YASKAWA

YASKAWA AC Drive L1000A
AC Drive for Elevator Applications
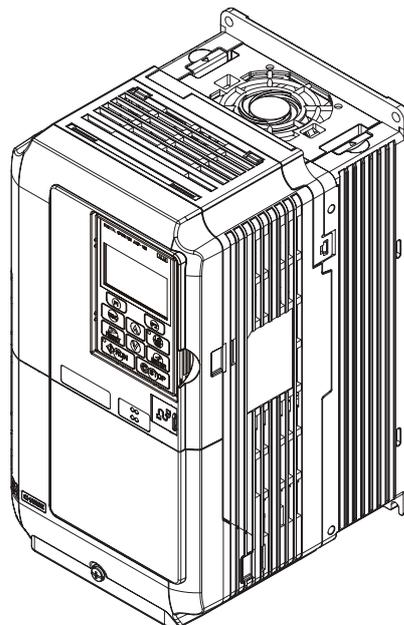# Quick Start Guide

Type: CIMR-LC☐A ☐☐☐☐☐☐
Models: 200 V Class: 4.0 to 45 kW
400 V Class: 4.0 to 75 kW

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

Table of Contents

1 Safety Instructions and General Warnings

YASKAWA Electric supplies component parts for use in a wide variety of industrial applications. The selection and application of YASKAWA products remain the responsibility of the equipment designer 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 products designed to incorporate a component part 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 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.

◆ Applicable Documentation

The following manuals are available for L1000A series drives:

	L1000A Series AC Drive Technical Manual
	This manual gives detailed instructions on installation, wiring, operation procedures, functions, troubleshooting, maintenance, and inspections to perform before operation. Contact your sales representative for ordering this book or download it from www.yaskawa.eu.com.
	L1000A Series AC Drive Quick Start Guide
	Read this manual first. This guide is packaged together with the product. It contains basic information required to install and wire the drive. This guide provides basic programming and simple setup and adjustment.

◆ General Warnings

⚠ WARNING
• **Read and understand the manuals available before installing, operating or servicing this drive.**   • **All warnings, cautions, and instructions must be followed.**   • **All work must be performed by qualified personnel.**   • **The drive must be installed according to this manual and local codes.**
Heed the safety messages in this manual.
The operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

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

The following conventions are used to indicate safety messages in this manual:

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

NOTICE
Indicates a property damage message.

◆ Safety Warnings

⚠ WARNING

Electrical Shock Hazard

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

Failure to comply could result in death or serious injury.

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

Do not touch any terminals before the capacitors have fully discharged.

Failure to comply could result in death or serious injury.

Before wiring terminals, 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 allow unqualified personnel to use 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.

Do not remove covers or touch circuit boards while the power is on.

Failure to comply could result in death or serious injury.

Always ground the motor-side grounding terminal.

Improper equipment grounding could result in death or serious injury by contacting the motor case.

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.

Never short the output circuits of the drive.

Do not short the output circuits of the drive. Failure to comply could result in death or serious injury.

When using a PM motor, make sure to block the rotor before performing work on the motor or drive output circuit.

A PM motor generates electrical power if rotated. If connected to the drive, the drive main circuit will be charged even if the power supply is off. Touching live parts in the drive or output circuit may result in death or serious injury.

Sudden Movement Hazard

Stay clear of the motor during rotational Auto-Tuning. The motor may start operating suddenly.

During automatic starting of equipment, the machine may start moving suddenly, which could result in death or serious injury.

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

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

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 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.

Do not connect AC line power to output terminals U, V, and W.

Make sure that the power supply lines are connected to main circuit input terminals R/L1, S/L2, T/L3.

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.

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.

⚠ CAUTION

Crush Hazard

Do not carry the drive by the front cover.

Failure to comply may result in minor or moderate injury from the main body of the drive falling.

Burn Hazard

Do not touch the heatsink or braking resistor hardware until a powered-down cooling period has elapsed.

NOTICE

Equipment Hazard

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

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

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

Improper equipment sequencing could result in damage to the drive.

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

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

Do not operate damaged equipment.

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

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

Install adequate branch circuit short circuit protection per applicable codes.

Failure to comply could result in damage to the drive.

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 (400V Class).

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.

Do not allow unqualified personnel to use the product.

Failure to comply could result in damage to the drive or braking circuit.

Carefully review the braking option instruction manual when connecting a braking option to the drive.

NOTICE
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 modification of the product made by the user. This product must not be modified.
Check all the wiring to ensure that all connections are correct after installing the drive and connecting other devices.
Failure to comply could result in damage to the drive.
Do not connect unapproved LC or RC interference suppression filters, capacitors, or overvoltage protection devices to the output of the drive.
Using unapproved filters could result in damage to the drive or motor equipment.
Check the motor rotation and elevator movement direction prior to starting up the drive.
The drive puts out voltage in phase sequence U-V-W with an Up command. Make sure the elevator moves up if the motor is supplied with this phase sequence.
Always remove the ropes when performing Rotational Auto-Tuning.
During Rotational Auto-Tuning the drive turns the motor for a certain time. Not removing the ropes might result in damage to the equipment.
When using a PM motor, make sure the motor can handle the maximum current delivered by the drive.
Operating the motor with too high current may result in demagnetization.

◆ Precautions for CE Low Voltage Directive Compliance

This drive has been tested according to European standard EN61800-5-1, and it fully complies with the Low Voltage Directive. The following conditions must be met to maintain compliance when combining this drive with other devices:

Do not use drives in areas with pollution higher than severity 2 and overvoltage category 3 in accordance with IEC664.

Ground the neutral point of the main power supply for 400 V Class drives.

◆ Precautions for UL/cUL Standards Compliance

This drive is tested in accordance with UL standard UL508C and complies with UL requirements. The following conditions must be met to maintain compliance when using this drive in combination with other equipment:

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

Use UL-listed copper wires (rated at 75°C) and closed-loop connectors or CSA-certified ring connectors. For details refer to the Technical Manual.

Wire low voltage wires with NEC Class 1 circuit conductors. Refer to national state or local codes for wiring. Use a class 2 (UL regulations) power supply for the control circuit terminal. For details refer to the Technical Manual.

This drive has undergone the UL short-circuit test, which certifies that during a short circuit in the power supply the current flow will not rise above 100,000 amps maximum at 240 V for 200 V class drives and 480 V for 400 V class drives.

The drive internal motor overload protection is UL listed and in accordance with the NEC and CEC. The setup can be done using the parameters L1-01/02. For details refer to the Technical Manual.

2   Mechanical Installation

◆ Upon Receipt

Perform the following tasks after receiving the drive:

• Inspect the drive for damage. If the drive appears damaged upon receipt, contact your supplier.
• Verify receipt of the correct model by checking the information on the nameplate. If you have received the wrong
 model, contact your supplier.

◆ Installation Environment

For optimum performance life of the drive, install the drive in an environment that meets the conditions listed below.

Environment	Conditions
Installation Area	Indoors
Ambient Temperature	–10 to +50°C 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 (for details refer to the Technical Manual)
Vibration	10 to 20 Hz at 9.8 m/s^2 20 to 55 Hz at 5.9 m/s^2
Orientation	Install the drive vertically to maintain maximum cooling effects.

◆ Installation Orientation and Spacing

Always install the drive in an upright position. Leave space around the unit for proper cooling as shown in the figure on the right.
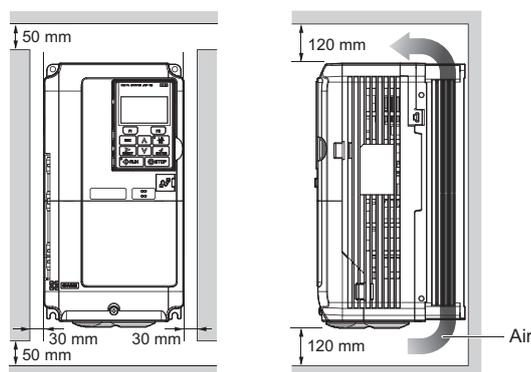
◆ Degree of Protection

The degree of protection of L1000A drives is IP20. Install the drive in a cabinet if higher degree of protection is required.
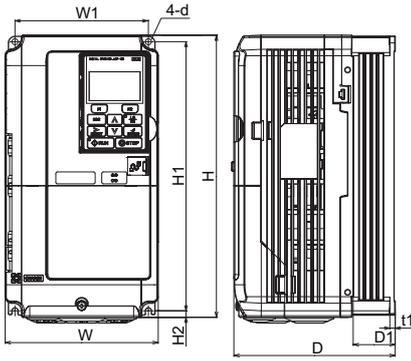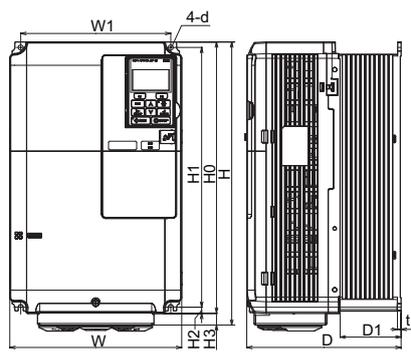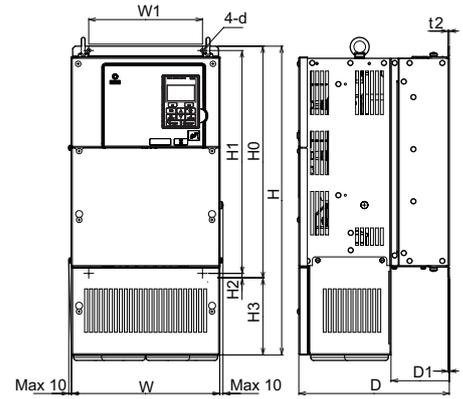
## ◆ Dimensions

Figure 1

Figure 2

Figure 3

Model CIMR-LC	Fig.	Dimensions (mm)												Weight (kg)
		W	H	D	W1	H0	H1	H2	H3	D1	t1	t2	d	
2A0018	1	140	260	164	122	–	248	6	–	55	5	–	M5	3.5
2A0025		140	260	167	122	–	248	6	–	55	5	–	M5	4.0
2A0033		140	260	167	122	–	248	6	–	55	5	–	M5	4.0
2A0047		180	300	187	160	–	284	8	–	75	5	–	M5	5.6
2A0060		220	350	197	192	–	335	8	–	78	5	–	M6	8.7
2A0075	2	220	365	197	192	350	335	8	15	78	5	–	M6	9.7
2A0085	3	254	534	258	195	400	385	7.5	134	100	2.3	2.3	M6	23
2A0115		279	614	258	220	450	435	7.5	164	100	2.3	2.3	M6	28
2A0145 [1]		329	630	283	260	550	535	7.5	80	110	2.3	2.3	M6	40
2A0180 [1]		329	630	283	260	550	535	7.5	80	110	2.3	2.3	M6	40
4A0009	1	140	260	164	122	–	248	6	–	55	5	–	M5	3.5
4A0015		140	260	167	122	–	248	6	–	55	5	–	M5	3.9
4A0018		140	260	167	122	–	248	6	–	55	5	–	M5	3.9
4A0024		180	300	167	160	–	284	8	–	55	5	–	M5	5.4
4A0031		180	300	187	160	–	284	8	–	75	5	–	M5	5.7
4A0039		220	350	197	192	–	335	8	–	78	5	–	M6	8.3
4A0045	3	254	465	258	195	400	385	7.5	65	100	2.3	2.3	M6	23
4A0060		279	515	258	220	450	435	7.5	65	100	2.3	2.3	M6	27
4A0075		329	630	258	260	510	495	7.5	120	105	2.3	3.2	M6	39
4A0091		329	630	258	260	510	495	7.5	120	105	2.3	3.2	M6	39
4A0112 [1]		329	630	283	260	550	535	7.5	80	110	2.3	2.3	M6	43
4A0150 [1]		329	630	283	260	550	535	7.5	80	110	2.3	2.3	M6	45

[1] The wire bending space (space between terminals and cable entry point) provided is smaller than recommended in the IEC61800-5.

3 Electrical Installation

The figure below shows the main and control circuit wiring.
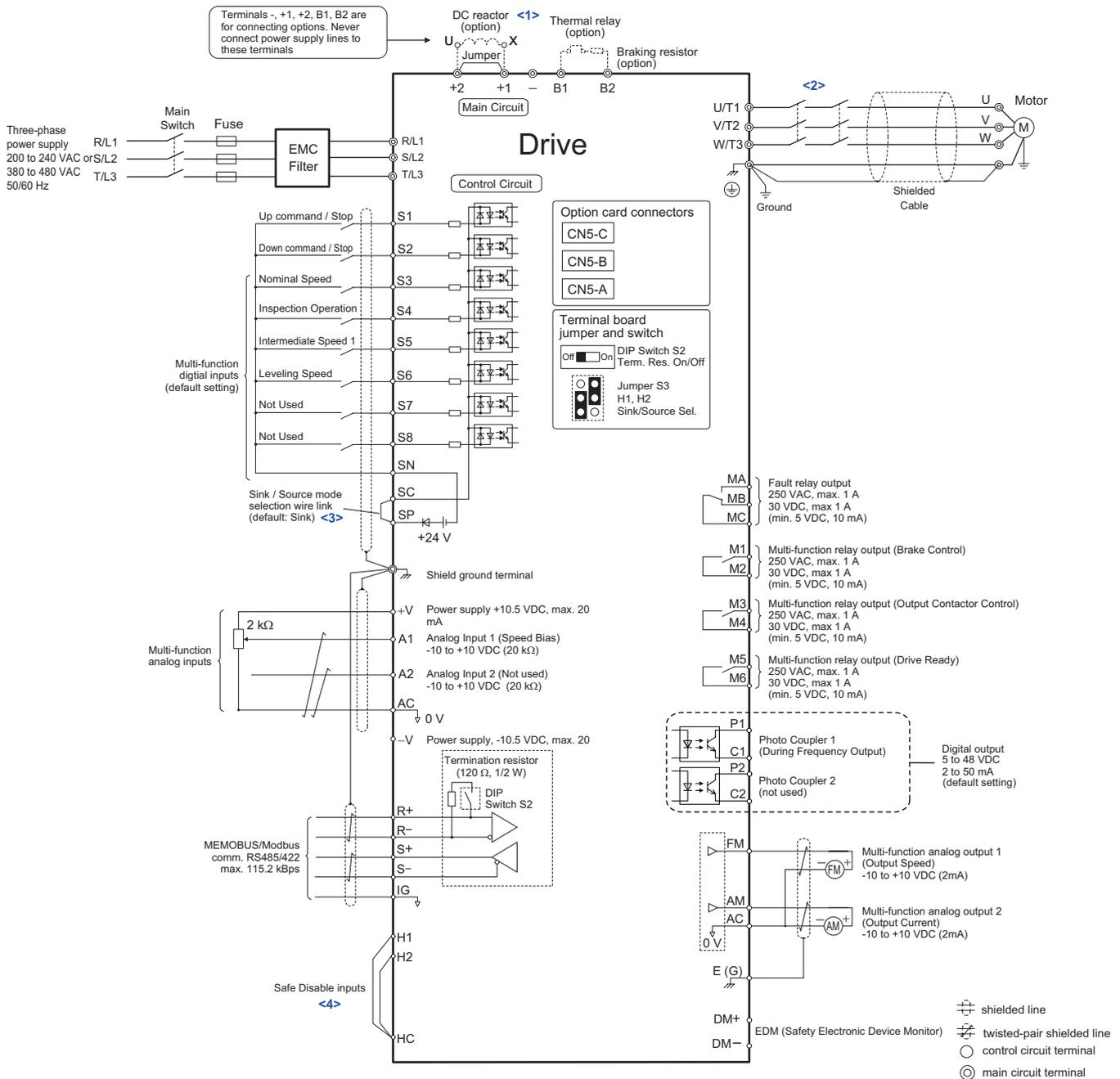
<1> Remove the jumper when installing a DC reactor. Models CIMR-LC2A0085 through 0180 and 4A0045 through 0150 come with a built-in DC reactor.

<2> The drive provides a stop function in compliance with Stop Category 0 (EN60204-1) and "Safe Torque Off" (IEC61800-5-2). It has been designed to meet the requirements of the EN954-1/ISO13849-1, Category 3 and IEC61508, SIL2. Using this function the number of motor contactors can be reduced to one. Refer to *Safe Disable Input Function on page 40* for details.

<3> Never short terminals SP and SN, as doing so will damage the drive.

<4> Disconnect the wire jumper between H1 - HC and H2 - HC when utilizing the Safe Disable inputs.

