 Connector Cover

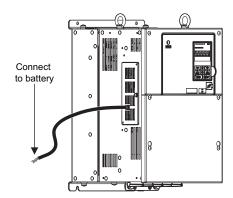


Figure 64 Drive and Battery CN19 Connection Complete

Rescue Operation Torque Limit

The Torque Limit During Rescue Operation is set in parameter S4-05. After Rescue Operation is complete, the drive utilizes to the torque limits set in the L7 parameters.

Light Load Direction Search Function

Light Load Direction Search can be used to automatically perform Rescue Operation in the direction with the lower load. It can help to minimize the amount of power required by the backup power supply required for Rescue Operation. Light Load Direction Search can be set so that it is automatically performed when Rescue Operation is started. To enable Light Load Direction Search set parameter S4-01 = 1.

When Light Load Direction Search is enabled the drive first runs in the up and then in the down direction, each for the time set to S4-03. It then compares the load condition of both operations and travels to the next floor using the lighter load condition direction. The speed reference used for Light Load Direction Search can be set in parameter S4-04.

• When the lightest load direction is up, the drive stops after Light Load Direction Search and then accelerates upwards to the Rescue Operation speed set in parameter d1-25. The output terminals set for "Light Load Direction" (H2- $\Box\Box$ = 54) and "Light Load Direction detection status" (H2- $\Box\Box$ = 55) will close.

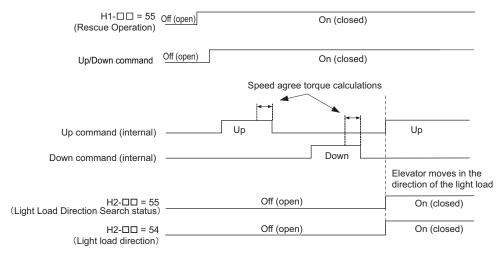


Figure 65 Light Load Direction Detection (Up)

• When the lightest direction is down, then after Light Load Direction Detection is finished the drive immediately accelerates to the Rescue Operation speed set in d1-25 without stopping. An output terminal set for "Light load direction" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction detection status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction detection status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction detection status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction detection status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction detection status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction detection status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction detection status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction detection status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction detection status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction detection status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction status" (H2-DD = 54) will stay open, and an output terminal set for "Light Load Direction status" (H2-DD = 54) will stay open, and an output te $\Box\Box$ = 55) will close.

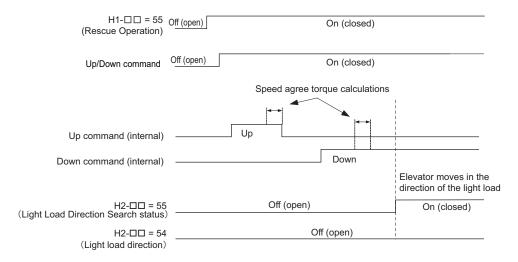


Figure 66 Light Load Direction Detection (Down)

♦ Setup Troubleshooting and Possible Solutions

This section describes troubleshooting problems that do not trip an alarm or fault.

Symptom		Page
Cannot Change Parameter Settings		106
Motor Doog Not Potate Preparly after Pressing PLIN Button	Motor Does Not Rotate	106
Motor Does Not Rotate Properly after Pressing RUN Button or after Entering External Up/Down Command	Motor Rotates in the Opposite Direction from the Up/Down Command	107
Motor Gets Too Hot		107
Drive Does Not Allow Selection of Rotational Auto-Tuning		108
Noise From Drive or Output Lines When the Drive is Powere	d On	108

■ Cannot Change Parameter Settings

Cause	Possible Solutions
The drive is running the motor (i.e., the Up/Down command is present).	 Stop the drive and switch over to the Programming Mode. Most parameters cannot be edited during run.
1 /	Viost parameters cannot be edited during run.
The Access Level is set to restrict access to parameter settings.	• Set the Access Level to allow parameters to be edited (A1-01 = 2).
	Verify the digital operator mode, Drive or Programming mode?
The operator is not in the Parameter Setup Mode.	• Switch to the Programming Mode. Refer to <i>The Drive and Programming Modes on page 51</i> .
	 If the password entered to A1-04 does not match the password saved to A1-05, then drive settings cannot be changed. Reset the password.
The wrong password was entered.	If the password is unknown:
The wrong password was entered.	• Scroll to A1-04. Press STOP and press at the same time. Parameter A1-05 will
	appear.
	• Set a new password to parameter A1-05.
Undervoltage was detected.	 Check the drive main input voltage by looking at the DC bus voltage (U1-07). Check all main circuit wiring.

■ Motor Does Not Rotate Properly after Pressing RUN Button or after Entering External Up/ Down Command

Motor Does Not Rotate

Cause	Possible Solutions
The drive is not in the Drive Mode.	 Check if the DRV on the digital operator is displayed. Enter the Drive Mode. <i>Refer to The Drive and Programming Modes on page 51</i>.
The button is enabled (o2-01=1) and was pushed.	Stop the drive and check if the correct frequency reference source is selected. If the digital
	operator is the source, the LO/RE button LED must be on. If the source is REMOTE, it must be off.
	Take the following steps to solve the problem:
	• Push the Push the button.
	• o2-01 is set to 0 by default, i.e. the LO/RE button is disabled.
Auto-Tuning has just completed.	• When Auto-Tuning completes, the drive is switched back to the Programming Mode. The Up/Down command will not be accepted unless the drive is in the Drive Mode.
	• Use the digital operator to enter the Drive Mode. <i>Refer to The Drive and Programming Modes on page 51</i> .
A Fast Stop was executed and is not reset.	Reset the Fast Stop command.

Cause	Possible Solutions
Settings are incorrect for the source that provides the Up/Down command.	Check parameter b1-02 (Up/Down Command Selection). Set b1-02 so that it corresponds with the correct Up/Down command source. 0: Digital operator 1: Control circuit terminal (default setting) 2: MEMOBUS/Modbus communications 3: Option card
There is faulty wiring in the control circuit terminals.	 Check the wiring for the control terminal. Correct wiring mistakes. Check the input terminal status monitor (U1-10).
The speed reference source setting is incorrect.	Check parameter b1-01 (Speed Reference Selection). Set b1-01 to the correct source of the speed reference. 0: Digital operator 1: Control circuit terminal (default setting) 2: MEMOBUS/Modbus communications 3: Option card
The settings for the analog speed reference are incorrect.	Check the settings (signal level, function, bias, gain) for the analog input that supplies the speed reference.
Selection for the sink/source mode and the internal/ external power supply is incorrect.	Check the position of the jumper and setting for S3. <i>Refer to Control I/O Configuration on page 43</i> .
Speed reference is too low.	 Check the speed reference monitor (U1-01). Increase the speed reference above the minimum output speed (E1-09). Make sure speed references are set properly and the speed selection works properly. If using an analog signal make sure the input signal is present at the time the Up/Down command is issued.
The brake does not release or motor contactor is not closed.	Check the brake and motor contactor sequence.
The Stop button is enabled (o2-02=1) and was pressed when the drive was started from a REMOTE source.	 When the STOP button is pressed, the drive will decelerate to stop. Switch off the Up/Down command and then re-enter a new Up/Down command. o2-02 is set to 0 by default, i.e. the Stop button is disabled.

Motor Rotates in the Opposite Direction from the Up/Down Command

Cause	Possible Solutions
Phase wiring between the drive and motor is	Check the motor wiring. Perform the steps described in <i>Motor Rotation Direction Setup on</i>
incorrect.	page 56 and PG Encoder Setup on page 56.
Drive control circuit terminals for the Up and Down	Check the control circuit wiring.
commands are switched.	Correct any fault wiring.

■ Motor is Too Hot

Cause	Possible Solutions
The load is too heavy.	If the load is too heavy for the motor, the motor will overheat as it exceeds its rated torque value for an extended period of time. Keep in mind that the motor also has a short-term overload rating in addition to the possible solutions provided below: Reduce the load. Lower the acceleration and deceleration ramps. (Increase the acceleration time and deceleration time) Check the values set for the motor protection (L1-01, L1-02) as well as the motor rated current (E2-01).
The air around the motor is too hot.	 Check the ambient temperature. Cool the area until it is within the specified temperature range.
The drive is operating in a vector control mode but Auto-Tuning has not yet been performed.	 Perform Auto-Tuning. Calculate the motor value and reset the motor parameters. Change the motor control method to V/f Control (A1-02 = 0).

4 Start-Up Programming & Operation

Cause	Possible Solutions
Insufficient voltage insulation between motor phases.	When the motor cable is long, high voltage surges occur between the motor coils and drive switching. Normally, surges can reach up to three times the drive input power supply voltage. • Use a motor with a voltage tolerance higher than the max voltage surge. • Install an AC reactor on the output side of the drive. Make sure the output reactor can handle frequencies in the range of the drive carrier frequency.
The motor fan has stopped or is clogged.	Check the motor fan.

■ Drive Does Not Allow Selection the Desired Auto-Tuning Mode

Cause	Possible Solutions
The desired Auto-Tuning mode is not available for	Check if the desired tuning mode is available for the selected control mode
the selected control mode.	• Change the motor control method by setting A1-02.

■ Electrical Noise From Drive or Output Lines When the Drive is Operating

Cause	Possible Solutions
PWM switching in the drive generates excessive noise.	 Lower the carrier frequency (C6-03). Install a noise filter on the input side of drive input power. Install a noise filter on the output side of the drive. Place the wiring inside a metal conduit to shield it from switching noise. Ground the drive and motor properly. Separate the main circuit wiring and the control lines. Make sure wires and the motor have been properly grounded.

5 Troubleshooting

♦ Fault Detection

■ Fault Displays, Causes, and Possible Solutions

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 30 Detailed Fault Displays, Causes, and Possible Solutions

Digital Operator Display		Fault Name
	h a T	Braking Transistor Overload
bol	boL	The braking transistor has reached its overload level.
		Option Communication Error
bUS	bUS	The connection was lost after establishing initial communication.
		Only detected when the Up/Down command speed reference is assigned to an option card.
		MEMOBUS/Modbus Communication Error
CE	CE	Communication data was not received for the amount of time set in parameter, H5-09 Communication Fault Detection Time.
		Control Fault
EF	CF	The torque limit was reached continuously for three seconds or longer while ramping to stop in OLV Control.
[PF]]] or [PF]] <1>	CPF00 or CPF01	Control Circuit Error
	CDE02	A/D Conversion Error
CPF02	CPF02	An A/D conversion error or control circuit error occurred.
50500		Control Board Connection Error
CPF03	CPF03	Connection error between the control board and the drive
	CPF06	EEPROM Memory Data Error
CPF06		An error in the data saved to EEPROM
EPF07	CPF07	
		Terminal Board Connection Error
CPF08	CPF08	
[PF2[] or [PF2 <1>	CPF20 or CPF21	Control Circuit Error
CPF22	CPF22	Hybrid IC Failure
21122		Control Board Connection Error
CPF23	CPF23	Connection error between the control board and the drive
		Drive Unit Signal Fault
CPF24	CPF24	The drive capacity cannot be detected correctly (drive capacity is checked when the drive is powered
		up).
CPF25	CPF25	Terminal Board not Connected
[PF26 to [PF34	CPF26 to CPF34	Control Circuit Error
[[[[[[[[[[[[[[[[[[[C1120 to C1134	CPU error
	CDE25	A/D Conversion Error
CPF35	CPF35	An A/D conversion error or control circuit error occurred.
		Speed Deviation (for Control Mode with Encoder)
dEυ	dEv	The deviation between the speed reference and speed feedback is greater than the setting in F1-10 for longer than the time set to F1-11.
	du 1	Encoder Z Pulse Fault
du l	dv1	The motor turned one full rotation without the Z Pulse being detected.

Digital Opera	tor Display	Fault Name
		Z Pulse Noise Fault Detection
du2	dv2	The Z pulse is out of phase by more than 5 degrees for the number of times specified in parameter F1-17.
		Inversion Detection
du3	dv3	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.
		Inversion Prevention Detection
du¥	dv4	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	Overacceleration Detection
du5	uvo	The acceleration of the elevator car exceeds the overacceleration detection level (S6-10)
du 7	dv7	Rotor Polarity Detection Timeover
00 1		Unable to detect the magnetic poles within the designated time.
	1.0	PM Rotor Position Estimation Error
du8	dv8	An invalid value resulted from Initial Pole Search.
		Note: Reset the fault and try Initial Pole Search again. Option Card External Fault
EF0	EF0	An external fault condition is present.
		^
EF3	EF3	External Fault (input terminal S3) External fault at multi-function input terminal S3.
		*
EF4	EF4	External Fault (input terminal S4) External fault at multi-function input terminal S4.
		^
EF5	EF5	External Fault (input terminal S5) External fault at multi-function input terminal S5.
	EF6	*
EF8		External Fault (input terminal S6) External fault at multi-function input terminal S6.
		External Fault (input terminal S7)
EF7	EF7	External fault at multi-function input terminal S7
		External Fault (input terminal S8)
EF8	EF8	External fault at multi-function input terminal S8
		EEPROM Write Error
Err	Err	Data cannot be written to the EEPROM.
		Speed Reference Missing
FrL	FrL	Parameter d1-18 is set to 3, leveling speed detection is not assigned to a digital input (H1- $\Box\Box \neq 53$) and no speed was selected while an Up or Down command was entered.
		Ground Fault
GF	GF	 A current short to ground exceeded 50% of rated current on the output side of the drive. Setting L8-09 to 1 enables ground fault detection.
		Output Phase Loss
LF	LF	Phase loss on the output side of the drive.
		• Setting L8-07 to 1 or 2 enables Phase Loss Detection.
LF2	LF2	Output Current Imbalance (detected when L8-29 = 1)
		One or more of the phases in the output current is lost.
оΕ	oC	Overcurrent Discourse the state of the stat
		Drive sensors have detected an output current greater than the specified overcurrent level.
oFR00	oFA00	Option Card Connection Error at Option Connector CN5-A
		Option compatibility error
oFRO I	oFA01	Option Card Fault at Option Connector CN5-A
0,		Option not properly connected

Digital Operator Display		Fault Name		
oFAO5, oFAO6	oFA05, oFA06			
oFR 10, oFR 1 1	oFA10, oFA11			
oFR 12 to oFR 17	oFA12 to oFA17	Option card error occurred at option port CN5-A		
oFR30 to oFR43	oFA30 to oFA43			
בווווט ט טבוווט		Option Card Fault at Option Port CN5-B		
oF600	oFb00	Option compatibility error		
C	oFb01	Option Card Fault at Option Port CN5-B		
oFb0 I	0001	Option not properly connected		
oFb02	oFb02	Option Card Fault at Option Port CN5-B Same type of option card already connected		
-6103 6111	oFb03 to oFb11	Same type of option eard aneady connected		
oFb03 to oFb11	oFb12 to oFb17	Option card error occurred at Option Port CN5-B		
oFb 12 to oFb 17	01012 to 01017	Option Card Connection Error at Option Port CN5-C		
oFC00	oFC00	Option cand connection error at Option Port CN3-C		
		Option Card Fault at Option Port CN5-C		
oF[0]	oFC01	Option not properly connected		
		Option Card Fault at Option Port CN5-C		
oFC02	oFC02	A maximum of two PG option boards can be used simultaneously. Remove the PG option board		
		installed into option port CN5-A.		
oFEO3 to oFE !!	oFC03 to oFC11	Option card error occurred at option port CN5-C		
oFE 12 to oFE 17	oFC12 to oFC17	option card circi occurred at option port circ		
oFC50	oFC50	Encoder Option AD Conversion Error		
0, 630		Error with the A/D conversion level (VCC level), or A/D conversion timed out.		
oFE5 1	oFC51	Encoder Option Analog Circuit Error		
0, 25 .		Incorrect signal level (+2.5 V signal)		
oFC52	oFC52	Encoder Communication Timeout		
		Signal encoder timed out waiting to receive data		
oFCS3	oFC53	Encoder Communication Data Error		
		Serial encoder CRC checksum error		
CCCII	oFC54	Encoder Error		
oF[54	01.034	Alarm reading EnDat absolute position data from encoder (OR flag from EnDat error for overvoltage, undervoltage, etc.)		
		Heatsink Overheat		
οН	оН	The temperature of the heatsink exceeded the overheat pre-alarm level set to L8-02. Default value		
		for L8-02 is determined by drive capacity (o2-04).		
	***	Heatsink Overheat		
oX I	oH1	The temperature of the heatsink exceeded the drive overheat level. The overheat level is determined by drive capacity (o2-04).		
		Motor Overload		
ol I	oL1	The electronic motor overload protection tripped.		
		Drive Overload		
oL2	oL2	The thermal sensor of the drive triggered overload protection.		
		Overtorque Detection 1		
oL3	oL3	The current has exceeded the value set for torque detection (L6-02) for longer than the allowable		
		time (L6-03).		
	* 4	Overtorque Detection 2		
oL4	oL4	The current has exceeded the value set for Overtorque Detection 2 (L6-05) for longer than the allowable time (L6-06).		
		anowable time (LU-00).		

Digital Operator Display		Fault Name
	-	External Digital Operator Connection Fault
		The external operator has been disconnected from the drive.
oPr	oPr	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).
o S	oS	Overspeed
		The motor speed feedback exceeded the F1-08 setting.
		DC Bus Overvoltage
Oυ	ov	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
		Input Phase Loss
PF	PF	Drive input power has an open phase or has a large imbalance of voltage between phases. Detected
		when $L8-05 = 1$ (enabled).
PFS	PF5	Rescue Operation Power Supply Deterioration Error
	DC:	Encoder Disconnected (for Control Mode with Encoder)
PGo	PGo	No encoder pulses are received for longer than the time set to F1-14.PGoH
חר יי	PGoH	Encoder Disconnected (detected when using an encoder)
РБоН	гооп	Encoder cable is not connected properly.
	rr	Dynamic Braking Transistor Fault
rr		The built-in dynamic braking transistor failed.
5 <i>E</i>	SC	IGBT Short Circuit
J.L	50	Short Circuit or Ground Fault is detected
5E I	SE1	Motor Contactor Response Error
י סכ י	SLI	Motor contactor does not respond within the time set to S1-10 (Run Command Delay Time).
582	SE2	Starting Current Error
JCC		The output current was lower than 25% of the motor no-load current at start.
5 <i>E 3</i>	SE3	Output Current Error
JEJ	SE3	The output current was lower than 25% of the motor no-load current during operation.
		Brake Feedback Error
5 <i>E</i> 4	SE4	The input terminal set for "Brake feedback" (H1- $\square\square$ = 79) did not respond within the SE4 error
		time set to S6-05 after an output terminal set for "Brake release" (H2- $\square\square$ = 50) closed.
SuE	SvE	Position Lock Error
Position deviation during Position Lock.		Position deviation during Position Lock.
111.3	111.2	Undertorque Detection 1
UL 3	UL3	The current has fallen below the minimum value set for torque detection (L6-02) for longer than the allowable time (L6-03).
		Undertorque Detection 2
UL Y	UL4	The current has fallen below the minimum value set for torque detection (L6-05) for longer than the
0.7	-	allowable time (L6-06).
		DC Bus Undervoltage
		One of the following conditions occurred while the drive was running:
Uo I	Uv1	• 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) Control Power Supply Voltage Fault
<i>Uu2</i>	Uv2	Control Power Supply Voltage Fault Voltage is too low for the control drive input power.
		Soft-Charge Bypass Circuit Fault
Uu 3	Uv3	The soft-charge bypass circuit failed.
		Output Voltage Detection Error
υoF	voF	Problem detected with the voltage on the output side of the drive.
		1 robiem detected with the voltage on the output side of the drive.

♦ Alarm Detection

■ Alarm Codes, Causes, and Possible Solutions

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.

When an alarm has been triggered, the ALM light on the digital operator display blinks and the alarm code display flashes. If a multi-function output is set for an alarm (H2- $\square\square = 10$), that output terminal will be triggered for certain alarms.

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

Table 31 Alarm Codes, Causes, and Possible Solutions

Digital Operator Display		Minor Fault Name
o.c	AEr	Communication Option Node ID Setting Error (CANopen)
AE-	AEI	Option card node address is outside the acceptable setting range.
	bb	Baseblock
66	00	Drive output interrupted as indicated by an external baseblock signal.
1 1	boL	Braking Transistor Overload
boL	OOL	The braking transistor in the drive has been overloaded.
		Option Communication Error
<i>6U5</i>	bUS	 After initial communication was established, the connection was lost.
		Assign a Up/Down command or speed reference to the option card.
EALL	CALL	Serial Communication Stand By
נווננ	GILL	Communication has not yet been established.
C E	CE	MEMOBUS/Modbus Communication Error
LC	0.2	Control data was not received correctly for two seconds.
[r5f	CrST	Cannot Reset
		Speed Deviation (when using a PG option card)
dEυ	dEv	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.
EF	EF	Up/Down Command Error
L1	2.1	Both forward run and reverse run closed simultaneously for over 0.5 s.
EF0	EF0	Option Card External Fault
Cru		An external fault condition is present.
EF3	EF3	External fault (input terminal S3)
Cro	EF3	External fault at multi-function input terminal S3.
EF4	EF4	External fault (input terminal S4)
נרז		External fault at multi-function input terminal S4.
555	EF5	External fault (input terminal S5)
EF5	EFS	External fault at multi-function input terminal S5.
555	EE(External fault (input terminal S6)
EF6	EF6	External fault at multi-function input terminal S6.
	DD5	External fault (input terminal S7)
EF7	EF7	External fault at multi-function input terminal S7.
	550	External fault (input terminal S8)
EF8	EF8	External fault at multi-function input terminal S8.
		Safe Disable Circuit Fault Signal (H1-HC, H2-HC) Release
H55	Hbb	Both Safe Disable Input channels are open.
_		Safe Disable Circuit Fault Signal (H1-HC, H2-HC) Release
H66F	HbbF	One Safe Disable channel is open while the other one is closed.

5 Troubleshooting

Digital Opera	tor Display	Minor Fault Name
uc o	НСА	High Current Alarm
HER	nea	Drive current exceeded overcurrent warning level (150% of the rated current).
		Cooling Fan Maintenance Time
LF-1	LT-1	The cooling fan has reached its expected maintenance period and may need to be replaced.
		Note: An alarm output (H2- \square = 10) will only be triggered if H2- \square = 2F.
	1.50	Capacitor Maintenance Time
LΓ-2	LT-2	The main circuit and control circuit capacitors are nearing the end of their expected performance life.
		Note: An alarm output (H2- $\square\square$ = 10) will only be triggered if H2- $\square\square$ = 2F. Soft Charge Bypass Relay Maintenance Time
LF-3	LT-3	The DC bus soft charge relay is nearing the end of its expected performance life.
		Note: An alarm output (H2- \square = 10) will only be triggered if H2- \square = 2F.
		IGBT Maintenance Time (90%)
L	LT-4	IGBTs have reached 90% of their expected performance life.
		Note: An alarm output (H2- \square = 10) will only be triggered if H2- \square = 2F.
		Heatsink Overheat
οН	οН	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).
		Overtorque Detection 1
oL 3	oL3	Drive output current (or torque in OLV, CLV, CLV/PM) was greater than L6-02 for longer than the time
		set in L6-03.
1.11	oL4	Overtorque Detection 2 Drive output current (or torque in OLV, CLV, CLV/PM) was greater than L6-05 for longer than the time
oL4	OL4	set in L6-06.
		Overspeed (for Control Mode with Encoder)
o S	oS	The motor speed feedback exceeded the F1-08 setting.
		DC Bus Overvoltage
		The DC bus voltage exceeded the trip point.
Ōυ	ov	For 200 V class: approximately 410 V
		For 400 V class: approximately 820 V
PRSS	PASS	MEMOBUS/Modbus Communication Test Mode Complete
o.c	PGo	Encoder Disconnected (for Control Mode with Encoder)
PGo	100	Detected when no encoder signal is received for a time longer than setting in F1-14.
РСоН	PGoH	Encoder Disconnected (detected when using an encoder)
7 0011	1 3011	Encoder cable has become disconnected.
5 <i>E</i>	SE	MEMOBUS/Modbus Self Test Failed
		IGBT Maintenance Time (90%)
r-P[TrPC	IGBTs have reached 90% of their expected performance life.
,,,,	111.0	Note: This alarm will not trigger a multi-function output terminal that is set for alarm output (H2- \square =
		10).
UL 3	UL3	Undertorque Detection 1 Drive output current (or torque in OLV, CLV, CLV/PM) less than L6-02 for longer than L6-03 time.
		Undertorque Detection 2
UL 4	UL4	Drive output current (or torque in OLV, CLV, CLV/PM) less than L6-05 for longer than L6-06 time.
		Undervoltage
		One of the following conditions was true when the drive was stopped and a Up/Down command was
	Uv	entered:
Uo		• DC bus voltage dropped below the level specified in L2-05.
		Contactor to suppress inrush current in the drive was opened. 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.
		Output Voltage Detection Error
uoF	voF	There is a problem with the output voltage.
	1	There is a problem with the output voltage.

♦ Operator Programming Errors

■ oPE Codes, Causes, and Possible Solutions

An Operator Programming Error (oPE) occurs when a contradictory parameter is set or an individual parameter is set to an inappropriate value.

The drive will not operate until the parameter or parameters causing the problem are set correctly. An oPE, however, does not trigger an alarm or fault output. If an oPE occurs, investigate the cause and refer to *Table 32* for the appropriate action. When an oPE appears on the operator display, press the ENTER button to view U1-18 and see which parameter is causing the oPE.

Table 32 oPE Codes, Causes, and Possible Solutions

Digital Oper	ator Display	Error Name
050.	oPE01	Drive Capacity Setting Fault
oPEO I	OPEUI	Drive capacity and the value set to o2-04 do not match.
0503	oPE02	Parameter Range Setting Error
oPEO2	OPEU2	Use U1-18 to find parameters set outside the range.
		Multi-function Digital Input Selection Error
oPE03	oPE03	A contradictory setting is assigned to multi-function contact inputs H1-03 to H1-08.
oPE04	oPE04	Terminal Board Mismatch Error
oPE05	oPE05	Reference Source Selection Error
oPE06	oPE06	Control Mode Selection Error
0, 500	OI LOO	Correct the setting for the control method.
		Multi-function Analog Input Selection Error
oPED7	oPE07	A contradictory setting is assigned to multi-function analog inputs H3-02 and H3-10.
	oPE08	Parameter Selection Error
oPE08		A function has been set that cannot be used in the motor control method selected.
		V/f Pattern Setting Error
		The following setting errors have occurred where:
oPE 10	oPE10	E1-04 is greater than or equal to E1-06, E1-06 is greater than or equal to E1-07, E1-07 is
		greater than or equal to E1-09, or E1-09 is greater than or equal to E1-11.
oPE 15	oPE16	Energy Savings Constants Error
		Parameter Setting Error, Online Tuning Parameter Setting Error
		• The input from load cell with load condition 1 (S3-29) is set to the
oPE 18	oPE18	same value as load condition 2 (S3-30).
		 DWELL 2 related parameters are not set correctly. Parameters that control Online Tuning are not set correctly.
	oPE20	PG-F3 Setting Error
oPE20		The encoder signal frequency is too high.
		Elevator Parameter Setting Fault
oPE2 I	oPE21	Elevator parameters are not set correctly.
		Dievator parameters are not set correctly.

◆ Auto-Tuning Fault Detection

When the Auto-Tuning faults shown below are detected, the fault is displayed on the digital operator and the motor coasts to a stop. Auto-Tuning faults do not trigger a multi-function terminal set for fault or alarm output.

An $End\Box$ error indicates that although Auto-Tuning has successfully completed, there is some discrepancy in the calculations.

If an End \square error occurs, check for the cause of the error using the table below, and perform Auto-Tuning again after fixing the problem. Start the application if no problem can be diagnosed despite the existence of the End \square error.

