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MD500L Series AC Drive

User Guide

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code 19011541 A00

Preface

Thank you for purchasing the MD500L Series AC Drive developed by Inovance.

■ First use

Read this user guide carefully if you use the product for the first time. For any doubt on its function or performance, contact our technicians for help.

■ Adjusting Drive Parameters

The drive when it leaves the factory with default settings should enable the user to get started quickly to check on the basic mechanical running conditions. At a later time, fine tuning to optimize the operation/performance can be undertaken.

Such parameter tuning should be done by qualified personnel who have prior training on AC Drives. Some parameter settings can have adverse results if manipulated incorrectly and care should be taken especially during the commissioning startup stages to prevent personnel from engaging the machine.

This manual provides a complete list of the parameters with functional description and care should always be taken whenever parameters are adjusted during a real-time operation startup. Inovance Technology and Authorized Distributors can provide product training and if in doubt seek advice.

Revision History

Date	Version	Revision Description
July 2021	A00	First release.

Safety Instructions

Safety Precautions

- Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations.
- To ensure the safety of humans and equipment, follow the signs on the equipment and all the safety instructions in this user guide.
- "CAUTION", "WARNING", and "DANGER" items in the user guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
- Use this equipment according to the designated environment requirements. Damage caused by improper usage is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Levels and Definitions

	indicates that failure to comply with the notice will result in severe personal injuries or even death.
	indicates that failure to comply with the notice may result in severe personal injuries or even death.
	indicates that failure to comply with the notice may result in minor personal injuries or damage to the equipment.

Safety Instructions

Unpacking

- Check whether the packing is intact and whether there is damage, water seepage, damp, and deformation.
- Unpack the package by following the package sequence. Do not hit the package with force.
- Check whether there are damage, rust, or injuries on the surface of the equipment or equipment accessories.
- Check whether the number of packing materials is consistent with the packing list.

- Do not install the equipment if you find damage, rust, or indications of use on the equipment or accessories.
- Do not install the equipment if you find water seepage, component missing or damage upon unpacking.
- Do not install the equipment if you find the packing list does not conform to the equipment you received.

Storage and Transportation

- Store and transport this equipment based on the storage and transportation requirements for humidity and temperature.
- Avoid transporting the equipment in environments such as water splashing, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing this equipment for more than three months. Long-term storage requires stricter protection and necessary inspections.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport this equipment with other equipment or materials that may harm or have negative impacts on this equipment.

- Use professional loading and unloading equipment to carry large-scale or heavy equipment.
- When carrying this equipment with bare hands, hold the equipment casing firmly with care to prevent parts falling. Failure to comply may result in personal injuries.
- Handle the equipment with care during transportation and mind your step to prevent personal injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is lifted by hoisting equipment.

Installation

- Thoroughly read the safety instructions and user guide before installation.
- Do not modify this equipment.
- Do not loosen fixed bolts (especially those marked in red) on equipment components.
- Do not install this equipment in places with strong electric or magnetic fields.
- When this equipment is installed in a cabinet or final equipment, protection measures such as a fireproof enclosure, electrical enclosure, or mechanical enclosure must be provided. The IP rating must meet IEC standards and local laws and regulations.

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Installation, wiring, maintenance, inspection, or parts replacement must be performed only by experienced personnel who have been trained with necessary electrical information.
- Installation personnel must be familiar with equipment installation requirements and relevant technical materials.
- Before installing equipment with strong electromagnetic interference, such as a transformer, install an electromagnetic shielding device for this equipment to prevent malfunctions.

Wiring

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Never perform wiring at power-on. Failure to comply will result in an electric shock.
- Before wiring, cut off all equipment power supplies. Wait at least 10 minutes before further operations because residual voltage exists after power-off.
- Make sure that the equipment is well grounded. Failure to comply will result in an electric shock.
- During wiring, follow the proper electrostatic discharge (ESD) procedures, and wear an antistatic wrist strap. Failure to comply will result in damage to internal equipment circuits.

- Never connect the power cable to output terminals of the equipment. Failure to comply may cause equipment damage or even a fire.
- When connecting a drive with the motor, make sure that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Wiring cables must meet diameter and shielding requirements. The shielding layer of the shielded cable must be reliably grounded at one end.
- After wiring, make sure that no screws are fallen and cables are exposed in the equipment.

Power-on

- Before power-on, make sure that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Before power-on, make sure that the power supply meets equipment requirements to prevent equipment damage or even a fire.
- At power-on, unexpected operations may be triggered on the equipment. Therefore, stay away from the equipment.
- After power-on, do not open the cabinet door and protective cover of the equipment. Failure to comply will result in an electric shock.
- Do not touch any wiring terminals at power-on. Failure to comply will result in an electric shock.
- Do not remove any part of the equipment at power-on. Failure to comply will result in an electric shock.

Operation

- Do not touch any wiring terminals during operation. Failure to comply will result in an electric shock.
- Do not remove any part of the equipment during operation. Failure to comply will result in an electric shock.
- Do not touch the equipment shell, fan, or resistor for temperature detection. Failure to comply will result in heat injuries.
- Signal detection must be performed only by professionals during operation. Failure to comply will result in personal injuries or equipment damage.

- Prevent metal or other objects from falling into the device during operation. Failure to comply may result in equipment damage.
- Do not start or stop the equipment using the contactor. Failure to comply may result in equipment damage.

Maintenance

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment at power-on. Failure to comply will result in an electric shock.
- Before maintenance, cut off all equipment power supplies and wait at least 10 minutes.

- Perform daily and periodic inspection and maintenance for the equipment according to maintenance requirements and keep a maintenance record.

Repair

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not repair the equipment at power-on. Failure to comply will result in an electric shock.
- Before inspection and repair, cut off all equipment power supplies and wait at least 10 minutes.

- Require repair services according to the product warranty agreement.
- When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record.
- Replace quick-wear parts of the equipment according to the replacement guide.
- Do not operate damaged equipment. Failure to comply may result in worse damage.
- After the equipment is replaced, perform wiring inspection and parameter settings again.

Disposal
WARNING ◆ Retire equipment by following local regulations or standards. Failure to comply may result in property damage, personal injuries, or even death. ◆ Dispose of or recycle retired equipment by following industry waste disposal standards to avoid environmental pollution.

Safety Signs

For safe equipment operation and maintenance, comply with safety signs on the equipment, and do not damage or remove the safety labels. The following table describes the safety signs.

Safety Sign	Description
	◆ Read the user guide before installation and operation. Failure to comply will result in an electric shock. ◆ Do not remove the cover at power-on or within 10 minutes after power-off. ◆ Before maintenance, inspection, and wiring, cut off input and output power, and wait at least 10 minutes until the power indicator is off.

Approvals

Certification marks on the product nameplate indicate compliance with the corresponding certificates and standards.

Certification	Mark	Directives		Standard
CE	CE	EMC directive	2014/30/EU	EN 61800-3
		LVD directive	2014/35/EU	EN 61800-5-1
		RoHS directive	2011/65/EU	EN 50581

NOTE

◆ The above EMC directives are complied with only when the EMC electric installation requirements are strictly observed.
◆ Machines and devices used in combination with this drive must also be CE certified and marked. The integrator who integrates the drive with the CE mark into other devices has the responsibility of ensuring compliance with CE standards and verifying that conditions meet European standards.
The installer of the drive is responsible for complying with all relevant regulations for wiring, circuit fuse protection, earthing, accident prevention and electromagnetic (EMC regulations). In particular fault discrimination for preventing fire risk and solid earthing practices must be adhered to for electrical safety (also for good EMC practice).
◆ For more information on certification, consult our distributor or sales representative.

Contents

1 Product Information

1.1 Nameplate and Model Number

MD500L - T 3.7 G B O

MD500L elevator drive

Code	Voltage Class
T	Three-phase 380–480 V

Code	Power Rating
3.7	3.7 kW
5.5	5.5 kW
7.5	7.5 kW
11	11 kW
15	15 kW
18.5	18.5 kW
22	22 kW
30	30 kW

Code	Support Motor Type
O	Open loop Asynchronous
C	Close loop Asynchronous (Under developement)

Code	Dynamic Braking Unit
B	Built-in

Code	Drive Duty
G	Heavy Duty

Figure 1-1 Model number

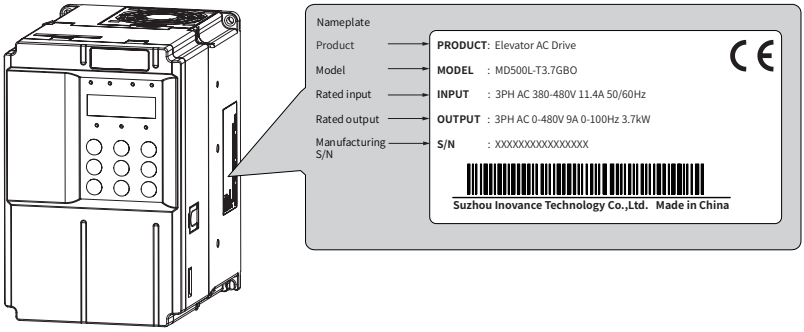


Figure 1-2 Nameplate

1.2 Components

The AC drive has either a plastic housing, as shown in the following figures.

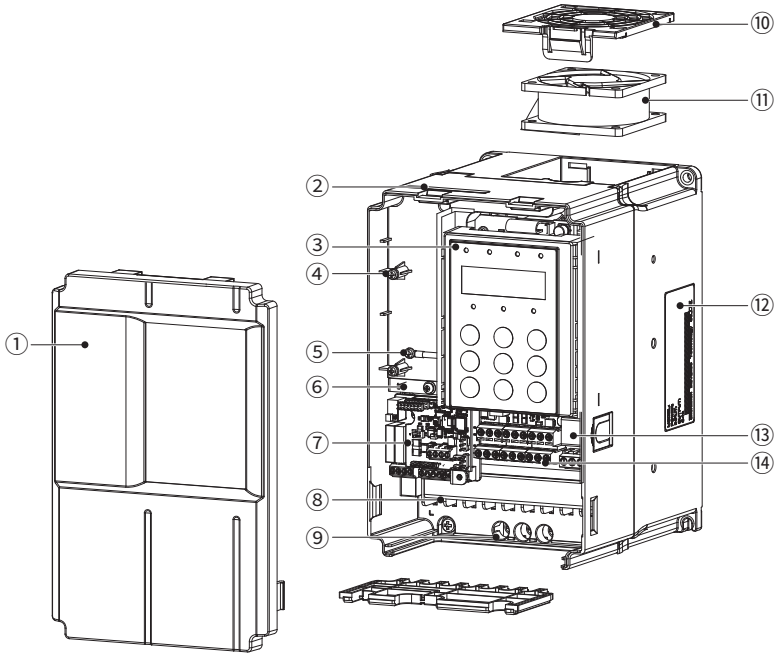


Figure 1-3 Product parts

Table 1-1 Description of components

No.	Component	No.	Component
①	Front cover	⑧	Main circuit terminals
②	Barcode	⑨	Grounding terminals
③	Operating panel	⑩	Fan cover
④	Fixing pin of extension encoder card	⑪	Cooling fan
⑤	Fixing pin of ground cable of the control board	⑫	Nameplate
⑥	Ground bar	⑬	Interface of external operating panel
⑦	I/O extension board	⑭	Control circuit terminals

1.3 Technical Data

Table 1-2 Models and technical data

Item			Specification							
MD500L-TXXGBO			3.7	5.5	7.5	11	15	18.5	22	30
Output	Applicable motor	(kW)	3.7	5.5	7.5	11	15	18.5	22	30
		(HP)	5	7.5	10	15	20	25	30	40
	Rated output current (A)		9.0	13.0	17.0	25.0	32.0	37	45	60
	Output voltage		0 to input voltage							
	Maximum output frequency		100 Hz (editable through a parameter)							
	Carrier frequency		0.8 to 8.0 kHz (automatically adjusted according to the load characteristics)							
	Overload capacity		150% for 60s & 180% for 3s							
Input	Rated input current (A)		11.4	16.7	21.9	32.2	41.3	49.5	59	57
	Rated voltage/ frequency		AC: Three-phase 380 to 480 V, 50/60 Hz							
	Allowed voltage fluctuation		-15% to 10%; actual allowed range: 323 to 528 V AC							
	Allowed frequency fluctuation		±5%							
	Power capacity (kVA)		12	17.5	22.8	33.4	42.8	45	54	52
Thermal design	Thermal power consumption (kW)		0.138	0.201	0.24	0.355	0.454	0.478	0.551	0.694
	Air flow (CFM)		20	24	30	40	42	51.9	57.4	118.5
Braking resistor	Recommended power (W)		750	1200	1500	2500	3000	4000	4500	6000
	Recommended resistance (Ω)		> 150	> 100	> 75	> 50	> 38	> 32	> 27	> 20

NOTE

The rated power is measured at 440 V AC input voltage.