Note:
1. The drive should be implemented in the system in a way so that a drive fault causes the safety chain to open. Always use terminal MA-MB-MC for this purpose.
2. Even though no fault is present conditions where the drive can not start can occur, e.g. when the Digital Operator is left in the Programming Mode. Use the "Drive Ready" output (default set to terminals M5-M6) to interlock operation in such situations.

◆ Wiring Specification

■ Main Circuit

Use the fuses and line filters listed in the table below when wiring the main circuit. Do not to exceed the given tightening torque values.

Model CIMR-LC	EMC Filter [Schaffner]	Main Fuse [Bussmann]	Recom. Motor cable (mm²)	R/L1,S/L2,T/L3, U/T1,V/T2,W/T3, -, +1, +2	+3	B1, B2	⏚
				Main Circuit Terminal Sizes			
2A0018	FS5972-35-07	FWH-90B	2.5	M4	–	M4	M4
2A0025		FWH-100B	6				M5
2A0033	FS5972-60-07	FWH-200B	10	M6		M5	
2A0047			16				M6
2A0060	FS5972-100-35		16	M8			
2A0075		FWH-300A	25				
2A0085	FS5972-170-40		35			M8	M8
2A0115		FWH-350A	50			M10	
2A0145	FS5972-250-37	FWH-400A	70	M10	M10	–	M10
2A0180			95				
4A0009	FS5972-18-07	FWH-90B	2.5	M4	–	M4	M4
4A0015	FS5972-35-07	FWH-80B					M5
4A0018		FWH-100B	4				
4A0024		FWH-125B	6	M5		M5	M6
4A0031		FWH-200B					
4A0039	FS5972-60-07	FWH-250A	16	M6			
4A0045				M8		M8	M8
4A0060	FS5972-100-35		25				
4A0075					M8	–	
4A0091			35				
4A0112	FS5972-170-40	FWH-350A	50	M10	M10	–	M10
4A0150		FWH-400A	70				

Tightening Torque Values

Tighten the main circuit terminals using the torque values provided in the table below.

Terminal Size	M4	M5	M6	M8	M10
Tightening Torque (N∙m)	1.2 to 1.5	2.0 to 2.5	4.0 to 6.0	9.0 to 11.0	18.0 to 23.0

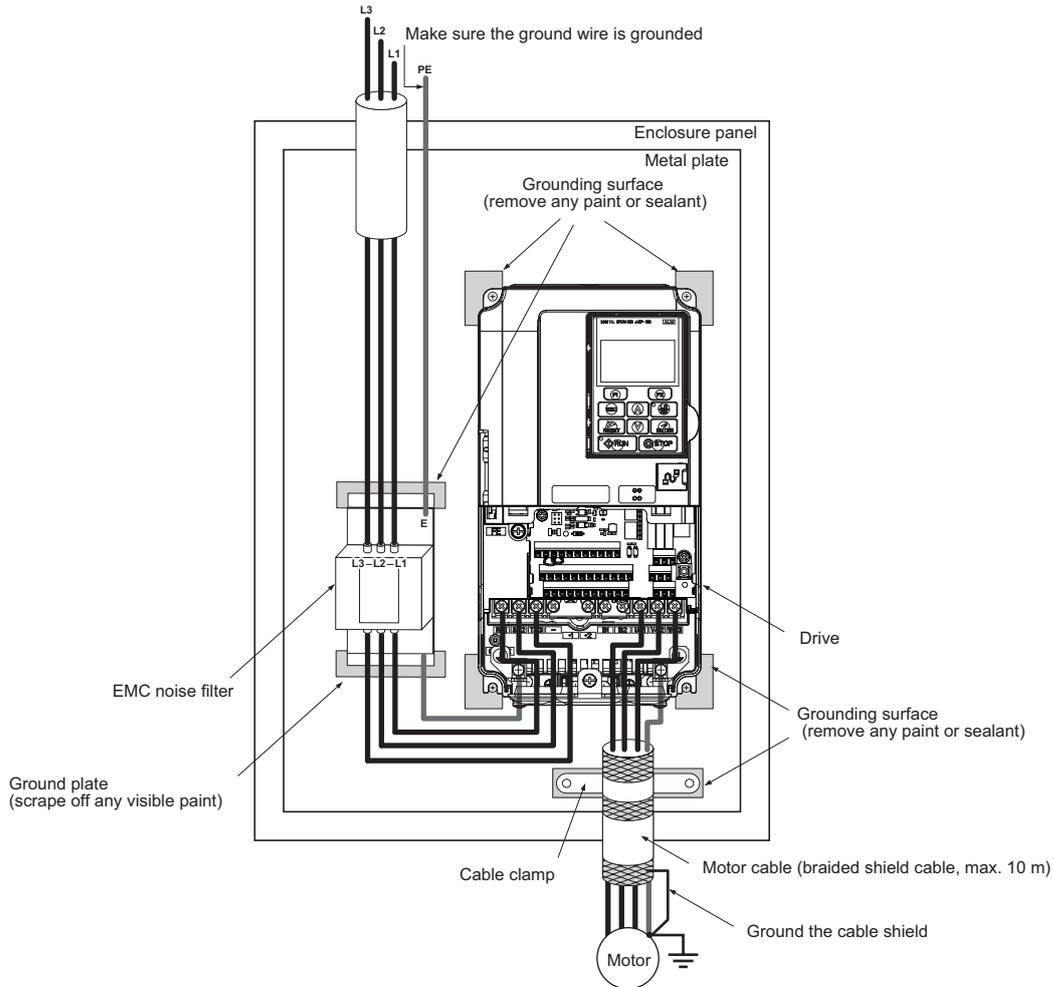### ■ Control Circuit

The control terminal board is equipped with screwless terminals. Always use wires within the specifications listed below. For safe wiring, YASKAWA recommends solid wires or flexible stranded wires with ferrules. Use ferrules with a length of 8 mm.

Wire Type	Wire size (mm²)
Solid	0.2 to 1.5
Stranded	0.2 to 1.0
Stranded wire with ferrule	0.25 to 0.5

◆ EMC Filter Installation

This drive has been tested in accordance with European standards EN61800-3. Install the drive and wire the main circuit as described below.

1. Install an appropriate EMC noise filter to the input side. See the table in or refer to the Technical Manual for details.
2. Place the drive and EMC noise filter in the same enclosure.
3. Use braided shield cable for motor and control circuit wiring.
4. Remove any paint or dirt from ground connections for minimal ground impedance.
5. Install an AC or DC reactor for EN12015 compliance. Refer to the Technical Manual or contact your supplier for details.

◆ Main and Control Circuit Wiring

■ Wiring the Main Circuit Input

Note the following precautions when wiring the main circuit input.

• Use only fuses recommended in .
• If using a ground fault circuit breaker, make sure the breaker is designed for use with AC drives (e.g., type B according to ICE60755).
• If using an input switch, make sure that the switch does not operate more frequently than once every 30 minutes.
• Use a DC reactor or AC reactor on the input side of the drive:
  • To suppress harmonic current.
  • to improve the power factor on the power supply side.
  • when using an advancing capacitor switch.
  • with a large capacity power supply transformer (over 600 kVA).

■ Wiring the Main Circuit Output

Note the following precautions for the output circuit wiring:

- Do not connect any load other than a three-phase motor to the output side of the drive.
- Never connect a power source to the drive output.
- Never short or ground the output terminals.
- Do not use phase correction capacitors.
- Check the control sequence to make sure that the motor contactor is not turned ON or OFF during drive operation. Turning on the motor contactor while voltage is output causes an inrush current that is likely to trigger the drive's overcurrent protection.

Note: The drive provides a Safe Disable function that can be utilized to reduce the number of motor contactors to one. Refer to *Safe Disable Input Function on page 40* for details.

■ Ground Connection

Take the following precautions when grounding the drive:

- Never share the ground wire with other devices such as welding machines, etc.
- Always use a ground wire that complies with electrical equipment technical standards. Keep ground wires as short as possible. Because leakage current is caused by the drive, potential on the ground terminal of the drive will become unstable if the distance between the ground electrode and the ground terminal is too long.
- Always make sure the ground impedance is conform to the requirements of local safety and installation regulations.
- Do not loop the ground wire when using more than one drive.

■ Control Circuit Wiring Precautions

Note the following precautions for wiring the control circuits:

- Separate control circuit wiring from main circuit wiring and other high-power lines.
- Separate wiring for control circuit terminals M1 to M6, MA, MB, and MC (contact output) from wiring to other control circuit terminals.
- Use twisted-pair or shielded twisted-pair cables for control circuits to prevent operating faults.
- Ground the cable shields with the maximum contact area of the shield and ground.
- Cable shields should be grounded on both cable ends.
- Note that flexible wires with ferrules may fit tightly into the terminals. To disconnect them, grasp the wire end with a pair of pliers, release the terminal using a straight-edge screwdriver, turn the wire for about 45°, and pull it gently out of the terminal. For details, refer to the Technical Manual. Use this procedure for removing the wire link between HC, H1, and H2 when the Safe Disable function is utilized.

■ Main Circuit Terminals

Terminal		Type			Function
200 V Class	**Model**	**2A0018 to 2A0075**	**2A0085, 2A0115**	**2A0145, 2A0180**	
400 V Class	**CIMR-LC**	**4A0009 to 4A0039**	**4A0045, 4A0060**	**4A0075 to 4A0150**	
R/L1, S/L2, T/L3		Main circuit power supply input			Connects line power to the drive
U/T1, V/T2, W/T3		Drive output			Connects to the motor
B1, B2		Braking resistor		Not available	Available for connecting a braking resistor or a braking resistor unit option
+2		• DC reactor connection (+1, +2). Remove the jumper between +1 and +2 • DC power supply input (+1, −)	Not available		For connecting • the drive to a DC power supply (terminals +1 and − are not EU or UL approved) • braking options • a DC reactor
+1, −			• DC power supply input (+1, −)	• DC power supply input (+1, −) • Braking transistor connection (+3, −)	
+3		Not available			
⏚		−			Grounding terminal

■ Control Circuit Terminals

The figure below shows the control circuit terminal arrangement. The drive is equipped with screwless terminals.

Use a straight-edge screwdriver with a blade width of max 2.5 mm and a thickness of max 0.6 mm to release the terminals
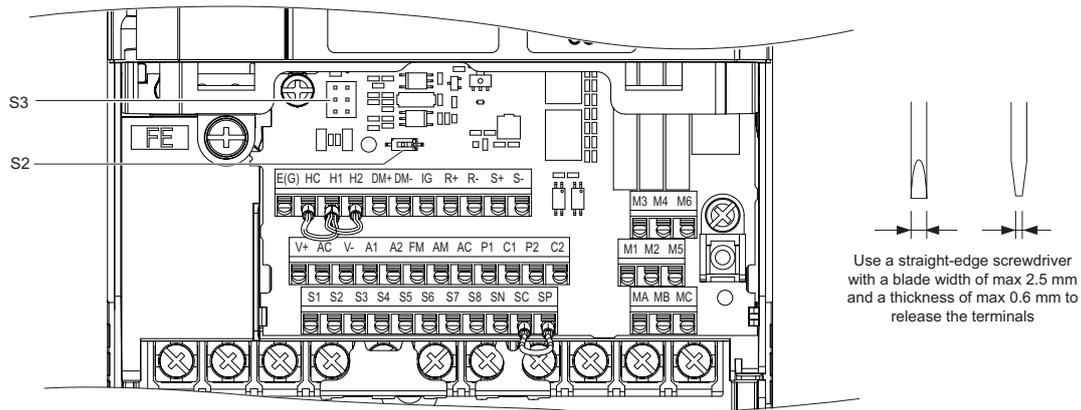
DIP switch S2 and jumper S3 are located on the terminal board. Set them as described below.

S2	RS422/485 Termination Resistor	Off ▮ On
S3	Safe Disable Input Sink/Source/External Supply Selection	Source — Sink — External 24 VDC Power Supply

■ Sinking/Sourcing Mode (NPN/PNP Selection)

Use a wire link 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 below (Default: Sink mode, internal power supply).

Note: Never short terminals SP and SN as doing so will damage the drive.

Internal Power Supply – Sinking Mode (NPN) (default)

External Power Supply – Sinking Mode (NPN)

Internal Power Supply – Sourcing Mode (PNP)

External Power Supply – Sourcing Mode (PNP)
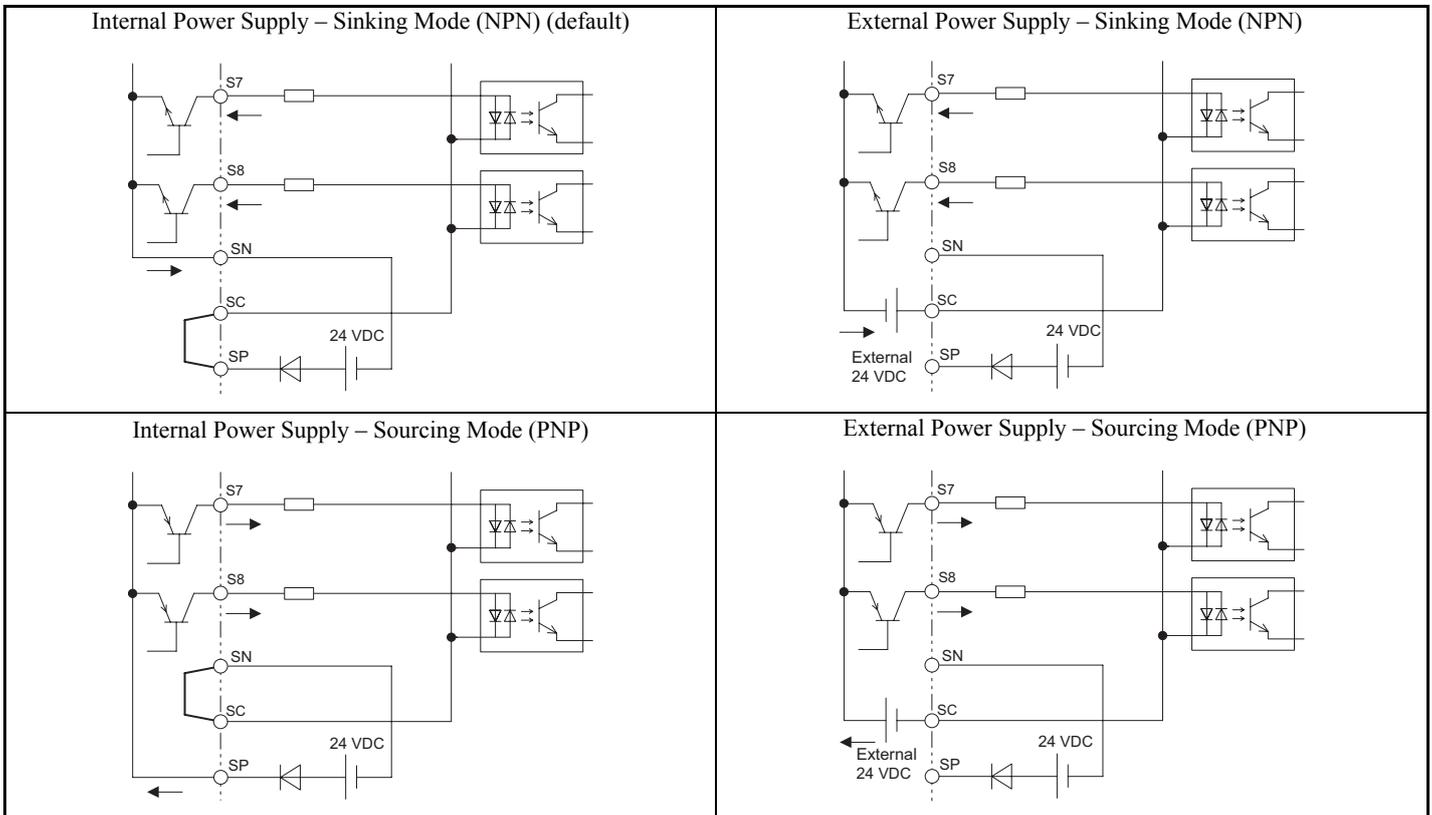
■ Control Circuit Terminal Functions