■ Auto-Tuning Codes, Causes, and Possible Solutions

Table 33 Auto-Tuning Codes, Causes, and Possible Solutions

Digital Oper	rator Display	Error Name
End I	End1	Excessive V/f Setting (detected only during Rotational Auto-Tuning, and displayed after Auto-Tuning is complete)
End2	End2	Motor Iron-Core Saturation Coefficient (detected only during Rotational Auto-Tuning and displayed after Auto-Tuning is complete)
End3	End3	Rated Current Setting Alarm (displayed after Auto-Tuning is complete)
EndY	End4	Adjusted Slip Calculation Error
End5	End5	Resistance Tuning Error
End6	End6	Leakage Inductance Alarm
End7	End7	No-Load Current Alarm
End8	End8	Rescue Operation Speed Warning
End9	End9	Rescue Operation Rotor Pole Position Search Warning
End 10	End10	Rescue Operation Rotor Polarity Detection Warning
Er-01	Er-01	Motor Data Error
Er-02	Er-02	Alarm
Er-03	Er-03	STOP Button Input
Er-04	Er-04	Line-to-Line Resistance Error
Er-05	Er-05	No-Load Current Error
Er-08	Er-08	Rated Slip Error
Er-09	Er-09	Acceleration Error
Er- 10	Er-10	Motor Direction Error
Er-11	Er-11	Motor Speed Fault
Er - 12	Er-12	Current Detection Error
Er - 13	Er-13	Leakage Inductance Error
Er- 18	Er-18	Induction Voltage Error
Er- 19	Er-19	Inductance Error
Er-20	Er-20	Stator Resistance Error
Er-21	Er-21	Z Pulse Correction Error
Er-22	Er-22	Initial Rotor Pole Search Error
Er-23	Er-23	Non-rotating Encoder Offset Tuning Warning

◆ Copy Function Related Displays

■ Tasks, Errors, and Troubleshooting

The table below lists the messages and errors that may appear when using the Copy function.

When executing the tasks offered by the Copy function, the operator will indicate the task being performed. When an error occurs, a code appears on the operator to indicate the error. Note that errors related to the Copy function do not trigger a multi-function output terminal that has been set up to close when a fault or alarm occurs. To clear an error, simply press any key on the operator and the error display will disappear.

Table 34 lists the corrective action that can be taken when an error occurs.

- **Note: 1.** Whenever using the copy function, the drive should be fully stopped.
 - 2. The drive will not accept an Up/Down command while the Copy function is being executed.
 - 3. Parameters can only be saved to a drive when the voltage class, capacity, control mode, and software version match.

Table 34 Copy Function Task and Error Displays

Digital Operator Display		Task	
CoPY	СоРу	Writing Parameter Settings (flashing)	
[PEr	CPEr	Control Mode Mismatch	
CP46	СРуЕ	Error Writing Data	
£58r	CSEr	Copy Unit Error	
dFP5	dFPS	Drive Model Mismatch	
828	ECE	Copy Error	
EC5	ECS	Checksum Error	
E d E	EdE	Write Impossible	
£ ,F	EiF	Write Data Error	
End	End	Task Complete	
696	EPE	ID Mismatch	
ErE	ErE	Data Error	
٤٠٤	EvE	Verify Error	
1.F.E.r	iFEr	Communication Error	
ndAl	ndAT	Model, Voltage Class, Capacity Mismatch	
rdEr	rdEr	Error Reading Data	
r EAd	rEAd	Reading Parameter Settings (flashing)	
u8Er	vAEr	Voltage Class, Capacity Mismatch	
uF YE	vFyE	Parameter settings in the drive and those saved to the copy function are not the same	
ur FY	vrFy	Comparing Parameter Settings (flashing)	

■ 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	Press on the digital operator when error code is displayed.	-MODE - DRV OC Overcurent PVD DESET
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).	Fault Reset Switch S4 Fault Reset Digital Input
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.		② ON THE

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.

6 Periodic Inspection & Maintenance

Inspection

Power electronics have limited life and may exhibit changes in characteristics or performance deterioration after years of use under normal conditions. To help avoid such problems, it is important to perform preventive maintenance and periodic inspection on the drive.

Drives contain a variety of power electronics such as power transistors, semiconductors, capacitors, resistors, fans, and relays. The electronics in the drive serve a critical role in maintaining proper motor control.

Follow the inspection lists provided in this chapter as a part of a regular maintenance program.

Note: The drive will require more frequent inspection if it is placed in harsh environments, such as:

- High ambient temperatures
- · Frequent starting and stopping
- Fluctuations in the AC supply or load
- · Excessive vibrations or shock loading
- Dust, metal dust, salt, sulfuric acid, chlorine atmospheres
- Poor storage conditions.

Perform the first equipment inspection one to two years after installation.

Recommended Daily Inspection

Table 35 outlines the recommended daily inspection for Yaskawa drives. Check the following items on a daily basis to avoid premature deterioration in performance or product failure. Copy this checklist and mark the "Checked" column after each inspection.

Table 35 General Recommended Daily Inspection Checklist

Inspection Category	Inspection Points	Corrective Action	Checked
Motor	Inspect for abnormal oscillation or noise coming from the motor.	 Check the load coupling. Measure motor vibration. Tighten all loose components.	
Cooling	Inspect for abnormal heat generated from the drive or motor and visible discoloration.	Check for excessive load. Excessive load. Loose connections. Dirty heatsink or motor. Ambient temperature.	
	Inspect drive cooling fan and circulation fan operation.	Check for the following: Clogged or dirty fan. Correct fan operation parameter setting.	
Environment	Verify the drive environment complies with the specifications listed in <i>Installation Environment on page 17</i> .	Eliminate the source of contaminants or correct poor environment.	
Load	The drive output current should not be higher than the motor or drive rating for an extended period of time.	Check for the following: • Excessive load. • Correct motor parameter settings.	
Power Supply Voltage	Check main power supply and control voltages.	 Correct the voltage or power supply to within nameplate specifications. Verify all main circuit phases. 	

■ Recommended Periodic Inspection

Table 36 outlines the recommended periodic inspections for Yaskawa drive installations. Although periodic inspections should generally be performed once a year, the drive may require more frequent inspection in harsh environments or with rigorous use. Operating and environmental conditions, along with experience in each application, will determine the actual inspection frequency for each installation. Periodic inspection will help to avoid premature deterioration in performance or product failure. Copy this checklist and mark the "Checked" column after each inspection.

Periodic Inspection

WARNING! Electrical Shock Hazard. Do not inspect, connect, or disconnect any wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing the drive, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components.

Table 36 Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action	Checked			
Main Circuit Periodic Inspection						
	Inspect equipment for discoloration from overheating or deterioration. Inspect for damaged or deformed parts.	Replace damaged components as required. The drive has few serviceable parts and may require complete drive replacement.				
General	Inspect for dirt, foreign particles, or dust collection on components.	 Inspect enclosure door seal if used. Use dry air to clear away foreign matter. Use a pressure of 39.2 × 10⁴ to 58.8 × 10⁴ Pa (4 to 6 kg·cm² / 57 to 85 psi). Replace components if cleaning is not possible. 				
Conductors and Wiring	 Inspect wiring and connections for discoloration, damage, or heat stress. Inspect wire insulation and shielding for wear. 	Repair or replace damaged wiring.				
Terminals	Inspect terminals for stripped, damaged, or loose connections.	Tighten loose screws and replace damaged screws or terminals.				
Relays and Contactors	 Inspect contactors and relays for excessive noise during operation. Inspect coils for signs of overheating such as melted or cracked insulation. 	 Check coil voltage for overvoltage or undervoltage conditions. Replace damaged removable relays contactors or circuit board. 				
Braking Resistors	Inspect for discoloration of heat stress on or around resistors.	Minor discoloration may be acceptable. Check for loose connections if discoloration exists.				
Electrolytic Capacitor	 Inspect for leaking, discoloration, or cracks. Check if the cap has come off, for any swelling, or if the sides have burst open. 	The drive has few serviceable parts and may require complete drive replacement.				
Diode, IGBT (Power Transistor)	Inspect for dust or other foreign material collected on the surface.	Use dry air to clear away foreign matter. Use a pressure of 39.2×10^4 to 58.8×10^4 Pa (4 to 6 kg·cm ² / 57 to 85 psi).				
	Motor Periodic In	spection				
Operation Check	Check for increased vibration or abnormal noise.	Stop the motor and contact qualified maintenance personnel as required.				
	Control Circuit Period	lic Inspection				
General	 Inspect terminals for stripped, damaged, or loose connections. Make sure all terminals have been properly tightened. 	 Tighten loose screws and replace damaged screws or terminals. If terminals are integral to a circuit board, then board or drive replacement may be required. 				

Inspection Area	Inspection Points	Corrective Action	Checked			
Circuit Boards	Check for any odor, discoloration, and rust. Make sure connections are properly fastened and that no dust or oil mist has accumulated on the surface of the board.	 Fix any loose connections. If an antistatic cloth or vacuum plunger cannot be used, replace the board. Do not use any solvents to clean the board. Use dry air to clear away foreign matter. Use a pressure of 39.2 × 10⁴ to 58.8 × 10⁴ Pa (4 to 6 kg·cm² / 57 to 85 psi). The drive has few serviceable parts and may require complete drive replacement. 				
Cooling System Periodic Inspection						
Cooling Fan, Circulation Fan, Control Board Cooling Fan	 Check for abnormal oscillation or unusual noise. Check for damaged or missing fan blades. 	Clean or replace the fan.				
Heatsink	Inspect for dust or other foreign material collected on the surface.	Use dry air to clear away foreign matter. Use a pressure of 39.2×10^4 to 58.8×10^4 Pa (4 to 6 kg·cm ² / 57 to 85 psi).				
Air Duct	Inspect air intake and exhaust openings. They must be free from obstruction and properly installed.	 Visually inspect the area. Clear obstructions and clean air duct as required. 				
	Display Periodic Inspection					
Digital Operator	 Make sure data appears on the operator properly. Inspect for dust or other foreign material that may have collected on surrounding components. 	 Contact a Yaskawa representative if there is any trouble with the display or keypad. Clean the digital operator. 				

♦ Periodic Maintenance

The drive has Maintenance Monitors that keep track of component wear. This feature provides advance maintenance warning and eliminates the need to shut down the entire system for unexpected problems. The drive allows the user to check predicted maintenance periods for the components listed below.

- Cooling Fan, Circulation Fan, Control Board Cooling Fan
- Electrolytic Capacitors
- Inrush Prevention Circuit
- IGBTs

For replacement parts, contact the distributor where the drive was purchased or contact Yaskawa directly.

■ Replacement Parts

Table 37 contains the estimated performance life of components that require replacement during the life of the drive. Only use Yaskawa replacement parts for the appropriate drive model and revision.

Table 37 Estimated Performance Life

Component	Estimated Performance Life
Cooling Fan, Circulation Fan	10 years
Electrolytic Capacitors	10 years < <i>t</i> >

<1> The drive has few serviceable parts and may require complete drive replacement.

NOTICE: Estimated performance life based on specific usage conditions. These conditions are provided for the purpose of replacing parts to maintain performance. Some parts may require more frequent replacement due to poor environments or rigorous use. Usage conditions for estimated performance life:

Ambient temperature: Yearly average of 40 °C (IP00 enclosure)

Load factor: 80% maximum Operation time: 24 hours a day

Performance Life Monitors Maintenance Monitors

The drive calculates the maintenance period for components that may require replacement during the life of the drive. A percentage of the maintenance period is displayed on the digital operator by viewing the appropriate monitor parameter.

When the maintenance period reaches 100%, there is increased risk that the drive may malfunction. Yaskawa recommends checking the maintenance period regularly to ensure maximum performance life.

Refer to Recommended Periodic Inspection on page 120 for more details.

Table 38 Performance Life Monitors Used for Component Replacement

Parameter	Component	Contents
U4-03	Cooling Fan, Circulation Fan, Displays the accumulated operation time of the fan, from 0 to 99999 hours. This valuation automatically reset to 0 once it reaches 99999.	
U4-04	Control Board Cooling Fan	Displays the accumulated fan operation time as a percentage of the specified maintenance period.
U4-05	DC Bus Capacitors	Displays the accumulated time the capacitors are used as a percentage of the specified maintenance period.
U4-06	Inrush (pre-charge) Relay	Displays the number of times the drive is powered up as a percentage of the performance life of the inrush circuit.
U4-07	IGBT	Displays the percentage of the maintenance period reached by the IGBTs.

Alarm Outputs for Maintenance Monitors

An output can be set up to inform the user when a specific components has neared its expected performance life.

When one of multi-function digital output terminals has been assigned the maintenance monitor function ($H2-\Box\Box=2F$), the terminal will close when the cooling fan, DC bus capacitors, or DC bus pre-charge relay reach 90% of the expected performance life, or when the IGBTs have reached 50% of their expected performance life. Additionally the digital operator will display an alarm like shown in *Table 39* to indicate the specific components that may need maintenance.

Table 39 Maintenance Alarms

Alarm I	Display	Function	Corrective Action
LED Operator	LCD Operator	runction	Corrective Action
1 1 1 1 2		The cooling fans have reached 90% of their designated lifetime.	Replace the cooling fan.
[[-5<1>	LT-2	The DC bus capacitors have reached 90% of their designated lifetime.	Replace the drive.
[[-]<1>	The DC bus charge circuit has reached 90% of its designated lifetime. Replace the drive.		Replace the drive.
[[-4<]>	LT-4	The IGBTs have reached 50% of their designated lifetime.	Check the load, carrier frequency, and output frequency.
[rP[<>>	TrPC	The IGBTs have reached 90% of their designated lifetime.	Replace the drive.

<1> This alarm message will be output only if the Maintenance Monitor function is assigned to one of the digital outputs (H2- $\Box\Box$ = 2F). The alarm will also trigger a digital output that is programmed for alarm indication (H2- $\Box\Box$ = 10).

Related Drive Parameters

Use parameters o4-03, o4-05, o4-07, and o4-09 to reset a Maintenance Monitor to zero after replacing a specific component. *Refer to Parameter Table on page 140* for details on parameter settings.

NOTICE: If these parameters are not reset after the corresponding parts have been replaced, the Maintenance Monitor function will continue to count down the performance life from the value that was reached with the old part. If the Maintenance Monitor is not reset, the drive will not have the correct value of the performance life for the new component.

<2> This alarm message will always be output, even if the Maintenance Monitor function is not assigned to any of the digital outputs (H2- $\square\square$ = 2F). The alarm will also trigger a digital output that is programmed for alarm indication (H2- $\square\square$ = 10).

Drive Replacement

■ Serviceable Parts

The drive contains some serviceable parts. The following parts can be replaced over the life span of the drive:

- Terminal board I/O PCBs
- Cooling fan(s)

Front cover

Replace the drive if the main power circuitry is damaged. Contact your local Yaskawa representative before replacing parts if the drive is still under warranty. Yaskawa reserves the right to replace or repair the drive according to Yaskawa warranty policy.

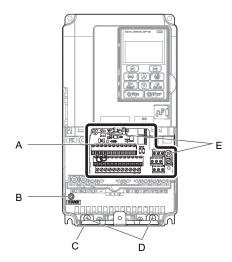
■ Terminal Board

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.

NOTICE: Correctly set parameter o2-04 when replacing the control terminal board. Failure to comply may result in drive damage due to lack of protective functions and poor drive performance.

The drive has a modular I/O terminal block that facilitates quick drive replacement. The terminal board contains on-board memory that stores all drive parameter settings and allows the parameters to be saved and transferred to the replacement drive. To transfer the terminal board, disconnect the terminal board from the damaged drive then reconnect it to the replacement drive. Once transferred, there is no need to manually reprogram the replacement drive.

Note: If the damaged drive and the new replacement drive are have different capacities, the data stored in the control terminal board cannot be transferred to the new drive and an oPE01 error will appear on the display. The control terminal board can still be used, but parameter setting from the old drive cannot be transferred. The replacement drive must be initialized and manually programmed.



A - Removable terminal board

D - Bottom cover screws

B - Charge LED

E - Control terminal board locking screws

C - Bottom cover

Figure 67 Terminal Board

■ Replacing the Drive

WARNING! Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing the drive, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components.

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

NOTICE: Damage to Equipment. 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.

The following procedure explains how to replace a drive. This section provides instructions for drive replacement only. To install option cards or other types of options, refer to the specific manuals for those options.

NOTICE: When transferring a braking transistor, braking resistor, or other type of option from a damaged drive to a new replacement drive, make sure they are working properly before reconnecting them to the new drive. Replace broken options to prevent immediate break down of the replacement drive.

1. Remove the terminal cover. Refer to *Terminal Cover on page 25* for details.

Note: The shape of the terminal covers and the numbers of the screws differ depending on the drive models.

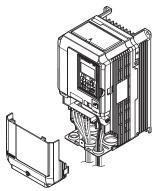


Figure 68 Drive Replacement: Removing the Terminal Cover

Loosen the screws holding the terminal board in place. Remove the screw securing the bottom cover and remove the bottom cover from the drive.

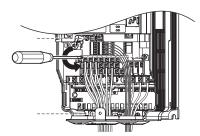


Figure 69 Drive Replacement: Removing the Control Terminal Board

3. Slide the terminal board as illustrated by the arrows to remove it from the drive along with the bottom cover.

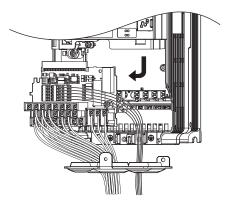


Figure 70 Drive Replacement: Remove the Control Terminal Board

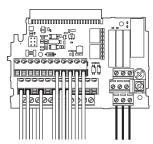


Figure 71 Drive Replacement: Removable Control Terminal Board Disconnected from the Drive

- **4.** Disconnect all option cards and options. Make sure they are intact before reusing them.
- 5. Replace the drive and wire the main circuit.

Installing the Drive

1. After wiring the main circuit, connect the terminal block to the drive as shown in *Figure 72*. Use the installation screw to fasten the terminal block into place.

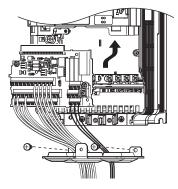


Figure 72 Drive Replacement: Installing the Control Terminal Board

- 2. Reconnect all options to the new drive in the same way they were installed in the old drive. Connect option boards to the same option ports in the new drive that were used in the old drive.
- 3. Put the terminal cover back into its original place.
- **4.** After powering on the drive, all parameter settings are transferred from the terminal board to the drive memory. If an oPE04 error occurs, load the parameter settings saved on the terminal board to the new drive by setting parameter A1-03 to 5550. Reset the Maintenance Monitor function timers by setting parameters o4-01 through o4-12 to 0, and parameter o4-13 to 1.

7 Option Card Installation

Option Card Installation

This section provides instructions on installing the option cards listed in *Table 40*.

Prior to Installing the Option

Prior to installing the option, wire the drive, make the necessary connections to the drive terminals, and verify that the drive functions normally. Refer to the *Table 40* for information on wiring and connecting the drive.

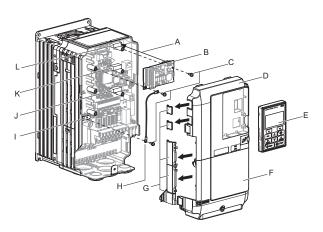
Table 40 below lists the number of option cards that can be connected to the drive and the drive connectors for connecting those option cards.

	Table 40	Option	Card	Installation
--	----------	--------	------	--------------

Option Card	Connector	Number of Cards Possible
SI-S3, DI-A3 <1>	CN5-A	1
PG-B3, PG-X3	CN5-B, C	2 <2>
DO-A3, AO-A3	CN5-A, B, C	1
PG-F3, PG-E3	CN5-C	1

<1> If installed to CN5-B or CN5-C, DI-A3 cannot be used to set the frequency reference, but the input status can still be viewed using U1-17 (for DI-A3).

Figure 73 shows an exploded view of the drive with the option and related components for reference.



A - Insertion point for CN5

B - Option card

C - Included screws

D - Front cover

E - Digital operator

F – Terminal cover

G - Removable tabs for wire routing

H - Ground wire

I - Drive grounding terminal (FE)

J - Connector CN5-A

K - Connector CN5-B

L - Connector CN5-C

Figure 73 Installing an Option Card

<2> If only one PG option card is connected to the drive, use the CN5-C connector. If two PG option cards are connected, use both CN5-B and CN5-C.

■ Installing the Option

Refer to the instructions below to install the option.

DANGER! Electrical Shock Hazard. Disconnect all power to the drive and wait at least the amount of time specified on the drive front cover safety label. After all indicators are off, measure the DC bus voltage to confirm safe level, and check for unsafe voltages before servicing to prevent electric shock. The internal capacitor remains charged even after the power supply is turned off.

WARNING! Electrical Shock Hazard. Do not allow unqualified personnel to perform work on the drive. 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 and Option Cards.

NOTICE: Damage to Equipment. Observe proper electrostatic discharge procedures (ESD) when handling the option, drive, and circuit boards. Failure to comply may result in ESD damage to circuitry.

NOTICE: Damage to Equipment. Tighten all terminal screws to the specified tightening torque. Failure to comply may cause the application to operate incorrectly or damage the drive.

1. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the digital operator (E) and front covers (D, F). Refer to *Digital Operator and Front Cover on page 27*.

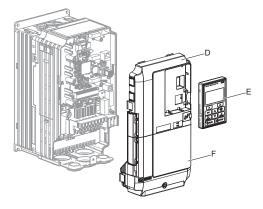


Figure 74 Remove the Front Covers and Digital Operator

2. Insert the option card (B) into the CN5-A (J), CN5-B (K) or CN5-C (L) connectors located on the drive and fasten it into place using one of the included screws (C).

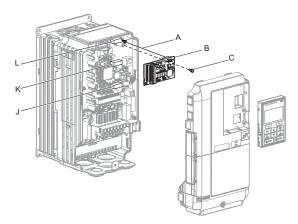


Figure 75 Insert the Option Card

3. Connect one end of the ground wire (H) to the ground terminal (I) using one of the remaining screws (C). Connect the other end of the ground wire (H) to the remaining ground terminal and installation hole on the option (B) using the last remaining provided screw (C).

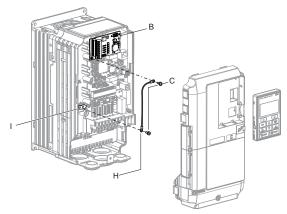


Figure 76 Connect the Ground Wire

- **Note:** 1. The option package includes two ground wires. Use the longer wire when plugging the option into connector CN5-C on the drive side. Use the shorter wire when plugging the option into connector CN5-B. Refer to the option card instruction manual for more information.
 - 2. There are two screw holes on the drive for use as ground terminals (I). When connecting three options, two ground wires will need to share the same drive ground terminal.
- **4.** Prepare and connect the wire ends as shown in *Figure 77* and *Figure 78*. *Refer to Wire Gauges, Tightening Torque, and Crimp Terminals on page 134* to confirm that the proper tightening torque is applied to each terminal. Take particular precaution to ensure that each wire is properly connected and wire insulation is not accidentally pinched into electrical terminals.

WARNING! Fire Hazard. Tighten all terminal screws according to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating electrical connections. Tightening screws beyond the specified tightening torque may result in erroneous operation, damage to the terminal block, or cause a fire.

NOTICE: Heat shrink tubing or electrical tape may be required to ensure that cable shielding does not contact other wiring. Insufficient insulation may cause a short circuit and damage the option or drive.

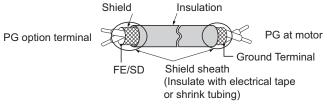


Figure 77 Preparing Ends of Shielded Cable

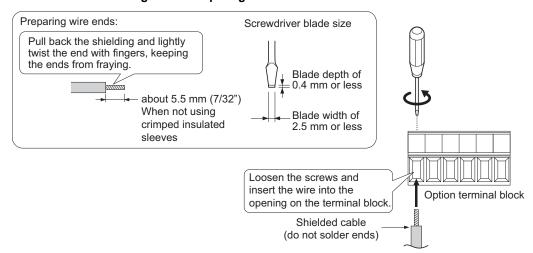
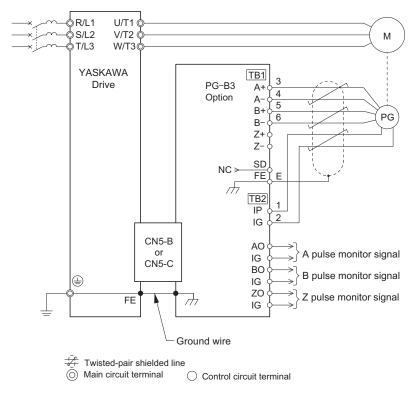


Figure 78 Preparing and Connecting Cable Wiring

5. For the PG-B3 and PG-X3 Option, wire the motor PG encoder to the terminal block. Refer to Figure 79 and Figure 80 for wiring instructions.
Refer to Terminal Functions of PG-B3 and PG-X3 Option on page 135 for a detailed description of the option terminal functions.

Connection Diagram of PG-B3

Refer to *Table 47* for a detailed description of the option board terminal functions.

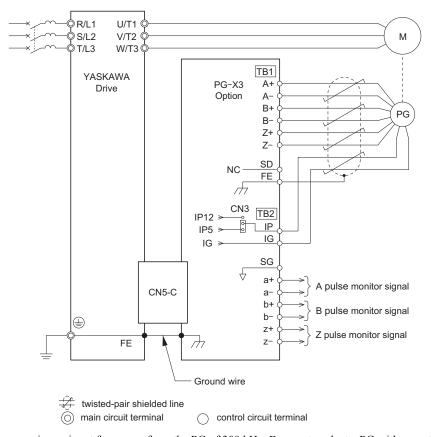


<1> The PG-B3 Option reads a maximum input frequency from the PG encoder of 50 kHz. Be sure to select an PG encoder with an output of maximum 50 kHz when operating at maximum speed.

Figure 79 PG-B3 Option and Encoder Connection Diagram

Connection Diagram of PG-X3

Refer to *Table 48* for a detailed description of the option board terminal functions.



<1> The PG-X3 Option reads a maximum input frequency from the PG of 300 kHz. Be sure to select a PG with an output of maximum 300 kHz when operating at maximum speed.

Figure 80 PG-X3 Option and PG Encoder Connection Diagram

PG Encoder Cables for PG-B3 Option

Yaskawa recommends using a LMA- $\square\square$ B-S185Y (complementary output) for cables running between the PG-B3 Option and the PG as show in *Figure 81*.

For instructions on wiring the terminal block, refer to *Table 47*.

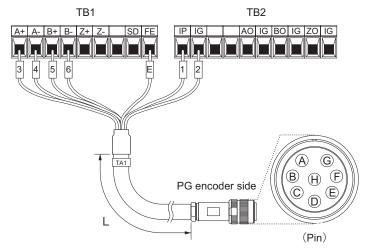


Figure 81 Wiring PG Encoder Cable

Table 41 Connecting the PG Encoder Cable Specification

Option Terminal	PG Encoder Cable				
Option Terminal	Wire	Color	Pin		
IP	1	Blue	C		
IG	2	White	Н		
A+	3	Yellow	В		
A-	4	White	G		
B+	5	Green	A		
В–	6	White	F		
FE	Е	N/A (shield)	D		

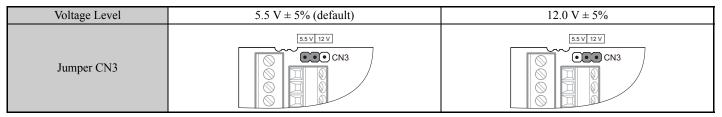
Table 42 PG Encoder Cable Types

Length	Type	Length	Type
10 m (32 ft.)	W5010	50 m (164 ft.)	W5050
30 m (98 ft.)	W5030	100 m (328 ft.)	W5100

6. For the PG-X3 Option, set the voltage for the PG encoder power supply using jumper CN3 located on the option. Position the jumper as shown in *Table 43* to select the voltage level.

NOTICE: The positioning of jumper CN3 selects the PG encoder power supply voltage (5.5 V or 12 V). Select the voltage level for the PG encoder connected to the option and motor. If the wrong voltage is selected, the PG encoder may not operate properly or may become damaged as a result.