1.4 Overall Dimensions

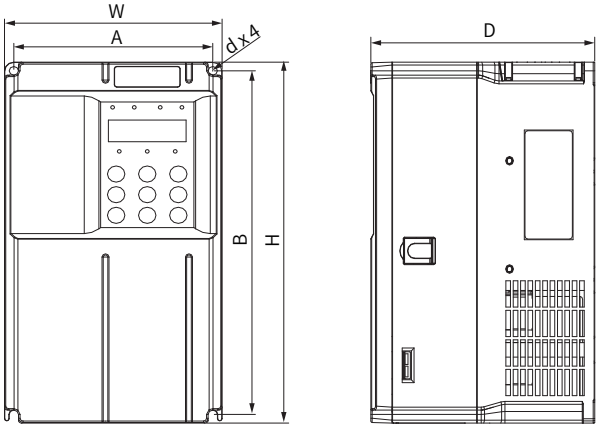


Figure 1-4 Overall and mounting dimensions of MD500L

Table 1-3 Mounting hole dimensions of MD500L

Model	Hole Dimensions (mm)		Overall Dimensions (mm)			Hole Diameter (mm)	Weight (kg)
	A	B	H	W	D	d	
MD500L-T3.7GBO	119	189	200	130	162	Φ5	2.0
MD500L-T5.5GBO							
MD500L-T7.5GBO	128	238	250	140	170	Φ6	3.3
MD500L-T11GBO							
MD500L-T15GBO	166	266	280	180	170	Φ6	4.3
MD500L-T18.5GBO	195	335	350	210	192	Φ6	7.6
MD500L-T22GBO							
MD500L-T30GBO	230	380	400	250	220	Φ7	17.5

2 Installation and Wiring

2.1 Installation

2.1.1 Installation Environment

1) Ambient temperature: The AC drive's service life is greatly influenced by the ambient temperature. Do not run the AC drive under a temperature exceeding the allowed temperature range (-10°C to +50°C).

2) Install the AC drive on the surface of a flame retardant object, and ensure that sufficient space is left around the enclosure to allow for efficient heat dissipation. The AC drive generates great heat during working. Use screws to install the AC drive on the mounting bracket vertically.

3) Install the AC drive without strong vibration. Ensure that the mounting location is not affected by levels of vibration that exceeds 0.6 g. Keep the AC drive away from punch machines.

4) Ensure that the mounting location is away from direct sunlight, damp or water drops.

5) Ensure that the mounting location is protected against corrosive, combustible or explosive gases and vapors.

6) Ensure that the mounting location is free from oil and dust.

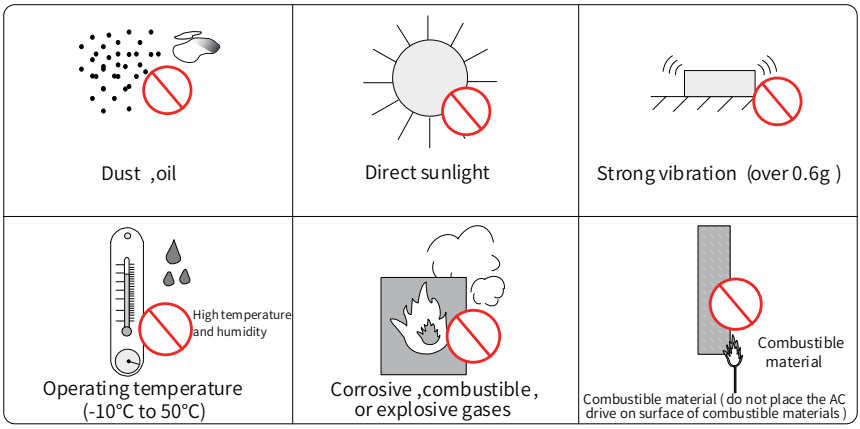


Figure 2-1 Installation environment requirements

7) The AC drive must be installed in a fireproof cabinet with doors that provide effective electrical and mechanical protection. The installation must conform to local and regional laws and regulations, and to relevant IEC requirements.

2.1.2 Backplate Mounting

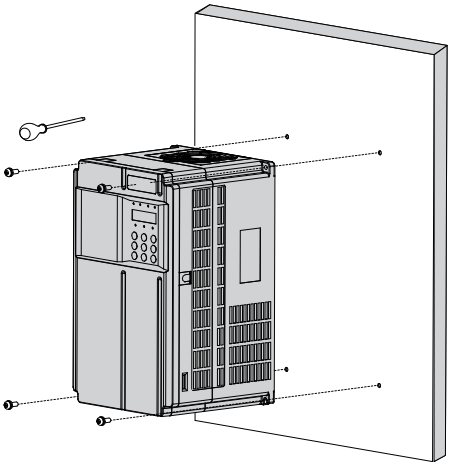


Figure 2-2 Backplate mounting of MD500L

NOTE

In this mode, do not just secure two screws on the top of the AC drive; otherwise, the AC drive may fall off or be damaged due to the unbalanced effect on the fixed part during long-time running.

2.2 Wiring

2.2.1 Typical wiring 1 (use multi -reference input as frequency reference)

(Default: **F0-03=6**, use multi-reference)

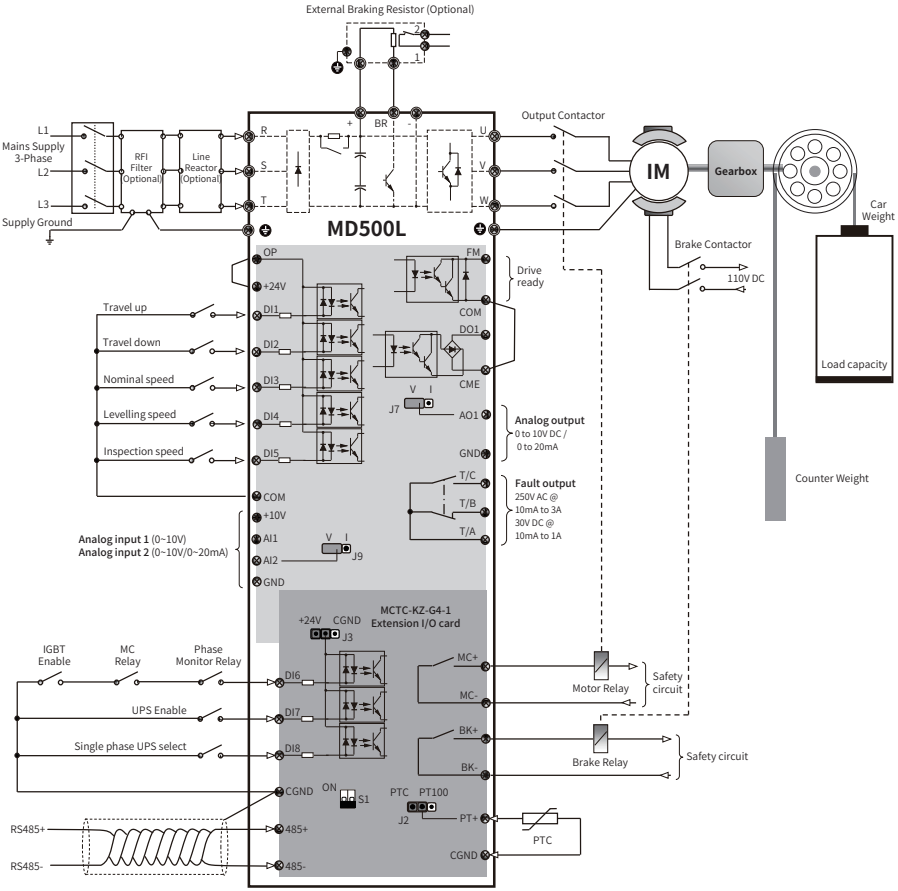


Figure 2-3 Typical wiring 1 (use multi -reference input as frequency reference)

2.2.2 Typical wiring 2 (use analog input as frequency reference)

(Set **F0-03=2** to use AI1)

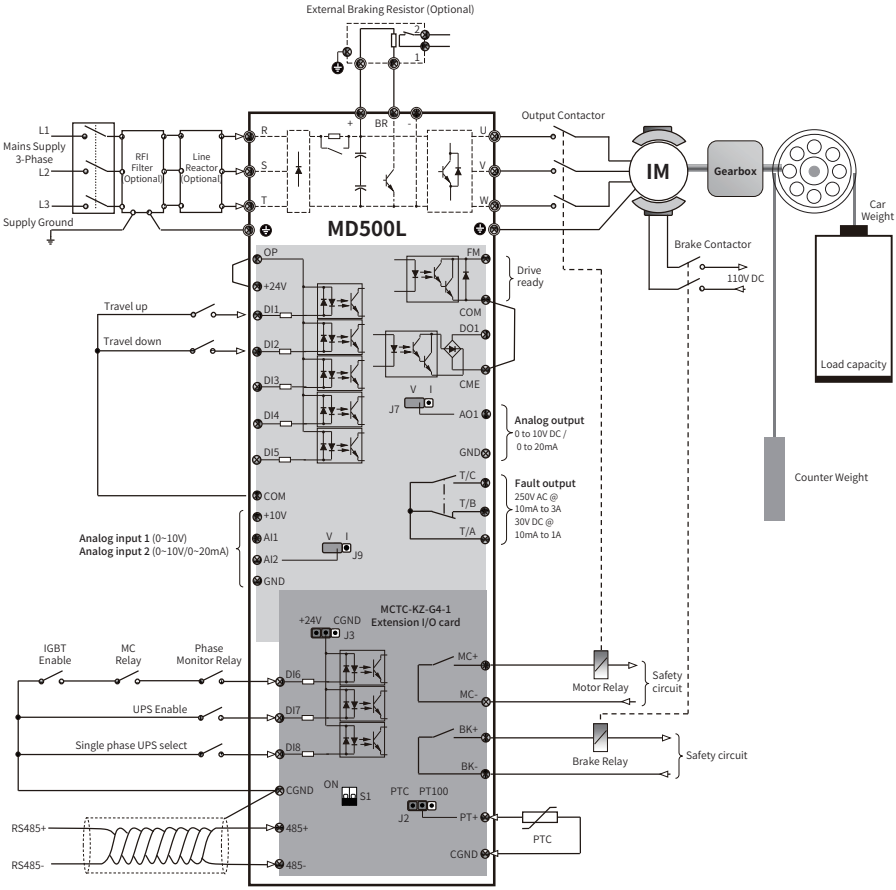


Figure 2-4 Typical wiring 2 (use analog input as frequency reference)