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting
Digital Inputs	S1	Up Command (Closed: Up, Open: Stop)	Photocoupler 24 VDC, 8 mA Use the wire link between terminals SC and SN or between SC and SP to select sinking or sourcing, and to select the power supply.
	S2	Down Command (Closed: Down, Open: Stop)	
	S3	Multi-function input 3 (Nominal Speed)	
	S4	Multi-function input 4 (Inspection Operation)	
	S5	Multi-function input 5 (Intermediate Speed 1)	
	S6	Multi-function input 6 (Leveling Speed)	
	S7	Multi-function input 7 (Not used)	
	S8	Multi-function input 8 (Not used)	
Digital Input Power Supply	SC	Multi-function input common	Photocoupler, 24 VDC, 8 mA Use the wire link between terminals SC and SN or between SC and SP to select sinking or sourcing, and to select the power supply.
	SN	0 V	
	SP	+24 VDC	
Safe Disable Inputs	H1	Safe Disable input 1	24 VDC, 8 mA One or both open: Drive output disabled Both closed: Normal operation Internal impedance: 3.3 kΩ Off time of at least 1 ms Set the S3 jumper to select sinking or sourcing, and to select the power supply.
	H2	Safe Disable input 2	
	HC	Safe Disable function common	Common for the Safe Disable function
Analog Inputs	+V	Power supply for analog inputs	10.5 VDC (max. allowable current 20 mA)
	−V	Power supply for analog inputs	−10.5 VDC (max. allowable current 20 mA)
	A1	Multi-function analog input 1 (Speed Reference Bias)	−10 to 10 VDC, 0 to 10 VDC (input impedance: 20 kΩ)
	A2	Multi-function analog input 2 (Not used)	−10 to 10 VDC, 0 to 10 VDC (input impedance: 20 kΩ)
	AC	Analog Input common	0 V
	E (G)	Ground for shielded lines and option cards	−
Fault Relay	MA	N.O. output	30 VDC, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 VDC, 10 mA
	MB	N.C. output	
	MC	Fault output common	
Multi-Function Relay Output	M1	Relay output 1 (Brake Control)	
	M2		
	M3	Relay output 2 (Output Contactor Control)	
	M4		
	M5	Relay output 3 (Drive Ready)	
	M6		
Multi-Function Photocoupler Output	P1	Photocoupler output 1 (During frequency output 2)	Photocoupler output 48 VDC, 2 to 50 mA
	C1		
	P2	Photocoupler output 2 (Not used)	
	C2		
Monitor Output	FM	Analog monitor output 1 (Output speed)	−10 to +10 VDC, 0 to +10 VDC
	AM	Analog monitor output 2 (Output current)	
	AC	Monitor common	0 V
Safety Monitor Output	DM+	Safety monitor output	Outputs status of Safe Disable function. Closed when both Safe Disable channels are closed. Up to +48 VDC 50 mA.
	DM−	Safety monitor output common	

NOTICE: *The terminals HC, H1, H2 are used for the Safe Disable function. Safe Disable can be used to enable/disable the drive. If special requirement are fulfilled, it can also be utilized for reducing the number of motor contactors to one. Refer to* ***Safe Disable Input Function on page 40*** *for details. Always remove the wire link between HC, H1, or H2 when using Safe Disable.*

NOTICE: *The wiring length to terminals HC, H1 and H2 should not exceed 30 m.*

NOTICE: *When connecting a reactive load such as a relay coil to a photo coupler output, attach a flywheel diode to the load (relay coil)*

like shown below. Ensure the diode rating is greater than the circuit voltage.
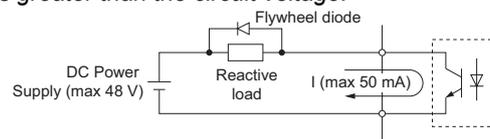
4   Keypad Operation

◆ Digital Operator and Keys

The digital operator is used to program the drive, to start and stop it, and to display fault information. The LEDs indicate the operating status of the drive.

■ Keys and Functions

Key	Name	Function
F1 F2	Function Key (F1, F2)	The functions assigned to F1 and F2 vary depending on the menu that is currently displayed. The name of each function appears in the lower half of the display window.
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.
> RESET	RESET Key	• Moves the cursor to the right. • Resets the drive to clear a fault situation.
◇ RUN	RUN Key	Starts the drive in the LOCAL mode. The Run LED • is on, when the drive is operating the motor. • flashes when decelerating to stop ("ramp to stop"), or when the speed reference is 0. • flashes quickly when the drive is disabled by a DI, when the drive was stopped using a Fast Stop command via the digital inputs, or when a Run command is active during power up.
∧	Up Arrow Key	Scrolls up to display the next item, selects parameter numbers and increments setting values.
∨	Down Arrow Key	Scrolls down to display the next item, selects parameter numbers and increments setting values.
⊘ STOP	STOP Key	Stops drive operation.
↵ ENTER	ENTER Key	• Enters parameter values and settings. • Selects a menu item to move between displays.
LO/RE	LO/RE Selection Key	Switches drive control between the operator (LOCAL) and the control circuit terminals (REMOTE). The LED is on when the drive is in the LOCAL mode (operation from keypad).
ALM	ALM LED Light	On: When the drive detects a fault. Flashing: • When an alarm occurs. • When oPE is detected. • When a fault or error occurs during Auto-Tuning.

◆ Menu Structure and Modes

The following illustration explains the operator keypad menu structure.
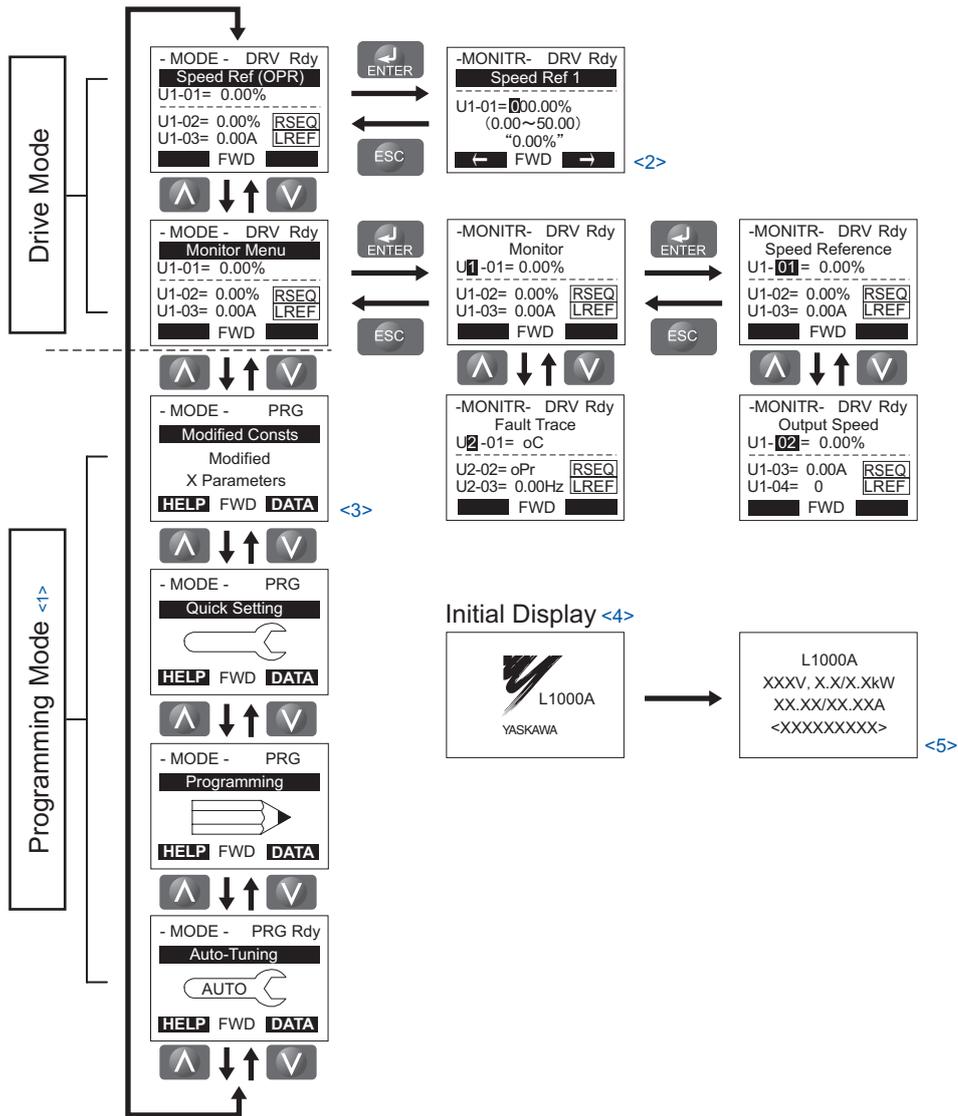
<1> Drive cannot operate the motor.
<2> Flashing characters are shown as **0**.
<3> X characters are shown in this manual. The LCD Operator will display the actual setting values.
<4> The speed reference appears after the initial display which shows the product name.
<5> The information that appears on the display will vary depending on the drive.

5   Start Up

◆ Drive Setup Procedure

The illustration below shows the basic setup procedure. The steps from switching on power are explained more detailed on the following pages.

```
                            ( START )
                                │
        ┌───────────────────────────────────────────────┐
        │          Mechanical installation               │
        └───────────────────────────────────────────────┘
                                │
        ┌───────────────────────────────────────────────┐
        │       Main and control circuit wiring          │
        └───────────────────────────────────────────────┘
                                │
        ┌───────────────────────────────────────────────┐
        │     Check the encoder power supply selection    │
        │            (Closed Loop Control only)           │
        └───────────────────────────────────────────────┘
                                │
        ┌───────────────────────────────────────────────┐
        │       Apply main power on to the drive.        │
        │ Adhere to safety messages concerning application of power. │
        └───────────────────────────────────────────────┘
                                │
        ┌───────────────────────────────────────────────┐
        │      Check the motor rotation direction.       │
        └───────────────────────────────────────────────┘
                                │
        ┌───────────────────────────────────────────────┐
        │   Select the control mode in parameter A1-02.  │
        └───────────────────────────────────────────────┘
                                │
        ┌───────────────────────────────────────────────┐
        │ Set up the encoder feedback in F1-□□ parameters when using a │
        │ Closed Loop Control and check the encoder rotation direction. │
        └───────────────────────────────────────────────┘
                                │
        ┌───────────────────────────────────────────────┐
        │ Set up o1-20 to o1-22 and then select the display units for speed, │
        │ accerleration and deceleration ramp and jerk settings in o1-03. │
        └───────────────────────────────────────────────┘
                                │
        ┌───────────────────────────────────────────────┐
        │ Perform Auto-Tuning for motor parameters and the encoder offset. │
        │                                                │
        │ For control modes below, refer to Auto-Tuning Induction Motors on page 21 │
        │ • V/f Control                                  │
        │ • Open Loop Vector Control                     │
        │ • Closed Loop Vector Control                   │
        │ For Closed Loop Vector for PM, refer to Auto-Tuning PM Motors on page 22 │
        └───────────────────────────────────────────────┘
                                │
```
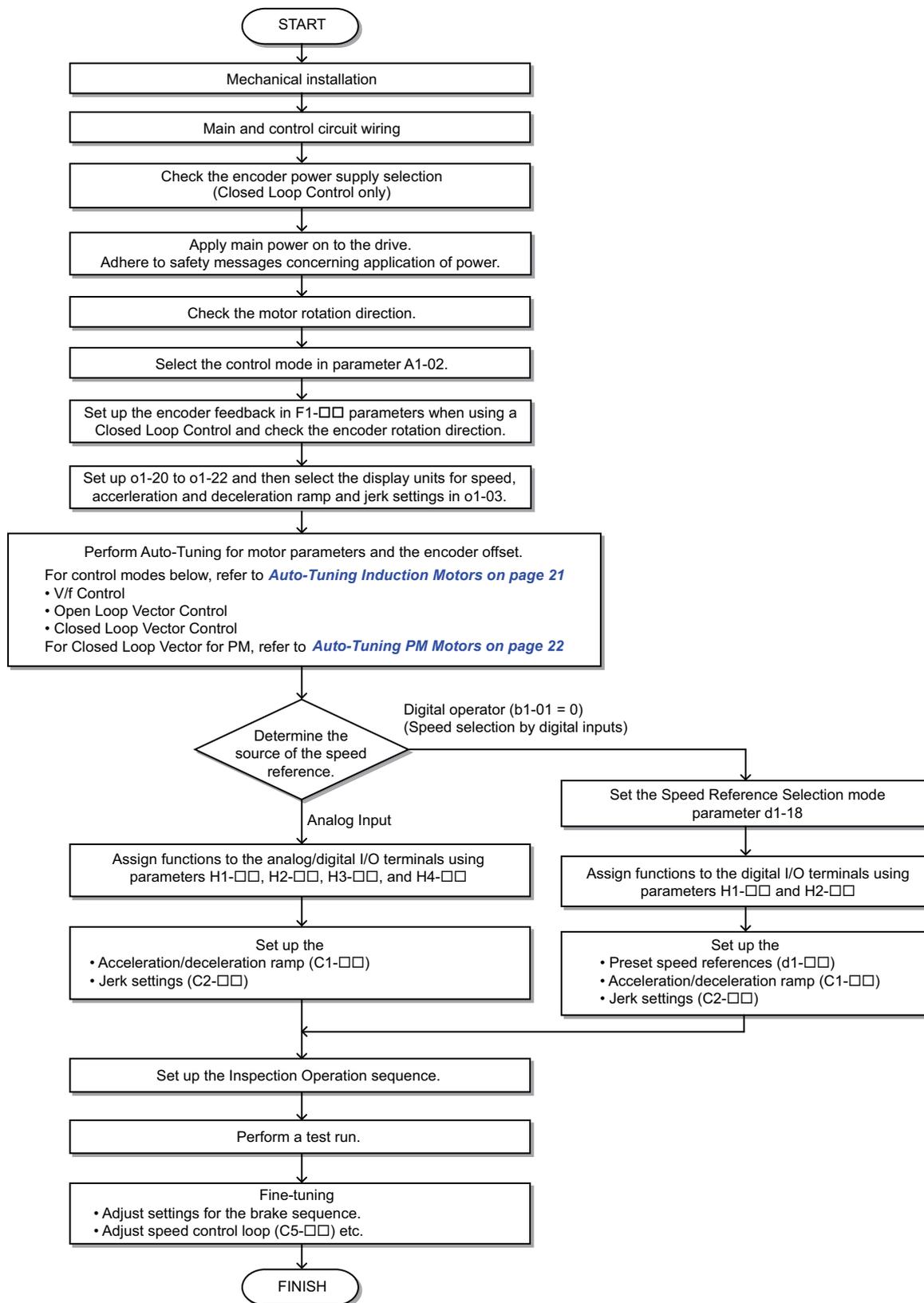
Determine the source of the speed reference.

Digital operator (b1-01 = 0)
(Speed selection by digital inputs)

Analog Input

Assign functions to the analog/digital I/O terminals using parameters H1-□□, H2-□□, H3-□□, and H4-□□

Set the Speed Reference Selection mode parameter d1-18

Set up the
• Acceleration/deceleration ramp (C1-□□)
• Jerk settings (C2-□□)

Assign functions to the digital I/O terminals using parameters H1-□□ and H2-□□

Set up the
• Preset speed references (d1-□□)
• Acceleration/deceleration ramp (C1-□□)
• Jerk settings (C2-□□)

Set up the Inspection Operation sequence.

Perform a test run.

Fine-tuning
• Adjust settings for the brake sequence.
• Adjust speed control loop (C5-□□) etc.

(FINISH)

◆ Power On

Before turning on the power supply

- Make sure all wires are connected properly. Also make sure motor phases are connected in the right sequence.
- Make sure that no screws, loose wire ends, or tools are left in the drive.
- If an encoder option card is used make sure the encoder is wired correctly and the power supply on the option card is set according to the encoder specification.

After turning the power on, the drive mode display should appear and no fault or alarm should be displayed. In case of any error refer to *Troubleshooting on page 35*.

◆ Control Mode Selection

When the drive is first powered up, one of the four control modes must be selected to match the application. Note that Closed Loop Vector modes require 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
	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
YASKAWA IPM motor with incremental encoder	Closed Loop Vector Control for PM motors	7	PG-X3

◆ Motor Rotation Direction Setup

Depending on the elevator configuration it might be necessary to change the motor direction in order to have the elevator traveling up when the Up command is given to the drive. Do the following to check the motor rotation direction.

- The drive puts out voltage in U-V-W phase sequence when an Up command is input. Check the motor rotation with this phase sequence (for most motors clockwise seen from the shaft side).
- If the motor drives the elevator in up direction with a U-V-W sequence, make sure parameter b1-14 is set to 0 (default).
- If the motor drives the elevator in down direction with a U-V-W sequence, set parameter b1-14 is set to 1.