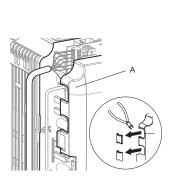
Table 43 Setting the PG Encoder Power Supply Voltage (IP) with Jumper CN3

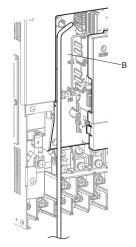


7. Route the option wiring.

Depending on the drive model, some drives may require routing the wiring through the side of the front cover to the outside. For drive models CIMR-L□2A0018 through 2A0033 and 4A0009 through 4A0018, cut out the perforated openings on the left side of the drive front cover as shown in *Figure 82*-A and leave no sharp edges to damage wiring.

Route the wiring inside the enclosure as shown in *Figure 82*-B for drive models CIMR-L□2A0047 through 2A0415 and 4A0024 through 4A0260 that do not require routing through the front cover.





A - Route wires through the openings provided on the left side of the front cover.
(CIMR-L□2A0018 to 2A0033, 4A0009 to 4A0018)

B – Use the open space provided inside the drive to route option wiring.

(CIMR-L□2A0047 to 2A0415, 4A0024 to 4A0260)

<1> The drive will not meet NEMA Type 1 requirements if wiring is exposed outside the enclosure.

Figure 82 Wire Routing Examples

8. Replace and secure the front covers of the drive (D, F) and replace the digital operator (E).

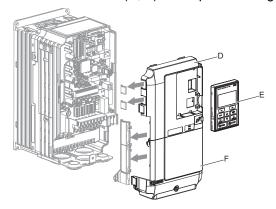


Figure 83 Replace the Front Covers and Digital Operator

Note: Take proper precautions when wiring the option so that the front covers will easily fit back onto the drive. Make sure cables are not pinched between the front covers and the drive when replacing the covers.

9. For the PG-B3 and PG-X3 Option, set drive parameters A1: Initialization Parameters on page 140 and F1: PG Speed Control Card on page 152 for proper motor rotation.

With a two-pulse or three-pulse PG encoder, the leading pulse determines the motor rotation direction. A PG encoder signal with leading A pulse is considered to be rotating forward (counter-clockwise when viewing rotation from motor load side).

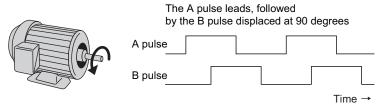


Figure 84 Displacement of A and B Pulses

10. After connecting the PG encoder outputs to the option, apply power to the drive and manually rotate the motor and check the rotation direction by viewing monitor U1-05 on the digital operator.

Reverse motor rotation is indicated by a negative value for U1-05; forward motor rotation is indicated by a positive value.

If monitor U1-05 indicates that the forward direction is opposite of what is intended, set F1-05 to 1, or reverse the two A pulse wires with the two B pulse wires on option terminal TB1 as shown in *Figure 85*.

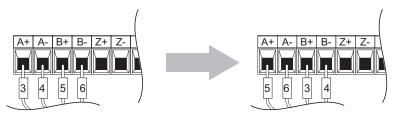


Figure 85 A Channel and B Channel Wire Switching

- **11.** If switching the wires is inconvenient, set drive parameter F1-05 to 1 to switch the direction of how the option reads pulses from the PG encoder output.
 - Please note that when the drive is initialized using A1-03 =1110, 2220, 3330, the value for F1-05 will reset to factory default and the parameter will need to be adjusted again to switch the direction.

■ Wire Gauges, Tightening Torque, and Crimp Terminals

Wire Gauges and Tightening Torques of PG-B3 and PG-X3 Option

Wire gauge and torque specifications are listed in *Table 44* and *Table 45*.

Table 44 Wire Gauges and Tightening Torques of PG-B3 Option

		Tightening Bare Cable		able	Crimp Terminals		
Terminal Signal	Screw Size	Torque N·m (in·lb)	Applicable Gauges mm ²	Recomm. Gauge mm ²	Applicable Gauges mm ²	Recomm. Gauge mm ²	Wire Type
A+, A-, B+, B-, Z+, Z-, FE, IP, IG	M2	0.22 to 0.25	Stranded wire: 0.25 to 1.0 (24 to 17 AWG)	0.75	0.25 to 0.5	0.5	Shielded twisted pair, etc.
AO, IG, BO, IG, ZO, IG	1712	(1.95 to 2.21)	Solid wire: 0.25 to 1.5 (24 to 16 AWG)	(18 AWG)	(24 to 20 AWG)	(20 AWG)	Shielded cable, etc.

Table 45 Wire Gauges and Tightening Torques of PG-X3 Option

		Tightening	Bare Cable		Crimp Terminals		
Terminal Signal	Screw Size	Torque N·m (in·lb)	Applicable Gauges mm ²	Recomm. Gauge mm ²	Applicable Gauges mm ²	Recomm. Gauge mm ²	Wire Type
A+, A-, B+, B-, Z+, Z-, SD, FE, IP, IG	M2	0.22 to 0.25	Stranded wire: 0.25 to 1.0 (24 to 17 AWG)	0.75	0.25 to 0.5	0.5	Shielded twisted pair, etc.
a+, a-, b+, b-, z+, z-, SG	1412	(1.95 to 2.21)	Solid wire: 0.25 to 1.5 (24 to 16 AWG)	(18 AWG)	(24 to 20 AWG)	(20 AWG)	Shielded cable, etc.

Crimp Terminals

Yaskawa recommends using CRIMPFOX 6 by Phoenix Contact or equivalent crimp terminals with the specifications listed in *Table 46* for wiring to ensure proper connections.

Note: Properly trim wire ends so loose wire ends do not extend from the crimp terminals.

Table 46 Crimp Terminal Sizes

	Wire Gauge mm ²	Phoenix Contact Model	L mm (in)	d1 mm (in)	d2 mm (in)
1 1	0.25 (24 AWG)	AI 0.25 - 6YE	10.5 (13/32)	0.8 (1/32)	2 (5/64)
d1 6 mm d2	0.34 (22 AWG)	AI 0.34 - 6TQ	10.5 (13/32)	0.8 (1/32)	2 (5/64)
d1 0 mm d2	0.5 (20 AWG)	AI 0.5 - 6WH	14 (9/16)	1.1 (3/64)	2.5 (3/32)

■ Terminal Functions of PG-B3 and PG-X3 Option

Table 47 PG-B3 Option Terminal Functions

Terminal Block	Terminal	Function	Description
	A+	A+ pulse signal input	D. I. C. A. DO
	A-	A– pulse signal input	• Pulse signal inputs from the PG.
	B+	B+ pulse signal input	Signal inputs from complementary and open-collector outputs Signal level
TB1	В–	B– pulse signal input	H level: 8 to 12 V
1101	Z+	Z+ pulse signal input	L level: 2.0 V or less
	Z–	Z– pulse signal input	2.0701. 2.0 7 01 1000
	SD	NC pin (open)	For use when cables shields should not be grounded
	FE	Ground	Used for grounding shielded lines
	IP	PG power supply	• Output voltage: 12.0 V ± 5%
	IG	PG power supply common	• Max output current: 200 mA
	AO	A pulse monitor signal	• Outputs the monitor signal for the A, B, and Z pulses from the PG
TB2	ВО	B pulse monitor signal	speed control card
	ZO	Z pulse monitor signal	For open collector outputs from the option
	IG	Monitor signal common	Max voltage: 24 V Max current: 30 mA

<1> A separate UL-listed class 2 power supply is necessary when the PG requires more than 200 mA to operate.

Table 48 PG-X3 Option Terminal Functions

Terminal Block	Terminal	Function	Description		
	A+	A+ pulse signal input			
	A-	A– pulse signal input	Lumber for the Ashermal Dehamal and Zandara from the DC		
	B+	B+ pulse signal input	• Inputs for the A channel, B channel, and Z pulses from the PG encoder		
	В–	B– pulse signal input	Signal level matches RS-422		
TB1	Z+	Z+ pulse signal input	Signal level matches RS-422		
	Z–	Z– pulse signal input			
	SD	NC pin (open)	Open connection connectors for use when cable shields should not be grounded		
	FE	Ground	Used as the shield ground termination point.		
	IP	PG encoder power supply	• Output voltage: $12.0 \text{ V} \pm 5\% \text{ or } 5.5 \text{ V} \pm 5\%$		
	IG	PG encoder power supply common	• Max. output current: 200 mA		
	SG	Monitor signal common			
	a+	A+ pulse monitor signal			
TB2	a–	A- pulse monitor signal	Output signal for monitoring A channel, B channel, and Z pulses		
	b+	B+ pulse monitor signal	from the PG encoder		
	b–	B- pulse monitor signal	Signal level matches RS-422		
	z+	Z+ pulse monitor signal			
	z–	Z- pulse monitor signal			

<1> A separate UL-listed class 2 power supply is necessary when the PG requires more than 200 mA to operate.

Specifications

Three-Phase 200 V Class Drives

Table 49 Power Ratings (Three-Phase 200 V Class)

Item		Specification													
	CIMR-LU2A	0018	0025	0033	0047	0060	0075	0085	0115	0145	0180	0215	0283	0346	0415
Maximum Applicable Motor Capacity (HP) <1>			7.5	10	15	20	25	30	40	50	60	75	100	125	150
	Input Current (A) <>>	18.9	28	37	52	68	80	82	111	136	164	200	271	324	394
	Rated Voltage Rated Frequency		Three-phase 200 to 240 Vac 50/60 Hz/270 to 340 Vdc												
Input	Allowable Voltage Fluctuation		-15 to 10%												
	Allowable Frequency Fluctuation	±5%													
	Input Power (kVA)	9.5	14	18	27	36	44	37	51	62	75	91	124	148	180
	Rated Output Capacity (kVA) <>>	6.7	9.5	12.6	17.9	23	29	32	44	55	69	82	108	132	158
	Rated Output Current (A)	17.5	25 <4>	33 <4>	47 <4>	60	75 <4>	85 <4>	115	145 <5>	180	215 <5>	283	346 <5>	415
Output	Overload Tolerance					150	% of ra	ated ou	tput cur	rent for	60 s				
	Carrier Frequency	User adjustable between 2 and 15 kHz User adjustable between 2 and 10 kHz							kHz						
	Maximum Output Voltage (V)				Three	-phase	200 to 2	240 V (proport	ional to	input	voltage))		
	Maximum output speed (Hz)	·						120 Hz	(user-s	et)	•			•	

<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.
42> 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> Rated motor capacity is calculated with a rated output voltage of 220 V.

<4> Carrier frequency can be set up to 8 kHz while keeping this current rating. Higher carrier frequency settings require derating.

<5> Carrier frequency can be set up to 5 kHz while keeping this current rating. Higher carrier frequency settings require derating.

<6> Carrier frequency is set to 2 kHz. Higher carrier frequency settings require derating

Three-Phase 400 V Class Drives

Table 50 Power Ratings (Three-Phase 400 V Class)

	Item	Specification														
CII	MR-LU4A	0009	0015	0018	0024	0031	0039	0045	0060	0075	0091	0112	0150	0180	0216	0260
Moto	um Applicable or Capacity (HP)	5	7.5	10	15	20	25-30	25-30	40	50-60	50-60	75	100	125- 150	150	200
	Input Current (A) <>>	10.4	15	20	29	39	44	43	58	71	86	105	142	170	207	248
	Rated Voltage Rated Frequency		Three-phase 380 to 480 Vac 50/60 Hz 510 to 680 Vdc													
Input	Allowable Voltage Fluctuation		-15 to 10%													
	Allowable Frequency Fluctuation		±5%													
	Input Power (kVA)	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	189	227
	Rated Output Capacity (kVA) <>>	7	11.3	13.7	18.3	24	30	34	48	57	69	85	114	137	165	198
	Rated Output Current (A)	9.2	14.8	18	24	31	39 <4>	45 <4>	60	75 <4>	91 <4>	112	150	180	216	260 <6>
	Overload Tolerance						150%	of rated	output o	current fo	or 60 s					
Output	Carrier Frequency			Us	er adjust	table bet	ween 2 a	and 15 k	Hz			User a	djustable	between	n 2 and	10 kHz
	Maximum Output Voltage (V)					Three-p	hase 380) to 480	V (propo	ortional	to input	voltage)				
	Maximum output speed (Hz)	(III)		NEG	14 1			120 Hz	(user-ad	justable)			1 11			

<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> Rated motor capacity is calculated with a rated output voltage of 440 V.</4> Carrier frequency can be set up to 8 kHz while keeping this current rating. Higher carrier frequency settings require derating.

<5> Carrier frequency can be set up to 5 kHz while keeping this current rating. Higher carrier frequency settings require derating.

<6> Carrier frequency is set to 2 kHz. Higher carrier frequency settings require derating

♦ Drive Specifications

Note: 1. Perform rotational Auto-Tuning to obtain the performance specifications given below.

2. For optimum performance life of the drive, install the drive in an environment that meets the required specifications.

	Item	Specification
		The following control methods can be set using drive parameters:
		• V/f Control (V/f)
	Control Method	Open Loop Vector Control (OLV)
		 Closed Loop Vector Control (CLV) Closed Loop Vector Control for PM (CLV/PM)
	E C + IB	
	Frequency Control Range	0.01 to 120 Hz
	Frequency Accuracy	Digital input: within $\pm 0.01\%$ of the max output speed (-10 to $\pm 40^{\circ}$ C)
	(Temperature Fluctuation)	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
	Output Speed Resolution	
	Frequency Setting Signal	Main speed frequency reference: DC -10 to +10 V (20 k Ω), DC 0 to +10 V (20 k Ω), 4 to 20 mA (250 Ω), 0 to 20 mA (250 Ω)
		V/f: 150% at 3 Hz
	Starting Torque	OLV: 200% at 0.3 Hz
	Starting forque 4	CLV, CLV/PM: 200% at 0 r/min
Control		V/f: 1:40
Characteris-	Speed Control Range	OLV: 1:200
tics	•	CLV: 1:1500
	Speed Control Accuracy </th <th>OLV: ±0.2% (25°C ±10°C), CLV: ±0.02% (25°C ±10°C)</th>	OLV: ±0.2% (25°C ±10°C), CLV: ±0.02% (25°C ±10°C)
	Consid Dominion	OLV: 10 Hz
	Speed Response	CLV, CLV/PM: 50 Hz
	Torque Limit	Parameters setting allow separate limits in four quadrants (available in OLV, CLV, CLV/PM)
	Accel/Decel Ramp	0.0 to 6000.0 s (4 selectable combinations of independent acceleration and deceleration settings,
	Accel/Decel Kamp	unit changeable to m/s ² or ft/s ²)
	Braking Transistor	Models CIMR-L□2A0018 to 2A0115, 4A0009 to 4A0060 have a built-in braking transistor.
	V/f Characteristics	Freely programmable
		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
	Main Control Functions	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.
	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 60 s at 150% of rated output current <>>
	Overveltege Protection	200 V class: Stops when DC bus voltage exceeds approx. 410 V
Protection	Overvoltage Protection	400 V class: Stops when DC bus voltage exceeds approx. 820 V
Functions	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 <>>
	DC Bus Charge LED	Remains lit until DC bus voltage falls below 50 V
		<u> </u>

	Ambient Temperature	-10 to 40 C (11 00 chelosate with top protective cover), -10 to 50 C (11 00 chelosate)
	Humidity	95 RH% or less (no condensation)
nvironment	Storage Temperature	-20 to 60°C (short-term temperature during transportation)
	Altitude	Up to 1000 meters without derating, up to 3000m 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 2A0180, 4A0009 to 4A0150) or 2.0 m/s ² (2A0215 to 2A0415, 4A0180 to 4A0260)
		 UL Underwriters Laboratories Inc: UL508C Power Conversion Equipment CE European Conformity: EN61800-3 Adjustable speed electrical power drive systems - EMC requirements and specific test methods EN61800-5-1 Adjustable speed electrical power drive systems - Safety requirements - Electrical, thermal and energy ISO International Organization for Standardization: ISO13849-1 Cat. 3 PLd Safety of machinery - Safety-related parts of control systems IEC International Electrotechnical Commission: IEC61508 SIL2 Functional safety of electrical/electronic/programmable electronic safety-related systems safety integrity level 2 CSA Canadian Standards Association International: 2411-02 Elevator Equipment - Enclosed Elevator-and Escalator Electrical Equipment 3211-06 Industrial Control Equipment - Motor Controllers - Miscellaneous C22.2 No.04-04 Bonding and Grounding of Electrical Equipment C22.2 No.14-05 Industrial Control Equipment B44.1/ASME-A17.5-2004 Safety Code for Elevators and Escalator Electrical Equipment used by CSA to evaluate the L1000 to Class 2411 (Elevator Equipment) ANSI/ASME American Society of Mechanical Engineers/American National Standards Institute: ANSI/ASME A17.1-2007/B44-04 Safety Code for Elevators and Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices using EN 12016:2004 immunity requirements. ANSI/ASME-A17.5-2004/CSA B44.1 - Elevator and Escalator Electrical Equipment, used by CSA to evaluate the L1000 to Class 2411 (Elevator Equipment)
	Protection Design	IP00 enclosure with top protective cover, IP00

Specification

-10 to 40°C (IP00 enclosure with top protective cover), -10 to 50°C (IP00 enclosure)

■ Altitude Derating

Item

Area of Use

Ambient Temperature

Indoors

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.

Solution a procession may be unggered when operating with 150% of the rated output current if the output speed is less than 6 Hz.
 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.

B Parameter Table

◆ A: Initialization Parameters

The A parameter group creates the operating environment for the drive. This includes the parameter Access Level, Motor Control Method, Password, User Parameters and more.

Indicates that the parameter setting can be changed while the drive is operating the motor

Motor 2: Refers the second motor when the drive is operating two motors (use input terminals to switch between motors).

■ A1: Initialization Parameters

No.	Name	Description	Setting
A1-00 TOTAL A1-00 A1-00	Language Selection	0: English 1: Japanese 2: German 3: French 4: Italian 5: Spanish 6: Portuguese 7: Chinese	Default: 0 Min: 0 Max: 7
A1-01	Access Level Selection	0: View and set A1-01 and A1-04. U parameters can also be viewed. 1: User Parameters (access to a set of parameters selected by the user, A2-01 to A2-32) 2: Advanced Access (access to view and set all parameters)	Default: 2 Min: 0 Max: 2
A1-02 	Control Method Selection	0: V/f Control 2: Open Loop Vector Control 3: Closed Loop Vector Control 7: Closed Loop Vector Control for PM Motors	Default: 2 Min: 0 Max: 7
A1-03	Initialize Parameters	0: No initialization 1110: User Initialize (parameter values must be stored using parameter o2-03) 2220: 2-wire initialization 5550: oPE04 error reset	Default: 0 Min: 0 Max: 5550
A1-04	Password	When the value set into A1-04 does not match the value set into A1-05,	Default: 0000 Min: 0000
A1-05	Password Setting	parameters A1-01 through A1-03, and A2-01 through A2-33 cannot be changed.	Max: 9999

<1> Parameter setting value is not reset to the default value when the drive is initialized.

■ A2: User Parameters

No.	Name	Description	Setting
A2-01 to A2-32	User Parameters 1 to 32	Parameters that were recently edited are listed here. The user can also select parameters to appear here for quick access.	Default: <5> Min: A1-00 Max: o4-16
A2-33	User Parameter Automatic Selection	 0: Parameters A2-01 through A2-32 are reserved for the user to create a list of User Parameters. 1: Save history of recently viewed parameters. Recently edited parameters will be saved to A2-17 through A2-32 for quick access. 	Default: 1 Min: 0 Max: 1

<5> Default setting is determined by the control mode (A1-02).

♦ b: Application

Application parameters configure the source of the Up/Down command, timer functions, the Dwell function, the Droop Control function, Energy Savings, and a variety of other application-related settings.

■ b1: Operation Mode Selection

No.	Name	Description	Setting
b1-01	Speed Reference Selection	0: Digital operator 1: Analog input terminals 2: MEMOBUS/Modbus communications 3: Option card	Default: 0 Min: 0 Max: 3
b1-02	Up/Down Command Selection	0: Digital operator 1: Digital input terminals 2: MEMOBUS/Modbus communications 3: Option card	Default: 1 Min: 0 Max: 3
b1-03	Stopping Method Selection	0: Ramp to stop 1: Coast to stop	Default: 0 Min: 0 Max: 1
b1-06	Digital Input Reading	O: Input status is read once and processed immediately (for quick response) 1: Input is read twice and processed only if the status is the same in both readings (robust against noisy signals)	Default: 1 Min: 0 Max: 1
b1-08	Up/Down Command Selection while in Programming Mode	Up/Down command not accepted while in the Programming Mode. Up/Down command accepted while in the Programming Mode. Prohibit entering Programming Mode during run.	Default: 0 Min: 0 Max: 2
b1-14	Phase Order Selection	0: U-V-W 1: U-W-V	Default: 0 Min: 0 Max: 1

■ b2: Magnetic Flux Compensation

No.	Name	Description	Setting
b2-08	Magnetic Flux Compensation Value	Sets the magnetic flux compensation as a percentage of the no-load current value (F2-03)	Default: 0% Min: 0% Max: 1000%

■ b4: Delay Timers

No.	Name	Description	Setting
b4-01	Timer Function On-Delay Time	Used to set the on-delay and off-delay times for a digital timer output (H2-	Default: 0.0 s Min: 0.0 s Max: 3000.0 s
b4-02	Timer Function Off-Delay Time	$\square\square=12$). The output is triggered by a digital input programmed to H1- $\square\square=18$)	Default: 0.0 s Min: 0.0 s Max: 3000.0 s

■ b6: Dwell Function

No.	Name	Description	Setting
b6-01	Dwell Speed at Start	Parameters b6-01 and b6-02 set the speed to hold and the time to maintain that speed at start. Parameters b6-03 and b6-04 set the speed to hold and the time to maintain that speed at stop.	Default: 0.0% Min: 0.0% Max: 100.0%
b6-02	Dwell Time at Start		Default: 0.0 s Min: 0.0 s Max: 10.0 s
b6-03	Dwell Speed at Stop		Default: 0.0% Min: 0.0% Max: 100.0%
b6-04	Dwell Time at Stop		Default: 0.0 s Min: 0.0 s Max: 10.0 s

■ b7: Droop Control

No.	Name	Description	Setting
b7-01 •◆RUN	Droop Control Gain	Sets the speed reduction gain applied at a torque reference of 100%. Set as a percentage of motor base speed.	Default: 0.0% Min: 0.0% Max: 100.0%
b7-02 ◆ RUN	Droop Control Delay Time	Used to adjust the responsiveness of Droop Control.	Default: 0.05 s Min: 0.03 s Max: 2.00 s

■ b8: Energy Saving

No.	Name	Description	Setting
b8-01	Energy Saving Control Selection	0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1
b8-16	Energy Saving Control Constant (Ki)	Enter the Energy Saving value (Ki) as specified on the motor name plate. (for IPM motors only)	Default: 0.10 Min: 0.00 Max: 2.00
b8-17	Energy Saving Control Constant (Kt)	Enter the Energy Saving value (Kt) as specified on the motor name plate. (for IPM motors only)	Default: 1.00 Min: 0.00 Max: 2.00

Parameter Table

♦ C: Tuning

C parameters are used to adjust the acceleration and deceleration ramps, jerk settings, slip compensation, torque compensation, and carrier frequency selections.

■ C1: Acceleration and Deceleration Ramps

No.	Name	Description	Setting
C1-01 •◆RUN	Acceleration Ramp 1	Sets the ramp to accelerate from 0 to maximum speed.	
C1-02	Deceleration Ramp 1	Sets the ramp to decelerate from maximum speed to 0.	
C1-03 ◆ RUN	Acceleration Ramp 2	Sets the ramp to accelerate from 0 to maximum speed.	
C1-04 ◆ RUN	Deceleration Ramp 2	Sets the ramp to decelerate from maximum speed to 0.	Default: 1.50 s <6> <8>
C1-05	Acceleration Ramp 3 (Motor 2 Accel Time 1)	Sets the ramp to accelerate from 0 to maximum speed.	Min: 0.00 s Max: 600.00 s <6> <8>
C1-06 ◆ RUN	Deceleration Ramp 3 (Motor 2 Decel Time 1)	Sets the ramp to decelerate from maximum speed to 0.	
C1-07 ◆ RUN	Acceleration Ramp 4 (Motor 2 Accel Time 2)	Sets the ramp to accelerate from 0 to maximum speed.	
C1-08 ◆ RUN	Deceleration Ramp 4 (Motor 2 Decel Time 2)	Sets the ramp to decelerate from maximum speed to 0.	
C1-09	Fast Stop Ramp	Sets the ramp for the Fast Stop function.	
C1-10	Accel/Decel Setting Resolution	0: 0.01 s unit 1: 0.1 s unit	Default: 0 Min: 0 Max: 1
C1-11	Accel/Decel Switching Speed	Sets the speed to switch between accel/decel ramp settings.	Default: 0.0% Min: 0.0% Max: 100.0%
C1-12	Motor 2 Acceleration Time	Sets the acceleration time for motor 2. Note: Parameter C1-12 determines the acceleration time for motor 2 as long as d1-27 is not set to 0.00 Hz.	Default: 1.0 s Min: 0.0 s Max: 600.0 s
C1-13	Motor 2 Acceleration Time	Sets the deceleration time for motor 2.	Default: 1.0 s Min: 0.0 s Max: 600.0 s
C1-15	Inspection Deceleration Ramp	Sets the deceleration ramp used for inspection run.	Default: 0.00 s <6> <8> Min: 0.00 s Max: 2.00 s <6> <8>

<6> Setting ranges and defaults vary by the setting units determined by parameter o1-03. Refer to *Defaults and Setting Ranges by Display Unit Selection (o1-03) on page 184*.
<8> Setting range value is dependent on parameter C1-10, Accel/Decel Setting Resolution. When C1-10 = 0 (units of 0.01 seconds), the setting range becomes 0.00 to 600.00 seconds.

■ C2: Jerk Settings

No.	Name	Description	Setting
C2-01	Jerk at Accel Start		Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>
C2-02	Jerk at Accel End	Five different jerk values can be set. They are automatically applied as shown in the figure below. Up/Down command ON OFF	Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>
C2-03	Jerk at Decel Start	Output speed C2-02 C2-03 C2-04 C2-05 C2-05 Time	Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>
C2-04	Jerk at Decel End		Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>
C2-05	Jerk below Leveling Speed	Sets the jerk used when the speed reference is lower than the leveling speed setting	Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>

<6> Setting ranges and defaults vary by the setting units determined by parameter o1-03. Refer to *Defaults and Setting Ranges by Display Unit Selection (o1-03) on page 184*.

■ C3: Slip Compensation

No.	Name	Description	Setting
C3-01 ◆ RUN	Slip Compensation Gain	Sets the gain for the motor slip compensation function.	Default: 1.0 Min: 0.0 Max: 2.5
C3-02 ◆ RUN	Slip Compensation Primary Delay Time	Adjusts the slip compensation function delay time.	Default: 2000 ms Min: 0 ms Max: 10000 ms
C3-03	Slip Compensation Limit	Sets an upper limit for the slip compensation function as a percentage of motor rated slip for motor 1 (E2-02).	Default: 200% Min: 0% Max: 250%
C3-04	Slip Compensation Selection during Regeneration	0: Disabled.1: Enabled above 6 Hz.2: Enabled whenever slip compensation is possible.	Default: 0 Min: 0 Max: 2
C3-05	Output Voltage Limit Operation Selection	Disabled. Enabled. Automatically decreases motor flux when output voltage saturation is reached.	Default: <5> Min: 0 Max: 1

<5> Default setting is determined by the control mode (A1-02).

■ C4: Torque Compensation

No.	Name	Description	Setting
C4-01	Torque Compensation Gain	Sets the gain for the automatic torque (voltage) boost function and helps to produce better starting torque.	Default: 1.00 Min: 0.00 Max: 2.50
C4-02 ◆ RUN	Torque Compensation Primary Delay Time	Sets the torque compensation filter time.	Default: <>> Min: 0 ms Max: 60000 ms
C4-03	Torque Compensation at Forward Start	Sets torque compensation at forward start as a percentage of motor torque.	Default: 0.0% Min: 0.0% Max: 200.0%
C4-04	Torque Compensation at Reverse Start	Sets torque compensation at reverse start as a percentage of motor torque.	Default: 0.0% Min: -200.0% Max: 0.0%

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No.	Name	Description	Setting
C4-05	Torque Compensation Time Constant	$(CA_{-}O3)$ and $CA_{-}O4$	Default: 10 ms Min: 0 ms Max: 200 ms

<5> Default setting is determined by the control mode (A1-02).