2.2.3 Main Circuit Terminals

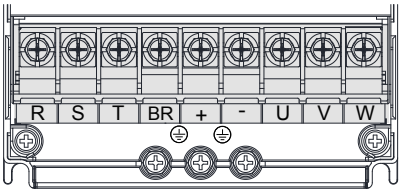


Figure 2-5 Terminal arrangement in MD500L-T3.7GBO to MD500L-T15GBO

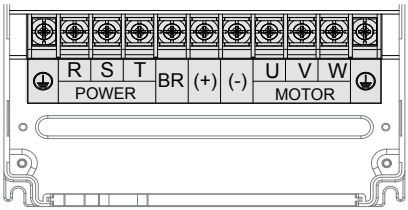


Figure 2-6 Terminal arrangement in MD500L-T18.5GBO to MD500L-T30GBO

Table 2-1 Description of main circuit terminals

Terminal	Name	Description
R, S, T	Three-phase power supply input terminals	Connected to AC input three-phase power supply
(+), (-)	DC bus positive and negative terminals	Common DC bus input, connected to the external braking unit for AC drives of 90 kW and above
(+), BR	Braking resistor connection terminals	Connected to the external braking resistor for AC drive of 75 kW and below
U, V, W	AC drive output terminals	Connected to a three-phase motor
⏚	Ground (PE) terminal	Grounding connection

2.2.4 Control Circuit Terminals

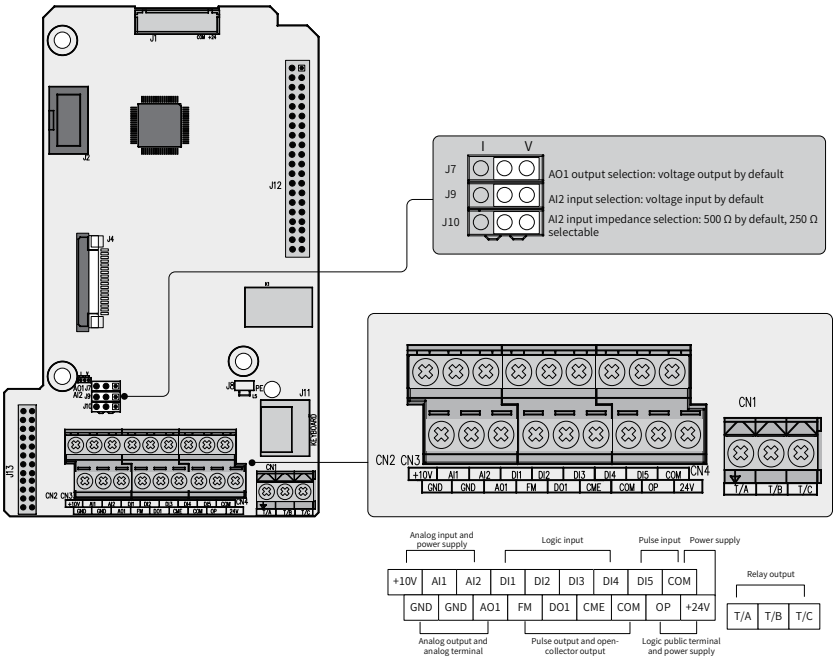


Figure 2-7 Control circuit terminal arrangement

Table 2-2 Description of control circuit terminals

Type	Terminal Mark	Terminal Name	Description
Power supply	+10 V-GND	+10 V power supply	Provides +10 V power supply to an external unit. Its maximum output current is 10 mA. Generally used to supply an external potentiometer of 1 to 5 kΩ.
	+24V-COM	+24 V power supply	Provides +24 V power supply to an external unit. Generally used for power supply for DI/DO terminals and external sensors. Maximum output current: 200 mA [1].
	OP	Input terminal for external power supply	Connected to +24 V by default. When DI1 to DI5 need to be driven by external signals, OP must be disconnected from + 24 V and connected to an external power supply.

Type	Terminal Mark	Terminal Name	Description
Analog input	AI1-GND	Analog input 1	Voltage range of inputs: 0 to 10 V DC. Input impedance: 22 kΩ.
	AI2-GND	Analog input 2	Either a voltage or current input, determined by jumper J9. Input voltage range: 0 to 10 V DC. Input current range: 0 to 20 mA. Input impedance: 22 kΩ (voltage input), 500 Ω or 250 Ω (current input) decided by J10 [2].
Digital input	DI1- OP	Digital input 1	Optically-coupled isolation compatible with dual-polarity inputs. Input impedance: 1.39 kΩ. Voltage range for inputs: 9 to 30 V.
	DI2- OP	Digital input 2	
	DI3- OP	Digital input 3	
	DI4- OP	Digital input 4	
	DI5- OP	High-speed pulse input	In addition to having the same features as DI1 to DI4, DI5 can also be used for high-speed pulse inputs. Maximum input frequency: 100 kHz. Input impedance: 1.03 kΩ.
Analog output	AO1-GND	Analog output 1	Either a voltage or current output, determined by jumper J7. Output voltage range: 0 to 10 V. Output current range: 0 to 20 mA.
Digital output	DO1-CME	Digital output 1	Optically-coupled isolation, dual-polarity open-collector output. Output voltage range: 0 to 24 V. Output current range: 0 to 50 mA. Note that CME and COM are internally insulated, but are shorted externally by a jumper. In this case, DO1 is driven by +24 V by default. Remove the jumper link if you need to apply external power to DO1.
	FM- COM	High-speed pulse output	Controlled by F5-00 (FM terminal output selection). Maximum output frequency: 100 kHz. When used as an open-collector output, the specification is the same as for DO1.
Relay output	T/A-T/B	Normally-closed (NC) terminal	Contact driving capacity: 250 V AC, 3 A, Cos Φ = 0.4. 30 V DC, 1 A.
	T/A-T/C	Normally-open (NO) terminal	

Type	Terminal Mark	Terminal Name	Description
Auxiliary interfaces	J13	Extension card interface	Interface for the 28-core terminal and optional cards (I/O extension card, PLC card, and various bus cards).
	J4	PG card interface	The open-collector, differential, and resolver interfaces are selectable options.
	J11	External operating panel interface	Connected to an external operating panel.
Jumper [3]	J7	AO1 output selection	Either a voltage or a current output. Voltage output by default.
	J9	AI2 input selection	Either a voltage or a current input. Voltage input by default
	J10	AI2 input impedance selection	Either 500 Ω or 250 Ω input. 500 Ω input by default

NOTE

- [1] When the ambient environment is above 23 °C the output current must be de-rated for 1.8 mA per 1°C rise. The maximum output current is 170 mA at 40 °C. When OP is shorted to 24 V, the current of the DI must also be considered.
- [2] Select 500 Ω or 250 Ω input impedance according to the with-load capacity of signal source. For example, if 500 Ω is selected, the maximum output voltage of signal source cannot be smaller than 10 V so that AI2 can measure 20 mA current.
- [3] For positions of jumpers J7, J9 and J10, see*"Figure 2-7 Control circuit terminal arrangement"*.

2.2.5 I/O extension board

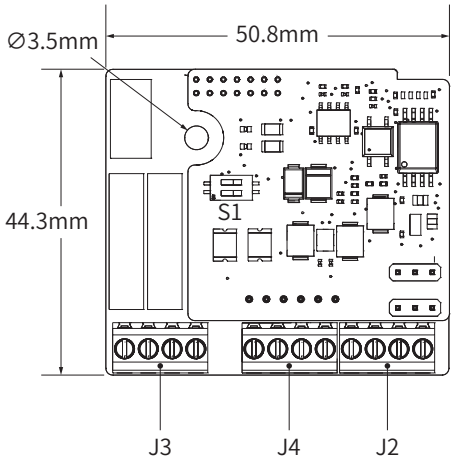


Figure 2-8 Outline and dimensions of the I/O extension board

Table 2-3 Description of I/O extension board terminals

Terminal	Pin	Function Description
J3 BK+ BK- MC+ MC-	BK+	Relay output terminal: Brake Relay
	BK-	
	MC+	Relay output terminal: MC Relay
	MC-	
J4 485+ 485- PT+ CGND	485+	RS485 communication input terminal
	485-	
	PT+	Temperature detection terminal, supporting PT100 and PTC
	CGND	Power ground
J2 DI6 DI7 DI8 CGND	DI6	DI terminal: IGBT Enable
	DI7	DI terminal: UPS Enable
	DI8	DI terminal: Single phase UPS Enable
	CGND	Power ground


NOTE

- S1: RS-485 communication protocol termination resistor selection.

  Left: The bus termination resistor available
  Right: The bus termination resistor not available
- J2: Temperature detection selection.

  Left: PTC
  Right: PT100
- J3：DI reference point selection.

  Left: 24V
  Right: CGND

3 Panel Operations

3.1 Introduction

The LED operating panel allows you to set and modify parameters, monitor system status, and start or stop the AC drive. For details, see "4 Panel Operation" in 19010355 MD500 Series AC Drive Advanced User Guide. An external LED (MD32NKE1) or LCD (MDKE9) operating panel is also available as an option.

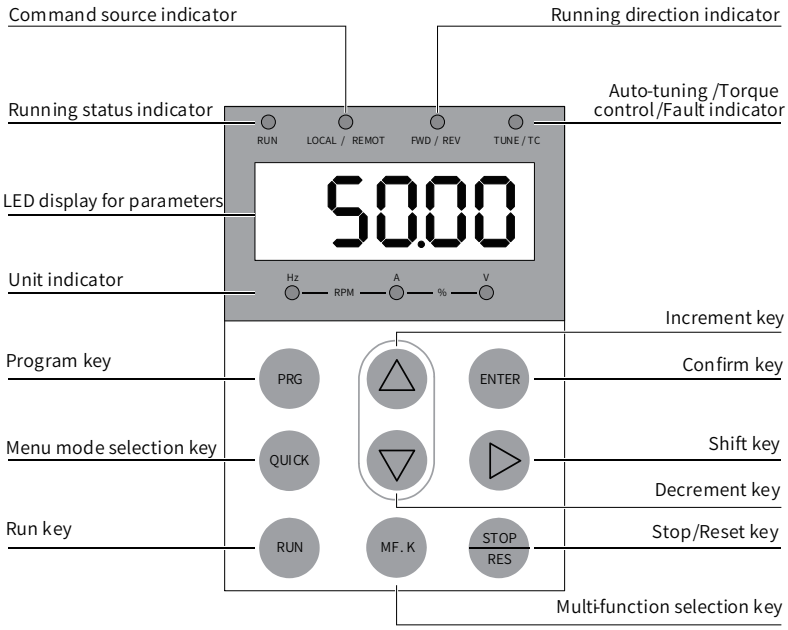


Figure 3-1 Details of the operating panel

3.2 Keys on the Operating Panel

Table 3-1 Function of keys on the operating panel

Key	Name	Function
PRG	Programming	Enter or exit Level I menu.
ENTER	Enter	Enter each level of menu interface and confirm displayed parameter setting.