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

◆ Encoder Setup

■ Encoder Resolution Setup

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

■ Encoder Rotation Direction Setup

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

If information about the signal sequence of the encoder are available
- Check the sequence of encoder phases A and B when the motor drives the elevator in up direction.
- If the encoder A phase leads phase B, make sure F1-05 is set to 0 (default).
- If the encoder B phase leads phase A, make sure F1-05 is set to 1.

If no information about the signal sequence of the encoder are available
- Turn the motor manually in elevator up direction while checking the value of monitor U1-05.
- If the value in U1-05 is positive, the set encoder direction is correct.
- 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 18*.

◆ Digital Operator Display Unit Selection

The drive allows to choose between different display units for speed related parameters and monitors, acceleration and deceleration rates and jerk settings. The units can be selected using parameter o1-03 like shown below.

o1-03 Setting	Display Unit		
	Speed Setting/Monitors (d1-□□, U1-02, U1-02,...)	Accel/Decel Rates (C1-□□)	Jerk Settings (C2-□□)
0	0.01 Hz		
1 (default)	0.01%		
2	1 rpm	0.01 s	0.01 s
3	User defined		
4	0.01 m/s		
5	0.01 m/s	0.01 m/s^2	0.01 m/s^3

When using setting 4 or 5 certain mechanical data have to be programmed to the drive prior to changing o1-03. Perform the following steps.

1. Make sure motor data are set up correctly. Verify the setting of the maximum output frequency in parameter E1-04 and the setting for the number of motor poles in parameter E2-04 or E5-04.
2. Set the traction sheave diameter in units of mm to parameter o1-20.
3. Set the correct roping to parameter o1-21.
4. If a mechanical gear is used, set the gear ratio ($n_{Motor}/n_{Traction\ Sheave}$) to parameter o1-22. If a gearbox is not used, make sure o1-22 is set to 1.0.
5. Change parameter o1-03 to setting 4 or 5. The unit and setting values of related parameters will be changed automatically.

◆ Motor Data and Encoder Auto-Tuning

■ Auto-Tuning Types

Auto-Tuning automatically programs the drive's motor and motor control related parameters. Select between Auto-Tuning methods listed below.

Motor Data Tuning Modes for Induction Motors (A1-02 = 0, 2, or 3)

Type	Setting	Requirements and Benefits	Control Mode (A1-02)		
			V/f (0)	OLV (2)	CLV (3)
Rotational Auto-Tuning	T1-01 = 0	• Rotational Auto-Tuning gives the most accurate results, and is therefore highly 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	• 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 set up properly before and the motor cable has changed.	Yes	Yes	Yes
Stationary Auto-Tuning 2	T1-01 = 4	• A motor test report is available. The no-load current and the rated slip have must be entered from the test report, all other motor-related parameters are calculated automatically. • Use if ropes can not be removed and if slip and no-load current data are available.	No	Yes	Yes

Motor Data Tuning Modes for Permanent Magnet Motors (A1-02 = 7)

Type	Setting	Requirements and Benefits
Motor Data Input	T2-01 = 0	• Use if a motor test report is available • Input motor data like on test report. Make sure to convert data into the correct unit before if necessary.

| Type	Setting	Requirements and Benefits
Stationary Auto-Tuning	T2-01 = 1	• Use if a motor test report is not available • Input motor data like on name plate. Make sure to convert data into the correct unit before. The drive automatically calculates the motor data.
Stationary Auto-Tuning for Stator Resistance	T2-01 = 2	• Tunes stator resistance only. • Should be performed if the motor cable has changed.
Rotational Back EMF Constant Auto-Tuning	T2-01 = 11	• Used the Motor Induction Voltage (E5-24) if no data are available. • Should be performed after Motor data have been set and the encoder offset has been adjusted. • The motor must be uncoupled from the mechanical system (remove ropes).

Encoder Offset Tuning Modes for Permanent Magnet Motors (A1-02 = 7)

Encoder Offset Tuning measures the angle between the encoder zero pulse and the rotor orientation. It needs to be performed when a drive is setup the first time or after initialization, when the motor rotation direction or encoder rotation direction has been changed or when the encoder was replaced.

Type	Setting	Requirements and Benefits
Initial Magnet Pole Search Parametes Auto-Tuning	T2-01 = 3	• Attempts to detect the motor rotor position, judges if the encoder offset can be tuned using Stationary Encoder Offset Tuning and sets parameters needed for Initial Magnet Pole Search (n8-36, n8-37). • Should be performed after motor Auto-tuning in order to decide the encoder tuning method. **Important:** When using a PG-X3 card with an incremental encoder and this tuning fails, the motor can not be driven using and incremental encoder. Change the encoder to an absolute encoder.
Stationary Encoder Offset Auto-Tuning	T2-01 = 4	• Tunes the encoder offset without rotating the motor. • If the encoder offset can not be tuned properly by this method run Rotating Encoder Offset Tuning.
Rotational Encoder Offset Auto-Tuning	T2-01 = 10	• Tunes the encoder offset while rotating the motor. • Motor and mechanical system must be uncoupled (ropes must be removed from traction sheave).

◼ Tuning Mode Selection and Data Input

For Auto-Tuning, enter the Auto-Tuning menu (via the T parameters) and perform the steps shown in the figure below. Data required from the motor nameplate will vary depending on the type of Auto-Tuning selected. This example shows the procedure for performing Rotational Auto-Tuning of an induction motor in Open Loop Vector control.
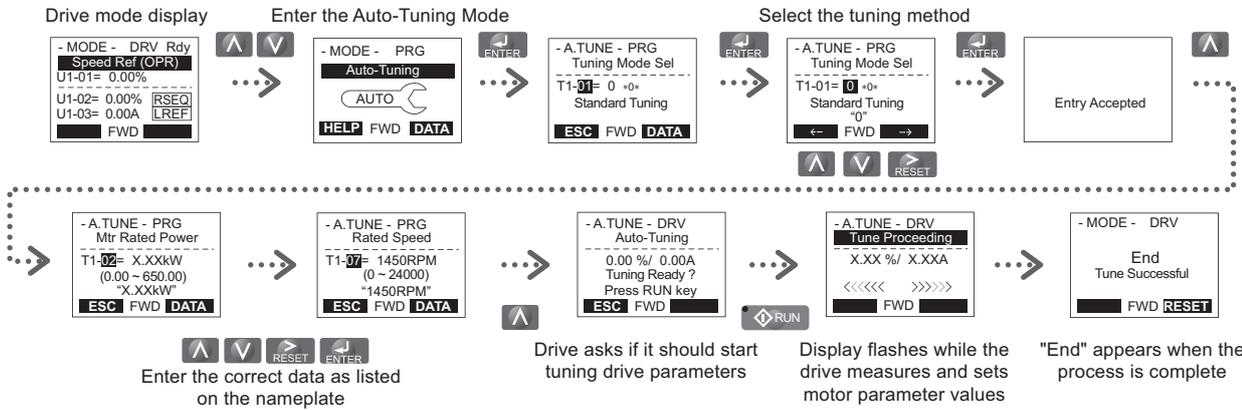
If Auto-Tuning can not be performed for some reason (no-load operation impossible, etc.), then set the maximum frequency and voltage in the E1-□□ parameters and enter the motor data manually into the E2-□□ parameters for induction motors or E5-□□ parameters for PM motors. Refer to *Auto-Tuning Errors on page 38*.

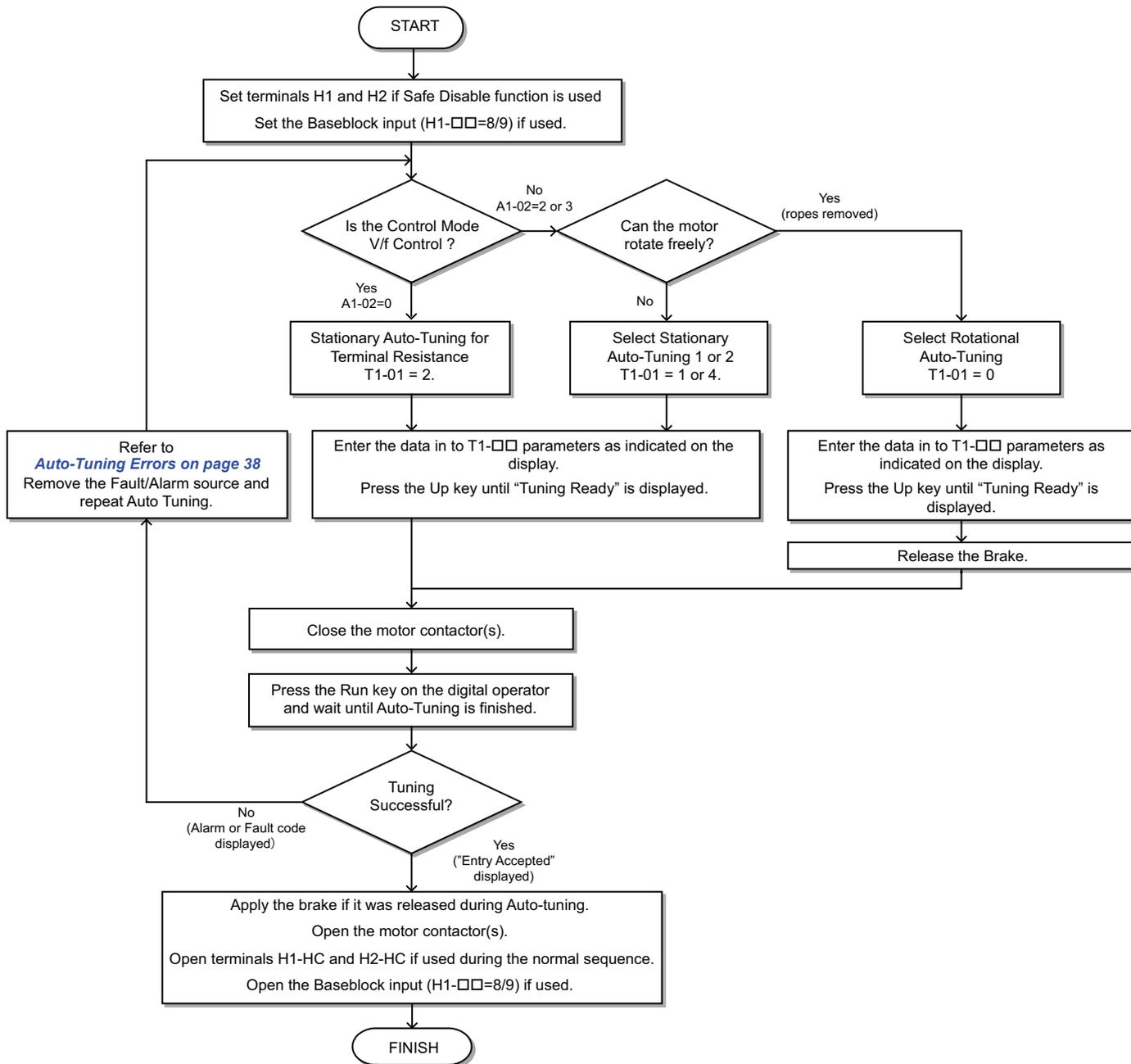## ◼ Precautions

• Always try to perform Rotational Auto-Tuning as it gives more accurate results than Non-Rotating Auto-Tuning. Perform Non-Rotating Auto-Tuning if the load can not be disconnected (e.g. ropes can not be removed).
• Make sure that the mechanical brake is closed for all Auto-Tuning methods except for Rotational Auto-Tuning.
• Motor contactors must be closed during the Auto-Tuning process.
• H1 and H2 signals must be ON when performing Auto-Tuning.
• Confirm that the motor is mechanically fixed.
• Do not touch the motor until the Auto-Tuning process is complete. Voltage is applied to the motor during the tuning process, even though the motor may not be rotating.
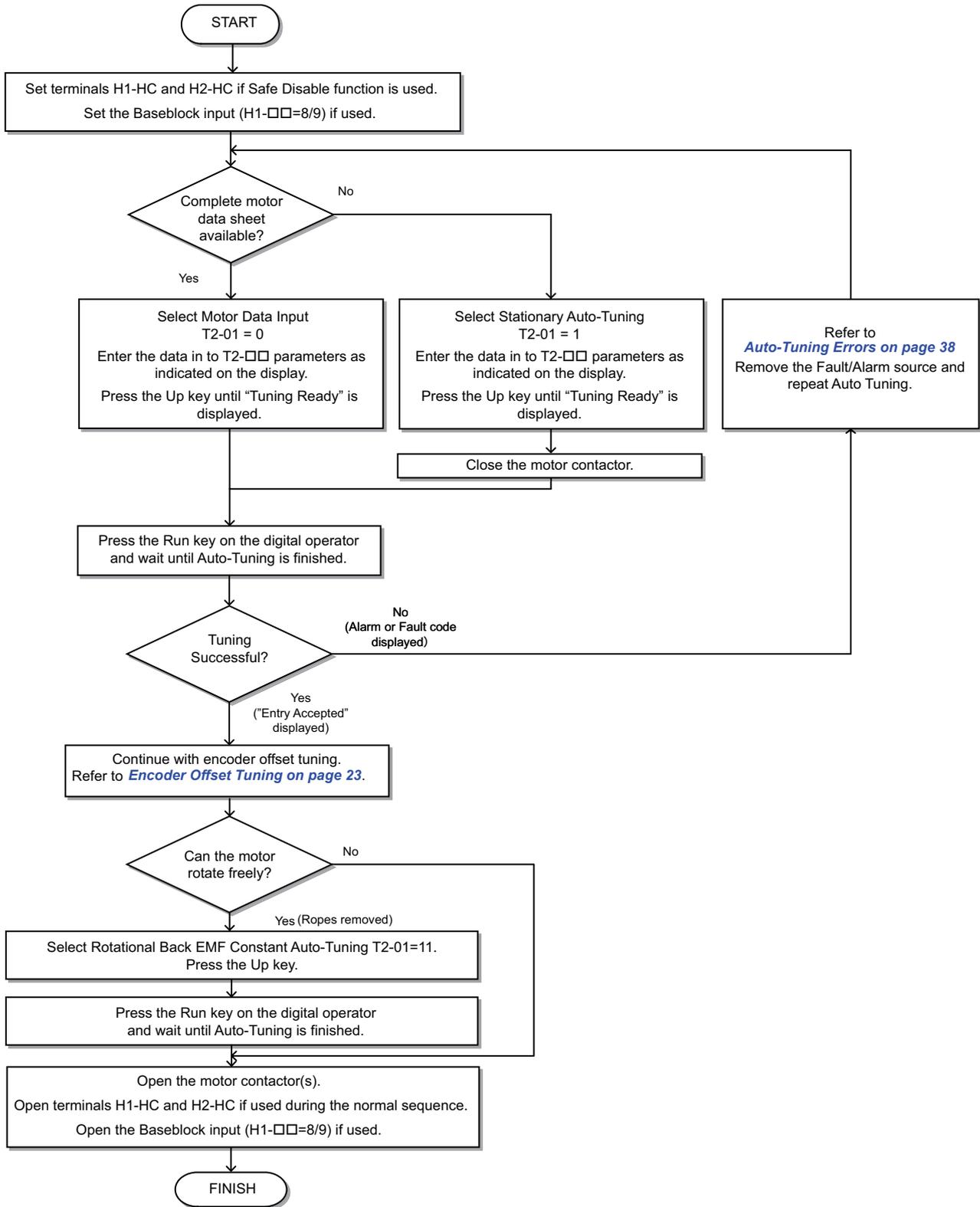
- To cancel Auto-Tuning, press the STOP key on the digital operator.
- During Auto-Tuning the motor is started and stopped repeatedly and may also rotate. When the tuning is finished, "END" will appear on the operator panel. Do not touch the motor until this display is shown and the motor has completely stopped.
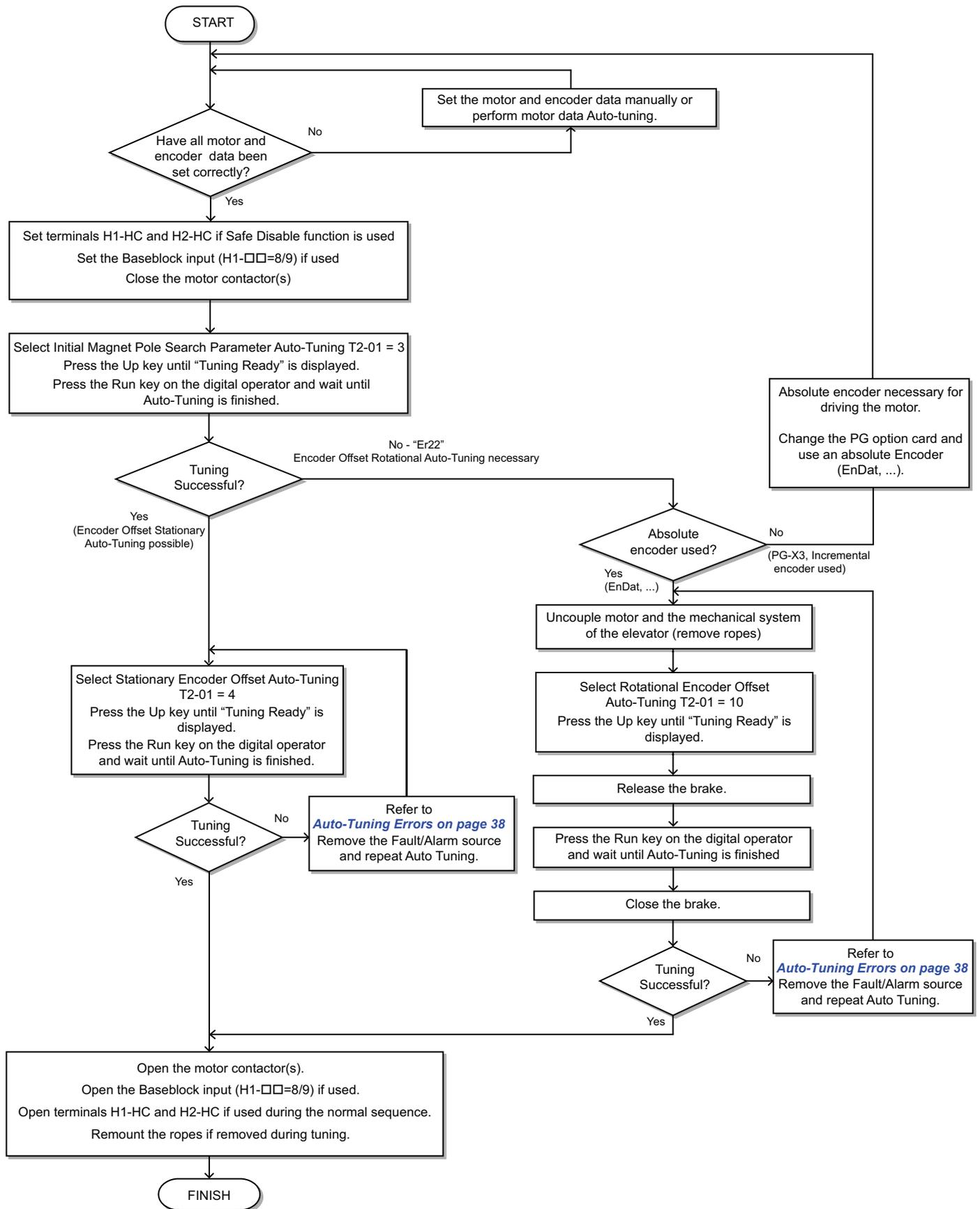
■ Auto-Tuning Procedure