■ C5: Speed Control Loop Settings

No.	Name	Description	Setting
C5-01 ◆ RUN	Speed Control Loop Proportional Gain 1	Sets the proportional gain 1 of the speed control loop.	Default: <5> Min: 0.00 Max: 300.00
C5-02 ◆ RUN	Speed Control Loop Integral Time 1	Sets the integral time 1 of the speed control loop.	Default: <5> Min: 0.000 s Max: 10.000 s
C5-03 ◆ RUN	Speed Control Loop Proportional Gain 2	Sets the proportional gain 2 of the speed control loop.	Default: <5> Min: 0.00 Max: 300.00
C5-04	Speed Control Loop Integral Time 2	Sets the integral time 2 of the speed control loop.	Default: 0.500 s Min: 0.000 s Max: 10.000 s
C5-06	Speed Control Loop Primary Delay Time Constant	Sets the filter time constant for the time from the speed loop to the torque command output.	Default: 0.004 s Min: 0.000 s Max: 0.500 s
C5-07	Speed Control Settings Switching Speed	Sets the speed for switching between proportional gain 1, 2, 3 and integral time 1, 2, 3.	Default: <5> Min: 0.0% Max: 100.0%
C5-08	Speed Control Loop Integral Limit	Sets the speed control loop integral upper limit as a percentage of rated torque.	Default: 400% Min: 0% Max: 400%
C5-13 ◆ RUN	Speed Control Loop Proportional Gain 3	Sets the proportional gain 3 of the speed control loop.	Default: <>> Min: 0.00 Max: 300.00
C5-14 •◆RUN	Speed Control Loop Integral Time 3	Sets the integral time 3 of the speed control loop.	Default: <5> Min: 0.000 s Max: 10.000 s
C5-16	Speed Control Loop Delay Time during Position Lock	Sets a delay to the torque command output from speed control loop during Position Lock.	Default: 0.000 s Min: 0.000 s Max: 0.500 s
C5-17	Motor Inertia	Sets the motor inertia.	Default:
C5-18	Load Inertia Ratio	Sets the ratio between the motor and load inertia.	Default: 1.0 Min: 0.0 Max: 6000.0
C5-19	Speed Control Loop Proportional Gain Time during Position Lock	Sets the Speed Control Loop Proportional gain used during Position Lock	Default: <5> Min: 0.00 Max: 300.00
C5-20 •◆RUN	Speed Control Loop Integral Time during Position Lock	Sets the Speed Control Loop Integral time used during Position Lock.	Default:0.100 s Min: 0.000 s Max: 10.000 s

<4> Default setting value varies by the drive model (o2-04).

<5> Default setting is determined by the control mode (A1-02).

■ C6: Carrier Frequency

No.	Name	Description	Setting
C6-03	Carrier Frequency	Sets the carrier frequency.	Default: Min: 1.0 kHz Max: 15.0 kHz
C6-06	PWM Method	Selects PWM modulation method. 0: 2-phase/3-phase conversion 1: 2-phase modulation 2: 3-phase modulation	Default: 0 Min: 0 Max: 2
C6-09	Carrier Frequency during Rotational Auto-Tuning	0: Carrier Frequency = 5 kHz 1: Setting value for C6-03	Default: 0 Min: 0 Max: 1
C6-21	Inspection Operation Carrier Frequency	Sets the carrier frequency during Inspection Run. 0: Setting value for C6-03 1: Carrier Frequency = 2 kHz	Default: 1 Min: 0 Max: 1
C6-23	Carrier Frequency during Initial Motor Pole Search	Sets the carrier frequency when estimating the initial polarity. 0: Carrier Frequency = 2 kHz 1: Setting value for C6-03	Default: 0 Min: 0 Max: 1
C6-31	Carrier Frequency during Rescue Operation	Sets the carrier frequency during Rescue Operation. 0: C6-03 setting 1: 2 kHz	Default: 0 Min: 0 Max: 1

<4> Default setting value varies by the drive model (o2-04).
<39> Available in drive software versions PRG: 7016 and later.

♦ d: Speed References

Speed Reference parameters are used to set the various speed reference values during operation.

■ d1: Speed Reference

No.	Name	Description	Setting
d1-01 ◆ RUN	Speed Reference 1		
d1-02 ◆ RUN	Speed Reference 2		
d1-03 ◆ RUN	Speed Reference 3		
d1-04 ◆ RUN	Speed Reference 4	Sets the Speed reference for the drive when d1-18 is set to 0 or 3. Setting units	Default: 0.00% <6> Min: 0.00%
d1-05 ◆ RUN	Speed Reference 5	are determined by parameter o1-03.	Max: 100.00% <6>
d1-06 ◆ RUN	Speed Reference 6		
d1-07 ◆ RUN	Speed Reference 7		
d1-08 ◆ RUN	Speed Reference 8		

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No.	Name	Description	Setting
d1-18	Speed Reference Selection Mode	Sets the mode of speed reference selection by digital inputs. 0: Use multi-speed references (d1-01 to d1-08) 1: High speed reference has priority (d1-19 to d1-23, d1-26) 2: Leveling speed reference has priority (d1-19 to d1-23, d1-26) 3: Use multi-speed references d1-02 to d1-08, no speed selection stops the drive. Drive will stop when all input terminals programmed for speed references (H1-	Default: 0 Min: 0 Max: 3
d1-19 ◆RUN	Nominal Speed	Sets the nominal speed reference when $d1-18 = 1$ or 2.	Default: 100.00% <6> Min: 0.00% Max: 100.00% <6>
d1-20 ◆ RUN	Intermediate Speed 1	Sets intermediate speed reference 1 when d1-18 = 1 or 2.	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>
d1-21 ◆ RUN	Intermediate Speed 2	Sets intermediate speed reference 2 when d1-18 = 1 or 2.	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>
d1-22 ◆ RUN	Intermediate Speed 3	Sets intermediate speed reference 3 when $d1-18 = 1$ or 3.	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>
d1-23 ♠ RUN	Releveling Speed	Sets speed reference for releveling when d1-18 = 1 or 2.	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>
d1-24 ◆ RUN	Inspection Operation Speed	Sets speed reference when inspection operation is enabled.	Default: 50.00% <6> Min: 0.00% Max: 100.00% <6>
d1-25 ◆ RUN	Rescue Operation Speed	Sets the speed reference during inspection operation.	Default: 10.00% <6> Min: 0.00% Max: 100.00% <6>
d1-26 ◆ RUN	Leveling Speed	Sets leveling speed reference when d1-18 = 1 or 2.	Default: 8.00% <6> Min: 0.00% Max: 100.00% <6>
d1-27	Motor 2 Speed Reference	Sets the speed reference for motor 2. Note: 1. If set to 0.00, the drive will control motor 1 instead. 2. When using motor 2, be sure that the accel/decel times are set in parameters C1-12 and C1-13.	Default: 0.00 Hz Min: 0.00 Hz Max: 120.00 Hz
d1-28	Leveling Speed Detection Level	Used when d1-18 = 0 or 3. If the speed reference selected is lower than d1-28, then the drive uses the leveling speed as the speed reference.	Default: 0.0% Min: 0.0% Max: 100.0%
d1-29	Inspection Speed Detection Level	Used when $d_{1-1}8 = 0$ or 3. If the speed reference selected is higher than $d_{1-2}8$ but lower or equal to $d_{1-2}9$, then the drive uses inspection speed as the speed reference.	Default: 0.0% Min: 0.0% Max: 100.0%

<6> Setting ranges and defaults vary by the setting units determined by parameter o1-03. Refer to *Defaults and Setting Ranges by Display Unit Selection (o1-03) on page 184*.

■ d6: Field Forcing

No.	Name	Description	Setting
d6-03	Field Forcing Selection	0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1
d6-06	Field Forcing Limit	Sets the upper limit of the excitation current command during magnetic field forcing. A setting of 100% is equal to motor no-load current. Disabled only during DC Injection Braking.	Default: 400% Min: 100% Max: 400%

♦ E: Motor Parameters

■ E1: V/f Pattern

No.	Name	Description	Setting
E1-01	Input Voltage Setting	This parameter must be set to the power supply voltage. WARNING! Electrical Shock Hazard. Drive input voltage (not motor voltage) must be set in E1-01 for the protective features of the drive to function properly. Failure to do so may result in equipment damage and/or death or personal injury.	Default: 230 V <9> Min: 155 V Max: 255 V <9>
E1-03	V/f Pattern Selection	F: Custom V/f, E1-04 through E1-13 settings define the V/f pattern	Default: F Min: – Max: F
E1-04	Maximum Output Frequency		Default: <5> Min: <33> Max: 120.0 Hz
E1-05	Maximum Voltage	To set linear V/f characteristics, set the same values for E1-07 and E1-09. In this	Default: 230.0 V <9> Min: 0.0 V Max: 255.0 V <9>
E1-06	Base Frequency	case, the setting for E1-08 will be disregarded. Ensure that the four frequencies are set according to these rules: $E1-09 \le E1-07 < E1-06 \le E1-11 \le E1-04$	Default: <>> Min: 0.0 Hz Max: 120.0 Hz
E1-07	Middle Output Frequency	Note that if E1-11 = 0, then both E1-11 and E1-12 are disabled, and the above conditions do not apply. Output Voltage (V)	Default: 3.0 Hz Min: 0.0 Hz Max: 120.0 Hz
E1-08	Middle Output Frequency Voltage	E1-05 E1-12 E1-13	Default: <2> <9> Min: 0.0 V Max: 255.0 V <9>
E1-09	Minimum Output Frequency	E1-08	Default: <>> Min: 0.0 Hz Max: 120.0 Hz
E1-10	Minimum Output Frequency Voltage	E1-10 E1-07 E1-06 E1-11 E1-04 Frequency (Hz)	Default: <2> <9> Min: 0.0 V Max: 255.0 V <9>
E1-11	Middle Output Frequency 2	 Note: Some parameters may not be available depending on the control mode. E1-07, E1-08 and E-10 are available only in the V/f control and Open Loop Vector control modes. 	Default: 0.0 Hz Min: 0.0 Hz Max: 120.0 Hz
E1-12 < <i>II</i> >	Middle Output Frequency Voltage 2	• E1-11, E1-12 and E-13 are available only in the V/f control and Closed Loop Vector control modes.	Default: 0.0 V <9> Min: 0.0 V Max: 255.0 V <9>
E1-13	Base Voltage		Default: 0.0 V <9><13> Min: 0.0 V Max: 255.0 V <9>

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<2> Default setting is dependent on the control mode (A1-02) and the drive model (o2-04).
<5> Default setting is determined by the control mode (A1-02).
<9> Values shown here are for 200 V class drives. The default is 400 V when using a 400 V class drive.
<11> Parameter is ignored when E1-11 and E1-12 are set to 0.0.
<13> Auto-Tuning will set E1-13 to the same value as E1-05.

<33> Setting range depends on the type of motor being used. CLV allows a setting range of 10.0 to 120.0 Hz, while CLV/PM allows a setting range of 4.0 to 120.0 Hz.

■ E2: Motor Parameters

No.	Name	Description	Setting
E2-01	Motor Rated Current	Sets the motor nameplate full load current in Amps. Automatically set during Auto-Tuning.	Default: Min: 10% of drive rated current Max: 200% of drive rated current <10>
E2-02	Motor Rated Slip	Sets the motor rated slip. Automatically set during Auto-Tuning.	Default: <-> Min: 0.00 Hz Max: 20.00 Hz
E2-03	Motor No-Load Current	Sets the no-load current for the motor. Automatically set during Auto-Tuning.	Default: <4> Min: 0 A Max: E2-01 <10>
E2-04	Number of Motor Poles	Sets the number of motor poles. Automatically set during Auto-Tuning.	Default: 4 Min: 2 Max: 48
E2-05	Motor Line-to-Line Resistance	Sets the phase-to-phase motor resistance. Automatically set during Auto-Tuning.	Default: Δ> Min: 0.000 Ω Max: 65.000 Ω
E2-06	Motor Leakage Inductance	Sets the voltage drop due to motor leakage inductance as a percentage of motor rated voltage. Automatically set during Auto-Tuning.	Default: Min: 0.0% Max: 40.0%
E2-07	Motor Iron-Core Saturation Coefficient 1	Sets the motor iron saturation coefficient at 50% of magnetic flux. Automatically set during Auto-Tuning.	Default: 0.50 Min: 0.00 Max: 0.50
E2-08	Motor Iron-Core Saturation Coefficient 2	Sets the motor iron saturation coefficient at 75% of magnetic flux. Automatically set during Auto-Tuning.	Default: 0.75 Min: E2-07 Max: 0.75
E2-09	Motor Mechanical Loss	Sets the motor mechanical loss as a percentage of motor rated power (kW).	Default: 0.0% Min: 0.0% Max: 10.0%
E2-10	Motor Iron Loss for Torque Compensation	Sets the motor iron loss.	Default: Min: 0 W Max: 65535 W
E2-11	Motor Rated Power	Sets the motor rated power in kilowatts (1 HP = 0.746 kW). Automatically set during Auto-Tuning.	Default: Min: 0.00 kW Max: 650.00 kW

<4> Default setting value varies by the drive model (o2-04).
<10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0018 to 2A0033 and CIMR-LU4A0009 to 4A0018 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415 and CIMR-LU4A0024 to 4A0260 display values in 0.1 A units.

■ E3: V/f Pattern for Motor 2

These parameters are hidden when a PM motor control mode has been selected for motor 1 (A1-02 = 7).

No.	Name	Description	Setting
E3-04	Motor 2 Maximum Output Frequency		Default: 60.0 Hz Min: 10.0 Hz Max: 120.0 Hz
E3-05	Motor 2 Maximum Voltage	These parameters are only applicable when E1-03 is set to F. To set linear V/f characteristics, set the same values for E3-07 and E3-09. In this case, the setting for E3-08 will be disregarded. Ensure that the four frequencies	Default: 230.0 V Min: 0.0 V Max: 255.0 V <9>
E3-06	Motor 2 Base Frequency	are set according to these rules or an oPE10 fault will occur: $E3-09 \le E3-07 < E3-06 \le E3-04$	Default: 60.0 Hz Min: 0.0 Hz Max: 120.0 Hz
E3-07	Motor 2 Mid Output Frequency	Output Voltage (V) E3-05	Default: 3.0 Hz Min: 0.0 Hz Max: 120.0 Hz
E3-08	Motor 2 Mid Output Frequency Voltage	E3-08	Default: Min: 0.0 V Max: 255.0 V
E3-09	Motor 2 Minimum Output Frequency	E3-10 7 E3-04 E3-09 E3-07 E3-04 Frequency (Hz)	Default: 1.5 Hz Min: 0.0 Hz Max: 120.0 Hz
E3-10	Motor 2 Minimum Output Frequency Voltage		Default: Min: 0.0 V Max: 255.0 V

<4> Default setting value is dependent on the drive model (o2-04).

■ E4: Motor 2 Parameters

These parameters are hidden when a PM motor control mode has been selected for motor 1 (A1-02 = 7).

No.	Name	Description	Setting
E4-01	Motor 2 Rated Current	Sets the full load current for motor 2. Automatically set during Auto-Tuning.	Default: Min: 10% of drive rated current Max: 200% of drive rated current <10>
E4-02	Motor 2 Rated Slip	Sets the rated slip for motor 2. Automatically set during Auto-Tuning.	Default: Min: 0.00 Hz Min: 20.00 Hz
E4-03	Motor 2 Rated No-Load Current	Sets the no-load current for motor 2. Automatically set during Auto-Tuning.	Default: Min: 0 A Min: [E4-01]
E4-04	Motor 2 Motor Poles	Sets the number of poles of motor 2. Automatically set during Auto-Tuning.	Default: 4 Min: 2 Max: 48
E4-05	Motor 2 Line-to-Line Resistance	Sets the phase-to-phase resistance for motor 2. Automatically set during Auto-Tuning.	Default: Δ Min: 0.000 Ω Max: 65.000 Ω
E4-06	Motor 2 Leakage Inductance	Sets the voltage drop for motor 2 due to motor leakage inductance as a percentage of rated voltage. Automatically set during Auto-Tuning.	Default: 4> Min: 0.0% Max: 40.0%

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.

<4> Default setting value is dependent on the drive model (o2-04).
<10> The display resolution depends on the rated output power of the drive. Models CIMR-L□2A0018 to 0033 and CIMR-L□4A0009 to 0018 display values in 0.01 A units, while models CIMR-L□2A0047 to 0415 and CIMR-L□4A0024 to 0260 display values in 0.1 A units.

■ E5: PM Motor Settings

No.	Name	Description	Setting
E5-02	Motor Rated Power	Sets the rated capacity of the motor.	Default: Min: 0.10 kW Max: 650.00 kW
E5-03 	Motor Rated Current	Sets the motor rated current.	Default: Min: 10% of drive rated current Max: 200% of drive rated current <10>
E5-04 <1>	Number of Motor Poles	Sets the number of motor poles.	Default: 12 Min: 2 Max: 48
E5-05 </td <td>Motor Stator Resistance (Single Phase)</td> <td>Sets the stator resistance (1 phase value).</td> <td>Default: Δ Min: 0.000 Ω Max: 65.000 Ω</td>	Motor Stator Resistance (Single Phase)	Sets the stator resistance (1 phase value).	Default: Δ Min: 0.000 Ω Max: 65.000 Ω
E5-06	Motor d-Axis Inductance	Sets the d-axis inductance.	Default: Min: 0.00 mH Max: 600.00 mH
E5-07	Motor q-Axis Inductance	Sets the q-axis inductance.	Default: Min: 0.00 mH Max: 600.00 mH
E5-09	Motor Induction Voltage Constant 1	Sets the induced phase peak voltage in units of 0.1 mV (rad/s) [electrical angle]. When setting this parameter, E5-24 should be set to 0.0.	Default: Min: 0.0 mV/(rad/s) Max: 6500.0 mV/(rad/s)
E5-11	Encoder Offset	Sets the offset between the rotor magnetic axis and the encoder zero position. Set during Encoder Offset Tuning.	Default: 0.0 deg Min: -180 deg Max: 180 deg
E5-24	Motor Induction Voltage Constant 2	Sets the induced phase-to-phase rms voltage in units of 0.1 mV/(r/min) [mechanical angle]. When setting this parameter, E5-09 should be set to 0.0.	Default: 0.0 mV/(r/min) Min: 0.0 mV/(r/min) Max: 6500.0 mV/(r/min)

<1> Parameter setting value is not reset to the default value when the drive is initialized.
<4> Default setting value is determined by the drive model (o2-04).
<10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0018 to 2A0033 and CIMR-LU4A0009 to 4A0018 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415 and CIMR-LU4A0024 to 4A0260 display values in 0.1 A units.

♦ F: Option Settings

F parameters are used to program the drive for Encoder and PG feedback from the motor and to function with option cards.

■ F1: PG Speed Control Card

No.	Name	Description	Setting
F1-01	Encoder 1 Resolution	Sets the encoder resolution (number of pulses per revolution)	Default: <5> Min: 1 ppr Max: 60000 ppr <34>
F1-02	Operation Selection at PG Open Circuit (PGo)	0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02.1: Coast to stop.2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09.3: Alarm only.	Default: 1 Min: 0 Max: 3
F1-03	Operation Selection at Overspeed (oS)	0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02.1: Coast to stop.2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09.3: Alarm only.	Default: 1 Min: 0 Max: 3
F1-04	Operation Selection at Deviation	0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02.1: Coast to stop.2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09.3: Alarm only.	Default: 3 Min: 0 Max: 3
F1-05	Encoder 1 Rotation Direction Selection	0: A phase leads B in up direction 1: B phase leads A in up direction	Default: <5> Min: 0 Max: 1
F1-06	PG 1 Pulse Monitor Output Division Ratio	Sets the division ratio for the pulse monitor used of the PG option card installed to connector CN5-C. By setting "xyz", the division ratio becomes $= [(1 + x)/yz]$. If only using the A pulse for one track input, then the input ratio will be 1:1, regardless of what F1-06 is set to.	Default: 1 Min: 1 Max: 132
F1-08	Overspeed Detection Level	Sets the overspeed detection level as a percentage of the maximum output frequency.	Default: 115% Min: 0% Max: 120%
F1-09	Overspeed Detection Delay Time	Sets the time in seconds for an overspeed situation to trigger a fault (oS).	Default: 0.0 s Min: 0.0 s Max: 2.0 s
F1-10	Excessive Speed Deviation Detection Level	Sets the speed deviation detection level as a percentage of the maximum output frequency.	Default: 10% Min: 0% Max: 50%
F1-11	Excessive Speed Deviation Detection Delay Time	Sets the time in seconds for a speed deviation situation to trigger a fault (dEv).	Default: 0.5 s Min: 0.0 s Max: 10.0 s
F1-14	PG Open-Circuit Detection Time	Sets the time required to trigger a PG Open fault (PGo).	Default: 2.0 s Min: 0.0 s Max: 10.0 s
F1-18	dv3 Detection Selection	0: Disabled n: Sets the number of dv3 situations that may be detected before triggering an actual dv3 fault.	Default: 10 Min: 0 Max: 10
F1-19	dv4 Detection Selection	0: Disabled n: Number of pulses that the A and B pulse are reversed that triggers dv4 detection.	Default: 128 Min: 0 Max: 5000
F1-20	PG Option Card Disconnect Detection 1	0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1

No.	Name	Description	Setting
F1-29	dEv Detection Condition Selection	Selects when DEV is active. 0: After speed reference, soft starter output and motor speed have matched once. 1: After speed reference and soft starter output have matched once. 2: Always during Run	Default: 2 Min: 0 Max: 2
F1-50 <39>	Encoder Selection	Selects the encoder connected the PG-F3 option. 0: EnDat 2.1/01, 2.2/01 Serial Communication + Sin/Cos 1: EnDat 2.2/22 Serial Communication 2: Hiperface	Default: 0 Min: 0 Max: 2
F1-51	PGoH Detection Level	Sets the level for detecting PG Hardware Fault (PGoH). Available when $F1-20=1$	Default: 80% Min: 1% Max: 100%
F1-52	Communication Speed of Serial Encoder Selection	Selects the communication speed between the PG-F3 option and serial encoder. 0: 1M bps/9600 bps 1: 500k bps/19200 bps 2: 1M bps/38400 bps 3: 1M bps/38400 bps	Default: 0 Min: 0 Max: 3
F1-63	PG-E3 R Track Selection	0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1

<5> Default setting is determined by the control mode (A1-02).

■ F3: Digital Input Card (DI-A3)

No.	Name	Description	Setting
F3-01	DI-A3 Option Card Input Selection	0: BCD, 1% units 1: BCD, 0.1% units 2: BCD, 0.01% units 3: BCD, 1 Hz units 4: BCD, 0.1 Hz units 5: BCD, 0.01 Hz units 6: BCD customized setting (5 digit), 0.02 Hz units 7: Binary input The unit and the setting range are determined by F3-03. F3-03 = 0: 255/100% (-255 to +255) F3-03 = 1: 40961/100% (-4095 to +4095) F3-03 = 2: 30000/100% (-33000 to +33000) When the digital operator units are set to be displayed in Hertz or user-set units (01-03 = 2 or 3), the units for F3-01 are determined by parameter o1-03.	Default: 0 Min: 0 Max: 7
F3-03	DI-A3 Option Card Data Length Selection	0: 8 bit 1: 12 bit 2: 16 bit	Default: 2 Min: 0 Max: 2

■ F4: Analog Monitor Card (AO-A3)

No.	Name	Description	Setting
F4-01	Terminal V1 Function Selection	Sets the monitor signal for output from terminal V1. Set this parameter to the last three digits of the desired $U\Box -\Box\Box$ monitor. Some U parameters are available only in certain control modes.	Default: 102 Min: 000 Max: 999
F4-02 ◆ RUN	Terminal V1 Gain	Sets the gain for voltage output via terminal V1.	Default: 100.0% Min: -999.9% Max: 999.9%

<34> Setting range is 1 to 15000 ppr when the drive is set for CLV/PM. <39> Available in drive software versions PRG: 7016 and later.

B Parameter Table

No.	Name	Description	Setting
F4-03	Terminal V2 Function Selection	Sets the monitor signal for output from terminal V2. Set this parameter to the last three digits of the desired $U\Box -\Box\Box$ monitor. Some U parameters are available only in certain control modes.	Default: 103 Min: 000 Max: 999
F4-04 ◆ RUN	Terminal V2 Gain	Sets the gain for voltage output via terminal V2.	Default: 50.0% Min: -999.9% Max: 999.9%
F4-05	Terminal V1 Bias	Sets the amount of bias added to the voltage output via terminal V1.	Default: 0.0% Min: -999.9% Max: 999.9%
F4-06	Terminal V2 Bias	Sets the amount of bias added to the voltage output via terminal V2.	Default: 0.0% Min: -999.9% Max: 999.9%
F4-07	Terminal V1 Signal Level Selection	0: 0 to 10 V	Default: 1 Min: 0 Max: 1
F4-08	Terminal V2 Signal Level Selection	1: -10 to 10 V	Default: 1 Min: 0 Max: 1

■ F5: Digital Output Card (DO-A3)

No.	Name	Description	Setting
F5-01	Terminal P1-PC Output Selection		Default: 0 Min: 0 Max: 161
F5-02	Terminal P2-PC Output Selection	1 1	Default: 1 Min: 0 Max: 161
F5-03	Terminal P3-PC Output Selection		Default: 2 Min: 0 Max: 161
F5-04	Terminal P4-PC Output Selection	Sets the function for contact output terminals M1-M2, M3-M4, and	Default: 4 Min: 0 Max: 161
F5-05	Terminal P5-PC Output Selection	photocoupler output terminals P1 through P6. In the photocoupler output terminals P1 through P6.	Default: 6 Min: 0 Max: 161
F5-06	Terminal P6-PC Output Selection		Default: 37 Min: 0 Max: 161
F5-07	Terminal M1-M2 Output Selection		Default: F Min: 0 Max: 161
F5-08	Terminal M3-M4 Output Selection		Default: F Min: 0 Max: 161
F5-09	DO-A3 Output Mode Selection	O: Output terminals are each assigned separate output functions. Binary code output Use output terminal functions selected by parameters F5-01 through F5-08.	Default: 0 Min: 0 Max: 2

■ F6: Communication Option Card

For more details on a specific option card, refer to the instruction manual for the option card.

No.	Name	Description	Setting
F6-01	Operation Selection after Communications Error	0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02.1: Coast to stop.2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09.3: Alarm only.	Default: 1 Min: 0 Max: 3
F6-02	External Fault from Communication Option Detection Selection	0: Always detected 1: Detection during run only	Default: 0 Min: 0 Max: 1
F6-03	External Fault from Communication Option Operation Selection	0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02.1: Coast to stop.2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09.3: Alarm only.	Default: 1 Min: 0 Max: 3
F6-04	bUS Error Detection Time	Sets the delay time for error detection if a bus error occurs.	Default: 2.0 s Min: 0.0 s Max: 5.0 s
F6-06	Torque Limit Selection from Communications Option	Disabled. Torque limit from option card disabled. Enabled. Torque limit from option card enabled.	Default: 0 Min: 0 Max: 1
F6-08 	Reset Communication Parameter	0: Communication-related parameters (F6-□□) are not reset when the drive is initialized using A1-03. 1: Reset all communication-related parameters (F6-□□) when the drive is initialized using A1-03.	Default: 0 Min: 0 Max: 1
F6-35	CANopen Node ID	Sets the node address.	Default: 0 Min: 0 Max: 126
F6-36	CANopen Communication Speed	0: Auto-detection 1: 10 kbps 2: 20 kbps 3: 50 kbps 4: 125 kbps 5: 250 kbps 6: 500 kbps 7: 800 kbps 8: 1 Mbps	Default: 6 Min: 0 Max: 8

<1> Parameter setting value is not reset to the default value when the drive is initialized.