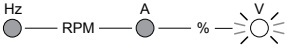
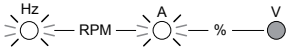
Key	Name	Function
△	Increment	Increase the displayed value when editing a parameter value.
▽	Decrement	Decrease the displayed value when editing a parameter value.
▷	Shift	Select the displayed parameter in the STOP or RUNNING status. Select the digit to be modified when modifying a parameter value.
RUN	RUN	Start the AC drive when using the operating panel control mode.
STOP RES	Stop/Reset	Stop the AC drive when the AC drive is in the RUNNING status. Perform a reset operation when the AC drive is in the FAULT status.
MF.K	Multifunction	Perform a function switchover as defined by the setting of F7-01 (MF.K key function selection).
QUICK	Menu mode selection	Switch over between menu modes as defined by the setting of FP-03 (Selection of individualized parameter display).

3.3 Indicators on the Operating Panel

☼ indicates that the light turns on, ● indicates that the light turns off, and ☼ indicates that the light flashes.

Table 3-2 Indicators on the operating panel

State		Indication
RUN Running status indicators	● RUN	OFF indicates the STOP status.
	☼ RUN	ON indicates the RUNNING status.
LOCAL/REMOT Running command indicators	● LOCAL/ REMOT	OFF indicates under operating panel control.
	☼ LOCAL/ REMOT	ON indicates under terminal control.
	☼ LOCAL/ REMOT	FLASHING indicates under serial communication control.

State		Indication
FWD/REV Forward and reverse rotation indicators		OFF indicates forward motor rotation.
		ON indicates reverse motor rotation.
TUNE/TC Auto-tuning, torque control and fault indicators		OFF indicates that the AC drive is normal.
		ON indicates the torque control mode.
		FLASHING SLOWLY (once a second) indicates auto-tuning status.
		FLASHING QUICKLY (four times a second) indicates a fault condition.
		Hz for frequency
		A for current
		V for voltage
		RPM for motor speed
		Percentage

4 Quick setup

4.1 Complete timing diagram for normal travel (use multi -reference as frequency reference)

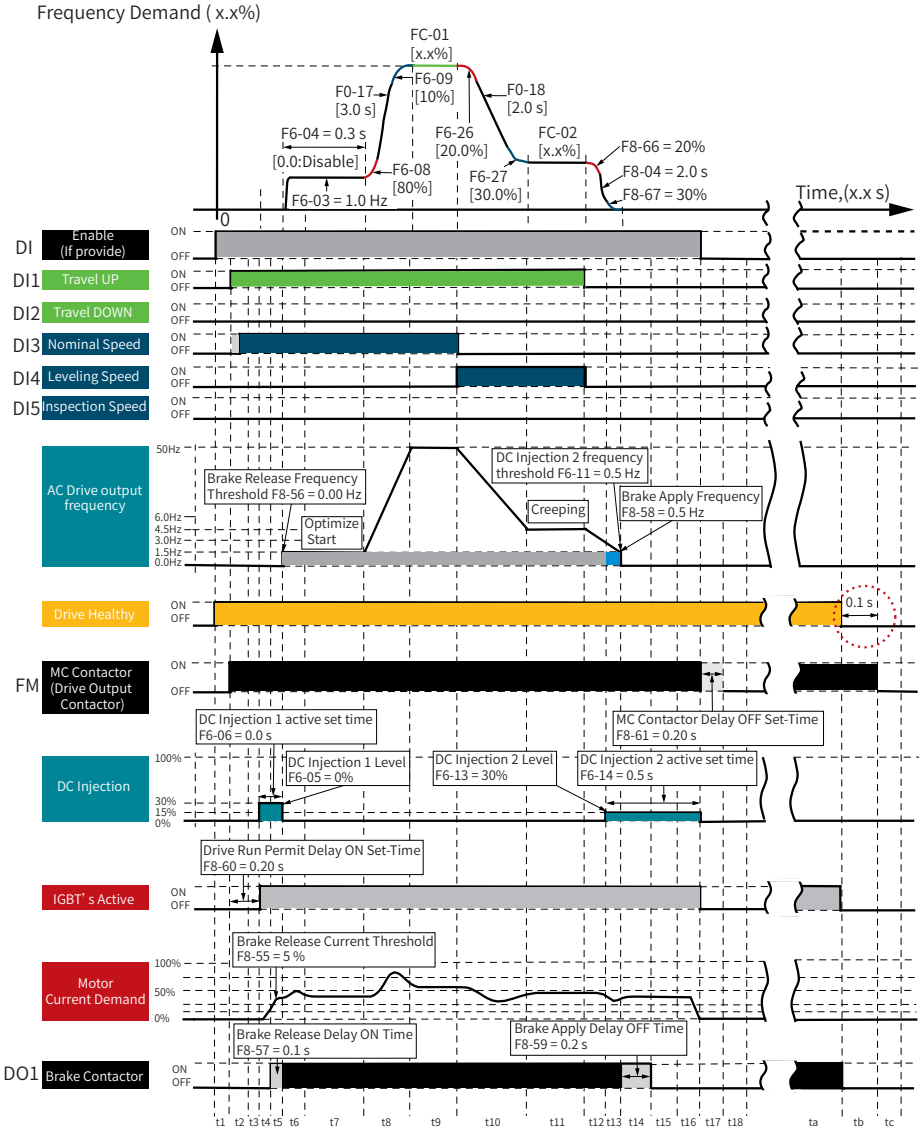


Figure 4-1 Timing diagram for normal travel (use multi-reference as frequency reference)

Table 4-1 Timing diagram description

Event	Descriptions	Function	Drive Status
ta	Drive healthy. MC and brake Contactor are energised.	-	RUN
tb	Drive Trip. IGBTs disable. Brake contactor de-energised.	-	Trip
tc	MC contactor got de-energised provided drive IGBTs are disabled after 0.1s.	-	Trip
t1	Drive waits to enable by lift controller.	-	Inhibit
t2	Drive MC contactor output energized when direction demand command enable by the lift controller. Desired preset speed reference command enable by lift controller.	F8-60	Ready
t3	Drive IGBTs immediately go into active mode after the desire drive run permit delay ON set time has elapse.	F8-60	STOP
t4	DC injection active. Motor brake contactor energized when motor current demand excess the brake release current level and brake release frequency.	F6-05 F6-06 F8-55 F8-56	RUN
t5	Motor brake contactor is energized. Optimize profile generator active. Motor start to run.	F8-57 F6-03 F6-04	RUN
t6	DC injection 1 disable after the desired set time has elapsed.	F6-06	RUN
t7	Start optimizer profile generator disable after the desired set time has elapse.	F6-04	RUN
t8	Motor ramp up to the desire preset speed reference.	F6-08 F6-09 F0-17 FC-0x	RUN
t9	Drive output at speed status.	FC-0x	RUN
t10	Change of preset speed reference demand. Motor ramp down to the desire preset speed reference.	F6-08 F6-09 F0-17 FC-0x	RUN
t11	Drive output at speed status.	FC-0x	RUN
t12	Direction demand command disabled. Motor ramp down to zero speed.	F6-08 F6-09 F0-18	RUN
t13	DC injection active when drive output falls below the DC injection 2 frequency threshold.	F6-11 F6-13	RUN
t14	Brake contactor got de-energise when the drive output frequency fall below the brake apply frequency.	F8-56 F8-59	RUN
t15	DC injection still active when brake contactor got de-energise.	F6-13	RUN
t16	DC injection disable after the desire set time has elapse.	F6-14	STOP

Event	Descriptions	Function	Drive Status
t17	Drive IGBTs got disable. MC contactor delay OFF time active.	-	Ready
t18	MC contactor de-energise after the desire set time has elapse.	F8-61	Inhibit

4.2 Elevator performance fine tuning

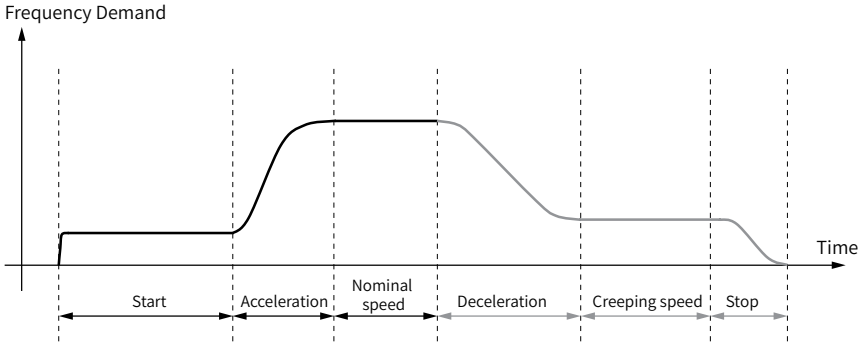


Figure 4-2 MD500L Running S-curve

Stage	Symptom	Diagnostics	Remedies
Start	Rollback	Brake device releases too early	Increase F8-57,ranging 0 to 0.5s.
		Start frequency is too low	Increase F6-03, ranging 0 to1.5Hz.
		Torque output is insufficient	Make sure F3-00=0, F3-01=0.
	Starting jerk	Brake device releases too late	Decrease F8-57, ranging 0 to 0.5s.
		Start frequency is too high	Decrease F6-03, ranging 0 to 1.5Hz.
Acceleration	Jerk when acceleration starts	Too fast acceleration at this section	Increase F6-08, ranging 0 to 80%; Or increase F0-17, ranging 0 to 20s.
	Jerk when acceleration end	Too fast acceleration at this section	Increase F6-09, ranging 0 to (95-(F6-08))% Or increase F0-17, ranging 0 to 20s.
	Overshoot when acceleration ends	Too big speed loop PI gains	Decrease F2-03, ranging 0 to 100 Or increase F2-04, ranging 0 to 10.

Stage	Symptom	Diagnostics	Remedies
Acceleration	Vibration	Too small margin between F2-02 and F2-05	Make sure F2-05 - F2-02 > 3Hz, usually increase F2-05, ranging from F2-02 to 7Hz.
		Overcurrent stall prevention occurs	Make sure F3-18=170%.
Nominal speed	Vibration	Too big speed loop PI gains	Decrease F2-00 or F2-03, ranging 0 to 100; Or increase F2-01 or F2-04, ranging 0.01 to 10.00.
		Too big current loop PI gains	Double check the motor parameters and then perform motor auto-tuning once more.

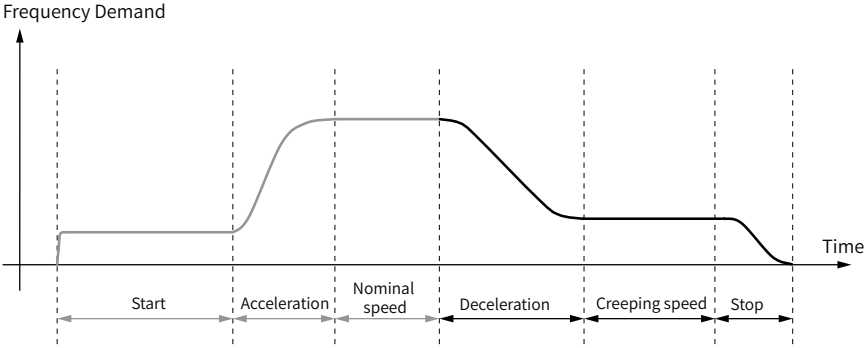
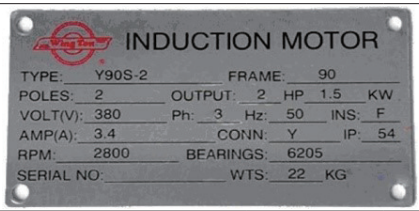


Figure 4-3 MD500L Running S-curve

Stage	Symptom	Diagnostics	Remedies
Deceleration	Jerk when deceleration starts	Too fast deceleration at this section	Increase F6-26, ranging 0 to 80%; Or increase F0-18, ranging 0 to 20s.
	Vibration	Overcurrent stall prevention occurs	Make sure F3-18=170%.
	Jerk when deceleration ends	Too fast deceleration at this section	Increase F6-27, ranging 0 to 80%; Or increase F0-18, ranging 0 to 20s.