Auto-Tuning Induction Motors

```
                                    ┌───────────┐
                                    │   START   │
                                    └───────────┘
                                          │
        ┌─────────────────────────────────────────────────────────────┐
        │  Set terminals H1 and H2 if Safe Disable function is used    │
        │  Set the Baseblock input (H1-□□=8/9) if used.                │
        └─────────────────────────────────────────────────────────────┘
```

Is the Control Mode V/f Control ?
 - No — A1-02=2 or 3 → Can the motor rotate freely?
   - Yes (ropes removed) → Select Rotational Auto-Tuning T1-01 = 0
   - No → Select Stationary Auto-Tuning 1 or 2 T1-01 = 1 or 4.
 - Yes — A1-02=0 → Stationary Auto-Tuning for Terminal Resistance T1-01 = 2.

Refer to *Auto-Tuning Errors on page 38* Remove the Fault/Alarm source and repeat Auto Tuning.

Enter the data in to T1-□□ parameters as indicated on the display. Press the Up key until "Tuning Ready" is displayed.

Enter the data in to T1-□□ parameters as indicated on the display. Press the Up key until "Tuning Ready" is displayed.

Release the Brake.

Close the motor contactor(s).

Press the Run key on the digital operator and wait until Auto-Tuning is finished.

Tuning Successful?
 - No (Alarm or Fault code displayed)
 - Yes ("Entry Accepted" displayed)

Apply the brake if it was released during Auto-tuning.
Open the motor contactor(s).
Open terminals H1-HC and H2-HC if used during the normal sequence.
Open the Baseblock input (H1-□□=8/9) if used.

```
                                    ┌───────────┐
                                    │  FINISH   │
                                    └───────────┘
```

Auto-Tuning PM Motors

```
                              ┌──────────┐
                              │  START   │
                              └──────────┘
                                   │
   ┌───────────────────────────────────────────────────────────┐
   │  Set terminals H1-HC and H2-HC if Safe Disable function    │
   │  is used.                                                  │
   │     Set the Baseblock input (H1-□□=8/9) if used.           │
   └───────────────────────────────────────────────────────────┘
                                   │
                          ╱────────────────╲            No
                         ╱  Complete motor   ╲─────────────────────────────┐
                         ╲  data sheet         ╱                           │
                          ╲  available?      ╱                             │
                           ╲───────────────╱                              │
                                   │ Yes                                   │
        ┌──────────────────┐       │         ┌──────────────────┐          │
        │ Select Motor     │       │         │ Select Stationary│   ┌──────────────────┐
        │ Data Input       │                 │ Auto-Tuning      │   │ Refer to          │
        │ T2-01 = 0        │                 │ T2-01 = 1        │   │ *Auto-Tuning      │
        │ Enter the data   │                 │ Enter the data   │   │ Errors on page 38*│
        │ in to T2-□□      │                 │ in to T2-□□      │   │ Remove the        │
        │ parameters as    │                 │ parameters as    │   │ Fault/Alarm source│
        │ indicated on the │                 │ indicated on the │   │ and repeat Auto   │
        │ display.         │                 │ display.         │   │ Tuning.           │
        │ Press the Up key │                 │ Press the Up key │   └──────────────────┘
        │ until "Tuning    │                 │ until "Tuning    │
        │ Ready" is        │                 │ Ready" is        │
        │ displayed.       │                 │ displayed.       │
        └──────────────────┘                 └──────────────────┘
```

Select Motor Data Input
T2-01 = 0
Enter the data in to T2-□□ parameters as indicated on the display.
Press the Up key until "Tuning Ready" is displayed.

Select Stationary Auto-Tuning
T2-01 = 1
Enter the data in to T2-□□ parameters as indicated on the display.
Press the Up key until "Tuning Ready" is displayed.

Refer to
Auto-Tuning Errors on page 38
Remove the Fault/Alarm source and repeat Auto Tuning.

Close the motor contactor.

Press the Run key on the digital operator and wait until Auto-Tuning is finished.

Tuning Successful? — No (Alarm or Fault code displayed)

Yes ("Entry Accepted" displayed)

Continue with encoder offset tuning.
Refer to *Encoder Offset Tuning on page 23*.

Can the motor rotate freely? — No

Yes (Ropes removed)

Select Rotational Back EMF Constant Auto-Tuning T2-01=11.
Press the Up key.

Press the Run key on the digital operator and wait until Auto-Tuning is finished.

Open the motor contactor(s).
Open terminals H1-HC and H2-HC if used during the normal sequence.
Open the Baseblock input (H1-□□=8/9) if used.

FINISH

Encoder Offset Tuning

```
                          ( START )
                              │
                              ▼
                    ┌──────────────────┐      Set the motor and encoder data manually or
                    │                  │ No   perform motor data Auto-tuning.
              ◇ Have all motor and ◇ ────────►
              ◇ encoder data been  ◇
              ◇ set correctly?     ◇
                    │
                   Yes
                    ▼
        ┌────────────────────────────────────┐
        │ Set terminals H1-HC and H2-HC if Safe Disable function is used │
        │ Set the Baseblock input (H1-□□=8/9) if used │
        │ Close the motor contactor(s) │
        └────────────────────────────────────┘
                    │
                    ▼
        ┌────────────────────────────────────┐
        │ Select Initial Magnet Pole Search Parameter Auto-Tuning T2-01 = 3 │
        │ Press the Up key until "Tuning Ready" is displayed. │
        │ Press the Run key on the digital operator and wait until │
        │ Auto-Tuning is finished. │
        └────────────────────────────────────┘
```

Set the motor and encoder data manually or perform motor data Auto-tuning.

Set terminals H1-HC and H2-HC if Safe Disable function is used

Set the Baseblock input (H1-□□=8/9) if used

Close the motor contactor(s)

Select Initial Magnet Pole Search Parameter Auto-Tuning T2-01 = 3
Press the Up key until "Tuning Ready" is displayed.
Press the Run key on the digital operator and wait until Auto-Tuning is finished.

Tuning Successful?

No - "Er22"
Encoder Offset Rotational Auto-Tuning necessary

Yes
(Encoder Offset Stationary Auto-Tuning possible)

Absolute encoder necessary for driving the motor.

Change the PG option card and use an absolute Encoder (EnDat, ...).

Absolute encoder used?

No
(PG-X3, Incremental encoder used)

Yes
(EnDat, ...)

Select Stationary Encoder Offset Auto-Tuning T2-01 = 4
Press the Up key until "Tuning Ready" is displayed.
Press the Run key on the digital operator and wait until Auto-Tuning is finished.

Uncouple motor and the mechanical system of the elevator (remove ropes)

Select Rotational Encoder Offset Auto-Tuning T2-01 = 10
Press the Up key until "Tuning Ready" is displayed.

Release the brake.

Press the Run key on the digital operator and wait until Auto-Tuning is finished

Close the brake.

Tuning Successful?

No

Refer to
Auto-Tuning Errors on page 38
Remove the Fault/Alarm source and repeat Auto Tuning.

Yes

Tuning Successful?

No

Refer to
Auto-Tuning Errors on page 38
Remove the Fault/Alarm source and repeat Auto Tuning.

Yes

Open the motor contactor(s).
Open the Baseblock input (H1-□□=8/9) if used.
Open terminals H1-HC and H2-HC if used during the normal sequence.
Remount the ropes if removed during tuning.

(FINISH)

◆ Up and Down Commands and Speed Reference Selection

■ Speed Reference Selection

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

b1-01	Reference source	Speed reference input
0 (default)	Operator keypad (Digital inputs)	Set the speed references in the d1-□□ parameters and use digital inputs to switch over 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

■ Up / Down Command Source Selection

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

b1-02	Up/Down source	Run 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 selected.
- The Safe Disable signals at terminals H1 and H2 must both be closed.
- An Up or Down Signal must be set at the source specified in b1-02.

Travel Stop

The drive stops under the following conditions:

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

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

Use parameter d1-18 to determine how different travel speeds are selected by digital inputs.

d1-18	Speed Selection
0	Multi-speed inputs 1, Speed references are set in d1-01 to d1-08
1 (default)	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.

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	Speed reference 2 d1-02
0	1	0	Speed reference 3 d1-03	Speed reference 3 d1-03
1	1	0	Speed reference 4 d1-04	Speed reference 4 d1-04
0	0	1	Speed reference 5 d1-05	Speed reference 5 d1-05
1	0	1	Speed reference 6 d1-06	Speed reference 6 d1-06
0	1	1	Speed reference 7 d1-07	Speed reference 7 d1-07
1	1	1	Speed reference 8 d1-08	Speed reference 8 d1-08

0 = Off, 1 = On

Setting d1-18 = 0

Eight separate speed settings (defined in parameters d1-01 to d1-08) can be selected by three digital input signals.

Setting d1-18 = 3

Seven separate speeds settings (defined in parameters d1-02 to d1-08) can be selected by three digital input signals. The drive stops when no speed is selected (i.e., all speed selection inputs are switched off).

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

With this setting, six different speeds (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 1 (d1-20)
S6	H1-06	53	Leveling speed (d1-26)

Depending on the assignment of speed selection functions to the digital input (H1-☐☐ settings), the different speed settings can be selected like shown in the table below.

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
Revelling Speed (d1-23)	0	0	1	A	0	0	1	0	1	0
Leveling Speed (d1-26)	0	0	0	1	0	0	0	X	X	1
Zero Speed	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A

0 = Off, 1 = On

A: No influence when d1-18=1, 0 when d1-18=2

B: No influence

N/A = Not available

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

The higher speed has priority over the leveling speed, meaning 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.
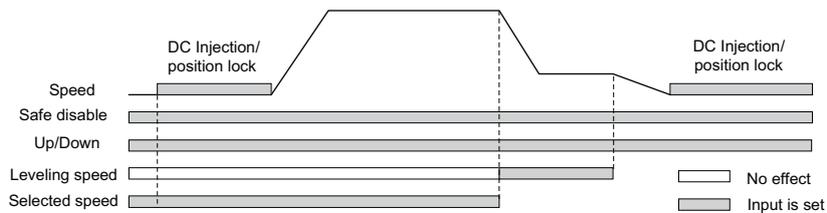
Higher Speed Priority is Selected and the Leveling Speed Input is Not Assigned (d1-18 = 1 and H1-☐☐ ≠ 53)

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 a "FrL" fault. To disable Speed Reference Missing (FrL) detection, set parameter S6-15 to "0". With this setting the drive starts using leveling speed if no other speed reference is selected.
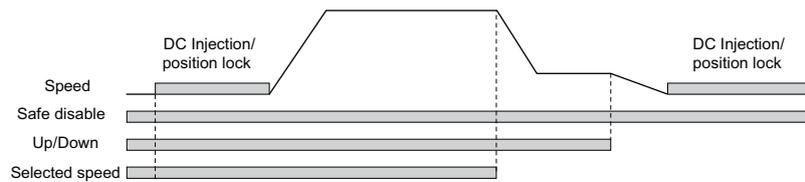
Leveling Speed has Priority and the Leveling Speed Input is Assigned (d1-18 = 2, H1-☐☐ = 53)

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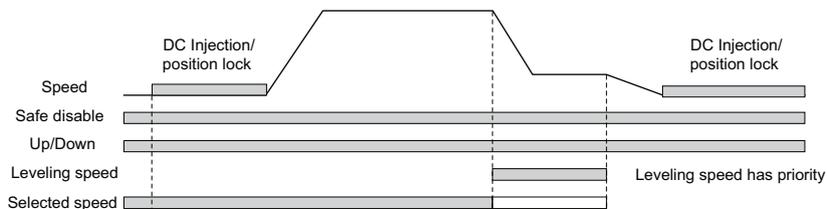
Leveling Speed Priority is Selected and the Nominal Speed Input is Not Assigned (d1-18 = 2, H1-☐☐ ≠ 50)

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.

CAUTION! *This sequence can be risky if the speed selection doesn't work for some reason (broken wire, etc.)*
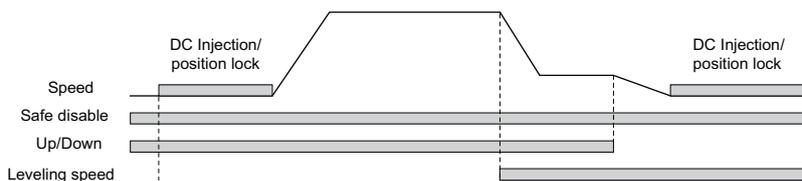
◆ I/O Signal Setup

Note: The default setting functions can be seen in the connection diagram on page *8*.

■ Multi-Function Digital Inputs

Assign functions to each digital input terminal using the H1-☐☐ parameters.

■ Multi-Function Digital Outputs

Determine the function for each digital output terminal with the H2-☐☐ parameters. The setting value of these parameters consists of three digits, where the middle and right digit determines the function, and the left digit sets the output characteristics. The output characteristics can be either "Output as selected" (0) or "Inverse output" (1).

■ Multi-Function Analog Inputs

The function of each analog input can be assigned in the H3-☐☐ parameters.

■ Multi-Function Analog Outputs

Use the H4-☐☐ parameters to set up the output value of the analog monitor outputs and to adjust the output signal levels.