♦ H: Multi-Function Terminals

H parameters assign functions to the multi-function input and output terminals.

■ H1: Multi-Function Digital Inputs

No.	Name	Description	Setting
H1-03	Terminal S3 Function Selection	Assigns a function to the multi-function digital inputs. Refer to page 156 to page 157 for a description of setting values. Note: Unused terminals should be set to F.	Default: <19> Min: 3 Max: 79
H1-04	Terminal S4 Function Selection		Default: <19> Min: 3 Max: 79
H1-05	Terminal S5 Function Selection		Default: <19> Min: 3 Max: 79
H1-06	Terminal S6 Function Selection		Default: <19> Min: 3 Max: 79
H1-07	Terminal S7 Function Selection		Default: <19> Min: 3 Max: 79
H1-08	Terminal S8 Function Selection		Default: F Min: 3 Max: 79

<19> With the speed reference priority d1-18 is set to 0 or 3, the default settings for parameters H1-03 to H1-07 governing input terminals S3 to S7 are: 24, 14, 3, 4, and 5 respectively. When d1-18 is set to 1 or 2, the default settings for H1-03 to H1-07 become 50, 54, 51, 53, and F respectively.

H1 Multi-Function Digital Input Settings			
H1-□□ Setting	Function	Description	
3	Multi-Step Speed Reference 1	When input terminals are set to Multi-Step Speed References 1 through 3, switching	
4	Multi-Step Speed Reference 2	combinations of those terminals will create a multi-step speed sequence using the speed	
5	Multi-Step Speed Reference 3	references set in d1-01 through d1-08.	
6	Jog reference selection	Closed: Jog frequency reference (d1-17) selected. The Jog frequency can be used when the speed reference selection is not assigned to input terminals (b1-01 \neq 1) and the speed reference priority is set to use the multi-step speed reference (d1-18 = 0 or 3).	
7	Accel/decel Ramp Selection 1	Used to switch between accel/decel ramp 1 (set in C1-01, C1-02) and accel/decel ramp 2 (set in C1-03, C1-04). When combined with another input terminal set for "Accel/Decel ramp 2" (H1-□□ = 1A), the drive can also switch between accel/decel ramp 3 (set in C1-05, C1-06) and accel/decel ramp 4 (set in C1-07, C1-08).	
8	Baseblock Command (N.O.)	Closed: No drive output	
9	Baseblock Command (N.C.)	Open: No drive output	
F	Not Used (Through Mode)	Select this setting when using the terminal in a pass-through mode. The terminal does not trigger a drive function but can be used as digital input for the controller the drive is connected to.	
14	Fault Reset	Closed: Resets faults if the cause is cleared and the Up/Down command is removed.	
15	Fast Stop (N.O.)	Closed: Decelerates to stop at the Fast Stop ramp set to C1-09.	
16	Motor 2 Selection	Open: Motor 1(E1-□□, E3-□□) Closed: Motor 2 (E2-□□, E4-□□)	
17	Fast Stop (N.C.)	Open: Decelerates to stop at the Fast Stop ramp set to C1-09.	
18	Timer Function Input	Triggers the timer set up by parameters b4-01 and b4-02. Must be set in conjunction with the timer function output (H2- $\square\square$ = 12).	

H1 Multi-Function Digital Input Settings			
H1-□□ Setting	Function	Description	
1A	Accel/decel Ramp Selection 2	Used in conjunction with an input terminal set for "Accel/decel ramp selection 1" (H1- $\Box\Box$ = 7), and allows the drive to switch between accel/decel ramp 3 and 4.	
20 to 2F	External Fault	20: N.O., Always detected, ramp to stop 21: N.C., Always detected, ramp to stop 22: N.O., During run, ramp to stop 23: N.C., During run, ramp to stop 24: N.O., Always detected, coast to stop 25: N.C., Always detected, coast to stop 26: N.O., During run, coast to stop 27: N.C., During run, coast to stop 28: N.O., Always detected, Fast Stop 28: N.O., Always detected, Fast Stop 29: N.C., Always detected, Fast Stop 20: N.C., During run, Fast Stop 21: N.C., During run, Fast Stop 22: N.O., Always detected, alarm only (continue running) 21: N.C., Always detected, alarm only (continue running) 22: N.O., During run, alarm only (continue running) 25: N.C., During run, alarm only (continue running)	
50	Nominal Speed	Closed: Activates the nominal speed (d1-19).	
51	Intermediate Speed	Closed: Activates the Intermediate Speed (d1-20).	
52	Releveling Speed	Closed: Activates the Releveling Speed (d1-23).	
53	Leveling Speed	Closed: Activates the Leveling Speed (d1-26).	
54	Inspection Operation	Closed: Activates Inspection operation using the speed set in d1-24.	
55	Rescue Operation	Closed: Activates rescue operation.	
56	Motor Contactor Feedback	Used for motor contactor supervision and fault detection.	
57	High Speed Limit (Up)	Closed: Uses the leveling speed as the maximum speed when going up.	
58	High Speed Limit (Down)	Closed: Uses the leveling speed as the maximum speed when going down.	
5C	Floor Sensor	Closed: Initiate Direct Landing (S5-10 = 1)	
67	Communications Test Mode	Tests the MEMOBUS/Modbus RS-485/422 interface. Displays "PASS" if the test completes successfully.	
79	Brake Feedback	Used for brake supervision and detection of incorrect operation.	

■ H2: Multi-Function Digital Outputs

No.	Name	Description	Setting
H2-01	Terminals M1-M2 Function Selection (relay)		Default: 50 Min: 0 Max: 161
H2-02	Terminals M3-M4 Function Selection (relay)		Default: 51 Min: 0 Max: 161
H2-03	Terminals M5-M6 Function Selection (relay)	Refer to <i>H2 Multi-Function Digital Output Settings on page 158</i> for a description of setting values.	Default: 6 Min: 0 Max: 161
H2-04	Terminal P1-C1 Function Selection (photocoupler)		Default: 37 Min: 0 Max: 161
H2-05	Terminal P2-C2 Function Selection (photocoupler)		Default: F Min: 0 Max: 161

		H2 Multi-Function Digital Output Settings
H2-□□ Setting	Function	Description
0	During Run	Closed: An Up/Down command is active or voltage is output.
1	Zero Speed	Open: Output speed is above the minimum output speed set in E1-09. Closed: Output speed is below the minimum output speed set in E1-09.
2	Speed Agree 1	Closed: Output speed equals the speed reference (plus or minus the hysteresis set to L4-02).
3	User-set Speed Agree 1	Closed: Output speed and speed reference equal L4-01 (plus or minus the hysteresis set to L4-02).
4	Speed Detection 1	Closed: Output speed is less than or equal to the value in L4-01 with hysteresis determined by L4-02.
5	Speed Detection 2	Closed: Output speed is greater than or equal to the value in L4-01 with hysteresis determined by L4-02.
6	Drive Ready	Closed: Power up is complete and the drive is ready to accept an Up/Down command.
7	DC Bus Undervoltage	Closed: DC bus voltage is below the Uv trip level set in L2-05.
8	During Baseblock (N.O.)	Closed: Drive has entered the baseblock state (no output voltage).
9	Speed Reference Source	Open: The speed reference is supplied by an external reference (set in b1-01). Closed: Digital operator supplies the speed reference.
A	Up/Down Command Source	Open: The Up/Down command is supplied by an external reference (set in b1-02). Closed: Digital operator supplies the Up/Down command.
В	Torque Detection 1	Closed: An overtorque or undertorque situation has been detected.
Е	Fault	Closed: Fault occurred.
F	Not used (Through Mode)	Set this value when using the terminal in the pass-through mode.
10	Minor Fault	Closed: An alarm has been triggered, or the IGBTs have reached 90% of their expected life span.
11	Fault Reset Command Active	Closed: A command has been entered to clear a fault via the input terminals or from the serial network.
12	Timer Output	Closed: Timer output.
13	Speed Agree 2	Closed: When drive output frequency equals the speed reference ±L4-04.
14	User-set Speed Agree 2	Closed: When the drive output speed is equal to the value in L4-03 \pm L4-04.
15	Speed Detection 3	Closed: When the drive output speed is less than or equal to the value in L4-03 ±L4-04.
16	Speed Detection 4	Closed: When the output speed is greater than or equal to the value in L4-03 ±L4-04.
18	Torque Detection 2	Closed: Overtorque or undertorque has been detected.
1A	During Down Direction	Closed: Drive is running in the down direction.
1B	During Baseblock 2 (N.C.)	Open: Drive has entered the baseblock state (no output voltage).
1C	Motor 2 Selection	Open: Motor 1 is selected Closed: Motor 2 is selected
1D	During Regeneration	Closed: Motor is operated in regenerative mode.
1E	Reset Enabled	Closed: An automatic reset is performed
1F	Motor Overload Alarm (oL1)	Closed: oL1 is at 90% of its trip point or greater. An oH3 situation also triggers this alarm.
20	Drive Overheat Pre-alarm (oH)	Closed: Heatsink temperature exceeds the parameter L8-02 value.
2F	Maintenance Period	Closed: Cooling fan, electrolytic capacitors, IGBTs, or the soft charge bypass relay may require maintenance.
30	During Torque Limit	Closed: When the torque limit has been reached.
33	Within Position Lock Bandwidth	Closed: Position deviation is within the Position Lock Bandwidth.
37	During Frequency Output	Open: Either the drive has stopped or baseblock, DC Injection Braking, or Initial Excitation is being performed. Closed: Drive is running the motor (not in a baseblock state and DC Injection is not being performed).
47	Input Phase Loss	Closed: Input phase loss has occurred Open: Normal operation (no phase loss detected)

H2 Multi-Function Digital Output Settings			
H2-□□ Setting	Function	Description	
4E	Braking Transistor Fault (rr)	Closed: The built-in dynamic braking transistor failed. Note: This function is not available in models CIMR-L□2A0145 to 2A0415, 4A0075 to 4A0216.	
50	Brake Control	Close: Release brake Open: Apply brake	
51	Output Contactor Control	Closed: Close output contactor	
52	Door Zone Reached	Closed: Indicates that the door zone has been reached.	
53	Not Zero Speed	Closed: Speed is greater than the zero speed level set to S1-01 Open: Operating at zero speed level	
54	Light Load Direction	Closed: Light load direction is up Open: Light load direction is down	
55	Light Load Direction Detection Status	Closed: Ready for Light Load Direction Search Open: Light Load Detection in progress	
58	Safe Disable Status	Closed: Safe Disable terminals H1-HC and H2-HC are open, drive is in a baseblock state Open: Safe Disable terminals H1-HC and H2-HC are closed (normal operation)	
60	Internal Cooling Fan Alarm	Closed: Internal cooling fan alarm	
61	Motor Pole Search Status	Closed: Motor pole search successful	
100 to 161	Function 0 to 61 with Inverse Output	Inverts the output switching of the multi-function output functions. Sets the last two digits of 1□□ to reverse the output signal of that specific function.	

■ H3: Multi-Function Analog Inputs

No.	Name	Description	Setting
H3-01	Terminal A1 Signal Level Selection	0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min: 0 Max: 1
H3-02	Terminal A1 Function Selection	Sets the function of terminal A1.	Default: 0 Min: 0 Max: 1F
H3-03 ◆ RUN	Terminal A1 Gain Setting	Sets the level of the input value selected in H3-02 when 10 V is input at terminal A1.	Default: 100.0% Min: -999.9% Max: 999.9%
H3-04 ◆ RUN	Terminal A1 Bias Setting	Sets the level of the input value selected in H3-02 when 0 V is input at terminal A1.	Default: 0.0% Min: -999.9% Max: 999.9%
H3-09	Terminal A2 Signal Level Selection	0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min: 0 Max: 0
H3-10	Terminal A2 Function Selection	Sets the function of terminal A2.	Default: 0 Min: 0 Max: 1F
H3-11 •◆RUN	Terminal A2 Gain Setting	Sets the level of the input value selected in H3-10 when 10 V is input at terminal A2.	Default: 100.0% Min: -999.9% Max: 999.9%
H3-12 •◆RUN	Terminal A2 Bias Setting	Sets the level of the input value selected in H3-10 when 0 V is input at terminal A2.	Default: 0.0% Min: -999.9% Max: 999.9%
Н3-13	Analog Input Filter Time Constant	Sets a primary delay filter time constant for terminals A1 and A2. Used for noise filtering.	Default: 0.03 s Min: 0.00 s Max: 2.00 s
Н3-16	Offset for Terminal A1	Applies an offset to analog input A1. Can be used for zero adjustment of the analog input.	Default: 0 Min: -500 Max: 500
Н3-17	Offset for Terminal A2	Applies an offset to analog input A2. Can be used for zero adjustment of the analog input.	Default: 0 Min: -500 Max: 500

	Н3 М	ulti-Function Analog Input Settings
H3-□□ Setting	Function	Description
0	Speed Reference Bias (value added to input signal when multiple analog terminals supply the speed reference)	10 V = E1-04 (maximum output frequency)
2	Auxiliary Speed Reference 1 (used as a second speed reference)	10 V = E1-04 (maximum output frequency)
3	Auxiliary Speed Reference 2 (used as third speed reference)	10 V = E1-04 (maximum output frequency)
14	Torque Compensation (load cell input)	10 V = Motor rated torque
1F	Not used (Through Mode)	Sets this value when using the terminal in the pass-through mode.

■ H4: Analog Outputs

No.	Name	Description	Setting
H4-01	Terminal FM Monitor Selection	Selects the data to be output through multi-function analog output terminal FM. Set the desired monitor parameter to the digits available in U□-□□. For example, enter "103" for U1-03.	Default: 102 Min: 000 Max: 999
H4-02 ◆ RUN	Terminal FM Gain	Sets the signal level at terminal FM that is equal to 100% of the selected monitor value.	Default: 100.0% Min: -999.9% Max: 999.9%
H4-03 ◆ RUN	Terminal FM Bias	Sets the bias value added to the terminal FM output signal.	Default: 0.0% Min: -999.9% Max: 999.9%
H4-04	Terminal AM Monitor Selection	Selects the data to be output through multi-function analog output terminal AM. Set the desired monitor parameter to the digits available in U□-□□. For example, enter "103" for U1-03.	Default: 103 Min: 000 Max: 999
H4-05 ◆ RUN	Terminal AM Gain	Sets the signal level at terminal AM that is equal to 100% of the selected monitor value.	Default: 50.0% Min: -999.9% Max: 999.9%
H4-06 ◆ RUN	Terminal AM Bias	Sets the bias value added to the terminal AM output signal.	Default: 0.0% Min: -999.9% Max: 999.9%
H4-07	Terminal FM Signal Level Selection	0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min: 0 Max: 1
H4-08	Terminal AM Signal Level Selection	0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min: 0 Max: 1

■ H5: MEMOBUS/Modbus Serial Communication

No.	Name	Description	Setting
H5-01 <14>	Drive Node Address	Selects drive station node number (address) for MEMOBUS/Modbus terminals R+, R-, S+, S Cycle power for the setting to take effect.	Default: 1 Min: 0 Max: FF
H5-02	Communication Speed Selection	0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps 6: 57600 bps 7: 76800 bps 8: 115200 bps Cycle power for the setting to take effect.	Default: 3 Min: 0 Max: 8
H5-03	Communication Parity Selection	0: No parity 1: Even parity 2: Odd parity Cycle power for the setting to take effect.	Default: 0 Min: 0 Max: 2
H5-04	Stopping Method After Communication Error (CE)	0: Ramp to stop 1: Coast to stop 2: Fast Stop 3: Alarm only	Default: 3 Min: 0 Max: 3
H5-05	Communication Fault Detection Selection	0: Disabled 1: Enabled. If communication is lost for more than two seconds, a CE fault will occur.	Default: 1 Min: 0 Max: 1
H5-06	Drive Transmit Wait Time	Sets the wait time between receiving and sending data.	Default: 5 ms Min: 5 ms Max: 65 ms
H5-07	RTS Control Selection	0: Disabled. RTS is always on. 1: Enabled. RTS turns on only when sending.	Default: 1 Min: 0 Max: 1
H5-09	Communication Fault Detection Time	Sets the time required to detect a communications error. Adjustment may be needed when networking several drives.	Default: 2.0 s Min: 0.0 s Max: 10.0 s
H5-10	Unit Selection for MEMOBUS/Modbus Register 0025H	0: 0.1 V units 1: 1 V units	Default: 0 Min: 0 Max: 1
H5-11	Communications ENTER Function Selection	Drive requires an Enter command before accepting any changes to parameter settings. Parameter changes are activated immediately without the Enter command.	Default: 0 Min: 0 Max: 1

<14> If this parameter is set to 0, the drive will be unable to respond to MEMOBUS/Modbus commands.

◆ L: Protection Functions

L parameters provide protection to the drive and motor, including control during momentary power loss, Stall Prevention, frequency detection, fault reset, overtorque detection, torque limits, and other types of hardware protection.

■ L1: Motor Protection

No.	Name	Description	Setting
L1-01	Motor Overload Protection Selection	0: Disabled 1: General purpose motor (standard fan cooled) 2: Drive dedicated motor with a speed range of 1:10 3: Vector motor with a speed range of 1:100 5: PM motor with constant torque characteristics	Default: <5> Min: 0 Max: 5
L1-02	Motor Overload Protection Time	Sets the motor thermal overload protection (oL1) time.	Default: 1.0 min Min: 0.1 min Max: 5.0 min
L1-13	Continuous Electrothermal Operation Selection	0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1

<5> Default setting is determined by the control mode (A1-02).

■ L2: Undervoltage Detection

No.	Name	Description	Setting
L2-05	Undervoltage Detection Level (Uv)	Sets the DC bus undervoltage trip level.	Default: <9> <15> Min: 150 Vdc Max: 210 Vdc <9>

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.

■ L3: Stall Prevention

No.	Name	Description	Setting
L3-01	Stall Prevention Selection during Acceleration	 0: Disabled. 1: General purpose. Acceleration is paused as long as the current is above the L3-02 setting. 2: Intelligent. Accelerate in the shortest possible time without exceeding the L3-02 level. 	Default: 1 Min: 0 Max: 2
L3-02	Stall Prevention Level during Acceleration	Used when L3-01 = 1 or 2. 100% is equal to the drive rated current.	Default: <16> Min: 0% Max: 150% <16>
L3-05	Stall Prevention Selection during Run	O: Disabled. Drive runs at a set frequency. A heavy load may cause speed loss. 1: Decel time 1. Uses the deceleration ramp set to C1-02 while Stall Prevention is performed. 2: Decel time 2. Uses the deceleration ramp set to C1-04 while Stall Prevention is performed.	Default: 1 Min: 0 Max: 2
L3-06	Stall Prevention Level during Run	Enabled when L3-05 is set to 1 or 2. 100% is equal to the drive rated current.	Default: <16> Min: 30% Max: 150% <16>

<16> The setting value is dependent on the setting for the carrier frequency reduction (L8-38).

<15> Default setting value is dependent on the setting for the input voltage (E1-01).

■ L4: Speed Detection

No.	Name	Description	Setting
L4-01	Speed Agreement Detection Level	L4-01 sets the speed detection level for digital output functions H2- \square =	Default: 0.0% Min: 0.0% Max: 100.0%
L4-02	Speed Agreement Detection Width	L4-02 sets the hysteresis or allowable margin for speed detection.	Default: 4.0% Min: 0.0% Max: 40.0%
L4-03	Speed Agreement Detection Level (+/-)	L4-03 sets the speed detection level for digital output functions H2- \square =	Default: 0.0% Min: -100.0% Max: 100.0%
L4-04	Speed Agreement Detection Width (+/-)	L4-02 sets the hysteresis or allowable margin for speed detection. L4-03 sets the speed detection level for digital output functions H2-□□ = 13, 14, 15, 16. L4-04 sets the hysteresis or allowable margin for speed detection. 0: Stop. Drive stops when the speed reference is lost. 1: Run. Drive runs at a reduced speed when the speed reference is lost. Sets the percentage of the speed reference that the drive should run with	Default: 4.0% Min: 0.0% Max: 40.0%
L4-05	Speed Reference Loss Detection Selection	O: Stop. Drive stops when the speed reference is lost. Run. Drive runs at a reduced speed when the speed reference is lost.	Default: 0 Min: 0 Max: 1
L4-06	Speed Reference at Reference Loss	Sets the percentage of the speed reference that the drive should run with when the speed reference is lost.	Default: 80% Min: 0.0% Max: 100.0%
L4-13	Door Zone Level	Sets the door zone speed level. The "door zone" multi-function digital output is closed when the speed falls below this level.	Default: 0.0% Min: 0.0% Max: 100.0%

■ L5: Automatic Fault Reset

No.	Name	Description	Setting
L5-01	Number of Auto Reset Attempts	Sets the number of times the drive may attempt to reset after the following faults occur: GF, LF, oC, ov, rr, oH1, oL1, oL2, oL3, oL4, UL3, UL4.	Default: 0 Min: 0 Max: 10
L5-02	Fault Output Operation during Auto Reset	Fault output not active. Fault output active during reset attempt.	Default: 0 Min: 0 Max: 1
L5-06	Undervoltage Fault Reset Selection	0: Same as L5-01 condition 1: Always automatically reset UV1	Default: 0 Min: 0 Max: 1

■ L6: Torque Detection

No.	Name	Description	Setting
L6-01	Torque Detection Selection 1	0: Disabled 1: oL3 detection only active during speed agree, operation continues after detection 2: oL3 detection always active during run, operation continues after detection 3: oL3 detection only active during speed agree, output shuts down on an oL3 fault 4: oL3 detection always active during run, output shuts down on an oL3 fault 5: UL3 detection only active during speed agree, operation continues after detection 6: UL3 detection always active during run, operation continues after detection 7: UL3 detection only active during speed agree, output shuts down on an oL3 fault 8: UL3 detection always active during run, output shuts down on an oL3 fault	Default: 0 Min: 0 Max: 8

B Parameter Table

No.	Name	Description	Setting
L6-02	Torque Detection Level 1	Sets the overtorque and undertorque detection level.	Default: 150% Min: 0% Max: 300%
L6-03	Torque Detection Time 1	Sets the time an overtorque or undertorque condition must exist to trigger torque detection 1.	Default: 0.1 s Min: 0.0 s Max: 10.0 s
L6-04	Torque Detection Selection 2	0: Disabled 1: oL4 detection only active during speed agree, operation continues after detection 2: oL4 detection always active during run, operation continues after detection 3: oL4 detection only active during speed agree, output shuts down on an oL4 fault 4: oL4 detection always active during run, output shuts down on an oL4 fault 5: UL4 detection only active during speed agree, operation continues after detection 6: UL4 detection always active during run, operation continues after detection 7: UL4 detection only active during speed agree, output shuts down on an oL4 fault 8: UL4 detection always active during run, output shuts down on an oL4 fault	Default: 0 Min: 0 Max: 8
L6-05	Torque Detection Level 2	Sets the overtorque and undertorque detection level.	Default: 150% Min: 0% Max: 300%
L6-06	Torque Detection Time 2	Sets the time an overtorque or undertorque condition must exist to trigger torque detection 2.	Default: 0.1 s Min: 0.0 s Max: 10.0 s

■ L7: Torque Limit

No.	Name	Description	Setting
L7-01	Forward Torque Limit	Sets the torque limit value as a percentage of the motor rated torque. Four individual quadrants can be set.	Default: 200% Min: 0% Max: 300%
L7-02	Reverse Torque Limit	Output Torque Positive Torque L7-04 L7-04 Motor	Default: 200% Min: 0% Max: 300%
L7-03	Forward Regenerative Torque Limit	Regeneration r/min REV Regeneration FWD	Default: 200% Min: 0% Max: 300%
L7-04	Reverse Regenerative Torque Limit	L7-03 L7-02 Negative Torque	Default: 200% Min: 0% Max: 300%
L7-16	Torque Limit Process at Start	0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1

■ L8: Drive Protection

No.	Name	Description	Setting
L8-02	Overheat Alarm Level	An overheat alarm will occur if the heatsink temperature exceeds the level set in L8-02.	Default: Min: 50°C Max: 150°C
L8-03	Overheat Pre-Alarm Operation Selection	O: Ramp to stop. A fault is triggered. 1: Coast to stop. A fault is triggered. 2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09. A fault is triggered. 3: Continue operation. An alarm is triggered.	Default: 3 Min: 0 Max: 3
L8-05	Input Phase Loss Protection Selection	Selects the detection of input current phase loss, power supply voltage imbalance, or main circuit electrolytic capacitor deterioration. 0: Disabled 1: Enabled always 2: Enabled during operation 3: Enabled during constant speed	Default: 1 Min: 0 Max: 3
L8-06	Input Phase Loss Detection Level	When ripple is observed in the DC bus, expansion of the input bias is calculated and becomes the input phase if the difference between the max and minimum values of the ripple are greater than L8-06. Detection Level = 100% = Voltage class $\times \sqrt{2}$ (determines standards for setting values)	Default: Min: 0.0% Max: 50.0%
L8-07	Output Phase Loss Protection Selection	0: Disabled 1: Enabled (triggered by a single phase loss) 2: Enabled (triggered when two phases are lost)	Default: 0 Min: 0 Max: 2
L8-09	Output Ground Fault Detection Selection	0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1
L8-10	Heatsink Cooling Fan Operation Selection	0: During run only. Fan operates only during run and for L8-11 seconds after stop.1: Fan always on. Cooling fan operates whenever the drive is powered up.2: Temperature controlled operation.	Default: 0 Min: 0 Max: 2
L8-11	Heatsink Cooling Fan Off Delay Time	Sets a delay time to shut off the cooling fan after the Up/Down command is removed when L8- $10 = 0$.	Default: 60 s Min: 0 s Max: 300 s
L8-12	Ambient Temperature Setting	Enter the ambient temperature. This value adjusts the oL2 detection level.	Default: 40°C Min: -10°C Max: 50°C
L8-15	oL2 (drive overload) Characteristics Selection at Low Speeds	0: No oL2 level reduction below 6 Hz. 1: oL2 level is reduced linearly below 6 Hz. It is halved at 0 Hz.	Default: 1 Min: 0 Max: 1
L8-27	Overcurrent Detection Gain	Sets the gain for overcurrent detection as a percentage of the motor rated current. Overcurrent is detected using the drive's overcurrent level or the value set to L8-27, whichever is lower.	Default: 300.0% Min: 0.0% Max: 300.0%
L8-29	Current Unbalance Detection (LF2)	0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1
L8-35 </td <td>Installation Selection</td> <td>0: IP00 enclosure drive 2: IP00 enclosure drive with top protective cover</td> <td>Default: Min: 0 Max: 2</td>	Installation Selection	0: IP00 enclosure drive 2: IP00 enclosure drive with top protective cover	Default: Min: 0 Max: 2
L8-38	Automatic Torque Boost Selection	Torque Boost increases the output current limit while decreasing the carrier frequency when the output current exceeds a certain value. 0: Disabled 3: Enabled	Default: 0 Min: 0 Max: 3
L8-39	Reduced Carrier Frequency	Sets the reduced carrier frequency used by the Torque Boost function.	Default: 3.0 kHz Min: 1.0 kHz Max: 15.0 kHz

No.	Name	Description	Setting
L8-55	Internal Braking Transistor Protection	Disabled. L8-55 should be disabled when using a regen converter or an optional braking unit. Protection enabled.	Default: 1 Min: 0 Max: 1
L8-62	Operation Selection at Input Phase Loss	Sets stopping method when a Input phase loss fault (PF) occurs. See parameter L8-05. 0: Ramp to Stop - Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to Stop 2: Fast Stop - Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only - Drive continues operation.	Default: 1 Min: 0 Max: 3
L8-77	Oscillation Suppression	Used to suppress speed oscillations that occur with an unloaded motor and that have the same frequency as the output frequency.	Default: 0 Min: -100 Max: 100
L8-88	Safe Disable Operation Mode	0: Mode 0 1: Mode 1	Default: 1 Min: 0 Max: 1

<1> Parameter setting value is not reset to the default value when the drive is initialized.