Stage	Symptom	Diagnostics	Remedies
Creeping speed	Vibration	Torque output is insufficient	Make sure F3-00=0, F3-01=0.
	Elevator gets stuck	Torque output is insufficient	Make sure F3-00=0, F3-01=0.
	Move much slower than expected	Torque output is insufficient	Make sure F3-00=0, F3-01=0.
		Too small creeping speed setting	Increase F4-16, ranging 0 to 100%; Or decrease relevant multi-reference.
Stop	Jerk	Too fast deceleration at this section	1) Increase F6-27, ranging 0 to 80%; Or increase F0-18, ranging 0 to 20s; 2) Use second deceleration time F8-04: First, set F8-04 bigger than F0-18, ranging F0-18 to 20s; then set F8-26= creeping speed.
		Braking device applies too early	Make sure F8-58=0.5Hz, then increase F8-59,ranging 0 to 0.5s.
		Too strong DC injection at stop	Decrease F6-13, ranging 0 to 100%.
	Slip	Too short DC injection active time at stop	Increase F6-14,ranging 0 to 1s.
		Too weak DC injection at stop	Increase F6-13, ranging 0 to 100%.
		Braking device applies too late	Make sure F8-58=0.5Hz, then decrease F8-59, ranging 0 to 0.5s.
	Inaccurate levelling position	Too slow deceleration	1) If F8-04 is not applied, then decrease F0-18, ranging 0 to 20s; 2) If F8-04 is applied, then firstly decrease F8-04, ranging F0-18 to 20s; secondly set F8-26 = creeping speed.
		Slip occurs	Refer to problem 'Slip'.
	Levelling varies with different loads	Too weak slip compensation	For SVC, increase F2-06 or F 2-00; For VF, increase F3-09.

4.3 Setup flowchart

START	Para.	Parameter Name	Default	Commissioning
Ahead of setup	-	Default values are elicited from enormous real elevator applications, so users can rely on them usually. Only some adjustments are necessary. If parameter restoration is prohibited due to some reasons, then the following steps have to be followed one by one.		
Remove DI wirings	-	Usually, if any DI is set as Forward or Reverse run and if signal is active, then some operations cannot succeed, such as restoring parameters, changing command source, which are necessary steps for quick setup. So it's seriously recommended to remove DI wirings at the beginning of commissioning.		
Restore parameters	FP-01	Parameter operation	0	1
		0: No operation 1: Restore default settings except motor parameters 2: Clear records including errors 4: Restore user's backup parameters 501: Backup parameters **NOTE:** Usually people have no idea what parameters have been changed, so it's seriously recommended to restore parameters to default at the beginning of commissioning.		
Set motor parameters	-	Motor Nameplate		
				
	F1-01	Rated motor power	Model dependent	-
		Unit: kW		
	F1-02	Rated motor voltage	400	-
		Unit: V		
	F1-03	Rated motor current	Model dependent	-
		Unit: A		
	F1-04	Rated motor frequency	50.00	-
		Unit: Hz		
	F1-05	Rated motor speed	1440	-
		Unit: rpm		
CONTINUE				

Select command source	F0-02	Command source selection	1	0
	0: Operation panel control (indicator 'LOCAL/REMOT' OFF) 1: Terminal control (indicator 'LOCAL/REMOT' ON) 2: Communication control (indicator 'LOCAL/REMOT' flashing)			
Perform motor auto tuning	F1-37	Auto-tuning selection	0	3
	0: No auto-tuning 2: Asynchronous motor dynamic auto-tuning 3: Asynchronous motor static auto-tuning(NEW) **NOTE:** Motor won't rotate at this stage. **Steps of auto-tuning:** 1. Make sure the UVW connection between the AC drive and motor is not cut off by output contactor; if it is cut off, then manually handle with the output contactor; 2. Set F1-37=3 and press ENTER, the LEDs on the operating panel will display "TUNE"; 3. Press the key RUN on the panel, then the motor starts auto-tuning. It usually takes about 30 seconds to finish this auto-tuning, wait until LEDs stop displaying "TUNE"; 4. Restore F0-02 to default value 1.			
Select Control mode	F0-01	Control mode selection	2	0 or 2
	0: SVC control 2: V/F control			
Select frequency reference source	F0-03	Main frequency source X selection	6	2 or 6
	0: Digital setting F0-08 (pressing ▽ or △ can change F0-08 easily, and the changed value won't be cleared even after power off) 1: Digital setting F0-08 (pressing ▽ or △ can change F0-08 easily, but the changed value will be cleared after power off) 2: AI1 3: AI2 4: AI3 5: Pulse setting (DI5) 6: Multi-reference setting 7: Simple PLC 8: PID 9: Communication setting			

CONTINUE

Set AI if AI is frequency reference

F4-13	AI curve 1 minimum input	0.00	0.00
	0 V to F4-15		
F4-14	Corresponding setting of AI1 minimum input	0.0	0.0
	-100.0% to 100.0%		
F4-15	AI1 maximum input	5.00	-
	F4-13 to 10.00 V		
F4-16	Corresponding setting of AI1 maximum input	100.0	-
	-100.0% to 100.0%		

Set multi-reference values

FC-01	Reference 1	100.0	100.00
	0.0 to 100.0%. **NOTE:** FC-01 is set as nominal speed of elevator.		
FC-02	Reference 2	11.0	11.0
	0.0 to 100.0%. **NOTE:** FC-02 is set as creep speed of elevator.		
FC-04	Reference 4	40.0	40.00
	0.0 to 100.0%. **NOTE:** FC-04 is set as inspection speed of elevator.		
FC-08	UPS reference frequency	10.0	10.0
	0.0 to 20.0%. **NOTE:** FC-08 is set as UPS speed of elevator.		

CONTINUE

Set DI function

F4-00	DI1 function selection	1	1 (Forward run)
	0: No function 1: Forward RUN (FWD) 2: Reverse RUN (REV) 8: IGBT enable 9: Fault reset (RESET) 12: Multi-reference terminal 1 13: Multi-reference terminal 2 14: Multi-reference terminal 3 Setting range: 0 to 59 **NOTE:** This signal comes from elevator controller.		
F4-01	DI2 function selection	2	2 (Reverse run)
	Setting range: same as DI1 **NOTE:** This signal comes from elevator controller.		
F4-02	DI3 function selection	12	12
	Setting range same as DI1 **NOTE:** If analog input is used as frequency reference, then DI3 is useless, just leave it alone. If multi-reference is used as frequency reference, then signal 'nominal speed' comes from elevator controller.		
F4-03	DI4 function selection	13	13
	Setting range: same as DI1 **NOTE:** If analog input is used as frequency reference, then DI4 is useless, just leave it alone. If multi-reference is used as frequency reference, then signal 'creep speed' comes from elevator controller.		
F4-04	DI5 function selection	14	14
	Setting range: same as DI1 **NOTE:** If analog input is used as frequency reference, then DI5 is useless, just leave it alone. If multi-reference is used as frequency reference, then signal 'inspection speed' comes from elevator controller.		
F4-05	DI6 function selection	0	-
	Setting range: same as DI1		

CONTINUE

Set DO function	**F5-01**	FM function selection	2	2 (Fault output)
		0: No output 1: AC Drive running 2: Fault output 36: Software current limit exceeded 42: Brake output 43: MC (Magnetic contactor) output Setting range: 0 to 59 **NOTE:** This signal goes to magnetic contactor.		
	F5-02	Relay function selection (TA/TB/TC)	43	43 (MC)
		Setting range: same as FM **NOTE:** This signal goes to magnetic controller.		
	F5-03	Relay function selection (PA/PB/PC)	42	42 (Brake)
		Setting range: same as FM **NOTE:** This signal goes to brake contactor.		
Set magnetic contactor	**F8-60**	Drive run delay ON set time	0.20	0.20
		0.20 to 10.00s **NOTE:** If MC is controlled by elevator controller, then F8-60 is useless.		
	F8-61	MC contactor delay OFF set time	0.20	0.20
		0.00 to 10.00s **NOTE:** If MC is controlled by elevator controller, then F8-61 is useless.		
Set brake contactor	**F8-55**	Brake release current threshold	20	20
		0 to 200%		
	F8-56	Brake release frequency threshold	0.20	0.20
		0.00 to 25.00 Hz		
	F8-57	Brake release delay ON set time	0.0	0.0
		0.0 to 5.0s		
	F8-58	Brake apply frequency threshold	0.5	0.5
		0.00 to 25.00 Hz		
	F8-59	Brake apply delay OFF set time	0.2	0.2
		0.0 to 5.0s		
CONTINUE				

Set acceleration and deceleration	F0-17	Acceleration time 1	3.0	3.0
		0.0 to 6500.0s		
	F0-18	Deceleration time 1	2.0	2.0
		0.0 to 6500.0s		
	F8-04	Stop stage deceleration time	2.0	2.0
		0.0 to 6500.0s		
Set startup frequency	F6-03	Startup frequency	1.0	1.0
		0.0 to 10.0 Hz		
	F6-04	Startup frequency active set time	0.3	0.3
		0.0 to 100.0s		
Set S-curve	F6-07	Acceleration/Deceleration mode	3	3
		0: Linear acceleration/ deceleration 3: S-curve acceleration/ deceleration C		
	F6-08	Time proportion of S-curve at Accel start	80.0	80.0
		0.0% to Min. [(100.0% - F6-09), 80%]		
	F6-09	Time proportion of S-curve at Accel end	10.0	10.0
		0.0% to Min. [(100.0% - F6-08), 80%]		
	F6-26	Time proportion of S-curve at Decel start	20.0	20.0
		0.0% to Min. [(100.0% - F6-27), 80%]		
	F6-27	Time proportion of S-curve at Decel end	30.0	30.0
		0.0% to Min. [(100.0% - F6-26), 80%]		
	F8-65	Brake apply keep frequency set time	0.50	0.50
		0.00s to 10.00s		
	F8-66	Time proportion of S-curve at Stop start	20.0	20.0
		0.0% to Min. [(100.0% - F8-67), 80%]		
	F8-67	Time proportion of S-curve at Stop start	30.0	30.0
		0.0% to Min. [(100.0% - F8-66), 80%]		
CONTINUE				

Set DC injection for stopping	**F6-11**	DC injection 2 frequency threshold	0.50	0.50
		0.00 Hz to maximum frequency		
	F6-12	DC Injection 2 delay ON set time	0.0	0.0
		0.0 to 36.0s		
	F6-13	DC injection 2 level	30	30
		0 to 100 Hz		
	F6-14	DC injection 2 active set time	0.5	0.5
		0.0 to 36.0s		
Set V/F parameters	**F3-00**	V/F curve selection	0	0
		0: Linear V/F 1: Multi-point V/F Setting range: 0 to 11		
	F3-01	Torque boost	0.0	0.0
		0.0 to 30.0 %; **NOTE:** If it is 0, then auto torque boost is activated, and it is recommended to use auto torque boost.		
Set SVC parameters	**F2-00**	Speed loop proportional gain 1	10	10
		0 to 100		
	F2-01	Speed loop integral time 1	0.5	0.5
		0.01 to 10.00s		
	F2-02	Switchover frequency 1	3.00	3.00
		0.00 Hz to F2-05		
	F2-03	Speed loop proportional gain 2	30	30
		0 to 100		
	F2-04	Speed loop integral time 2	0.5	0.5
		0.01 to 10.00s		
	F2-05	Switchover frequency 2	7.00	7.00
		F2-02 to maximum output frequency		
OVER				

4.4 IGBT Enable

In all elevator applications, an Output Contactor is installed between the AC drive output U, V, W and the motor.