◆ Acceleration Ramp, Deceleration Ramp, and Jerk Settings

The acceleration and deceleration ramps are set in the parameters C1-01 and C1-02, while the jerk settings are set in the C2-☐☐ parameters as shown in the figure below.
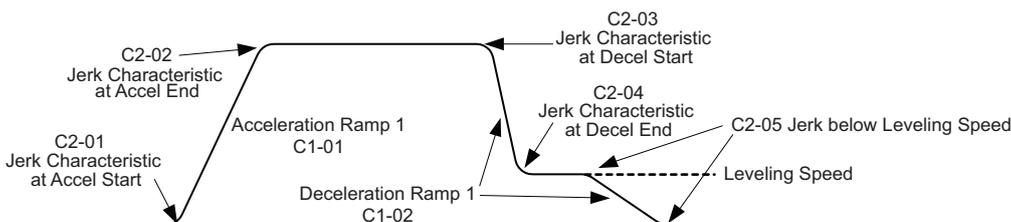
The way of setting these parameters and their setting units change with parameter o1-03 as shown below:

	o1-03 = 0, 1, 2, 3, 4	o1-03 = 5
Accel/Decel Ramps C1-☐☐	Set in units of second as the time to accelerate from zero to the rated speed, respectively as time to decelerate from rated speed to zero.	Set in units of m/s² as accel/decel rate used when changing the speed.
Jerk Settings C2-☐☐	Set in units of second as the time used to change the accel/decel rate from zero to the accel/decel ramp setting of C1-☐☐ and vice versa.	Set in units of m/s³ as the accel/decel change rate.

◆ Brake Sequence

The figure below shows the brake sequence and parameters that can be used for adjustment.
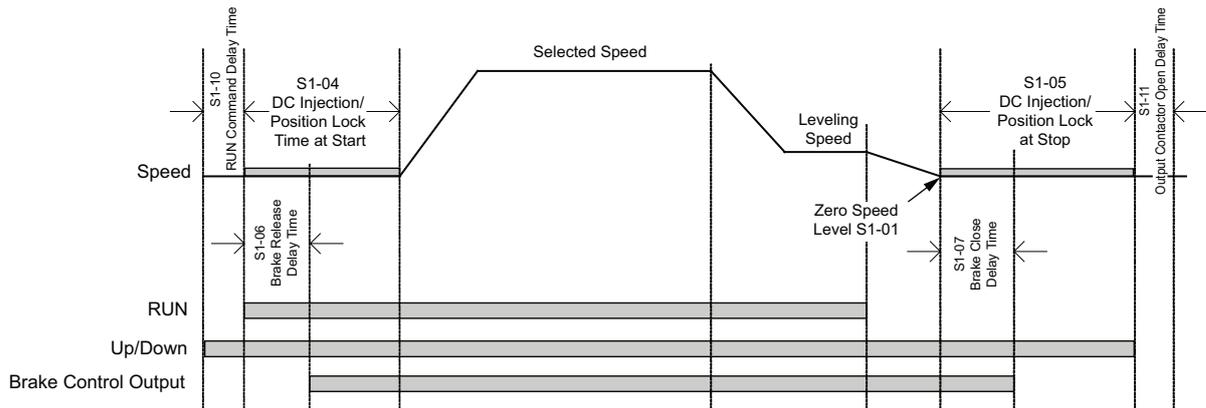
◆ Inspection Operation

■ Start in Inspection Mode

Inspection operation is performed when an Up or Down signal is input while one of the conditions below 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-□□ = 54) is enabled.

The start is performed using the same acceleration characteristics, brake sequence and contactor sequence like in normal operation. The carrier frequency is set to 2 kHz during Inspection Operation but can be changed using parameter C6-21.

■ Stop in Inspection Mode

To stop the drive in Inspection Mode either remove the Up or Down signal or unselect the Inspection Operation Speed Reference (conditions listed for Start in Inspection Mode must become untrue).

The stop can be performed using a deceleration ramp, depending on the setting of parameter C1-15 (Inspection Operation Deceleration Ramp).

• If C1-15 = 0, the drive immediately closes the brake, shuts off the drive output and opens the motor contactor.
• If C1-15 > 0, the drive decelerates to stop, closes the brake, shuts the output off and opens the motor contactor.

6 Fine Adjustments

This section provides tips for improving the ride quality after the basic setup is complete and lists solutions to potential problems. Refer to the Technical Manual for detailed description.

◆ Potential Problems and Solutions

Problem	Control Mode and Possible Cause		Corrective Action
Rollback at start	V/f and OLV	Not enough torque when the brake is released	• Increase the DC Injection Braking current at start using parameter S1-02. • Set the time for DC Injection Braking at start (S1-04) to as short a value as possible, but make sure that brake releases completely before the motor starts to turn. • Increase the minimum (E1-10) and medium (E1-08) V/f pattern voltages. Make sure, that the starting and leveling current does not rise too high.
	CLV	The speed control is not responding quickly enough when the brake is released	• Adjust the speed control loop settings at start. Increase the gain setting in C5-03 and decrease integral time setting in C5-04. If vibration occurs, set the values back in small increments. • Increase the position lock gain at start in parameter S3-01.
	PM/CLV		• First adjust the speed control loop parameters properly (C5-03 and C5-04). • Increase the position lock gain at start 1 in S3-01 gradually. If vibration occurs reduce it. • Increase the position lock gain at start 2 in S3-02 gradually until rollback disappears.
	All	Motor torque is not fully established when the brake is released	Lengthen the brake release delay time (S1-06) and the time for DC Injection Braking / Position Lock at start (S1-04).
		Motor contactors close too late	Make sure, that the contactors are closed before the Up/Down command is set.
Shock at start	All	Motor starts turning when the brake is not completely released or runs against the brake	Increase the DC Injection Braking time at start using parameter S1-04.
		Acceleration rate is changing too quickly	Decrease the Jerk at start. Decrease C2-01 if set in m/s², increase C2-01 if set in s.
		Rollback occurs during brake opening.	See above under "Rollback at start".
Motor or machine vibrates in the low or medium speed range	V/f	Output voltage is too high	Reduce the V/f pattern settings (E1-08, E1-10).
	OLV	Torque compensation is responding too quickly	Increase the torque compensation delay time (C4-02).
		Output voltage is too high	Reduce the V/f pattern settings (E1-08, E1-10).
	OLV CLV	The value for the motor slip is set incorrectly	Check the motor slip value in parameter E2-02. Increase or decrease it in steps of 0.2 Hz.
	CLV CLV/PM	Speed control loop adjusted too hard.	• Decrease C5-01 and then increase C5-02 if the problem occurs at speed higher than C5-07 • Decrease C5-03 and then increase C5-04 if the problem occurs at speed lower than C5-07
Motor or machine vibrates at high speed or top speed	OLV	Torque compensation is responding too quickly	Increase the torque compensation delay time (C4-02).
	CLV CLV/PM	Speed control loop adjusted too hard.	Decrease C5-01, then increase C5-02.
Car jerks suddenly due to overshoot as the motor reaches top speed	OLV	Too fast torque compensation or slip compensation	• Increase the torque compensation delay time (C4-02). • Increase the slip compensation delay time (C3-02).
	CLV CLV/PM	Speed control Loop setting are too soft or too hard	• Adjust the speed control loop gain C5-01 and integral time C5-02. • Adjust inertia compensation parameters (n5-☐☐) if only speed control loop settings can not solve the problem
		Wrong motor data	• For induction motors readjust the motor data (E2-☐☐), especially the slip (E2-02) and no-load current values (E2-03), or perform Auto-Tuning again. • For PM motors readjust the motor data in E5-☐☐ or perform Auto-Tuning.
	All	The acceleration rate changes too quickly	Decrease the jerk at the end of acceleration. Decrease C2-02 if set in m/s², increase C2-02 if set in s.

Problem	Control Mode and Possible Cause		Corrective Action
Motor stops short (undershoot) when the leveling speed is reached	V/f and OLV	Not enough torque at low speed	Increase the minimum and mid voltage levels for the V/f pattern voltage (E1-10 and E1-08 respectively). Make sure that the starting and leveling current does not rise too high.
	OLV and CLV	Motor data incorrect	Adjust the motor data (E2-□□), especially the motor slip (E2-02) and no-load current values (E2-03), or perform Auto-Tuning.
		Too much slip compensation	
	CLV CLV/PM	Speed control loop responds too slow	Increase the C5-13 and decrease the C5-14.
	All	Deceleration rate changes too quickly.	Decrease the Jerk at the end of deceleration. Decrease C2-04 if set in m/s², increase C2-04 if set in s.
Shock at stop	All	Brake is applied too early, causing the motor to run against the brake	Increase the delay time for the brake (S1-07). If necessary, also increase the DC Injection Braking time at stop S1-05.
		Motor contactor is released though the brake has not yet fully closed	Check the motor contactor sequence.
	CLV CLV/PM	Rollback occurs before at stop	• Make sure the speed control loop parameters are adjusted properly (C5-13 and C5-14). • Increase the position lock gain at stop S3-03 gradually until no rollback occurs anymore. If vibration occurs reduce the gain S3-03.
High frequency motor noise	All	The carrier frequency is too low	Increase the carrier frequency in parameter C6-03. If the increasing the carrier frequency must be set higher than the default setting, a current derating must be considered (refer to the Technical Manual for details).
Vibrations which increase with the speed	CLV CLV/PM	Encoder vibrates	Check the encoder mounting and the orientation of the motor shaft.
	All	Mechanical problems	Check bearings and gearbox.
		Rotational parts (motor armature, handwheel, brake disk/drum) are not properly balanced	Balance the rotating parts.

◆ Speed Loop Adjustments (CLV and PM/CLV)

The speed control loop uses three different gain and integral time settings that can be adjusted using C5-□□ parameters. The settings are switched over when the motor speed reaches the level set in parameter C5-07.

• Proportional gain and integral time C5-03/04 are used at start when the speed is lower than the setting of C5-07.
• Proportional gain and integral time C5-01/02 are used at speeds above the setting of C5-07.
• Proportional gain and integral time C5-13/14 are used at stop when the speed is lower than the setting of C5-07.

Increase the gain and shorten the integral time to increase speed control responsiveness in each of the sections. Reduce the gain and increase the integral time if vibration or oscillation occurs.

◆ Inertia Compensation (CLV and PM/CLV)

Inertia compensation can be used to eliminate motor speed overshoot at the acceleration end or undershoot at the end of deceleration caused by the system inertia. Adjust the function following the steps below.

1. Make sure the speed control loop parameters are adjusted properly (C5-□□).
2. Set parameter n5-01 = 1 to enable inertia compensation.
3. Calculate and set n5-02 and n5-03 as follows:

Motor Acceleration Time n5-02	$n5\text{-}02 = J_{Mot} \cdot \dfrac{\pi \cdot n_{r\_Mot}}{30 \cdot T_{r\_Mot}}$	• J_{Mot} - Motor inertia in kgm² • n_{r_Mot} - Rated motor speed in min⁻¹ • T_{r_Mot} - Rated motor torque in Nm
Inertia Compensation Gain n5-03	$\Sigma J = J_{TS} \cdot i^2 + \Sigma m \cdot \left(\dfrac{30 \cdot v_{r\_Elev}}{\pi \cdot n_{r\_Mot}} \right)^2$ $n5\text{-}03 = \Sigma J / J_{Mot}$	• J_{TS} - Traction sheave inertia in kgm² • i - Gear ratio (n_{Load}/n_{Mot}) • v_{r_Elev} - Rated elevator speed in m/s • Σm - Mass of all moved parts (car, counterweight, ropes, load *<1>*) in kg

<1> Insert 0 kg for the load to calculate the lowest setting, insert the elevator rated load to calculate the maximum setting for n5-03. Use the lower setting for initial trials.

4. Change the setting of n5-03 within the limits calculated in step 3 until the desired performance is achieved.

7   Parameter Table

This table below lists the most important parameters with default settings appearing in bold type. Refer to the Technical Manual for a complete list of parameters.

No.	Name	Description
Initialization Parameters		
A1-00	Language Selection	**0: English** 1: Japanese 2: German 3: French 4: Italian 5: Spanish 6: Portuguese 7: Chinese
A1-01	Access Level Selection	0: View and set parameters 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)**
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
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
Operation Mode Selection		
b1-01	Speed Reference Selection 1	0: Digital operator **1: Analog input terminals** 2: MEMOBUS/Modbus communications 3: Option Card
b1-02	Run Command Selection1	0: Digital operator **1: Digital input terminals** 2: MEMOBUS/Modbus communications 3: Option Card
b1-14	Output Phase Order Selection	Output phase order with an Up command. **0: U-V-W** 1: U-W-V
Acceleration/ Deceleration Settings		
C1-☐☐	Acceleration/ Deceleration Ramps	These parameters set the acceleration and deceleration ramps. Setting units are determined by parameter o1-03. Refer to page *19*.
C2-☐☐	Jerk Settings	These parameters adjust the Jerk settings. Setting units are determined by parameter o1-03. Refer to page *19*.
Slip Compensation		
C3-01	Slip Compensation Gain	• Increase C3-01 if motor slip requires more compensation (motor speed is lower than speed reference) • Decrease if slip is overcompensated

No.	Name	Description
C3-02	Slip Compensation Primary Delay Time	• Decrease if the drive does not provide motor slip compensation quickly enough • Increase if motor oscillation occurs
Speed Control Loop (ASR)		
C5-01	Speed Control Loop Gain 1	Set the speed control loop responsiveness at high speed.
C5-02	Speed Control Loop I Time 1	
C5-03	Speed Control Loop Gain 2	Set the speed control loop responsiveness at low speed during start.
C5-04	Speed Control Loop I Time 2	
C5-07	Speed Loop Switching Speed	Sets the switching speed for speed loop settings.
C5-13	Speed Control Loop Gain 3	Set the speed control loop responsiveness at low speed during stop.
C5-14	Speed Control Loop I Time 3	
Carrier Frequency		
C6-03	Carrier Frequency	Sets the carrier frequency. Settings above the default requires output current derating.
Speed Reference		
d1-01 to d1-08	Speed Reference 1 to 8	Speed reference values for multi-speed inputs. Setting units are determined by parameter o1-03. Refer to page *19*.
d1-18	Speed Reference Selection	0: Multi-speed references 1 to 8 **1: Higher speed reference has priority** 2: Leveling speed reference has priority 3: Multi-Speed References 2 to 8 (with Multi-speed 1 selected the drive stops)
d1-19	Nominal Speed	Speed reference values for separate speed selection inputs. Setting units are determined by parameter o1-03. Refer to page *19*.
d1-20	Intermediate Speed 1	
d1-21	Intermediate Speed 2	
d1-22	Intermediate Speed 3	
d1-23	Relevel. Speed	
d1-24	Inspection Operation Speed	
d1-26	Leveling Speed	
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.
d1-29	Inspection Speed Detection Level	Used when d1-18 = 0 or 3. If the speed reference selected is between d1-28 and d1-29, then the speed reference is regarded as the Inspection Speed, and the inspection operation sequence is activated.