♦ n: Advanced Performance Set-Up

The n parameters are used to adjust more advanced performance characteristics such as speed feedback detection, Online Tuning for motor line-to-line resistance, and PM motor control tuning.

■ n2: Speed Feedback Detection Control (AFR) Tuning

No.	Name	Description	Setting
n2-01	Speed Feedback Detection Control (AFR) Gain	Sets the internal speed feedback detection control gain in the automatic frequency regulator (AFR). If hunting occurs, increase the set value. If response is low, decrease the set value.	Default: 1.00 Min: 0.00 Max: 10.00
n2-02	Speed Feedback Detection Control (AFR) Time Constant 1	Sets the time constant used for speed feedback detection control (AFR).	Default: 50 ms Min: 0 ms Max: 2000 ms
n2-03	Speed Feedback Detection Control (AFR) Time Constant 2	Sets the AFR time constant to be used during regen.	Default: 750 ms Min: 0 ms Max: 2000 ms

■ n5: Inertia Compensation

No.	Name	Description	Setting
n5-01	Inertia Compensation Selection	0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1
n5-02	Motor Acceleration Time	Sets the time required to accelerate the motor at 100% torque from 0 to the nominal speed.	Default: <-> Min: 0.001 s Max: 10.000 s
n5-03	Inertia Compensation Gain	Sets the ratio between motor and load inertia. Lower this setting if overshoot occurs at the end of acceleration.	Default: 1.00 Min: 0.00 Max: 100.00
n5-07	Speed Feedback Compensation Selection	0: Disabled 1: Enabled 2: Test Mode	Default: 1 Min: 0 Max: 2
n5-08	Speed Feedback Compensation Gain (P)	Sets the proportional gain for the Speed Feedback Compensation.	Default: 12.00 Min: 0.00 Max: 300.00

<4> Default setting value is dependent on the drive model (o2-04).

<4> Default setting is determined by the drive model (o2-04).

■ n6: Online Tuning

No.	Name	Description	Setting
n6-01	Online Tuning Selection	0: Disabled 1: Line-to-line resistance tuning 2: Voltage correction.	Default: 2 Min: 0 Max: 2
n6-05	Online Tuning Gain	Decrease this setting for motors with a relatively large rotor time constant. If overload occurs, increase this setting slowly in increments of 0.1.	Default: 1.0 Min: 0.1 Max: 50.0

■ n8: PM Motor Control Tuning

No.	Name	Description	Setting
n8-01	Initial Polarity Estimation Current	Sets the current used for initial rotor position estimation as a percentage of the motor rated current (E5-03). If the motor nameplate lists an "Si" value, that value should be entered here.	Default: 50% Min: 0% Max: 100%
n8-02	Pole Attraction Current	Sets the current during initial polar attraction as a percentage of the motor rated current. Enter a high value when attempting to increase starting torque.	Default: 80% Min: 0% Max: 150%
n8-29	q-Axis Current Control Gain during Normal Operation	Sets the q axis proportional gain for the normal control range.	Default: 1000 rad/s Min: 0 rad/s Max: 2000 rad/s
n8-30	q-Axis Current Control Integral Time during Normal Operation	Sets the q axis integral time for the normal control range.	Default: 10.0 ms Min: 0.0 ms Max: 100.0 ms
n8-32	d-Axis Current Control Gain during Normal Operation	Sets the d axis proportional gain for the normal control range.	Default: 1000 rad/s Min: 0 rad/s Max: 2000 rad/s
n8-33	d-Axis Current Control Integral Time during Normal Operation	Sets the d axis integral time for the normal control range.	Default: 10.0 ms Min: 0.0 ms Max: 100.0 ms
n8-35	Initial Rotor Position Detection Selection	1: High frequency injection 2: Pulse injection	Default: 1 Min: 1 Max: 2
n8-36	High Frequency Injection Level	Sets the frequency in Hz for the superimposed signal used for superimposed harmonics.	Default: 500 Hz Min: 25 Hz Max: 1000 Hz
n8-37	High Frequency Injection Amplitude	Sets the amplitude for superimposed harmonics according to the voltage class of the motor. Adjust this value when there is too much or too little current as a result of the settings assigned to motor parameters.	Default: 20.0% Min: 0.0% Max: 99.9%
n8-62	Output Voltage Limit	Prevents output voltage saturation. Should be set just below the voltage provided by the input power supply.	Default: 200.0 V <9> Min: 0.0 V Max: 230.0 V <9>
n8-81	High Frequency Injection during Rescue Operation	Sets the frequency used for Polar Detection Method 1 during Rescue Operation.	Default: 90 Hz Min: 25 Hz Max: 1000 Hz
n8-82	High Frequency Injection Amplitude during Rescue Operation	Sets the amplitude for High Frequency Injection during Rescue Operation as a percentage of the voltage (200 V or 400 V).	Default: 15.0% Min: 0.1% Max: 99.9%
n8-84	Polarity Detection Current	Sets the current level (E5-03) as a percentage for detecting polarity during Initial Polarity Estimation.	Default: 100% Min: 0% Max: 150%
n8-86	Magnet Pole Search Error Detection Selection	0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.

■ n9: Current Detection Adjustments

No.	Name	Description	Setting
n9-60	A/D Conversion Start Delay	Sets a delay time for starting the current signal A/D conversion. This value seldom needs to be changed.	Default: Min: 0.0 μs Max: 40.0 μs

<4> Default setting is determined by the drive model (o2-04).

• o: Operator Related Parameters

The o parameters set up the digital operator displays.

■ o1: Digital Operator Display Selection

No.	Name	Description	Setting
01-01 ◆RUN	Drive Mode Unit Monitor Selection	Selects the content of the last monitor that is shown when scrolling through Drive Mode display. Enter the last three digits of the monitor parameter number to be displayed: U□-□□.	Default: 106 (Monitor U1-06) Min: 105 Max: 699
o1-02 ●◆RUN	User Monitor Selection after Power Up	1: Speed reference (U1-01) 2: Direction 3: Output speed (U1-02) 4: Output current (U1-03) 5: User-selected monitor (set by o1-01)	Default: 1 Min: 1 Max: 5
o1-03	Digital Operator Display Unit Selection	Sets the units the drive should use to display the frequency reference and motor speed monitors. 0: 0.01 Hz 1: 0.01% (100% = E1-04) 2: r/min (calculated using the number of motor poles setting in E2-04, E4-04, or E5-04) 3: User-selected units (set by o1-10 and o1-11) 4: Elevator units 1 (speed in m/s, accel/decel rate and jerk in s) 5: Elevator units 2 (speed in m/s, accel/decel rate in m/s², jerk in m/s³) 6: Elevator units 3 (speed in ft/min, accel/decel rate in ft/s², jerk in ft/s³)	Default: 1 Min: 0 Max: 6 <21>
o1-04	V/f Pattern Setting Units	0: Hz 1: r/min	Default: <5> Min: 0 Max: 1
01-10	User-Set Display Units Maximum Value	These settings define the display values when o1-03 is set to 3. o1-10 sets the display value that is equal to the maximum output	Default: <20> Min: 1 Max: 60000
o1-11	User-Set Display Units Decimal Display	frequency. o1-11 sets the position of the decimal position.	Default: <20> Min: 0 Max: 3
01-12	Length Units	0: Millimeter unit 1: Inch unit	Default: 0 Min: 0 Max: 1
01-20	Traction Sheave Diameter	Sets the traction sheave diameter for display unit calculations.	Default: 400 mm <38> Min: 100 mm Max: 2000 mm <38>
01-21	Roping Ratio	Sets the roping ratio. 1: 1:1 2: 1:2 3: 1:3 4: 1:4	Default: 2 Min: 1 Max: 4

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No.	Name	Description	Setting
01-22	Mechanical Gear Ratio	Sets the ratio of the gear installed for display unit calculations.	Default: <5> Min: 0.10 Max: 50.00

<5> Default setting is determined by the control mode (A1-02).

■ o2: Digital Operator Keypad Functions

No.	Name	Description	Setting
02-01	LO/RE Key Function Selection	0: Disabled 1: Enabled. LO/RE key switches between LOCAL and REMOTE operation.	Default: 0 Min: 0 Max: 1
02-02	STOP Key Function Selection	0: Disabled. STOP key is disabled in REMOTE operation. 1: Enabled. STOP key is always enabled.	Default: 0 Min: 0 Max: 1
02-03	User Parameter Default Value	O: No change. 1: Set defaults. Saves parameter settings as default values for a User Initialization. 2: Clear all. Clears the default settings that have been saved for a User Initialization.	Default: 0 Min: 0 Max: 2
o2-04 	Drive Model Selection	Enter the drive model. Setting required only if installing a new control board.	Default: Determined by drive capacity Min: – Max: –
02-05	Speed Reference Setting Method Selection	O: ENTER key must be pressed to enter a speed reference. 1: ENTER key is not required. The speed reference can be adjusted using the up and down arrow keys only.	Default: 0 Min: 0 Max: 1
02-06	Operation Selection when Digital Operator is Disconnected	O: The drive continues operating if the digital operator is disconnected. 1: A fault is triggered (oPr) and the motor coasts to stop.	Default: 0 Min: 0 Max: 1
o2-09	Reserved	_	_

<1> Parameter setting value is not reset to the default value when the drive is initialized.

■ o3: Copy Function

No.	Name	Description	Setting
03-01	Copy Function Selection	O: No action 1: Read parameters from the drive, saving them onto the digital operator. 2: Copy parameters from the digital operator, writing them to the drive. 3: Verify parameter settings on the drive to check if they match the data saved on the operator.	Default: 0 Min: 0 Max: 3
03-02	Copy Allowed Selection	0: Read operation prohibited 1: Read operation allowed	Default: 0 Min: 0 Max: 1

 ^{20&}gt; This parameter appears when the drive displays user-set units (o1-03 = 3).
 21> The control mode determines the selections available. In V/f Control, only settings 1 through 3 are permitted.
 28> Default setting and setting range changes when inches are selected for the length units (o1-12 = 1). The setting range becomes 3.70 to 78.00 inches, and the default becomes 15.70 inches.

■ o4: Maintenance Monitor Settings

No.	Name	Description	Setting
04-01	Cumulative Operation Time Setting	Sets the value for the cumulative operation time of the drive in units of 10 h.	Default: 0 Min: 0 Max: 9999
04-02	Cumulative Operation Time Selection	0: Logs power-on time 1: Logs operation time when the drive output is active (output operation time).	Default: 0 Min: 0 Max: 1
04-03	Cooling Fan Operation Time Setting	Sets the value of the fan operation time monitor U4-03 in units of 10 h.	Default: 0 h Min: 0 h Max: 9999 h
04-05	Capacitor Maintenance Setting	Sets the value of the Maintenance Monitor for the capacitors. See U4-05 to check when the capacitors may need to be replaced.	Default: 0% Min: 0% Max: 150%
04-07	DC bus Pre-charge Relay Maintenance Setting	Sets the value of the Maintenance Monitor for the soft charge bypass relay. See U4-06 to check when the bypass relay may need to be replaced.	Default: 0% Min: 0% Max: 150%
04-09	IGBT Maintenance Setting	Sets the value of the Maintenance Monitor for the IGBTs. See U4-07 to check when the IGBTs may need to be replaced.	Default: 0% Min: 0% Max: 150%
o4-11	U2, U3 Initialization	0: U2-□□ and U3-□□ monitor data is not reset when the drive is initialized (A1-03). 1: Resets the data for the U2-□□ and U3-□□ monitors. Once o4-11 is set to 1 and the ENTER key is pressed, fault data is erased and the display returns to 0.	Default: 0 Min: 0 Max: 1
o4-12	kWh Monitor Initialization	0: U4-10 and U4-11 monitor data is not reset when the drive is initialized (A1-03). 1: Resets the kWh counter. The monitors U4-10 and U4-11 will display "0" after they are initialized. Once o4-12 is set to 1 and the ENTER key is pressed, kWh data is erased and the display returns to 0.	Default: 0 Min: 0 Max: 1
04-13	Number of Travels Counter Reset	0: Keep the number of travels counter value. The counter is not reset when the drive is initialized (A1-03). 1: Resets the number 0 travels counter. The monitor U4-24/25 will show 0. Once o4-13 is set to 1 and the ENTER key is pressed, the counter value is erased and the display returns to 0.	Default: 0 Min: 0 Max: 1
04-15 	Maintenance Alarm Snooze Period	After a maintenance alarm output has been triggered, o4-15 determines the level that will trigger the next alarm for the same component. The same alarm will be triggered by the detection level that triggered the original alarm plus the level set in o4-15.	Default: 2% Min: 0% Max: 20%
o4-16 <i><1</i> >	Maintenance Monitoring Selection	Selects the Maintenance Monitor using bits 0 to 3. 0: LT1 (cooling fan) 1: LT2 (DC bus capacitors) 2: LT3 (soft-charge bypass relay) 3: LT4 (IGBTs have passed 90% of the their life expectancy)	Default: 1000 Min: 0000 Max: 1111

<1> Parameter setting value is not reset to the default value during drive initialization (A1-03).

♦ S: Elevator Parameters

This section describes various functions and faults needed to operate an elevator application: braking sequence, slip compensation for elevators, start/stop optimization, Rescue Operation, and elevator-related faults.

■ S1: Brake Sequence

No.	Name	Description	Setting
S1-01	Zero Speed Level at Stop	Determines the speed to begin applying DC Injection (or Position Lock) when the drive is ramping to stop $(b1-03 = 0)$. Set as a percentage of the maximum output frequency (E1-04).	Default: <5> Min: 0.000% Max: 9.999%
S1-02	DC Injection Current at Start	Determines the amount of current to use for DC Injection at start. Set as a percentage of the drive rated current.	Default: 50% Min: 0% Max: 100%
S1-03	DC Injection Current at Stop	Determines the amount of current to use for DC Injection at stop. Set as a percentage of the drive rated current.	Default: 50% Min: 0% Max: 100%
S1-04	DC Injection/Position Lock Time at Start	Determines how long the drive should perform DC Injection at start. In CLV and CLV/PM, S1-04 determines how long Position Lock should be performed. A setting of 0.00 disables S1-04.	Default: 0.40s Min: 0.00 s Max: 10.00 s
S1-05	DC Injection/Position Lock Time at Stop	Determines how long the drive should perform DC Injection at stop. In CLV and CLV/PM, S1-05 determines how long Position Lock should be performed. A setting of 0.00 disables S1-05.	Default: 0.60s Min: 0.00 s Max: 10.00 s
S1-06	Brake Release Delay Time	Determines the delay time between the start of DC injection/Position Lock and setting the brake control command (H2-□□=50) in order to release the brake at the beginning of the ride.	Default: 0.20s Min: 0.00 s Max: 10.00 s
S1-07	Brake Close Delay Time	Determines the delay time between reaching Zero Speed (S1-01) and resetting the brake control command (H2- $\square\square$ = 50) in order to apply the brake at the end of the ride.	Default: 0.10s Min: 0.00 s Max: [S1-05]
S1-10	Run Command Delay Time	Sets the time that must pass after the Up/Down command is entered until the drive internal Run command is set and the ride is started.	Default: 0.10s Min: 0.00 s Max: 1.00 s
S1-11	Output Contactor Open Delay Time	Determines the delay time between shutting off the output of the drive and resetting the contactor control command (H2- $\square\square$ = 51) in order to release the motor contactor after a ride has finished.	Default: 0.10s Min: 0.00 s Max: 1.00 s
S1-12 <39>	Motor Contactor Control During Auto-Tuning	Determines the state of the output contactor control command (H2-□□ = 51) during Auto-Tuning. 0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1

<5> Default setting is determined by the control mode (A1-02).

■ S2: Slip Compensation for Elevators

No.	Name	Description	Setting
S2-01	Motor Rated Speed	Sets the motor rated speed.	Default: 1380 rpm Min: 300 rpm Max: 1800 rpm
\$2-02 ◆ RUN	Slip Compensation Gain in Motoring Mode	Slip compensation for leveling speed can be set separately for motoring and regenerative states. This can help improve the accuracy of leveling.	Default: 0.7 Min: 0.0 Max: 5.0
\$2-03 ◆ RUN	Slip Compensation Gain in Regenerative Mode		Default: 1.0 Min: 0.0 Max: 5.0
S2-05	Slip Compensation Torque Detection Delay Time	Sets a delay time before detecting torque for slip compensation.	Default: 1000 ms Min: 0 ms Max: 10000 ms
S2-06	Slip Compensation Torque Detection Filter Time Constant	Sets the filter time constant applied to the torque signal used for the slip compensation value calculation.	Default: 500 ms Min: 0 ms Max: 2000 ms

<39> Available in drive software versions PRG: 7016 and later.

■ S3: Start/Stop Optimization

No.	Name	Description	Setting
S3-01	Position Lock Gain at Start		Default: 5
♦ RUN	1	Sets gain levels 1 and 2 for the Position Lock function. Position Lock at	Min: 0
VII.311		start attempts to keep the car position when opening the brake in order to	Max: 100
S3-02	Position Lock Gain at Start	avoid roll back.	Default: 0.00
♦ RUN	2	arold foll back.	Min: 0.00
·	(Anti Rollback Gain)		Max: 100.00
S3-03		Sets the Position Lock gain at stop. Position Lock at stop keeps the car in	Default: 5
♦ RUN	Position Lock Gain at Stop	position until the brake has been applied entirely.	Min: 0
			Max: 100
S3-04	Dogition Loals Dondwidth	Determines the bandwidth around the stop position in which a digital	Default: 10
33-04	Position Lock Bandwidth	output programmed for "Within Position Lock Bandwidth" (H2- \square = 33) is closed.	Min: 0 Max: 16383
	Starting Torque		Default: 500 ms
S3-10	Compensation Increase	Sets a time constant for the torque reference to reach 300%. Enabled by	Min: 0 ms
55 10	Time	setting an analog input terminal for torque compensation (H3- \square = 14).	Max: 5000 ms
	Starting Torque		Default: 0
S3-12	Compensation Bias in	Adds a bias to torque compensation value from the load cell when moving	Min: -40.0%
	Down Direction	in down direction.	Max: 40.0%
	T C	Sets the speed level for torque compensation to fade out during the time	Default: 0.0%
S3-14	Torque Compensation Fade Out Speed	determined by S3-15. Sets as a percentage of the maximum output	Min: 0.0%
	rade Out Speed	frequency (E1-04). A setting of 0.0% essentially disables this function.	Max: 100%
	Torque Compensation	Sets the time for torque compensation to fade out once motor speed	Default: 1000 ms
S3-15	Fade Out Time	reaches the level set in S3-14.	Min: 0 ms
	Tude out Time		Max: 5000 ms
		Determines the reduction rate used bring the internal torque reference	Default: 100 ms
S3-16	Torque Limit Reduction	value down to zero after Position Lock at Stop has finished.	Min: 0 ms
	Time	$Rate = \frac{Torque\ 300\%}{S3-16}$	Max: 10000 ms
		55-10	Default: 0.00%
S3-20	Dwell 2 Speed Reference	Sets the speed reference for the Dwell 2 function.	Min: 0.00%
55-20	Dwen 2 Speed Reference	Note: A setting of 0.00 essentially disables the Dwell 2 function.	Max: 100.00%
		The Dwell 2 function will end when the drive reaches this speed.	Default: 0.00%
S3-21	Dwell 2 End Speed	Note: A setting of 0.00 will disable the acceleration rate switch that occurs	Min: 0.00%
	· ·	at the end of Dwell 2.	Max: 100.00%
	DC Injection Gain in	Sets the gain level applied to the DC injection current at stop (S1-03) for	Default: 100%
S3-25	Regenerative Operation	when the load is 100% regenerative. The current applied during DC	Min: 0%
	Regenerative Operation	Injection at stop is determined as $S1-03 \times S3-25$.	Max: 400%
	DC Injection Gain in	Sets the gain level applied to the DC injection current at stop (S1-03) for	Default: 20%
S3-26	Motoring Operation	when the load is 100% motoring. The current applied during DC Injection	Min: 0%
		at stop is determined as $S1-03 \times S3-26$.	Max: 400%
S3-27	Torque Compensation	Used for starting torque compensation utilizing a load cell signal. Sets the	Default: -50%
33-27	Value with Load Condition	torque compensation value for load condition 1.	Min: -100% Max: 100%
	Torque Compensation		Default: 50%
S3-28	Value with Load Condition	Used for starting torque compensation utilizing a load cell signal. Sets the	Min: -100%
	2	torque compensation value for load condition 2.	Max: 100%
		Head for starting torque commencation willing a land will size of Guest.	Default: 0.0%
S3-29	Analog Input from Load	Used for starting torque compensation utilizing a load cell signal. Sets the	Min: -100%
	Cell with Load Condition 1	analog signal level from the load cell for load condition 1.	Max: 100%
	Analog Innut from Load	Used for starting torque compensation utilizing a load cell signal. Sets the	Default: 100.0%
S3-30	Analog Input from Load Cell with Load Condition 2	analog signal level from the load cell for load condition 2.	Min: -100.0%
	con with Load Condition 2 analog signal level from the load con for load condition 2.	Max: 100%	
	Anti-Rollback Torque Bias	Sets the Anti-Rollback Bias applied at small position deviations during	Default: 0.0%
S3-34	1	Position Lock at start.	Min: 0.0%
			Max: 100.0%

No.	Name	Description	Setting
S3-35	Anti-Rollback Torque Bias 2	Sets the Anti-Rollback Bias applied at large position deviations during Position Lock at start.	Default: 0.0% Min: 0.0% Max: 100.0%
S3-37	Position Deviation Level to Apply ARB Torque Bias 1	Sets the position deviation level to active at Anti-Rollback Torque Bias 1 (S3-34).	Default: 0 Min: 0 Max: 32767
S3-38	Position Deviation Level to Apply ARB Torque Bias 2	Determines the position deviation level for when the drive should switch from the torque bias set in S3-34 to the torque bias set in S3-35.	Default: 0 Min: 0 Max: 32767
S3-39	Anti-Rollback Integral Gain	Determines the drive's responsiveness for Anti-Rollback during Position Lock.	Default: 0.00 Min: -30.00 Max: 30.00
S3-40	Anti-Rollback Movement Detection	Sets the amount of pulses for movement detection during Anti-Rollback.	Default: 1 pulse Min: 0 pulse Max: 100 pulses
S3-41	Position Lock Gain at Start 2 Reduction	Sets a reduction factor for the Position Lock Gain at Start 2 (Anti-Rollback Gain) set in parameter S3-02.	Default: 0.50 Min: 0.00 Max: 1.00

■ S4: Rescue Operation

No.	Name	Description	Setting
S4-01	Light Load Direction Search Selection	0: Disabled 1: Enabled 2: Enabled for Motor 1 only	Default: 0 Min: 0 Max: 2
S4-02	Light Load Direction Search Method	Determines how the drive detects the light load direction. 0: Output Current 1: Regenerative direction detection	Default: 1 Min: 0 Max: 1
S4-03	Light Load Direction Search Time	Sets the time to perform Light Load Direction Search.	Default: 1.0 s Min: 0.0 s Max: 5.0 s
S4-04	Light Load Direction Search Speed Reference	Sets the speed reference to use during Light Load Direction Search.	Default: <5> Min: 0.00% Max: 20.00%
S4-05	Rescue Operation Torque Limit	Sets the torque limit used during Rescue Operation.	Default: 100% Min: 0% Max: 300%
S4-06	Rescue Operation Power Supply Selection	0: Battery 1: UPS (single-phase) 2: UPS (3-phase)	Default: 0 Min: 0 Max: 2
S4-07	UPS Power	Sets the capacity of the UPS.	Default: 0.0kVA Min: 0.0kVA Max: 100.0kVA
S4-08	UPS Operation Speed Limit Selection	Determines how a speed limit should be applied to the Rescue Operation speed (d1-25) when operating from a UPS. 0: Disabled 1: Enabled until Light Load Direction Search is complete 2: Enabled until stop	Default: 2 Min: 0 Max: 2
S4-12	DC Bus Voltage during Rescue Operation	Sets the DC bus voltage during Rescue Operation.	Default: 0 V Min: 0 V Max: 800 V
S4-13	Rescue Operation Power Supply Deterioration Detection Level	Determines at which level of backup power supply deterioration a PF5 fault is triggered.	Default: 80% Min: 10% Max: 100%
S4-15 <39>	Speed Reference Selection for Rescue Operation	Selects the speed reference used for Rescue Operation.	Default: 0 Min: 0 Max: 1

<5> Default setting is determined by the control mode (A1-02). <39> Available in drive software versions PRG: 7016 and later.

■ S5: Short Floor Operation

No.	Name	Description	Setting
S5-01	Short Floor Operation Selection	0: Disabled 1: Enabled (Short Floor) 2: Enabled (Advance Short Floor)	Default: 0 Min: 0 Max: 2
S5-02	Nominal Speed for Short Floor Calculation	When d1-18 (Speed Priority Selection) is set to 0 or 3, S5-02 determines the rated speed used during Short Floor.	Default: 0.0% Min: 0.0% Max: 100.0%
S5-03	Short Floor Minimum Constant Speed Time	Sets the minimum operation time when the Advanced Short Floor function is enabled (S5-01 = 2).	Default: 0.0 s Min: 0.0 s Max: 2.0 s
S5-04	Distance Calculation Acceleration Time Gain	Set for acceleration jerk compensation in Distance Calculation.	Default: 150.0% Min: 50.0% Max: 200.0%
S5-05	Distance Calculation Deceleration Time Gain	Set for deceleration jerk compensation in Distance Calculation.	Default: 150.0% Min: 50.0% Max: 200.0%
S5-10	Stopping Method Selection	0: Disabled 1: Direct Landing 2: Leveling Distance Control	Default: 0 Min: 0 Max: 2
S5-11	Deceleration Distance	Sets the deceleration distance when Stop Distance Control is enabled	Default: 0 mm Min: 0 mm Max: 32767 mm
S5-12	Stop Distance	Sets the stopping distance when Stop Distance Control is enabled.	Default: 0 mm Min: 0 mm Max: 10000 mm
S5-13	Direct Landing Minimum Speed Level	Sets the speed level for the start of Direct Landing. Direct Landing is essentially disabled if the starting speed for Direct Landing is less than the maximum output speed multiplied by this parameter (E1-04 \times S5-13).	Default: 20% Min: 0% Max: 100%

<36> When the length units are set for inches (o1-12 = 1), the setting range becomes 0.00 to 650.00 inches. <37> When the length units are set for inches (o1-12 = 1), the setting range becomes 0.00 to 393.00 inches.

■ S6: Error Detection

No.	Name	Description	Setting	
	Motor Contactor Response	0: Detect during stop, SE1 must be manually reset	Default: 0	
S6-01	Error (SE1) Detection/	1: Detect during stop, SE1 can be automatically reset	Min: 0	
	Reset Selection	2: No SE1 detection	Max: 2	
	Starting Current Error		Default: 200 ms	
S6-02	(SE2) Detection Delay	Sets a delay time for detecting SE2.	Min: 0.00 ms	
30-02	Time	Sets a delay time for detecting SE2.	Max:	
	Time		[S1-04]-[S1-06]	
	Outroot Comment Emper (CE2)		Default: 200 ms	
S6-04	Output Current Error (SE3) Detection Delay Time	Sets a delay time for detecting SE3.	Min: 0 ms	
			Max: 5000 ms	
	Brake Response Error (SE4) Detection Time	1 Sets a delay time for detecting SEA		Default: 500 ms
S6-05			Sets a delay time for detecting SE4.	Min: 0 ms
			Max: 10000 ms	
	O	If the elevator car accelerates at an abnormal rate, the drive triggers an	Default: <7>	
S6-10	Overacceleration Detection	overspeed fault (dv6) and has the motor coast to stop. Parameter S6-10	Min: 0.0 m/s ²	
	Level	determines th	determines the acceleration rate that triggers a fault.	Max: 20.0 m/s ² <7>
S6-11	Overacceleration Detection		Default: 50 ms	
	Time Time	Sets a primary delay for detecting overacceleration.	Min: 0 ms	
			Max: 5000 ms	

No.	Name	Description	Setting
S6-12	Overacceleration Detection Selection	0: Always enabled 1: During run only	Default: 0 Min: 0 Max: 1
S6-15	Speed Reference Loss Detection	Enabled or disables detection for speed reference missing (FrL). 0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1
S6-16	Restart after Baseblock Selection	0: No restart after Baseblock/Safe Torque-Off 1: Restart after Baseblock/Safe Torque-Off	Default: 0 Min: 0 Max: 1

<7> Default setting value is determined by the digital operator display unit selection (o1-03). The default is normally 1.5 m/s2, but when o1-03 = 6, the default becomes 5.0 ft/s² (Setting Range: $0.0 \text{ to } 50.0 \text{ ft/s}^2$).