In an emergency, the Safety Line is opened due to an unsafe condition and the Output Contactor disconnects the power from the inverter to the motor (the motor brake is also applied at the same time). When the Output Contactor opens with current flowing through to the motor (inverter IGBTs are active), there will be arcing in the Output Contactor depending on the motor inductive energy. Arcing of the Output Contactor can reduce the lifetime of the contactor and in some severe cases can damage the contacts poles. Therefore it is recommended to electronically switch off the AC drive IGBT firing circuits before opening the Output Contactor (milliseconds later). The AC drive IGBT firing can be electronically switched off with the "IGBT Enable" function as shown in the timing charts below.

CAUTION: An Output Contactor MUST always be installed as the final safety power cut off to the motor. The "IGBT Enable" function is NOT a substitute for an Output Contactor, it is designed to work together with the Output Contactor.

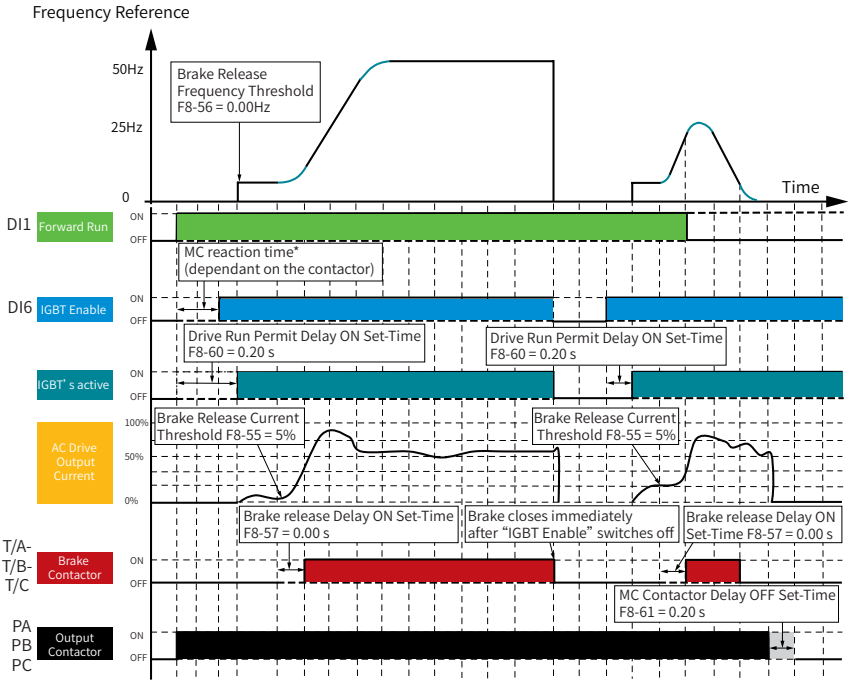


Figure 4-4 IGBT Enable timing diagram

*** MC reaction time**: the reaction time of output relay of MC.

For some applications, the status of output contactor needs to be checked before AC drive starts up, hence one relay output of MC will feedback to IGBT Enable (above in the diagram it is DI6).

This function can work by assigning "IGBT Enable" function to a digital input, please refer to the table below to set.

Take DI6 for example: assign "IGBT Enable" to DI6, then set F4-05=8. If it's necessary to change active mode of IGBT Enable, then use F4-38 or F4-39 to set (low level or high level active).

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F4-00	DI1 function selection	0: No function 1: Forward RUN (FWD) 2: Reverse RUN (REV) ..... 8: IGBT Enable ..... 12: Multi-reference terminal 1 13: Multi-reference terminal 2 14: Multi-reference terminal 3 15: Multi-reference terminal 4	N.A	1	-
F4-01	DI2 function selection		N.A	2	-
F4-02	DI3 function selection		N.A	12	-
F4-03	DI4 function selection		N.A	13	-
F4-04	DI5 function selection		N.A	14	-
F4-05	DI6 function selection		N.A	0	8
F4-06	DI7 function selection		N.A	15	-
F4-07	DI8 function selection		N.A	0	-
F4-08	PTC function enable (On-board expansion card)		N.A	0	-
F4-38	DI active mode selection (Normal: low level active) DI5 active mode: 0: Normal 1: Opposite DI4 active mode: 0: Normal 1: Opposite DI3 active mode: 0: Normal 1: Opposite DI2 active mode: 0: Normal 1: Opposite DI1 active mode: 0: Normal 1: Opposite	7-segment 00000 to 11111 (binary)	N.A	00000	-

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F4-39	DI active mode selection 2 DI8 active mode: 0: Normal 1: Opposite DI7 active mode: 0: Normal 1: Opposite DI6 active mode: 0: Normal 1: Opposite	7-segment 00000 to 11111 (binary)	N.A	00000	-

4.5 UPS/ARD mode rescue operation

In this scheme, 220V AC UPS/ARD provides power supply to the Elevator controller and Inverter for rescue operation during power failure. The following below figure shows the wiring interface between Elevator Controller, UPS/ARD and MD500L Inverter.

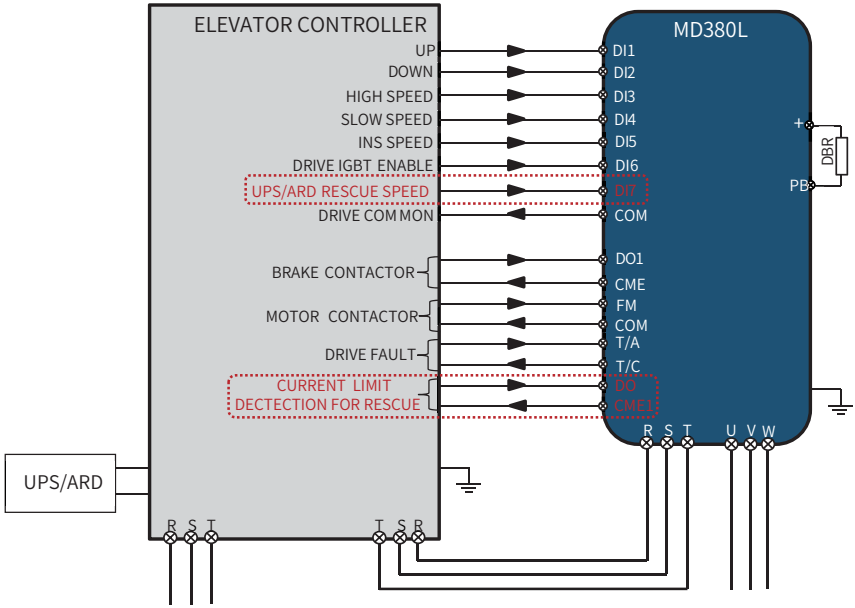


Figure 4-5 Wiring Diagram

Table 4-2 Parameter setting for activating the UPS/ARD mode rescue operation in MD500L

Parameter	Parameter Name	Setting Range	New Setting to Enable
F4-06	DI7 function selection (On-board expansion card)	15-Multi Speed Reference 4	F4-06=15
FC-08	UPS reference frequency	0.0 to 100.0%	FC-08= ⩽ 20% (⩽ 10HZ) for Rescue speed in UPS/ARD Power supply
A5-06	UnderVoltage Throsold Level	60% to 140%	A5-06=60%
Optional Parameter when inverter software current limit function is used to check the least current durection running in UPS/ARD mode			
F5-05	Extension card relay function (MC+/MC-)	36 Software current Exceeding Limit	F5-05=36
F8-36	Output current exceeding limit value	0.0% (no detection) 0.1%-300.0% (Motor rated current)	Adjust the value based on the site requirement
F8-37	Output current exceeding limit detection delay time	0.00s-600.00s	Adjust the value based on the site requirement

- When power fails during the Elevtaor operation, the UPS/ARD provide temporary power supply to the Elevator controller which routes the UPS/ARD power supply to MD500L inverter also for Elevator rescue operation.
- When door is fully closed and safeties are connected/closed, the elevator controller does the rescue function which provides Up/Down direction command and Rescue speed reference command to the MD500L inverter to run the machine. Elevator opens/enables the Brake and starts to run in rescue speed set in the inverter (FC-08) to the rescue floor.
- If Elevator controller detect the least current direction by running the machine in both direction for some distance to check the machine drawing current by its rescue logic or with help of MD500L inverter function (F5-05=36 Software current exceeding limit), then the rescue direction will be selected in least current direction by the elevator controller in UPS/ARD rescue mode.
- Providing Least current direction running in UPS/ARD mode consume lesser Battery energy.
- After Elevator reaching Rescue floor, elevator controller withdraws the commands to the MD500L inverter and stops the elevator by applying the brake on machine and opens the doors.

5 Trouble shooting and Solutions

5.1 Fault Codes and Solutions

Troubleshoot the faults occurred during operating the AC drive as follows.

Display	Fault Name	Possible Causes	Solutions
Err02	Overcurrent during acceleration	1. The output circuit is short circuited. 2. The acceleration time is too short. 3. Manual torque boost or V/F curve is not appropriate. 4. The power supply is too low. 5. The startup operation is performed on the rotating motor. 6. A sudden load is added during acceleration. 7. The AC drive model is of too small power class.	1. Eliminate short circuit. 2. Increase the acceleration time F0-17. 3.Adjust the manual torque boost or V/F curve. 4. Check that the power supply is normal. 5. Select speed tracking restart or start the motor after it stops. 6. Remove the added load. 7. Select a drive of higher power class.
Err03	Overcurrent during deceleration	1. The output circuit is short circuited. 2. The deceleration time is too short. 3. The power supply is too low. 4. A sudden load is added during deceleration. 5. The braking resistor is not installed.	1. Eliminate short circuit. 2. Increase the deceleration timeF0-18. 3. Check the power supply, and ensure it is normal. 4. Remove the added load. 5. Install the braking resistor.
Err04	Overcurrent at constant speed	1. The output circuit is short circuited. 2. The power supply is too low. 3. A sudden load is added during operation. 4. The AC drive model is of too small power class.	1. Eliminate short circuit. 2. Adjust power supply to normal range. 3. Remove the added load. 4. Select a drive of higher power class.
Err05	Overvoltage during acceleration	1. The DC bus voltage is too high ☆. 2. An external force drives the motor during acceleration. 3. The acceleration time is too short. 4. The braking resistor is not installed.	1. Replace with a proper braking resistor. 2. Cancel the external force or install braking resistor. 3. Increase the acceleration time. 4. Install a braking resistor.
Err06	Overvoltage during deceleration	1. The DC bus voltage is too high ☆. 2. An external force drives the motor during deceleration. 3. The deceleration time is too short. 4. The braking resistor is not installed.	1. Replace with a proper braking resistor. 2. Cancel the external force or install braking resistor. 3. Increase the deceleration time. 4. Install the braking resistor.