No.	Name	Description
V/f Pattern for Motor 1		
E1-01	Input Voltage Setting	This parameter must be set to the power supply voltage. WARNING! Drive input voltage (not motor voltage) must be set in E1-01 for the protective features of the drive to function properly.
E1-04	Maximum Output Frequency	V/f pattern settings E1-07, E1-08, and E-10 are available only in V/f Control and Open Loop Vector Control. For linear V/f characteristics, set the same values to E1-07 and E1-09. With these settings, the drive will disregard the value set to E1-08. Parameters must be set so that: E1-09 ≤ E1-07 < E1-06 ≤ E1-04
E1-05	Maximum Voltage	
E1-06	Base Frequency	
E1-07	Mid Output Frequency	
E1-08	Mid Output Frequency Voltage	
E1-09	Minimum Output Frequency	
E1-10	Minimum Output Frequency Voltage	
E1-13	Base Voltage	
Induction Motor Parameters		
E2-01	Rated Current	Motor data for Induction Motors.
E2-02	Rated Slip	
E2-03	No-Load Current	
E2-04	Number of Motor Poles	
E2-05	Line-to-Line Resistance	
E2-06	Leakage Inductance	
Permanent Magnet Motor Parameters		
E5-02	Rated Power	Motor data for permanent magnet motors. E5-09 is set as peak-to-peak value for one motor phase in units of 0.1 mVs/rad (electrical angle) E5-24 is set as phase-to-phase RMS value in units of 0.1 mVmin (mechanical angle) If a value is set to E5-09, then E5-24 must be set to 0.0 and vice versa.
E5-03	Rated Current	
E5-04	Number of Motor Poles	
E5-05	1 Phase Stator Resistance	
E5-06	d-Axis Inductance	
E5-07	q-Axis Inductance	
E5-09	Induction Volt. Const. 1	
E5-24	Induction Volt. Const. 2	
Encoder Feedback Settings		
F1-01	Encoder Resolution	Sets the encoder resolution.
F1-05	Encoder Rotation Direction	**0: A phase leads B in up direction** 1: B phase leads A in up direction

No.	Name	Description
Multi-Function Digital Inputs / Outputs		
H1-03 to H1-08	Multi-Function Digital Input Terminal S3 to S8 Function Selection	Selects the function of terminals S3 to S8.
H2-01 to H2-03	Terminal M1-M6 Function Selection	Sets the function for the relay outputs M1-M2, M3-M4, and M5-M6.
H2-04, H2-05	Terminal P1-C1, P2-C2 Function Sel.	Sets the function for the photocoupler outputs P1-C1 and P2-C2.
Major functions are listed at the end of the table.		
Multi-Function Analog Inputs		
H3-01, H3-09	Terminal A1, A2 Signal Level Sel.	**0: 0 to 10 V** 1: −10 to 10 V
H3-02, H3-10	Terminal A1, A2 Function Selection	0: Speed bias 2: Auxiliary speed 1 3: Auxiliary speed 2 14: Torque compensation **1F: Through mode**
H3-03, H3-11	Terminal A1, A2 Gain	Sets the level of the input value selected in H3-02 and H3-10 when 10 V is input at terminals A1 and A2.
H3-04, H3-12	Terminal A1, A2 Bias	Sets the level of the input value selected in H3-02 and H3-10 when 0 V is input at terminals A1 and A2.
Multi-Function Analog Outputs		
H4-01, H4-04	Analog Output Terminal FM, AM Monitor Selection	Selects the data to be output through multi-function analog output terminals FM and AM.
H4-02, H4-05	Analog Output Terminal FM, AM Gain	Sets the signal level for terminals FM and AM that is equal to 100% of the monitor output that has been selected.
H4-03, H4-06	Analog Output Terminal FM, AM Bias	Sets the signal level for terminals FM and AM that is equal to 0% of the monitor output that has been selected.
H4-07, H4-08	Analog Output Terminal FM, AM Signal Sel.	**0: 0 to 10 V** 1: −10 to 10 V
Motor Protection		
L1-01	Motor Overload Protection Selection	0: Disabled **1: General purpose motor (self-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 control
Inertia Compensation		
n5-01	Inertia Compensation Selection	**0: Disabled** 1: Enabled
n5-02	Motor Acceleration Time	Sets the time the motor needs to accelerate from 0 to the nominal speed at 100% torque.
n5-03	Inertia Compensation Gain	Sets the gain used for inertia compensation. This value defines the ratio between motor and load inertia.

No.	Name	Description
Digital Operator Display Units		
o1-03	Display Unit Selection	0: 0.01 Hz **1: 0.01%** 2: r/min 4: Elevator units 1 (speed = m/s, accel/decel ramp = s, Jerk = s) 5: Elevator units 2 (speed = m/s, accel/decel ramp = m/s², Jerk = m/s³) Note: If o1-03 = 4 or 5, then parameters o1-20, o1-21, and o1-22 must also be set.
o1-20	Traction Sheave Diameter	Set the traction sheave diameter in mm.
o1-21	Roping Ratio	1: 1:1 **2: 1:2** 3: 1:3 4: 1:4
o1-22	Gear Ratio	Set the gear ratio of the mechanical gear.
Brake Sequence		
S1-01	Zero Speed Level	Sets the speed to close the brake at stop.
S1-02	DC Injection Current at Start	Adjusts the torque to hold the motor at zero speed during start and stop. Increase if roll-back occurs.
S1-03	DC Injection Current at Stop	
S1-04	DC Inj./Zero Speed Time at Start	Sets the time between the Up/Down command and acceleration start.
S1-05	DC Inj./Zero Speed Time at Stop	Sets the time between reaching the Zero Speed Level and when the drive output shuts off.
S1-06	Brake Release Delay Time	Sets the wait time between the Up/Down command and the brake release command.
S1-07	Brake Close Delay Time	Sets the wait time between reaching Zero Speed and the brake close command.
Slip Compensation		
S2-01	Motor Rated Speed	Sets the motor rated speed in r/min.
S2-02/ S2-03	Slip Compensation Gain Motoring /Regen. Mode	Set the slip compensation gain for motoring operation (S2-02) and during regenerative operation (S2-03).
Start Stop Optimization		
S3-01	Position Lock Gain at Start 1	Sets the gain for maintaining Zero Speed at start. Adjust the value so that no vibration occurs during Zero Speed at start.
S3-02	Position Lock Gain at Start 2	Used to prevent roll-back. Increase if roll-back occurs and S3-01 has already been set.
S3-03	Position Lock Gain at Stop	Sets the gain for maintaining Zero Speed at stop. Adjust the value so that no vibration occurs during Zero Speed at stop.
Short Floor Operation		
S5-01	Short Floor Operation Selection	**0: Disabled** 1: Enabled

No.	Name	Description
Induction Motor Auto-Tuning		
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 10: Inertia Tuning
T1-02	Motor Rated Power	Sets the motor rated power as specified on the motor nameplate.
T1-03	Motor Rated Voltage	Sets the motor rated voltage as specified on the motor nameplate.
T1-04	Motor Rated Current	Sets the motor rated current as specified on the motor nameplate.
T1-05	Motor Base Frequency	Sets the rated frequency of the motor as specified on the motor nameplate.
T1-06	Number of Motor Poles	Sets the number of motor poles as specified on the motor nameplate.
T1-07	Motor Base Speed	Sets the rated speed of the motor as specified on the motor nameplate.
T1-08	Encoder Resolution	Set the number of pulses per revolution for the encoder being used
T1-09	Motor No-Load Current	Sets the no-load current and rated slip for the motor. Automatically calculated after setting the T1-02 and T1-04. If know enter the no-load current and slip as indicated on the motor test report. If not, proceed with shown values.
T1-10	Motor Rated Slip	
PM Motor Auto-Tuning		
T2-01	Auto-Tuning Mode Selection	**0: Motor Data input** 1: Stationary Auto-Tuning 2: Stationary stator resistance Auto-Tuning 3: Initial magnet pole search parameters Auto-Tuning 4: Stationary encoder offset Auto-Tuning 10: Rotational encoder offset Auto-Tuning 11: Rotational back EMF constant Auto-Tuning
T2-04	Motor Rated Power	Sets the motor rated power as specified on the motor nameplate.
T2-05	Motor Rated Voltage	Sets the motor rated voltage as specified on the motor nameplate.
T2-06	Motor Rated Current	Sets the motor rated current as specified on the motor nameplate.
T2-08	Number of Motor Poles	Sets the number of motor poles as specified on the motor nameplate.
T2-09	Motor Base Speed	Sets the rated speed of the motor as specified on the motor nameplate.
T2-10	1 Phase Stator Resistance	Sets the 1-phase resistance of the stator winding in ohms.
T2-11/ T2-12	d-axis/q-axis Inductance	Sets the d-axis and q-axis inductance in mH.
T2-13	Induced Voltage Unit	0: mV/min⁻¹ **1: mVs/rad**
T2-14	Induced Voltage Const.	Sets the induced voltage (back EMF) constant.
T2-16	Encoder Resolution	Sets the encoder resolution.
T2-17	Encoder Offset	Sets the encoder offset.

Monitor	Description
U1-01	Speed Reference (Hz)
U1-02	Output Speed (Hz)
U1-03	Output Current (A)
U1-05	Motor Speed (Hz)
U1-06	Output Voltage Reference (VAC)
U1-07	DC Bus Voltage (VDC)
U1-08	Output Power (kW)
U1-09	Torque Reference (% of motor rated torque)
U1-10	Displays the input terminal status. U1-10 = 0 0 0 0 0 0 0 0 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)
U1-11	Displays the output terminal status. U1-11 = 0 0 0 0 0 0 0 0 Multi-Function Digital Output (terminal M1-M2) Multi-Function Digital Output (terminal M3-M4) Multi-Function Digital Output (terminal M5-M6) Multi-Function Digital Output (terminal P1-C1) Multi-Function Digital Output (terminal P2-C2) Not Used Fault Relay (terminal MA-MC closed MA-MC open)
U1-12	Verifies the drive operation status. U1-12 = 0 0 0 0 0 0 0 0 During run During zero-speed Down Direction Fault reset signal input During speed agree Drive ready During alarm detection During fault detection
U1-13	Terminal A1 Input Level
U1-14	Terminal A2 Input Level
U1-16	Output Speed after Soft Starter
U1-18	oPE Fault Parameter
Fault Trace	
U2-01	Current Fault
U2-02	Previous Fault
U2-03	Speed Reference at Previous Fault
U2-04	Output Speed at Previous Fault
U2-05	Output Current at Previous Fault
U2-06	Motor Speed at Previous Fault
U2-07	Output Voltage at Previous Fault
U2-08	DC Bus Voltage at Previous Fault
U2-09	Output Power at Previous Fault

Monitor	Description
U2-10	Torque Reference at Previous Fault
U2-11	Input Terminal Status at Previous Fault
U2-12	Output Terminal Status at Previous Fault
U2-13	Drive Operation Status at Previous Fault
U2-14	Cumulative Operation Time at Previous Fault
U2-15	Soft Starter Output at Previous Fault
U2-16	Motor q-Axis Current at Previous Fault
U2-17	Motor d-Axis Current at Previous Fault
U2-20	Heatsink Temperature at Previous Fault
Fault History	
U3-01 to U3-04	First to 4th Most Recent Fault
U3-05 to U3-10	5th to 10th Most Recent Fault
U3-11 to U3-14	Cumulative Operation Time at 1st to 4th Most Recent Fault
U3-15 to U3-20	Cumulative Operation Time at 5th to 10th Most Recent Fault
* The following faults are not recorded in the error log: CPF00, 01, 02, 03, Uv1, and Uv2.	
Fault Trace	
U4-01	Cumulative Operation time
U4-24	Number of travels (lower 4 digits)
U4-25	Number of travels (upper 4 digits)
U4-26	Maximum current during acceleration
U4-27	Maximum current during deceleration
U4-28	Maximum current during constant speed
U4-29	Maximum current during leveling speed

DI/DO Sel.	Description
Digital Input Function Selections	
3	Multi-step speed reference 1
4	Multi-step speed reference 2
5	Multi-step speed reference 3
F	Through mode (Set when a terminal is not used)
14	Fault reset (Reset when turned ON)
20 to 2F	External fault; Input mode: N.O. contact / N.C. contact Detection mode: Normal/during operation
50	Nominal speed (d1-19)
51	Intermediate speed (d1-20)
52	Releveling speed (d1-23)
53	Leveling speed (d1-26)
54	Inspection operation
56	Motor contactor feedback
79	Brake feedback
Digital Output Function Selections	
0	During Run (ON: Run command is ON or voltage is being output)
6	Drive Ready
E	Fault
F	Not used (through mode)
50	Brake Control
51	Output Contactor Control
58	Safe Disable Status

8 Troubleshooting

◆ General Fault and Alarms

Faults and alarms indicate problems in the drive or in the machine.

The drive indicates that an alarm has occurred with a code on the data display screen and a flashing ALM LED. The drive output may be shut off depending on the alarm.

The drive indicates that a fault has occurred with a code on the data display screen and a lit ALM LED. The drive output is always switched off immediately and the motor coasts to stop.

To remove an alarm or reset a fault, first figure out what cause the problem, take corrective action, and finally reset the drive by pushing the RESET key on the operator or by cycling the power supply.

The table below lists the most important alarms and faults only. Please refer to the Technical Manual for a complete list.

Digital Operator	AL	FLT	Possible Cause	Corrective Action
Baseblock bb	○		The software baseblock function is assigned to one of the digital inputs and the input is off. The drive does not accept Up/Down commands during this time.	• Check the functions assigned to the digital input terminals. • Check the upper controller sequence.
Control Fault CF		○	The torque limit was reached during deceleration for longer than 3 s and one of the following was true: • the load inertia is too big. • the torque limit is too low. • the motor parameters are set incorrectly.	• Check the load. • Set the torque limit to the most appropriate setting (L7-01 through L7-04). • Check the motor parameters settings.
Control Circuit Fault CPF02 to CPF24		○	There is a problem in the drive's control circuit.	• Cycle the drive power supply. • Initialize the drive. • Replace the drive if the fault occurs again.
Cannot Reset CrST	○		Fault reset was input when the Up or Down command was active.	Turn off the Up and Down command and reset the drive.
Speed Deviation dEv		○	F1-04 is set to 0, 1, or 2 and a speed deviation higher than the value in F1-10 occurred longer than the time set in F1-11.	• Reduce the load • Decrease the acceleration and deceleration rate. • Check the mechanical system (lubrication, etc.) • Check the setting of F1-10 and F1-11 • Check the brake sequence to make sure the brake is fully open when acceleration starts.
	○		F1-04 is set to 3 and a speed deviation higher than the value in F1-10 occurred longer than the time set in F1-11.	
Rotation Direction Fault dv3		○	A speed deviation higher than 30% occurred while the torque reference and acceleration direction are opposite.	• Check the encoder wiring • Verify the encoder rotation direction. Perform an offset tuning. • Reduce the load. • Check the brake sequence.
Rotation Direction Fault dv4		○	Motor speed and speed reference directions are opposite and a deviation larger than set in F1-19 occurs.	• Verify the encoder direction. • Perform an encoder tuning. • Check the brake sequence.
Over acceleration dv6		○	The car acceleration is higher than the value set in parameter S6-10 for longer than the time set in S6-17.	• Check the settings of o1-20, o1-21, and o1-22. • Adjust acceleration and deceleration rates. • Check the value set to S6-10 is not too small.
Up/Down Command Error EF	○		The Up and Down command were input simultaneously for longer than 500 ms.	Check the sequence and make sure that the Up and Down command are not enabled at the same time.
External Faults EF03 to EF08	○	○	• An external fault was triggered by an external device via one of the digital inputs (S3 to S8). • The digital inputs are set incorrectly.	• Find out why the device tripped the EF. Remove the cause and reset the fault. • Check the functions assigned to the digital inputs.
Speed Reference Missing FrL		○	Parameter d1-18 is set to 3, leveling speed detection is not assigned to a digital input (H1-□□ ≠ 53) and no speed was selected while an Up or Down command was entered.	• Check the speed selection inputs. • Check the sequence. Make sure the speed is selected before the Up or Down command is input.