◆ T: Motor Tuning

Enter data into the following parameters to tune the motor and drive for optimal performance.

■ T1: Induction Motor Auto-Tuning

No.	Name	Description	Setting
T1-01	Auto-Tuning Mode Selection	0: Rotational Auto-Tuning 1: Stationary Auto-Tuning 1 2: Stationary Auto-Tuning for Line-to-Line Resistance 4: Stationary Auto-Tuning 2	Default: 0 <5> Min: 0 Max: 4 <18>
T1-02	Motor Rated Power	Sets the motor rated power as specified on the motor nameplate. Note: Use the following formula to convert horsepower into kilowatts: $kW = HP \times 0.746$.	Default: Min: 0.00 kW Max: 650.00 kW
T1-03	Motor Rated Voltage	Sets the motor rated voltage as specified on the motor nameplate.	Default: 200.0 V <9> Min: 0.0 V Max: 255.0 V <9>
T1-04	Motor Rated Current	Sets the motor rated current as specified on the motor nameplate.	Default: Min: 10% of drive rated current Max: 200% of drive rated current <10>
T1-05	Motor Base Frequency	Sets the rated frequency of the motor as specified on the motor nameplate.	Default: 50.0 Hz Min: 0.0 Hz Max: 120.0 Hz
T1-06	Number of Motor Poles	Sets the number of motor poles as specified on the motor nameplate.	Default: 4 Min: 2 Max: 48
T1-07	Motor Base Speed	Sets the rated speed of the motor as specified on the motor nameplate.	Default: 1450 r/min Min: 0 r/min Max: 24000 r/min
T1-08	Encoder Resolution (pulses per revolution)	Set the number of pulses per revolution for the PG being used (pulse generator or encoder).	Default: 1024 ppr Min: 0 ppr Max: 60000 ppr
T1-09	Motor No-Load Current (Stationary Auto-Tuning 1 and 2)	Sets the no-load current for the motor. After setting the motor capacity to T1-02 and the motor rated current to T1-04, this parameter will automatically display the no-load current for a standard 4 pole Yaskawa motor. Enter the no-load current as indicated on the motor test report.	Default: – Min: 0 A Max: Up to T1-04 <10>
T1-10	Motor Rated Slip (Stationary Auto-Tuning 2)	Sets the motor rated slip. After setting the motor capacity to T1-02, this parameter will automatically display the motor slip for a standard 4 pole Yaskawa motor. Enter the motor slip as indicated on the motor test report.	Default: – Min: 0.00 Hz Max: 20.00 Hz

- <4> Default setting value varies by the drive model (o2-04).
 <5> Default setting is determined by the control mode (A1-02).
 <9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.
 <10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0018 to 2A0033 and CIMR-LU4A00049. LU4A0009 to 4A0018 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415 and CIMR-LU4A0024 to 4A0260 display values in 0.1 A units.
- <18> The variety of Auto-Tuning methods depends on the control mode setting. V/f Control allows T1-01 to be set to 2 or 3, while vector control modes (OLV and CLV) allow T1-01 to be set to 0 through 4.

■ T2: PM Motor Auto-Tuning

No.	Name	Description	Setting
T2-01	Motor Auto-Tuning Mode Selection	O: Motor Data input 1: Stationary Auto-Tuning 2: Stationary stator resistance Auto-Tuning 3: Initial magnet pole search parameters Auto-Tuning 4: Encoder offset stationary Auto-Tuning 10: Encoder offset rotational Auto-Tuning 11: Rotational back EMF constant Auto-Tuning	Default: 0 Min: 0 Max: 11
T2-04	Motor Rated Power	Sets the motor rated power as indicated on the motor nameplate.	Default: Min: 0.00 kW Max: 650.00 kW
T2-05	Motor Rated Voltage	Enter the motor rated voltage as indicated on the motor nameplate.	Default: 200.0 V <9> Min: 0.0 V Max: 255.0 V <9>
T2-06	Motor Rated Current	Enter the motor rated current as indicated on the motor nameplate.	Default: Min: 10% of drive rated current Max: 200% of drive rated current <10>
T2-08	Number of Motor Poles	Enter the number of motor poles for the motor as indicated on the motor nameplate.	Default: 6 Min: 2 Max: 48
T2-09	Motor Base Speed	Enter the base speed for the motor as indicated on the motor nameplate.	Default: 150 r/min Min: 0 r/min Max: 24000 r/min
T2-10	Single Phase Stator Resistance	Enter the 1-phase resistance of the stator winding.	Default: $-$ Min: 0.000Ω Max: 65.000Ω
T2-11	Motor d-Axis Inductance	Enter the d-axis inductance for the motor as indicated on the motor nameplate.	Default: – Min: 0.00 mH Max: 600.00 mH
T2-12	Motor q-Axis Inductance	Enter the q-axis inductance for the motor as indicated on the motor nameplate.	Default: – Min: 0.00 mH Max: 600.00 mH
T2-13	Induced Voltage Constant Unit Selection	0: mV/(r/min). E5-09 will automatically be set to 0.0, and E5-24 will be used. 1: mV/(rad/sec). E5-24 will automatically be set to 0.0, and E5-09 will be used	Default: 1 Min: 0 Max: 1
T2-14	Motor Induced Voltage Constant	Enter the induced voltage coefficient for the motor as indicated on the motor nameplate.	Default: – Min: 0.0 Max: 6500.0 <30>
T2-16	Encoder Resolution	Sets the number of pulses per revolution for the PG being used (pulse generator or encoder).	Default: 1024 ppr Min: 1 ppr Max: 15000 ppr
T2-17	Encoder Offset	Sets the offset between encoder offset and the rotor magnetic axis.	Default: 0.0 deg Min: -180.0 deg Max: 180.0 deg

- <4> Default setting value varies by the drive model (o2-04).<
 9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.
 10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0018 to 2A0033 and CIMR-LU4A0009 to 4A0018 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415 and CIMR-LU4A0024 to 4A0260 display values in 0.1 A units.
- <30> Setting units are determined by the induced voltage constant unit selection for PM motors set to T2-13.

◆ U: Monitors

Monitor parameters allow the user to view drive status, fault information, and other data concerning drive operation.

■ U1: Operation Status Monitors

No.	Name	Description	Analog Output Level	Unit
U1-01	Speed Reference	Monitors the speed reference.	10 V: Max frequency	0.01% <31>
U1-02	Output Speed	Displays the output speed.	10 V: Max frequency	0.01% <31>
U1-03	Output Current	Displays the output current.	10 V: Drive rated current	<10>
U1-04	Control Method	0: V/f Control 2: Open Loop Vector Control 3: Closed Loop Vector Control 7: Closed Loop Vector Control for PM	No signal output available	-
U1-05	Speed Feedback	Displays the motor speed feedback.	10 V: Max Frequency	0.01% <3 <i>I</i> >
U1-06	Output Voltage Reference	Displays the output voltage.	10 V: 200 Vrms <9>	0.1 Vac
U1-07	DC Bus Voltage	Displays the DC bus voltage.	10 V: 400 V <9>	1 Vdc
U1-08	Output Power	Displays the output power (this value is calculated internally).	10 V: Drive rated power (kW)	<12>
U1-09	Torque Reference	Monitors the internal torque reference.	10 V: Motor rated torque	0.1%
U1-10	Input Terminal Status	Displays the input terminal status. U1 - 10=0000000 U1 - 10=0000000 U1 - 1 Digital input 1 (terminal S1 enabled) Digital input 2 (terminal S2 enabled) Digital input 3 (terminal S3 enabled) Digital input 4 (terminal S4 enabled) Digital input 5 (terminal S5 enabled) Digital input 6 (terminal S6 enabled) Digital input 7 (terminal S7 enabled) Digital input 8 (terminal S8 enabled)	No signal output available	

No.	Name	Description	Analog Output Level	Unit
U1-11	Output Terminal Status	Displays the output terminal status. U1 - 11 = 0000000	No signal output available	
U1-12	Drive Status	Verifies the drive operation status. U1 - 12=0000000 During run 1 During zero-speed 1 During fault reset signal input 1 During speed agree 1 Drive ready 1 During alarm detection 1 During fault detection 1 During fault detection	No signal output available	1
U1-13	Terminal A1 Input Voltage	Displays the voltage input to terminal A1.	10 V: 100%	0.1%
U1-14	Terminal A2 Input Voltage	Displays the voltage input to terminal A2.	10 V: 100%	0.1%
U1-16	Output Speed after Soft Start	Displays output speed with ramp time and jerk settings. Units determined by o1-03.	10 V: Max frequency	0.01% <31>
U1-17	DI-A3 Option Card Input Status	Displays the reference value input from the DI-A3 option card. Display will appear in hexadecimal as determined by the digital card input selection in F3-01. 3FFFF: Set (1 bit) + sign (1 bit) + 16 bit	No signal output available	_
U1-18	oPE Fault Parameter	Displays the parameter number that caused the oPE02 or oPE08 (Operation error).	No signal output available	-
U1-19	MEMOBUS/Modbus Error Code	Displays the contents of a MEMOBUS/Modbus error. U1 - 19=0000000 L 1 CRC Error 1 Data Length Error 0 Not Used 1 Parity Error 1 Overrun Error 1 Framing Error 1 Timed Out 0 Not Used	No signal output available	-
U1-25	Software Number (Flash)	FLASH ID	No signal output available	_
U1-26	Software No. (ROM)	ROM ID	No signal output available	-

- <9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.
- <10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0018 to 2A0033 and CIMR-LU4A0009 to 4A0018 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415 and CIMR-LU4A0024 to 4A0260 display values in 0.1 A units.
- <12> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0018 to 2A0033 and CIMR-LU4A0009 to 4A0018 display values in 0.01 kW units, while models CIMR-LU2A0047 to 2A0415 and CIMR-LU4A0024 to 4A0260 display values in 0.1 kW units.
- <31> Setting units are determined by the digital operator display unit selection (o1-03). When o1-03 = 0, the value is set in Hertz. When o1-03 = 4 or 5, the value is displayed in m/s. When o1-03 = 6, the value is displayed in ft/min.

■ U2: Fault Trace

No.	Name	Description	Analog Output Level	Unit
U2-01	Current Fault	Displays the current fault.	No signal output available	_
U2-02	Previous Fault	Displays the previous fault.	No signal output available	_
U2-03	Speed Reference at Previous Fault	Displays the speed reference at the previous fault.	No signal output available	0.01%
U2-04	Output Speed at Previous Fault	Displays the output speed at the previous fault.	No signal output available	0.01%
U2-05	Output Current at Previous Fault	Displays the output current at the previous fault.	No signal output available	<10>
U2-06	Motor Speed at Previous Fault	Displays the motor speed at the previous fault.	No signal output available	0.01%
U2-07	Output Voltage at Previous Fault	Displays the output voltage at the previous fault.	No signal output available	0.1 Vac
U2-08	DC Bus Voltage at Previous Fault	Displays the DC bus voltage at the previous fault.	No signal output available	1 Vdc
U2-09	Output Power at Previous Fault	Displays the output power at the previous fault.	No signal output available	0.1 kW
U2-10	Torque Reference at Previous Fault	Displays the torque reference at the previous fault.	No signal output available	0.1%
U2-11	Input Terminal Status at Previous Fault	Displays the input terminal status at the previous fault. Displayed as in U1-10.	No signal output available	_
U2-12	Output Terminal Status at Previous Fault	Displays the output status at the previous fault. Displays the same status displayed in U1-11.	No signal output available	_
U2-13	Drive Operation Status at Previous Fault	Displays the operation status of the drive at the previous fault. Displays the same status displayed in U1-12.	No signal output available	_
U2-14	Cumulative Operation Time at Previous Fault	Displays the cumulative operation time at the previous fault.	No signal output available	1 h
U2-15	Soft Starter Output at Previous Fault	Displays the speed reference for the soft starter at the previous fault. Displayed in the same way as U1-16.	No signal output available	0.01%
U2-16	Motor q-Axis Current at Previous Fault	Displays the q-axis current for the motor at the previous fault. Displayed in the same way as U6-01.	No signal output available	0.10%
U2-17	Motor d-Axis Current at Previous Fault	Displays the d-axis current for the motor at the previous fault. Displayed in the same way as U6-02.	No signal output available	0.10%
U2-20	Heatsink Temperature at Previous Fault	Displays the temperature of the heatsink when the most recent fault occurred.	No signal output available	1°C
U2-21	Peak Hold Current during Fault	Displays the peak current that occurred just prior to the previous fault.	No signal output available	0.01 A
U2-22	Peak Hold Frequency during Fault	Displays the output frequency when the peak current displayed in U2-21 occurred.	No signal output available	0.01 Hz

<10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0018 to 2A0033 and CIMR-LU4A0009 to 4A0018 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415 and CIMR-LU4A0024 to 4A0260 display values in 0.1 A units.

<31> Setting units are determined by the digital operator display unit selection (o1-03). When o1-03 = 0, the value is set in Hertz. When o1-03 = 4 or 5, the value is displayed in m/s. When o1-03 = 6, the value is displayed in ft/min.

■ U3: Fault History

No.	Name	Description	Analog Output Level	Unit
U3-01 to U3-04	First to 4th Most Recent Fault	Displays the first to the fourth most recent faults.	No signal output available	_
U3-05 to U3-10	5th to 10th Most Recent Fault	Displays the fifth to the tenth most recent faults. After ten faults have occurred in the drive, data for the oldest fault is deleted. The most recent fault appears in U3-01, with the next most recent fault appearing in U3-02. The data is moved to the next monitor parameter every time a fault occurs.	No signal output available	_
U3-11 to U3-14	Cumulative Operation Time at 1st to 4th Most Recent Fault	Displays the cumulative operation time when the first to the fourth most recent faults occurred.	No signal output available	1 h
U3-15 to U3-20	Cumulative Operation Time at 5th to 10th Most Recent Fault	Displays the cumulative operation time when the fifth to the tenth most recent faults occurred.	No signal output available	1 h

■ U4: Maintenance Monitors

No.	Name	Description	Analog Output Level	Unit
U4-01	Cumulative Operation Time	Displays the cumulative operation time of the drive. The value for the cumulative operation time counter can be reset in parameter o4-01. Use parameter o4-02 to determine if the operation time should start as soon as the power is switched on or only while the Up/Down command is present. The maximum number displayed is 99999, after which the value is reset to 0.	No signal output available	1 h
U4-03	Cooling Fan Operation Time	Displays the cumulative operation time of the cooling fan. The default value for the fan operation time is reset in parameter o4-03. This value will reset to 0 and start counting again after reaching 99999.	No signal output available	1 h
U4-04	Cooling Fan Maintenance	Displays main cooling fan usage time in as a percentage of its expected performance life. Parameter o4-03 can be used to reset this monitor. The fan should be replaced when this monitor reaches 90%.	No signal output available	1%
U4-05	Capacitor Maintenance	Displays main circuit capacitor usage time in as a percentage of their expected performance life. The capacitors should be replaced when this monitor reaches 90%. Parameter 04-05 can be used to reset this monitor.	No signal output available	1%
U4-06	Soft Charge Bypass Relay Maintenance	Displays the soft charge bypass relay maintenance time as a percentage of its estimated performance life. The soft charge relay should be replaced when this monitor reaches 90%. Parameter o4-07 can be used to reset this monitor.	No signal output available	1%
U4-07	IGBT Maintenance	Displays IGBT usage time as a percentage of the expected performance life. The IGBTs should be replaced when this monitor reaches 90%. Parameter o4-09 can be used to reset this monitor.	No signal output available	1%
U4-08	Heatsink Temperature	Displays the heatsink temperature.	10 V: 100°C	1°C
U4-09	LED Check	Lights all segments of the LED to verify that the display is working properly.	No signal output available	-
U4-10	kWh, Lower 4 Digits	Monitors the drive output power. The value is shown as a 9 digit number displayed across two monitor parameters, U4-10 and U4-11. Example:	No signal output available	1 kWh
U4-11	kWh, Upper 5 Digits	12345678.9 kWh is displayed as: U4-10: 678.9 kWh U4-11: 12345 MWh	No signal output available	1 MWh
U4-13	Peak Hold Current	Displays the highest current value that occurred during a ride.	No signal output available	0.01 A
U4-14	Peak Hold Output Frequency	Displays the output frequency when the current value shown in U4-13 occurred.	No signal output available	0.01 Hz

No.	Name	Description	Analog Output Level	Unit
U4-16	Motor Overload Estimate (oL1)	Shows the value of the motor overload detection accumulator. 100% is equal to the oL1 detection level.	10 V: 100%	0.1%
U4-17	Drive Overload Calculations (OL2)	Displays the level of the drive overload detection (oL2). A value of 100% is equal to the oL2 detection level.	10 V = 100%	0.1%
U4-18	Speed Reference Selection Results	Displays the source for the speed reference as XY-nn. X: indicates which reference is used: 1 = Reference 1 (b1-01) Y-nn: indicates the reference source 0-01 = Digital operator 1-01 = Analog (terminal A1) 1-02 = Analog (terminal A2) 2-02 to 8 = Digital Inputs (d1-02 to 8) 3-01 = MEMOBUS/Modbus communications 4-01 = Communication option card	No signal output available	-
U4-19	Speed Reference from MEMOBUS/Modbus Comm.	Displays the speed reference provided by MEMOBUS/Modbus (decimal).	No signal output available	0.01% <31>
U4-20	Speed Reference From Option Card	Displays the speed reference input by an option card (decimal).	No signal output available	0.01% <31>
U4-21	Up/Down Command Source Selection	Displays the source for the Up/Down command as XY-nn. X: Indicates which Up/Down command source is used: 1 = Reference 1 (b1-02) Y: Input power supply data 0 = Digital operator 1 = External terminals 3 = MEMOBUS/Modbus communications 4 = Communication option card nn: Up/Down command limit status data 00: No limit status. 01: Up/Down command was left on when stopped in the PRG mode 02: Up/Down command was left on when switching from LOCAL to REMOTE operation 03: Waiting for soft charge bypass contactor after power up (Uv or Uv1 flashes after 10 s) 04: Waiting for "Up/Down Command Prohibited" time period to end 05: Fast Stop (multi-function input, operator) 07: During baseblock while coast to stop with timer 08: Speed reference is below minimal reference during baseblock 09: Waiting for Enter command	No signal output available	_
U4-22	MEMOBUS/Modbus Communications Reference	Displays the drive control data set by MEMOBUS/Modbus communications register no. 0001H as a four-digit hexadecimal number.	No signal output available	_
U4-23	Communication Option Card Reference	Displays drive control data set by an option card as a four-digit hexadecimal number.	No signal output available	_
U4-24	Number of Travels (Lower 4 digit)	Displays the lower four digits for the number of trips the drive has made.	No signal output available	1 time
U4-25	Number of Travels (Higher 4 digit)	Displays the upper four digits for the number of trips the drive has made.	No signal output available	1 time
U4-26	Max. Current during Acceleration	Shows the maximum current that occurred during acceleration.	No signal output available	0.1 A
U4-27	Max. Current during Deceleration	Shows the maximum current that occurred during deceleration.	No signal output available	0.1 A
U4-28	Max. Current during Constant Speed	Shows the maximum current that occurred during ride at top speed.	No signal output available	0.1 A
U4-29	Max. Current during Leveling Speed	Shows the maximum current that occurred during ride at leveling speed.	No signal output available	0.1 A

No.	Name	Description	Analog Output Level	Unit
U4-30	Slip Compensation Value	Shows the slip compensation value.	No signal output available	0.01%
U4-31	Car Acceleration Rate	Shows the car acceleration rate.	No signal output available	0.01 m/s ²
U4-40	Speed Reference Limit at Rescue Operation	Displays the speed limit for Rescue Operation based on how much power the backup battery or UPS has. Displays 0% when Rescue Operation is not being performed.	No signal output available	1%
U4-42 <35>	Remaining Distance	Displays the remaining distance according to the stopping method selected.	10 V: S5-10 = 1: S5-11 S5-10 = 2: S5-12	
U4-43 <35>	Minimum Deceleration Distance	Displays the Minimum Deceleration Distance calculated by E1-04.	No signal output available	1 mm
U4-44 <35>	Minimum Stop Distance	Displays the Minimum Stop Distance calculated by d1-26.	No signal output available	1 mm

<31> Setting units are determined by the digital operator display unit selection (o1-03). When o1-03 = 0, the value is set in Hertz. When o1-03 = 4 or 5, the value is displayed in m/s. When o1-03 = 6, the value is displayed in ft/min.

Note: Fault trace (i.e., the fault history) is not maintained when CPF00, CPF01, CPF06, CPF24, oFA00, oFb00, oFC00, Uv1, Uv2, or Uv3 occur.

■ U6: Control Monitors

No.	Name	Description	Analog Output Level	Unit	
U6-01	Motor Secondary Current (Iq)	Displays the value of the motor secondary current (Iq). Motor rated secondary current is 100%.	10 V: Motor secondary rated current	0.1%	
U6-02	Motor Excitation Current (Id)	Displays the value calculated for the motor excitation current (Id). Motor rated secondary current is 100%.	10 V: Motor secondary rated current	0.1%	
U6-03	Speed Control Loop Input		10 V: Max frequency		
U6-04	Speed Control Loop Output	Displays the input and output values of the speed control loop.	10 V: Motor secondary rated current	0.01%	
U6-05	Output Voltage Reference (Vq)	Output voltage reference (Vq) for the q-axis.	10 V: 200 Vrms <9>	0.1 Vac	
U6-06	Output Voltage Reference (Vd)	Output voltage reference (Vd) for the d-axis.	10 V: 200 Vrms <9>	0.1 Vac	
U6-07	q-Axis Current Controller Output	Displays the output value for current control relative to motor secondary current (q-axis).	10 V: 200 Vrms <9>	0.1%	
U6-08	d-Axis Current Controller Output	Displays the output value for current control relative to motor secondary current (d-axis).	10 V: 200 Vrms <9>	0.1%	
U6-13	Flux Position Detection (sensor)	Monitors the value of the flux position detection (sensor).	10 V: 180 deg -10 V: -180 deg	0.1 deg	
U6-18	Speed Detection PG1 Counter	Monitors the number of pulses for speed detection (PG1).	10 V: 65536	1 pulse	
U6-22	Position Lock Deviation Counter	Displays how far the rotor has moved from its last position in PG pulses (multiplied by 4).	10 V: No. of pulses per revolution	1	
U6-25	Feedback Control Output	Output monitor for the speed control loop.	10 V: Motor secondary rated current	0.01%	

<35> o1-12 (Length Units) determines the units. When o1-12 is set to 0, the unit is millimeters. When o1-12 is set to 1, the unit is inch.

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No.	Name	Description	Analog Output Level	Unit
U6-26	Inertia Compensation Output	1	10 V: Motor secondary rated current	0.01%
U6-56	Speed Feedback Compensation Output	Displays observed speed when n5-07=1 or 2.	10 V: Max output frequency	0.01%
U6-80 to U6-99	Option Monitor 1 to 20	Monitors reserved to display data from option cards	No signal output available	_

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.

◆ Defaults and Setting Ranges by Display Unit Selection (o1-03)

Table 51 shows parameters, default settings, and setting ranges that change according to parameter o1-03, Display Unit Selection.

Table 51 Defaults and Setting Ranges by Display Unit Selection (o1-03)

		o1-03 (Digital Operator Display Unit Selection)							
No.	Name	0 (0.01 Hz)	1 (0.01%)	2 (r/min)	3 (User-set)	4 (Elevator units 1)	5 (Elevator units 2)	6 (Elevator units 3)	Default
C1-01	Acceleration Ramp 1								
C1-02	Deceleration Ramp 1								
C1-03	Acceleration Ramp 2								
C1-04	Deceleration Ramp 2								
C1-05	Acceleration Ramp 3		0	.00 to 600.00) c		0.00 to <1>	0.00 to <1>	1.50 s
C1-06	Deceleration Ramp 3		U.	.00 10 000.00	7.5		m/s ²	ft/s ²	
C1-07	Acceleration Ramp 4								
C1-08	Deceleration Ramp 4								
C1-09	Fast Stop Time								
C1-15	Inspection Run Deceleration								0.00 s
C2-01	Jerk at Accel Start								
C2-02	Jerk at Accel End						0.00.4	0.004	
C2-03	Jerk at Decel Start		C	0.00 to 10.00	S		$0.00 \text{ to } < I > 0.00 \text{ to} m/s^3 0.00 \text{ to} ft/s^3$	0.00 to < 1>	0.50 s
C2-04	Jerk at Decel End		m/s^3 IU/s^3						
C2-05	Jerk below leveling speed								
C1-11	Accel/Decel Switching Speed								0.0%
d1-01	Speed Reference 1								
d1-02	Speed Reference 2								
d1-03	Speed Reference 3								
d1-04	Speed Reference 4								0.000/
d1-05	Speed Reference 5								0.00%
d1-06	Speed Reference 6								
d1-07	Speed Reference 7								
d1-08	Speed Reference 8	0.00 to	0.00 to	0.00 to <>>	User define	0.00 to	m/s	0.00 to <1>	
d1-19	Nominal Speed	[E1-04] Hz	100.00%	r/min				ft/min	100.0%
d1-20	Intermediate Speed 1								
d1-21	Intermediate Speed 2								
d1-22	Intermediate Speed 3								0.00%
d1-23	Releveling Speed								
d1-24	Inspection Operation Speed								50.00%
d1-25	Rescue Operation Speed								10.00%
d1-26	Leveling Speed								8.00%

<1> Automatically calculated according to the values set to o1-20, o1-21, o1-22, and E2-\(\sigma\) parameters. <2> Automatically calculated according to the values set to the E2-\(\sigma\) parameters.

C Standards Compliance

♦ European Standards



The CE mark indicates compliance with European safety and environmental regulations. It is required for engaging in business and commerce in Europe.

European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers, and the EMC guidelines for controlling noise.

This drive displays the CE mark based on the EMC guidelines and the Low Voltage Directive.

Low Voltage Directive: 2006/95/EC
EMC Guidelines: 2004/108/EC

Devices used in combination with this drive must also be CE certified and display the CE mark. When using drives displaying the CE mark in combination with other devices, it is ultimately the responsibility of the user to ensure compliance with CE standards. After setting up the device, verify that conditions meet European standards.

■ CE Low Voltage Directive Compliance

This drive has been tested according to European standard IEC61800-5-1, and it fully complies with the Low Voltage Directive.

To comply with the Low Voltage Directive, be sure to meet the following conditions when combining this drive with other devices:

Area of Use

Do not use drives in areas with pollution higher than severity 2 and overvoltage category 3 in accordance with IEC664.