Display	Fault Name	Possible Causes	Solutions
Err07	Overvoltage at constant speed	1. The DC bus voltage is too high ☆. 2. An external force drives the motor during deceleration.	1. Replace with a proper braking resistor. 2. Cancel the external force.

☆ : Voltage thresholds

Voltage Class	DC Bus Overvoltage threshold	DC Bus Undervoltage threshold	Braking operation level
Three-phase 220 V	400V DC	200V DC	380V DC
Three-phase 380 V	810V DC	350V DC	750V DC

Err08	Control power fault	The input voltage exceeds the allowed range.	Adjust the input voltage to within the allowed range.
Err09	Undervoltage	1. Instantaneous power failure occurs. 2. The input voltage exceeds the allowed range. 3. The DC bus voltage is too low ☆. 4. The rectifier bridge and buffer resistor are faulty. 5. The drive board is faulty. 6. The control board is faulty.	1. Reset the fault. 2. Adjust the input voltage to within the allowed range. 3 to 6. Seek for maintenance.
Err10	Drive overload	1. The load is too heavy or the rotor is locked. 2. The drive is of too small power class.	1. Reduce the load, or check the motor, or check the machine whether it is locking the rotor. 2. Select a drive of higher power class.
Err11	Motor overload	1. F9-01 is too small. 2. The load is too heavy or the rotor is locked. 3. The drive is of too small power class.	1. Set F9-01 correctly. 2. Reduce load, or check motor, or check the machine whether it is locking the rotor. 3. Select a drive of larger power class.
Err12	Power input phase loss	1. The three-phase power supply is abnormal. 2. The drive board is faulty. 3. The lightening protection board is faulty. 4. The control board is faulty.	1. Check the power supply. 2 to 4. Seek for maintenance.
Err13	One drive output phase loss	1. The cable between drive and motor is faulty. 2. The drive's three-phase output is unbalanced when the motor is running. 3. The drive board is faulty. 4. The IGBT is faulty.	1. Check the cable. 2. Check the motor windings. 3 to 4. Seek for maintenance.

Display	Fault Name	Possible Causes	Solutions
Err14	IGBT overheat	1. The ambient temperature is too high. 2. The air filter is blocked. 3. The cooling fan is damaged. 4. The thermal sensor of IGBT is damaged. 5. The IGBT is damaged.	1. Reduce the ambient temperature. 2. Clean the air filter. 3 to 5. Seek for maintenance.
Err15	External equipment fault	1. External fault signal is input via DI. 2. External fault signal is input via VDI.	Reset the fault.
Err16	Communication fault	1. The host computer is abnormal. 2. The communication cable is faulty. 3. The extension card type set in F0-28 is incorrect. 4. The communication parameters in group FD are set improperly.	1. Check cabling of the host computer. 2. Check the communication cabling. 3. Set F0-28 correctly. 4. Set the communication parameters properly.
Err18	Current detection fault	The drive board is faulty.	Replace the drive board.
Err19	Motor tuning fault	1. Motor parameters are wrong. 2. Motor tuning overtime.	1. Check motor parameters F1-00 to F1-05. 2. Check the wiring between drive and motor.
Err21	EEPROM read-write fault	The EEPROM chip is damaged.	Replace the main control board.
Err23	Short circuit to ground	The motor is short-circuited to ground.	Replace the cables or motor.
Err26	Accumulative running time reached	The accumulative running time reaches the setting of F8-17.	Clear the record by performing parameter initialization (set FP-01 to 2).
Err27	User-defined fault 1	1. The user-defined fault 1 signal is input via DI. 2. User-defined fault 1 signal is input via VDI.	Reset the fault.
Err28	User-defined fault 2	1. The user-defined fault 2 signal is input via DI 2. The user-defined fault 2 signal is input via VDI.	Reset the fault.
Err29	Accumulative power-on time reached	The accumulative power-on time reaches the setting of F8-16.	Clear the record by performing parameter initialization (set FP-01 to 2).
Err30	Off load fault	Offload when it's running.	Check the connection between motor and load.

Display	Fault Name	Possible Causes	Solutions
Err31	PID feedback lost during running	The PID feedback is lower than FA-26.	Check the PID feedback signal or set FA-26 to a proper value.
Err40	Quick current limit	1. The load is too heavy or the rotor is locked. 2. The drive is of too small power class.	1. Reduce the load, or check the motor, or check the machine whether it is locking the rotor. 2. Select a drive of higher power class.
Err41	Motor switchover fault during running	The current motor is switched over via a terminal during running of the AC drive.	Switch over the motor only after the AC drive stops.
Err45	Motor over-temperature detected by PT100	Cable connection of the temperature sensor becomes loose.	Check cable connection of the temperature sensor.
		The motor temperature is too high.	Increase the carrier frequency or take other measures to cool the motor.
Err61	Two or three drive output phases loss	1. The drive output connections get loose; 2. The output contactor gets wrongly operated or malfunctions.	1. Check drive output connections; 2. Check drive output contactor.
Err63	PTC over-temperature	PTC sensor temperature higher than 110°C	Check whether the temperature of the motor connected to an external PTC sensor exceeds 110°C (over-temperature threshold).

5.2 Common Symptoms and Solutions

Fault Name	Possible Causes	Solutions
There is no display at power-on.	1. There is no power supply or the power supply is too low. 2. The switching power supply on the drive board is faulty. 3. The rectifier bridge is damaged. 4. The buffer resistor of the drive is damaged. 5. The control board or the keypad is faulty. 6. The cable between the control board and the drive board or keypad breaks.	1. Check the power supply. 2 to 5. Seek for maintenance. 6. Re-connect the 4-core and 28-core flat cables, or seek for maintenance.

Fault Name	Possible Causes	Solutions
"HC" is displayed at power-on.	1. The cable between the drive board and the control board is in poor contact. 2. The control board is damaged. 3. The motor winding or the motor cable is shortcircuited to the ground. 4. The power supply is too low.	1. Re-connect the 4-core and 28-core flat cables, or seek for maintenance. 2. Seek for maintenance. 3. Check the motor or replace it, and check the motor cable. 4. Check the power supply according to *"1.3 Technical Data"*.
The display is normal upon power-on, but "HC" is displayed after start and the motor stops immediately.	1. The cooling fan is damaged or the rotor is locked. 2. A certain terminal is short-circuited.	1. Replace cooling fan, or check the machine whether it is locking the rotor. 2. Eliminate short circuit.
Err14 is reported frequently.	1. The carrier frequency is set too high. 2. The cooling fan is damaged, or the air filter is blocked. 3. Components (thermal coupler or others) inside the drive are damaged.	1. Reduce F0-15. 2. Replace the fan and clean the air filter. 3. Seek for maintenance.
The motor does not rotate after the AC drive outputs a non-zero reference.	1. The motor or motor cable is damaged. 2. The motor parameters are set improperly. 3. The cable between the drive board and the control board is in poor contact. 4. The drive board is faulty. 5. The rotor is locked.	1. Check the motor, or check the cable between the drive and the motor. 2. Check and re-set motor parameters. 3. Re-connect the 4-core and 28-core flat cables, or seek for maintenance. 4. Seek for maintenance. 5. Check the machine whether it is locking the rotor.
The DI terminals are disabled.	1. The DI parameters are set incorrectly. 2. The input signal is incorrect. 3. The wire jumper between OP and +24V is in poor contact. 4. The control board is faulty.	1. Check and reset DI parameters in group F4. 2. Check the input signals, or check the input cable. 3. Check the jumper between OP and +24 V. 4. Seek for maintenance.
The drive reports overcurrent and overvoltage frequently.	1. The motor parameters are set improperly. 2. The acceleration/deceleration time is too small. 3. The load fluctuates.	1. Reset motor parameters. 2. Set proper acceleration/deceleration time. 3. Check the machine, or seek for maintenance.

6 Maintenance

6.1 Routine Maintenance

Check the following items daily to ensure normal running and prevent damage to the AC drive. Copy this checklist and sign the "Checked" column after each inspection.

Inspection Item	Inspection Points	Solutions	Checked
Motor	Inspect whether the abnormal sounds and vibration occur on the motor.	◆ Check whether the mechanical connection is normal. ◆ Check whether output phase loss occurs on the motor. ◆ Check whether retaining screws of the motor are tightened.	
Fan	Inspect whether the cooling fan of the AC drive and motor work abnormally.	◆ Check running of the cooling fan of the AC drive. ◆ Check whether the cooling fan of the motor is normal. ◆ Check whether the ventilation is clogged. ◆ Check whether the ambient temperature is within the permissible range.	
Installation environment	Inspect whether the cabinet and cable duct are abnormal.	◆ Check input and output cables for damaged insulation. ◆ Check for vibration of hanging bracket. ◆ Check whether ground bars and terminals become loose or get corroded.	
Load	Inspect whether the running current of the AC drive exceeds the rated current of the AC drive and motor for a certain period.	◆ Check whether motor parameters are set properly. ◆ Check whether the motor is overloaded. ◆ Check whether the mechanical vibration is severe (allowed range: < 1 g).	
Input voltage	Inspect whether the power voltage of the main and control circuits is within the allowed range.	◆ Check that the input voltage is within the allowed range. ◆ Check whether start of heavy load exists.	

6.2 Periodic Inspection

Inspection Item	Inspection Point	Solution	Checked
General	Inspect for wastes, dirt, and dust on the surface of the AC drive.	◆ Check whether the cabinet of the AC drive is powered off. ◆ Use a vacuum cleaner to suck up wastes and dust to prevent direct touching. ◆ Wipe stubborn stains with alcohol and wait until the alcohol evaporates.	
Cables	Inspect power cables and connections for discoloration. Inspect wiring insulation for aging or wear.	◆ Replace cracked cables. ◆ Replace damaged terminals.	
Peripheral devices such as relay and contactor	Check whether the contactor is loose or abnormal noise exists during operation. Check whether short-circuit, water stain, expansion, or cracking occurs on peripheral devices.	◆ Replace abnormal peripheral devices.	
Ventilation	Inspect whether ventilation and heatsink are clogged. Check whether the fan is damaged.	◆ Clean the ventilation. ◆ Replace the fan.	
Control circuit	Inspect for control components in poor contact. Inspect for loose terminal screws. Inspect for control cables with cracked insulation.	◆ Clear away foreign matters on the surface of control cables and terminals. ◆ Replace damaged or corroded control cables.	

6.3 Replacement of Wear Parts

6.3.1 Service Life of Wear Parts

The service life of fans and electrolytic DC bus capacitors is related to the operating environment and maintenance status. The general service life is listed as follows.

Component	Service Life [1]
Fan	⩾ 5 years
Electrolytic capacitor	⩾ 5 years

[1] You can determine when to replace these parts according to the actual operating time.