Digital Operator	AL	FLT	Possible Cause	Corrective Action
Ground Fault GF		○	• Ground leakage current has exceeded 50% of the drives rated output current. • Cable or motor insulation is broken. • Excessive stray capacitance at drive output.	• Check the output wiring and the motor for short circuits or broken insulation. Replace any broken parts. • Reduce the carrier frequency.
Safe Disable Hbb	○		Both Safe Disable inputs are open. The drive output is safely disabled and the motor can not be started.	• Check why the upper controller's safety device disabled the drive. Remove the cause and restart. • Check the wiring. Terminals HC, H1, and H2 must be linked if the Safe Disable function is not utilized.
Safe Disable Circuit Fault HbbF	○		Drive output is disabled while only one of the Safe Disable inputs is open (normally both input signals H1 and H2 should be open). • One channel is internally broken and does not switch off, even if the external signal is removed. • Only one channel is switched off by the upper controller.	• Check the wiring from the upper controller and make sure that both signals are handled correctly. • If the signals are set correctly and the alarm does not disappear, replace the drive.
Output Phase Loss LF		○	• Output cable is disconnected or the motor winding is damaged. • Drive output wires are loose. • Motor is too small (less than 5% of drive current).	• Check the power supply. • Make sure that all cables are properly connected to the correct terminals.
Overcurrent oC		○	• Short-circuit or ground fault on the drive output side. • The load is too heavy. • The acceleration or deceleration ramps are too short. • Incorrect motor data or V/f pattern settings. • The motor contactor was switched while the drive was running.	• Check the output wiring and the motor for short circuits or broken insulation. Replace the broken parts. • Check the machine for damages (gears, etc.) and repair any broken parts. • Make sure the brake fully opens. • Check accel/decel settings in C1-□□ and C2-□□. • Check V/f pattern settings in E1-□□. • Check the output contactor sequence.
Encoder Communication Data Error oFx53		○	• Encoder power supply voltage wrong. • Wrong encoder type. • Wrong wiring.	• Check the encoder power supply setting on the option card. • Check the encoder wiring, especially the serial signal wires.
Encoder Error oFx54		○	• Noise on the encoder signal. • Bad wiring.	Check the encoder wiring and make sure the encoder cable shield is properly grounded.
Heatsink Overheat oH or oH1	○	○	• Surrounding temperature is too high. • The cooling fan has stopped. • The heatsink is dirty. • The airflow to the heatsink is restricted.	• Check the surrounding temperature and install cooling devices if necessary. • Check the drive cooling fan. • Clean the heatsink. • Check the airflow around the heatsink.
Motor Overload oL1		○	• The motor load is too heavy. • Acceleration and deceleration cycle times are too short. • Value set for the motor rated current is incorrect.	• Check the elevator mechanics. • Check the sequence. • Check the rated current setting.
Drive Overload oL2		○	• The load is too heavy. • The drive is too small. • Too much torque at low speed.	• Check the load. • Make sure that the drive is big enough to handle the load. • The overload capability is reduced at low speeds. Reduce the load or increase the drive size.
DC Overvoltage ov	○	○	• DC bus voltage rose too high. • Braking transistor is too small • Braking chopper or resistor is broken. • Unstable motor control in OLV. • Input voltage is too high.	• Make sure the braking resistor and braking chopper are working correctly. • Check motor parameter settings and adjust torque and slip compensation as needed. • Make sure that the power supply voltage meets the drives specifications.
Over Speed oS		○	F1-03 is set to 0, 1, or 2 and the motor speed exceeded the value of F1-08 for longer than the time set in F1-09)	• Check and adjust the speed control loop settings (C5-□□) • If an external speed reference signal (analog, etc.) is used make sure the signal is ok. • Check the settings of F1-08 and F1-09.
	○		F1-03 is set to 3 and the motor speed exceeded the value of F1-08 for longer than the time set in F1-09)	

Digital Operator	AL	FLT	Possible Cause	Corrective Action
Input Phase Loss PF		◯	• Input voltage drop or phase imbalance. • One of the intput phases is lost. • Drive input wire are loose.	• Check the motor wiring. • Make sure all terminal screws in the drive and motor are properly tightened. • Check the motor and drive capacity.
Encoder Disconnected PGo		◯	F1-02 is set to 0, 1, or 2 and no signal is received from the encoder for longer than the time set in F1-14.	• Check the encoder wiring and fix it if needed. • Check the encoder power supply. • Check the command sequence. Check if the brake fully opens before acceleration starts.
	◯		F1-02 is set to 3 and no signal is received from the encoder for longer than the time set in F1-14.	
Braking Transistor Fault rr		◯	The internal braking transistor is broken or the braking resistor is connected wrong.	• Make sure the braking resistor is connected correctly. • Cycle the power supply. • Replace the drive if the fault reoccurs.
Motor Contactor Response Error SE1		◯	The motor contactor response was not input within the time set in S1-10.	• Make sure the motor contactor really closes. • Check the setting of S1-10. • Check the motor contactor feedback wiring.
Starting Current Error SE2		◯	The output current was lower than 25% of the motor no-load current at start.	• Check the motor wiring. • Check the motor contactor and the contactor sequence. Make sure it closes properly during start.
Output Current Error SE3		◯	The output current was lower than 25% of the motor no-load current during operation.	• Check the motor wiring. • Check the motor contactor and the contactor sequence. Make sure does not open during operation.
Brake Response Error SE4		◯	The brake close command was set but he status of the brake feedback signal did not change.	• Make sure the brake works properly. • Check the brake feedback input.
Position Lock Error SvE		◯	The motor turned too much out of the target position during position lock operation.	• Check the speed control loop parameters (C5-□□) and adjust if necessary. • Check the position lock settings (S3-01/02/03). • Check the speed feedback signal for noise.
DC Undervoltage Uv1 (Uv)	◯	◯	• The voltage in the DC bus fell below the undervoltage detection level (L2-05). • The power supply failed or one input phase has been lost. • The power supply is too weak.	• Check the power supply. • Make sure that the power supply can provide enough voltage.
Controller Undervoltage Uv2		◯	The control power supply does not have enough voltage.	• Cycle power to the drive. Check if the fault reoccurs. • Replace the drive if the fault continues to occur.
DC Charge Circuit Fault Uv3		◯	The charge circuit for the DC bus is broken.	• Cycle power to the drive and see if the fault reoccurs. • Replace the drive if the fault reoccurs.

◆ Operator Programing Errors

An Operator Programming Error (oPE) occurs when an inapplicable parameter is set or an individual parameter setting is inappropriate. When an oPE error is displayed, press the ENTER button to display U1-18. Monitor U1-18 will display the parameter that is causing the oPE error.

Digital Operator	Possible Cause	Corrective Action
oPE01	Drive capacity and the value set to o2-04 do not match.	Set to o2-04 to the correct value.
oPE02	Parameters were set outside the allowable setting range.	Set parameters to the proper values.
oPE03	A contradictory setting is assigned to multi-function contact inputs H1-03 through to H1-08. • The same function is assigned to two inputs (this excludes "External fault" and "Not used"). • An input function that must be set in combination with another function was set alone. • Input functions that are not allowed to be used simultaneously have been set.	• Fix any incorrect settings. • Refer to the Technical Manual for more details.

Digital Operator	Possible Cause	Corrective Action
oPE05	The source of the Run command or speed reference is assigned to option card (b1-01 or b1-02 = 3), but no option card is installed.	• Install the required option card. • Correct the values set to b1-01 and b1-02.
oPE06	A control mode has been selected that requires an encoder to be installed, but no encoder is installed (A1-02 = 3 or 7).	• Connect an encoder. • Correct the value set to A1-02.
oPE07	H3-02 and H3-10 are set to the same value (this excludes settings 0 and F).	• Fix any incorrect settings. • Refer to the Technical Manual for more details.
oPE08	A function has been set that cannot be used in the control mode selected (this error often appears after the control mode has been changed).	• Fix any incorrect setting. • Refer to the Technical Manual for more details.
oPE10	The V/f pattern setting is incorrect.	• Check the V/f pattern settings. • Refer to the Technical Manual for more details.

◆ Auto-Tuning Errors

Digital Operator	Cause	Corrective Action
Er-01	Motor data fault The input motor data are not valid. (e.g. the base frequency and base speed do not fit).	Re-enter the data and repeat Auto-Tuning.
Er-02	Minor Fault • The wiring is faulty. • Drive was in baseblock condition or the Safe Disable Input were open during Auto-Tuning.	Check the wiring.
Er-03	The STOP key was pressed and Auto-Tuning was canceled.	Repeat the Auto-Tuning.
Er-04	Resistance fault • Wrong input data. • Auto tuning exceeded the given time frame. • Calculated values out of range.	
Er-05	No-Load Current Error • Wrong input data. • Auto tuning exceeded the given time frame. • Calculated values out of range.	• Check the input data. • Check the wiring. • Re-enter the data and repeat the Auto-Tuning.
Er-08	Rated Slip Error • Wrong input data. • Auto tuning exceeded the given time frame. • Calculated values out of range.	
Er-09	Acceleration Error The motor did not accelerate following the specified acceleration ramp.	• Lengthen the acceleration ramp. Increase C1-01 if set in s, decrease C1-01 if set in m/s^2. • Check the torque limits L7-01 and L7-02.
Er-11	Motor speed fault. The torque reference was too high.	• Lengthen the acceleration ramp. Increase C1-01 if set in s, decrease C1-01 if set in m/s^2. • If possible, disconnect the load.
Er-12	Current detection error • One or all output phases are lost. • Current is either too low or exceeds the drives rating. • The current sensors are faulty.	• Check the wiring. Make sure the motor contactor is closed during tuning. • Make sure, that the drive rating fits to the motor. • Check the load. (Auto-Tuning should have been performed without the load connected or with very low load.) • Replace the drive.
Er-13	Leakage Inductance Error Drive was unable to complete tuning for leakage inductance within 300 s.	• Check all wiring and correct any mistakes. • Double check the motor rated current value that was entered to T1-04 for Auto-Tuning. • Check the motor rated current value written on the motor nameplate and enter the correct value.
Er-18	The induced voltage constant attempted to set a value outside the allowable setting range.	
Er-19	The induced voltage constant attempted to set a value to E5-09 outside the allowable range	Double check the data that was entered to the T2-□□ parameters, and perform Auto-Tuning again.
Er-20	Stator resistance tuning attempted to set a value to E5-06 that is outside the allowable setting range.	

Digital Operator	Cause	Corrective Action
Er-21	Motor was coasting when Auto-Tuning was performed.	Make sure the motor has stopped completely. Repeat Auto-Tuning.
	Either the motor or the encoder on the motor is not properly wired.	Check the wiring for the motor and the encoder. Repeat Auto-Tuning.
	The direction for the encoder is set incorrectly, or the number of pulses set for the encoder is wrong.	Check the direction and number of pulses set for the encoder. Repeat Auto-Tuning.
	Encoder is damaged.	Check the signal output from the encoder attached to the motor. Replace the encoder if damaged.
Er-22	Initial pole search tuning found that the encoder offset can not be tuned without rotating the motor.	• Perform rotating encoder offset tuning. • If a PG-X3 option card with an incemental encoder is used, replace the encoder by an absolute encoder.
Er-23	A too large error occurred when the drive attempted to detect the rotor position during non-rotating encoder offset tuning.	Perform rotating encoder offset tuning.
End1	Rated current alarm • The torque reference exceeded 20% during Auto-Tuning. • The calculated no-load current is above 80% of the motor rated current.	• Check the V/f pattern setting. • Perform Auto-Tuning without the load connected. • Check the input data and repeat Auto-Tuning.
End2	Motor iron-core saturation coefficient • Calculated core saturation values out of range. • Incorrect data was entered.	• Check the input data. • Check the motor wiring. • Perform Auto-Tuning without load connected.
End3	Rated current setting alarm	Check the input data and repeat tuning.
End4	Adjusted Slip Calculation Error The slip that was calculated is outside the allowable range.	• Make sure the data entered for Auto-Tuning is correct. • Execute Rotational Auto-Tuning instead. If not possible, try Stationary Auto-Tuning 2.
End5	Resistance Tuning Error The resistance value that was calculated is outside the allowable range.	• Double check the data that was entered for the Auto-Tuning process. • Check the motor and motor cable connection for faults.
End6	Leakage Inductance Alarm The leakage inductance value that was calculated is outside the allowable range.	Double check the data that was entered for the Auto-Tuning process.
End7	No-Load Current Alarm • The entered no-load current value was outside the allowable range. • Auto-Tuning results were less than 5% of the motor rated current.	• Check and correct faulty motor wiring. • Double check the data that was entered for the Auto-Tuning process.

9 Safe Disable Input Function

This section briefly explains the Safe Disable function and how to use it in an elevator installation. Refer to the Technical Manual or contact YASKAWA for more detailed information.

◆ Specifications

The Safe Disable circuit consists of two independent hardware input channels that can block the output transistors. It provides a stop function in compliance with Stop Category 0 as defined in the EN60204-1 (uncontrolled stop by power removal), and "Safe Torque Off" as defined in the IEC61800-5-2. Safe Disable inputs have been designed to meet the requirements of the EN954-1/ISO13849-1, Category 3 and IEC61508, SIL2.

Inputs / Outputs		Two Safe Disable inputs and 1 EDM output according to EN61800-5-1, EN954-1/ISO13849 Cat. 3, IEC/EN61508 SIL2, Insulation coordination: class 1.
Operation Time		Time from input open to drive output stop is less than 1 ms.
Failure Probability	**Demand Rate Low**	$PFD = 5.15E^{-5}$
	Demand Rate High or Continuous	$PFH = 1.2E^{-9}$
Performance Level		The Safe Disable feature satisfies all requirements of performance level d (PLd) as defined by ISO13849-1 (this includes DC from EDM).

◆ Precautions

DANGER! *Improper use of the Safe Disable function can result in serious injury or even death. Make sure the whole system or machinery that the Safe Disable function is used in complies with safety requirements.*

DANGER! *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 degree (electrically). Make sure such a situation would have no effect on the safety of the application when using the Safe Disable function. This is not a concern with induction motors.*

DANGER! *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.*

DANGER! *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.*

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

DANGER! *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.*

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.*

NOTICE: *When utilizing the Safe Disable function, use only the EMC filters recommended in EMC Filter Installation on page 10.*

◆ EN81-1 Conform Circuit with one Motor Contactor

■ Installation

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 must are opened and the drive output shuts off when the safety chain is interrupted.
- A drive digital output must be programmed as Safe Disable Status (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 (Terminals DM+ and DM- can not be used).
- 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, i.e. jumper S3 must be set like shown below.

Drive Internal Power Supply	External 24 Vdc Power Supply
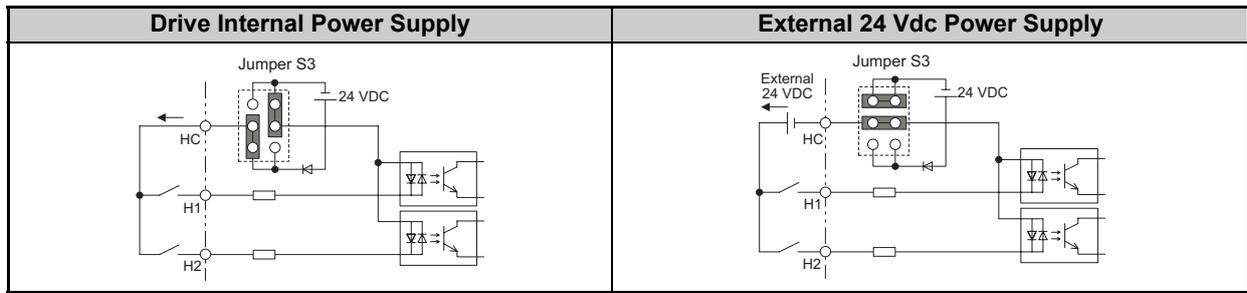
The figure below shows a wiring example.
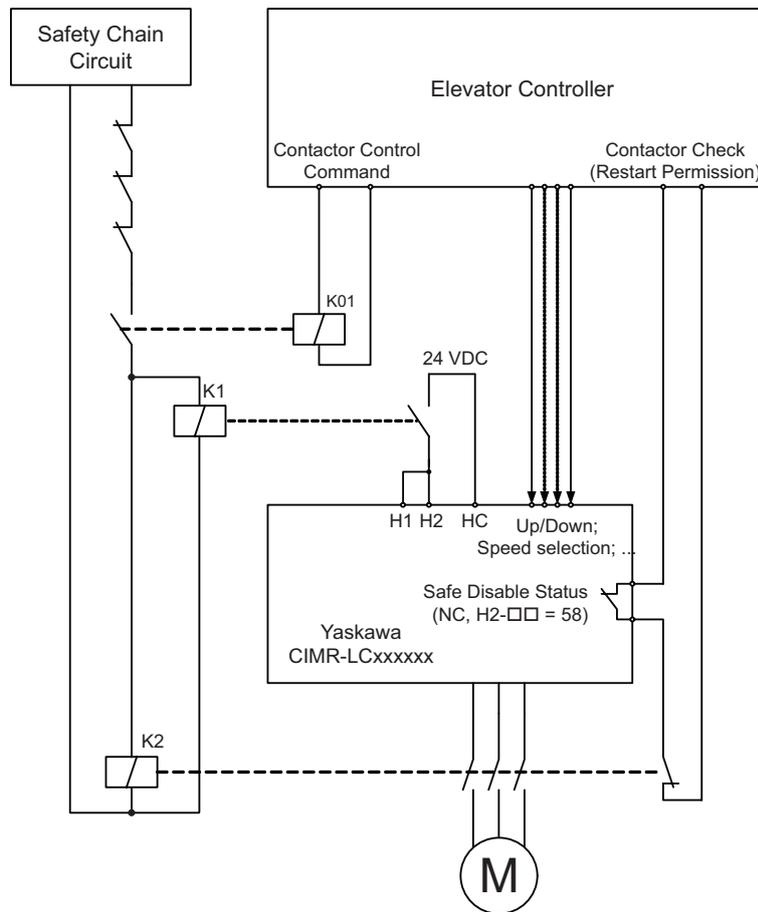
Note: 1. The drive output will shut off immediately when either of the inputs H1 or H2 is opened. In order to prevent uncontrolled movement of the elevator, the circuit should be designed so that the brake closes instantly when terminal H1 or H2 is opened.
2. The drive output can only be activated when 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.

■ Safe Disable Monitor Output Function and Digital Operator Display

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

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

Revision History

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

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YASKAWA AC Drive L1000A
AC Drive for Elevator Applications
Quick Start Guide

⚡ YASKAWA

YASKAWA ELECTRIC CORPORATION

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