Factory Recommended Branch Circuit Protection

Table 52 Recommended Input Fuse Selection

	L1000								
Drive Model CIMR-LU	Nominal Output Power HP	AC Drive Input Amps	MCCB Rating Amps	Time Delay Fuse Rating Amps	Non-time Delay Fuse Rating Amps	Bussman Semi-conductor Fuse Rating (Fuse Ampere) 🦇			
			240 V Mod	els					
2A0018	5	18.9	35	30	50	FWH-90B(90)			
2A0025	7.5	28	50	40	75	FWH-100B (100)			
2A0033	10	37	60	60	100	FWH-200B (200)			
2A0047	15	52	100	90	150	FWH-200B (200)			
2A0060	20	68	125	110	200	FWH-200B (200)			
2A0075	25	80	150	125	225	FWH-300A (300)			
2A0085	30	82	150	125	225	FWH-300A (300)			
2A0115	40	111	200	175	250	FWH-350A (350)			
2A0145	50	136	250	225	350	FWH-400A (400)			
2A0180	60	164	300	250	450	FWH-400A (400)			
2A0215	75	200	400	350	600	FWH-600A (600)			
2A0283	100	271	500	450	800	FWH-700A (700)			
2A0346	125	324	600	500	900 <5>	FWH-800A (800)			
2A0415	150	394	700	600	1100 <5>	FWH-1000A (1000)			

		L1000					
Drive Model CIMR-LU	Nominal Output Power HP	AC Drive Input Amps	MCCB Rating Amps	Time Delay Fuse Rating Amps	Non-time Delay Fuse Rating Amps	Bussman Semi-conductor Fuse Rating (Fuse Ampere) <4>	
			480 V Mod	els			
4A0009	5	10.4	20	17.5	30	FWH-90B (90)	
4A0015	7.5	15	30	25	40	FWH-80B (80)	
4A0018	10	20	40	35	60	FWH-100B (100)	
4A0024	15	29	50	50	80	FWH-125B (125)	
4A0031	20	39	75	60	110	FWH-200B (200)	
4A0039	25	47	75	75	125	FWH-250A (250)	
4A0045	30	43	75	75	125	FWH-250A (250)	
4A0060	40	58	100	100	150	FWH-250A (250)	
4A0075	60	71	125	110	200	FWH-250A (250)	
4A0091	60	86	150	150	250	FWH-250A (250)	
4A0112	75	105	175	175	300	FWH-350A (350)	
4A0150	100	142	225	225	400	FWH-400A (400)	
4A0180	125	170	250	250	500	FWH-500A (500)	
4A0216	150	207	350	350	600	FWH-600A (600)	
4A0260	200	248	400	400	700	FWH-700A (700)	

- <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.

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.

■ EMC Guidelines Compliance

This drive is tested according to European standards EN61800-3: 2004, and complies with the European standards EN12015 (requires an optional AC reactor) and EN12016.

Note: Make sure the protective earthing conductor complies with technical standards and local safety regulations. Because the leakage current exceeds 3.5 mA when an EMC filter is installed, IEC 61800-5-1 states that either the power supply must be automatically disconnected in case of discontinuity of the protective earthing conductor or a protective earthing conductor with a cross-section of at least 10 mm² (Cu) or 16 mm² (Al) must be used.

EMC Filter Installation

The following conditions must be met to ensure continued compliance with European standards EN12015 and EN12016. **Refer to EMC Filters on page 189** for EMC filter selection.

Installation Method

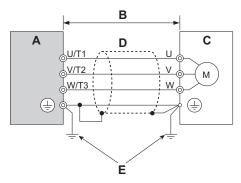
Verify the following installation conditions to ensure that other devices and machinery used in combination with this drive also comply with EMC guidelines.

- 1. Install an EMC noise filter to the input side specified by Yaskawa for compliance with European standards.
- 2. Place the drive and EMC noise filter in the same enclosure.
- 3. Use braided shield cable for the drive and motor wiring, or run the wiring through a metal conduit.

<4> When using semiconductor fuses, Bussman FWH and FWP are required for UL compliance. Select FWH for 240 V and 480 V models and FWP fuses for 600 V models.

<5> Class L fuse is also approved for this rating.

4. Keep wiring as short as possible. Ground the shield on both the drive side and the motor side.



A - Drive

D - Metal conduit

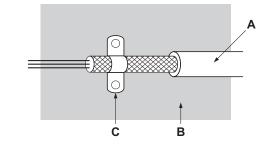
B - 10 m max cable length between drive and motor

E - Ground wire should be as short as possible.

C - Motor

Figure 87 Installation Method

- **5.** Make sure the ground conductor complies with technical standards and local safety rules. When an EMC filter is installed, the leakage current exceeds 3.5 mA. Therefore according to IEC61800-5-1, at least one of the conditions below must be satisfied:
 - a) The cross-section of the protective earthing conductor must be at least 10 mm² (Cu) or 16 mm² (Al).
 - b) The power supply must be disconnected automatically in case of discontinuity of the protective earthing conductor.



A - Braided shield cable

C - Cable clamp (conductive)

B - Metal panel

Figure 88 Ground Area

6. Connect an AC reactor or a DC link choke to minimize harmonic distortion.

Three-Phase 200 V / 400 V Class

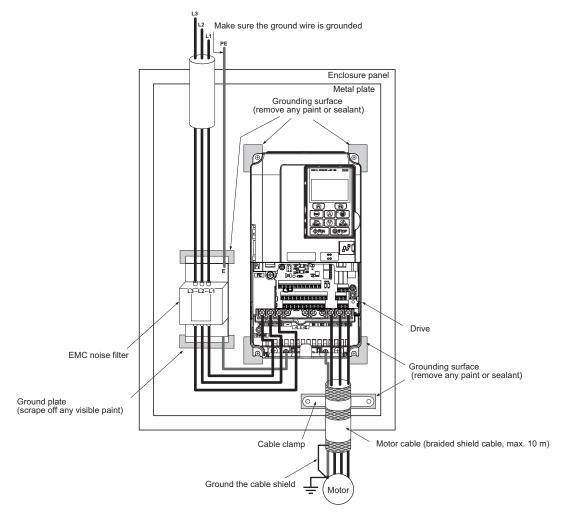


Figure 89 EMC Filter and Drive Installation for CE Compliance (Three-Phase 200 V / 400 V Class)

EMC Filters

Install the drive with the EMC filters to comply with the EN61800-3/EN12015 requirements.

Note: If the Safe Disable function of the drive is part of the safety concept of a machine or installation and used for a safe stop according to EN60204-1, stop category 0, use these filters recommended by Yaskawa. For all other EMC filters, additional measurements must be performed to prove EMC compatibility. This also applies when using the safe disable function in one motor contactor installations as described in *Safe Disable Input Function on page 199*.

Table 53 EN61800-3 Filters

Model CIMR-L□	Туре	Rated Current (A)	Weight (kg)	Dimensions [W x D x H] (mm)	YxX	Figure			
Three-Phase 200 V Class									
2A0018	FS5972-35-07	35	2.1	$206 \times 50 \times 355$	175 × 336				
2A0025						1			
2A0033	FS5972-60-07	60	4.0	$236 \times 65 \times 408$	205×390				
2A0047									
2A0060	FS5972-100-35	100	3.4	$90 \times 150 \times 330$	65×255				
2A0075									
2A0185	FS5972-170-40	170	6.0	$120 \times 170 \times 451$	102×365	2			
2A0115									
2A0145	FS5972-250-37	250	11.7	$130 \times 240 \times 610$	90×498				
2A0180									
2A0215 2A0283	FS5972-410-99	410	10.5	$260 \times 115 \times 386$	235×120				
						3			
2A0346 2A0415	FS5972-600-99	600	11	$260 \times 135 \times 386$	235×120				
ZA0415		Three D	hase 400 V Class						
4A0009	FS5972-18-07	18	1.3	141 × 46 × 330	115 × 313				
4A0009 4A0015	F339/2-16-0/	10	1.3	141 × 40 × 330	113 × 313				
4A0018	FS5972-35-07	35	2.1	$206 \times 50 \times 355$	175 × 336				
4A0018	133972-33-07	33	2.1	200 × 30 × 333	173 × 330	1			
4A0024 4A0031									
4A0031 4A0039	FS5972-60-07	60	4	$236 \times 65 \times 408$	202 × 390				
4A0045	155772-00-07		7	230 / 03 / 400	202 \ 370				
4A0060									
4A0075	FS5972-100-35	100	3.4	$90 \times 150 \times 330$	65×255				
4A0091									
4A0112	FS5972-170-35	170	6.0	$120 \times 170 \times 451$	102×365	2			
4A0150		- , ,							
4A0180	FS5972-250-37	250	11.7	$130 \times 240 \times 610$	90×498				
4A0216									
4A0260	FS5972-410-99	410	10.5	$260 \times 115 \times 386$	235×120	3			

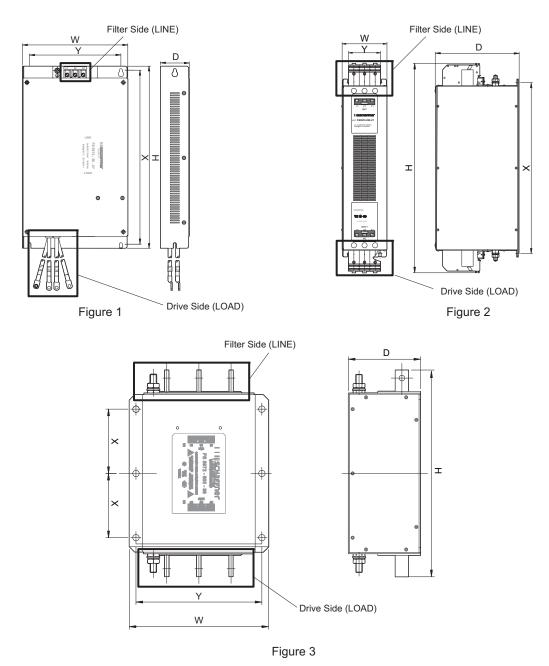


Figure 90 EMC Filter Dimensions

AC Reactors for EN 12015 Compliance

Contact Yaskawa for information about reactors.

UL and CSA 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.



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

- -10 to 40°C (IP00 enclosure with top protective cover)
- -10 to 50°C (IP00 enclosure).

Main Circuit Terminal Wiring

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 CIMR-L□2A0085 to 2A0415 and 4A0045 to 4A0260. Use only the tools recommended by the terminal manufacturer for crimping.

The wire gauges listed in *Table 54* and *Table 55* 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

Table 54 Wire Gauge and Torque Specifications (Three-Phase 200 V Class)

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
	R/L1, S/L2, T/L3	10	12 to 10		
	U/T1, V/T2, W/T3	10	12 to 10		10, 15
2A0018	-, +1, +2	_	12 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	B1, B2	_	14 to 10		(10.0 to 15.5)
	⊕	10	12 to 10		
	R/L1, S/L2, T/L3	8	10 to 6		
	U/T1, V/T2, W/T3	8	10 to 6	M4	1.2 to 1.5
2A0025	-, +1, +2	-	10 to 6	1014	(10.6 to 13.3)
ZA0023	B1, B2	-	14 to 10		
	(a)	8	10 to 8	M5	2 to 2.5 (17.7 to 22.1)

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
	R/L1, S/L2, T/L3	6	8 to 6		
	U/T1, V/T2, W/T3	8	8 to 6	M4	1.2 to 1.5
2A0033	-, +1, +2	_	6	1714	(10.6 to 13.3)
	B1, B2	_	12 to 10		
	(b)	8	10 to 8	M5	2 to 2.5 (17.7 to 22.1)
	R/L1, S/L2, T/L3	4	6 to 4		4 to 6
	U/T1, V/T2, W/T3	4	6 to 4	M6	(35.4 to 53.1)
2 + 00 47	-, +1, +2	_	6 to 4		
2A0047	B1, B2	_	10 to 6	M5	2 to 2.5 (17.7 to 22.1)
	(b)	6	8 to 6	M6	4 to 6 (35.4 to 53.1)
	R/L1, S/L2, T/L3	3	4 to 3		9 to11
	U/T1, V/T2, W/T3	3	4 to 3	M8	(79.7 to 97.4)
2 + 00 < 0	-, +1, +2	_	4 to 3		
2A0060	B1, B2	_	8 to 6	M5	2 to 2.5 (17.7 to 22.1)
		6	6 to 4	M6	4 to 6 (35.4 to 53.1)
	R/L1, S/L2, T/L3	2	3 to 2		9 to11
	U/T1, V/T2, W/T3	2	3 to 2	M8	(79.7 to 97.4)
	-, +1, +2	-	3 to 2		, , , , , , , , , , , , , , , , , , , ,
2A0075	B1, B2	-	6	M5	2 to 2.5 (17.7 to 22.1)
		6	6 to 4	M6	4 to 6 (35.4 to 53.1)
	R/L1, S/L2, T/L3	1/0	3 to 1/0	i	
2A0085	U/T1, V/T2, W/T3	1/0	3 to 1/0		9 to 11
2A0063 <1>	-, +1	_	2 to 1/0	M8	(79.7 to 97.4)
	B1, B2	_	6 to 1/0		(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	+	6	6 to 4		
	R/L1, S/L2, T/L3	2/0	1 to 2/0		
2.01.5	U/T1, V/T2, W/T3	2/0	1 to 2/0	M10	18 to 23
2A0115	-, +1	-	1/0 to 3/0		(159 to 204)
\1 >	B1, B2	_	4 to 2/0		9 to 11
	(4)	4	4	M8	(79.7 to 97.4)
	R/L1, S/L2, T/L3	4/0	2/0 to 4/0		
	U/T1, V/T2, W/T3	4/0	3/0 to 4/0		18 to 23
2A0145	-, +1	_	1 to 4/0	M10	(159 to 204)
	+3	-	1/0 to 4/0		0 : 11
	(a)	4	4 to 2		9 to 11 (79.7 to 97.4)
	R/L1, S/L2, T/L3	1/0 × 2P	1/0 to 2/0		
	U/T1, V/T2, W/T3	1/0 × 2P	1/0 to 2/0		18 to 23
2A0180	-, +1	_	1 to 4/0	M10	(159 to 204)
< <i>I</i> >	+3	_	1/0 to 4/0		
	(a)	4	4 to 1/0		9 to 11 (79.7 to 97.4)

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N⋅m (lb.in.)
	R/L1, S/L2, T/L3	3/0 × 2P	3/0 to 300		22
	U/T1, V/T2, W/T3	3/0 × 2P	3/0 to 300	M12	32 to 40 (283 to 354)
2A0215	-, +1	-	3/0 to 300		(203 to 334)
	+3	-	2 to 300	M10	18 to 23 (159 to 204)
	(a)	3	3 to 300	M12	32 to 40 (283 to 354)
	R/L1, S/L2, T/L3	$4/0 \times 2P$	3/0 to 300		22 / 40
	U/T1, V/T2, W/T3	3/0 × 2P	3/0 to 300	M12	32 to 40 (283 to 354)
2A0283	-, +1	-	3/0 to 300		(203 to 334)
	+3	-	3/0 to 300	M10	18 to 23 (159 to 204)
	(a)	2	2 to 300	M12	32 to 40 (283 to 354)
	R/L1, S/L2, T/L3	250 × 2P	4/0 to 600		22 / 40
	U/T1, V/T2, W/T3	4/0 × 2P	4/0 to 600	M12	32 to 40 (283 to 354)
2A0346	-, +1	_	250 to 600		(203 to 334)
	+3	_	3/0 to 600	M10	18 to 23 (159 to 204)
		1	1 to 350	M12	32 to 40 (283 to 354)
	R/L1, S/L2, T/L3	350 × 2P	250 to 600		22 : 40
	U/T1, V/T2, W/T3	300 × 2P	300 to 600	M12	32 to 40 (283 to 354)
2A0415	-, +1	_	300 to 600		(203 to 33 1)
	+3	_	3/0 to 600	M10	18 to 23 (159 to 204)
	\(\exists\)	1	1 to 350	M12	32 to 40 (283 to 354)

<1> Drive models CIMR-LU2A0085 to 2A0415 require the use of closed-loop crimp terminals for UL/cUL compliance. 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.

Table 55 Wire Gauge and Torque Specifications (Three-Phase 400 V Class)

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
	R/L1, S/L2, T/L3	12	14 to 10		
	U/T1, V/T2, W/T3	14	14 to 10		1.2 to 1.5 (10.6 to 13.3)
4A0009	-, +1, +2	-	14 to 10	M4	
	B1, B2	-	14 to 10		
	⊕	10	14 to 10		
	R/L1, S/L2, T/L3	10	12 to 6		
	U/T1, V/T2, W/T3	10	12 to 6	N/4	1.2 to 1.5
4A0015	-, +1, +2	-	12 to 6	M4	(10.6 to 13.3)
4A0013	B1, B2	_	12 to 10		
	⊕	10	14 to 10	M5	2 to 2.5 (17.7 to 22.1)

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
4A0018	R/L1, S/L2, T/L3	10	10 to 6		1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	10	10 to 6	M4	
	-, +1, +2	_	12 to 6	1111	
	B1, B2	_	12 to 10		
		10	12 to 10	M5	2 to 2.5 (17.7 to 22.1)
	R/L1, S/L2, T/L3	8	8 to 6	M5	2 to 2.5
	U/T1, V/T2, W/T3	8	10 to 6		(17.7 to 22.1)
440004	-, +1, +2	-	10 to 6		
4A0024	B1, B2	-	10 to 8	M5	2 to 2.5 (17.7 to 22.1)
	+	8	10 to 8	M6	4 to 6 (35.4 to 53.1)
	R/L1, S/L2, T/L3	6	8 to 6		2 to 2.5
	U/T1, V/T2, W/T3	8	8 to 6	M5	2 to 2.5 (17.7 to 22.1)
	-, +1, +2	_	6		
4A0031	B1, B2	_	10 to 8	M5	2 to 2.5 (17.7 to 22.1)
	\(\begin{array}{c} \\ \eta \\	6	10 to 6	M6	4 to 6 (35.4 to 53.1)
	R/L1, S/L2, T/L3	6	6 to 4	M6	44.6
	U/T1, V/T2, W/T3	6	6 to 4		4 to 6 (35.4 to 53.1)
	-, +1, +2	-	6 to 4		(55.4 to 55.1)
4A0039	B1, B2	_	10 to 8	M5	2 to 2.5 (17.7 to 22.1)
	\(\begin{array}{c} \\ \exists \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	6	8 to 6	M6	4 to 6 (35.4 to 53.1)
	R/L1, S/L2, T/L3	4	6 to 4		2 . 44
44.0045	U/T1, V/T2, W/T3	4	6 to 4		
4A0045	-, +1	_	6 to 1	M8	9 to 11 (79.7 to 97.4)
47	B1, B2	_	8 to 4		(17.1 10 71.4)
	=	6	8 to 6		
	R/L1, S/L2, T/L3	3	4 to 3		9 to 11
4A0060	U/T1, V/T2, W/T3	3	4 to 3		
	-, +1	_	4 to 1	M8	(79.7 to 97.4)
	B1, B2	_	6 to 3		
	(a)	6	6		
	R/L1, S/L2, T/L3	2	3 to 1/0		
4A0075	U/T1, V/T2, W/T3	2	3 to 1/0		9 to 11
	-, +1	_	3 to 1/0	M8	(79.7 to 97.4)
	+3		6 to 1/0		
	⊕ D/11 C/12 T/12	1/0	6 to 4		
	R/L1, S/L2, T/L3	1/0	2 to 1/0		
4A0091	U/T1, V/T2, W/T3	1	2 to 1/0	MO	9 to 11
!>	-, +1 +3	_	3 to 1/0 4 to 1/0	M8	(79.7 to 97.4)
			6 to 4		
	=	4	0 10 4		

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
	R/L1, S/L2, T/L3	3/0	1/0 to 4/0		18 to 23 (159 to 204)
440112	U/T1, V/T2, W/T3	2/0	1/0 to 4/0		
4A0112	-, +1	-	1/0 to 4/0	M10	
47	+3	_	3 to 4/0		(13) to 204)
	+	4	4		
	R/L1, S/L2, T/L3	4/0	3/0 to 4/0		
44.0150	U/T1, V/T2, W/T3	4/0	3/0 to 4/0		10 / 22
4A0150	-, +1	-	1 to 4/0	M10	18 to 23 (159 to 204)
	+3	-	1/0 to 4/0		(137 to 204)
		4	4 to 2		
	R/L1, S/L2, T/L3	300	2 to 300		18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	300	2 to 300		
4A0180	-, +1	_	1 to 250	M10	
	+3	_	3 to 3/0		
	=	4	4 to 300		
	R/L1, S/L2, T/L3	400	1 to 600		
	U/T1, V/T2, W/T3	400	1/0 to 600		
4A0216	-, +1	_	3/0 to 600	M10	18 to 23 (159 to 204)
<1>	+3	-	1 to 325		(139 to 204)
	+	2	2 to 350		
	R/L1, S/L2, T/L3	500	2/0 to 600		
	U/T1, V/T2, W/T3	500	2/0 to 600	M12	32 to 40 (283 to 354)
4A0260	-, +1	-	3/0 to 600		(203 to 334)
4A0200 	+3	-	1 to 325	M10	18 to 23 (159 to 204)
	+	2	2 to 350	M12	32 to 40 (283 to 354)

<1> Drive models CIMR-LU4A0045 to 4A0260 require the use of closed-loop crimp terminals for UL/cUL compliance. 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.

Closed-Loop Crimp Terminal Recommendations

Yaskawa recommends using closed-loop crimp terminals on all drive models. UL approval requires the use of crimp terminals when wiring the drive main circuit terminals on models CIMR-L\(\sigma\) A0085 to 2A0415 and 4A0045 to 4A0260. 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 56 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 56 Closed-Loop Crimp Terminal Size

Wire Cours	Terminal	Terminal Crimp Terminal		Tool		Code <1>
Wire Gauge Screw	Screws	Model Number	Machine No.	Die Jaw	Model No.	Code <1>
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
12 / 10 AWG	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
o AWU	M5	R8-5	YA-4	AD-901	TP-008	100-054-032

Wine O	Terminal	Crimp Terminal	To	ool	Insulation Cap	0.4.
Wire Gauge	Screws	Model Number	Machine No.	Die Jaw	Model No.	Code <1>
	M4	14-NK4	YA-4	AD-902	TP-014	100-054-033
CANC	M5	R14-5	YA-4	AD-902	TP-014	100-054-034
6 AWG	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
4 AWG	M8	R22-8	YA-5	AD-953	TP-022	100-051-263
2/2/1 ANVC	M8	R38-8	YA-5	AD-954	TP-038	100-051-264
3/2/1 AWG	M10	R38-10	YA-5	AD-954	TP-038	100-061-114
1/0 AWG	M8	R60-8	YA-5	AD-955	TP-060	100-051-265
$1/0 \text{ AWG} \times 2P$	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
3/0 AWG × 2P	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
4/0 AWG × 2P	M12	100-L12	YF-1, YET-300-1	TD-324, TD-312	TP-100	100-051-560
250 / 200 1 1	M10	R150-10	YF-1. YET-150-1	TD-229, TD-215	TP-150	100-051-272
250 / 300 kcmil	M12	R150-12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-273
250 kcmil × 2P	M10	150-L10	YF-1, YET-150-1	TD-229, TD-215	TP-150	100-051-561
$300 \text{ kcmil} \times 2P$	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 kemil	M10	325-10	YF-1, YET-300-1	TD-328, TD-315	TP-325	100-051-565
600 / 650 kcmil 500 kcmil × 2P 600 kcmil × 2P	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].

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.

Input Fuse Installation

The installation manual specifies that branch circuit protection should be provided by any of the following:

- Non-time delay Class J, T, or CC fuses sized at maximum 300% of the drive input rating
- Time delay Class J, T, or CC fuses sized at maximum 175% of the drive input rating
- MCCB sized at maximum 200% of the drive input rating. If a calculated current for MCCB is less than 15A, MCCB rated 15A shall be used.

Always install fuses at the drive input side. Refer to *Recommended Input Fuse Selection on page 185* for selecting fuses.

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.

Example 2: Models with $\frac{4}{0}$ AWG \times $\frac{2}{P}$ 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].

Table 57 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
Analog inputs / outputs	+V, -V, A1, A2, AC, AM, FM	class 2 for external power supply.

Drive Short Circuit Rating

This drive is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, 600 Vac maximum (Up to 240 V in 200 V class drives, up to 480 V for 400 V class drives), when protected by Bussmann Type FWH fuses as specified in *Table 52*.

■ CSA Standards Compliance

CSA for Industrial Control Equipment

The L1000 is CSA certified as Industrial Control Equipment Class 3211.

Specifically, the L1000 is certified to: CAN/CSA C22.2 No.04-04 and CAN/CSA C22.2 No.14-05.



Figure 92 CSA Mark

CSA for Elevator Equipment

The L1000 is tested and complies with CSA B44.1-04/ASME A17.5-2004 standard. This standard is used by CSA to evaluate the L1000 to Class 2411 (Elevator Equipment).



Figure 93 CSA B44.1-04/ASME A17.5-2004 Mark

■ 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)

Setting Range: Model Dependent Default Setting: 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.

This parameter selects the motor overload curve used according to the type of motor applied.

Table 58 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.

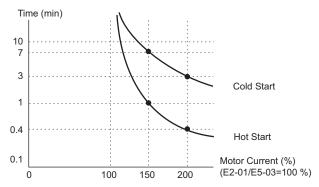


Figure 94 Motor Overload Protection Time

♦ 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.
	Demand Rate Low	$PFD = 5.15E^{-5}$
Failure Probability	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).

■ 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.

WARNING! 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.

NOTICE: When utilizing the Safe Disable function, use only the EMC filters recommended in EMC Filter Installation on page 186.

■ 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 38* for signal specifications when using this output.

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

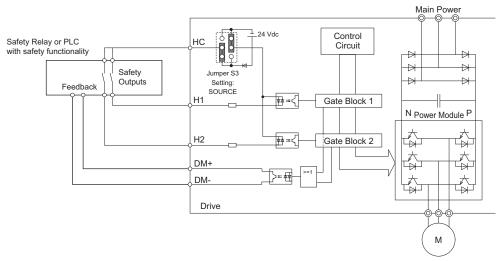


Figure 95 Safe Disable Function Wiring Example (Source Mode)

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

Figure 96 illustrates a Safe Disable input operation example.

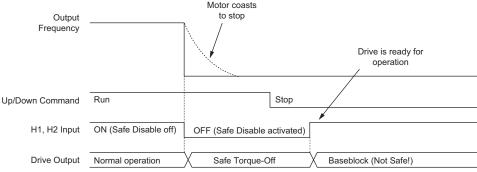


Figure 96 Safe Disable Operation

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			Digital Operator
Input 1, H1-HC	Input 2, H2-HC	Monitor, DM+ - DM–	Monitor, H2-□□ = 58	Drive Output Status	Display
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- $\Box\Box$ = 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.

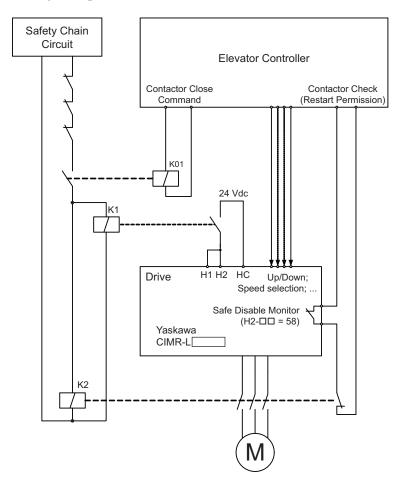
Should only one of the Safe Disable channels be on while the other is off, "HbbF" will flash in the display to indicate that there is a problem in the safety circuit or in the drive. This display should not appear under normal conditions if the Safe Disable circuit is utilized properly. *Refer to Alarm Codes, Causes, and Possible Solutions on page 113* to resolve possible errors.

◆ EN81-1 Conform 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 Sinking/Sourcing Mode Selection for Safe Disable Inputs on page 44* for details on setting jumper S3.

The figure below shows a wiring example.

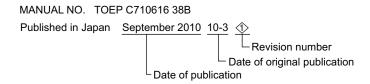


Note: 1. The drive output will immediately shut off when either of the inputs H1 or H2 is opened. In this case the brake should apply immediately in order to prevent uncontrolled movement of the elevator.

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.

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
February 2012 🕸		All	Revision: Reviewed and corrected entire documentation and revised for drive software version PRG: 7016
		Back cover	Revision: Address
March 2011	\$	Front cover	Revision: Format
		Preface & General Safety, chapter 2 to 5, Appendix B and C	Revision: Reviewed and corrected entire documentation
		Chapter 7	Revision: Option card installation procedure
		Back cover	Revision: Address, format
September 2010		All	Revision: Reviewed and corrected entire documentation
	ľ	Chapter 7	Addition: Option Card Installation
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