- Ambient temperature: 40°C
- Load rate: 80%

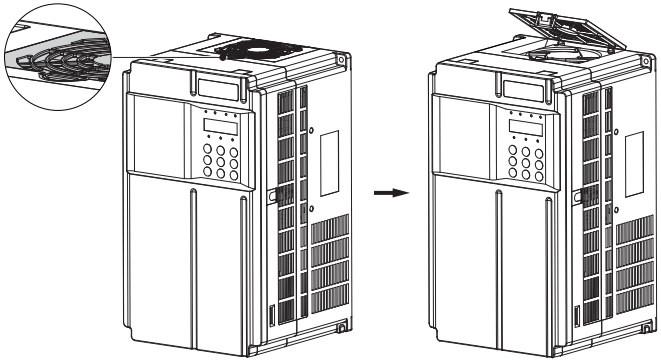
- Operating rate: 24 hours per day

6.3.2 Replacing Cooling Fans

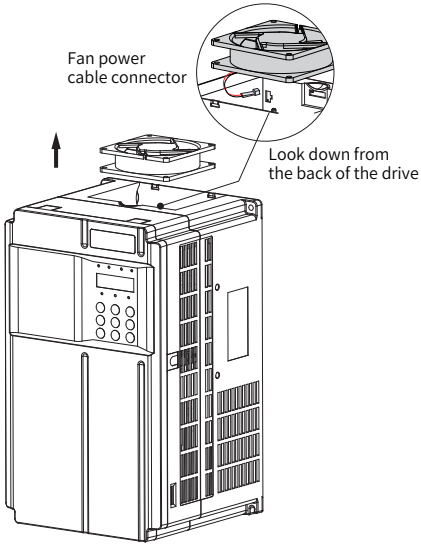
- Possible damage causes: bearing worn and blade aging.
- Judging criteria: whether there is crack on the blade; whether there is abnormal vibration noise upon startup; whether the blade runs abnormally.

Removal

1. Depress the fan cover hook and take the fan cover off the top of the drive.

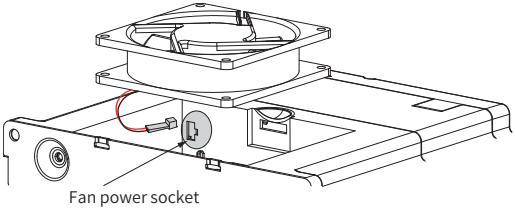


2. Pull the fan upward and disconnect the pluggable connector of power cable.

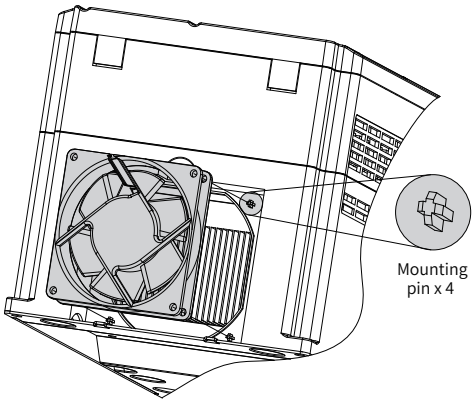


Installing

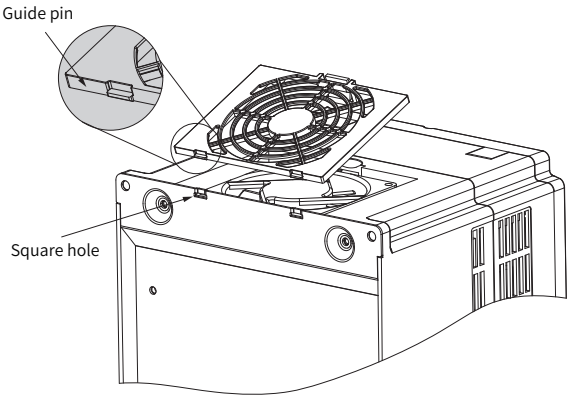
1. Plug in the fan power cable .



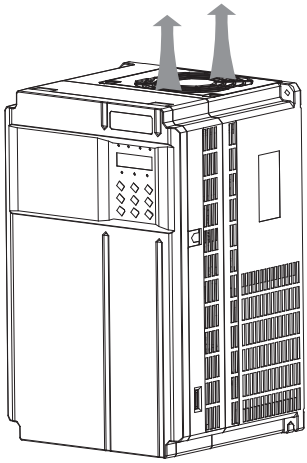
2. Install the fan into the drive and ensure that the mounting pins are aligned.



3. Insert the two guide pins into the square holes and then press in the hook.



4. Keep air flow direction upward.



6.4 Storage

For storage of the AC drive, pay attention to the following three aspects:

Pack the AC drive with the original packing box provided by Inovance.

Do not expose the AC drive to moisture, high temperature or outdoor direct sunlight for a long time.

The electrolytic capacitor will deteriorate after being stored for a long time. Therefore, the AC drive must be switched on once every 6 months, each time lasting at least 5 hours. Ensure to increase the input voltage gradually to the rated value by using a voltage regulator. Contact professionals for technical support if necessary.

7 Parameter Table

Group F0: fundamental

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F0-01	Motor 1 control mode	0: Sensor-less flux vector control (SFVC) 2: V/F control	N.A	2	-
F0-02	Command source selection	0: Operating panel control (LED off) 1: Terminal control (LED on) 2: Communication control (LED flashing)	N.A	1	-
F0-03	Main frequency source X selection	2: AI-1 3: AI-2 4: AI-3 6: Multi-reference	N.A	6	-
F0-07	Frequency source selection	0: Main frequency source X	N.A	0	-
F0-09	Rotation direction	0: Same direction 1: Reverse direction	N.A	0	-
F0-10	Maximum frequency	50.00 to 100.00	Hz	50.00	-
F0-15	Carrier frequency	0.5 to 11.0 (SVC mode: 0.5 to 9) (V/F mode: 0.5 to 11)	kHz	Model dependant	-
F0-17	Acceleration time 1	0.00 to 650.00 (F0-19 = 2) 0.0 to 6500.0 (F0-19 = 1) 0 to 65000 (F0-19 = 0)	s	3.0	-
F0-18	Deceleration time 1	0.00 to 650.00 (F0-19 = 2) 0.0 to 6500.0 (F0-19 = 1) 0 to 65000 (F0-19 = 0)	s	2.0	-
F0-19	Acceleration/ Deceleration time unit	0: 1 1: 0.1 2: 0.01	s	1	1

Group F1: motor 1 parameters

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F1-00	Motor type selection	0: Common asynchronous motor 1: Variable frequency asynchronous motor	N.A	0	-
F1-01	Rated motor power	0.1 to 1000.0	kW	Model dependent	-
F1-02	Rated motor voltage	1 to 2000	V	400	-
F1-03	Rated motor current	0.01 to 655.35 (AC drive power ⩽ 55 kW) 0.1 to 6553.5 (AC drive power > 55 kW)	A	Model dependent	-
F1-04	Rated motor frequency	0.01 Hz to max. frequency	Hz	50	-
F1-05	Rated motor rotational speed	1 to 65535	RPM	1440	-
F1-06	Stator resistance (asynchronous motor)	0.001 to 65.535 (AC drive power ⩽ 55 kW) 0.0001 to 6.5535 (AC drive power > 55 kW)	Ω	0	-
F1-07	Rotor resistance (asynchronous motor)	0.001 to 65.535 (AC drive power ⩽ 55 kW) 0.0001 to 6.5535 (AC drive power > 55kW)	Ω	0.000	-
F1-08	Leakage inductive reactance (asynchronous motor)	0.01 to 655.35mH (AC drive power ⩽ 55 kW) 0.001 to 65.535 (AC drive power > 55 kW)	mH	0.00	-
F1-09	Mutual inductive reactance (asynchronous motor)	0.01 to 655.35 (AC drive power ⩽ 55 kW) 0.001 to 65.535 (AC drive power > 55 kW)	mH	0.00	-
F1-10	No-load current (asynchronous motor)	0.01 to F1-03 (AC drive power ⩽ 55 kW) 0.1 to F1-03 (AC drive power > 55 kW)	A	0.00	-
F1-37	Auto-tuning selection	0: No auto-tuning 2: Asynchronous motor dynamic auto-tuning 3: Asynchronous motor static auto-tuning (NEW)	N.A	0	-

Group F2: vector control

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F2-00	Speed loop proportional gain 1	0 to 100	N.A	15	-
F2-01	Speed loop integral time 1	0.01 to 10.00	s	0.30	-
F2-02	Switchover frequency 1	0.00 to F2-05	Hz	3.00	-
F2-03	Speed loop proportional gain 2	0 to 100	N.A	30	-
F2-04	Speed loop integral time 2	0.01 to 10.00	s	0.5	-
F2-05	Switchover frequency 2	F2-02 to max. output frequency	Hz	7.00	-
F2-06	SVC slip gain	50 to 200	%	100	-
F2-10	Torque upper limit (for SVC)	0.0 to 200.0 (% AC drive rated current)	%	150.0	-
F2-13	Excitation adjustment proportional gain	0 to 20000	N.A	2000	-
F2-14	Excitation adjustment integral gain	0 to 20000	N.A	1300	-
F2-15	Torque adjustment proportional gain	0 to 20000	N.A	2000	-
F2-16	Torque adjustment integral gain	0 to 20000	N.A	1300	-
F2-20	Retard coefficient	0 to 200	N.A	50	-

Group F3: V/F control

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F3-00	V/F curve setting	0: Linear V/F 1: Multi-point V/F 2 to 11: no relevant settings	N.A	0	-
F3-01	Torque boost	0.0 to 30.0 (if it is 0, then auto torque boost is activated)	%	0	-
F3-02	Cut-off frequency of torque boost	0.00 to max. output frequency	Hz	50.00	-
F3-03	Multi-point V/F frequency 1 (F1)	0.00 to F3-05	Hz	1.50	-
F3-04	Multi-point V/F voltage 1 (V1)	0.0 to 100.0	%	6.0	-

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F3-05	Multi-point V/F frequency 2 (F2)	F3-03 to F3-07	Hz	3.00	-
F3-06	Multi-point V/F voltage 2 (V2)	0.0 to 100.0	%	8.0	-
F3-07	Multi-point V/F frequency 3 (F3)	F3-05 to rated motor frequency (F1-04)	Hz	8.00	-
F3-08	Multi-point V/F voltage 3 (V3)	0.0 to 100.0	%	20.0	-
F3-09	V/F slip compensation gain	0 to 200.0	%	0.0	-
F3-10	V/F over-excitation gain	0 to 200	%	0	-
F3-11	V/F oscillation suppression gain	0 to 100	%	30	-
F3-13	Voltage source for V/F separation	0 to 8	N.A	0	-
F3-14	Voltage digital setting for V/F separation	0 to rated motor voltage	V	0	-
F3-15	Voltage rise time of V/F separation	0.0 to 1000.0	s	0.0	-
F3-18	Overcurrent stall prevention current limit (for V/F mode)	100 to 200 (% AC drive rated current)	%	170	-
F3-19	Overcurrent stall prevention enable (for V/F mode)	0: Disable 1: Enable	N.A	1	-
F3-20	Overcurrent stall prevention gain (for V/F mode)	0 to 100	N.A	20	-
F3-22	Overvoltage stall prevention voltage limit (for V/F or SVC)	650 to 800	V	770	-
F3-23	Overvoltage stall prevention enable (for V/F or SVC)	0: Disable 1: Enable	N.A	0	-
F3-24	Overvoltage stall prevention frequency gain (for V/F or SVC)	0 to 100	N.A	30	-
F3-25	Overvoltage stall prevention voltage gain (for V/F or SVC)	0 to 100	N.A	30	-

Group F4: input terminals

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F4-00	DI1 function selection (Standard on-board)	0: No function 1: Forward RUN (FWD) 2: Reverse RUN (REV) 3: Three-line control 4: Jog Forward (FJOG) 5: Jog Reverse (RJOG) 6: Terminal UP 7: Terminal DOWN 8: IGBT Enable 9: Fault reset (RESET) 10: RUN Pause 11: Normally open (NO) input of external fault 12: Multi-reference terminal 1 13: Multi-reference terminal 2 14: Multi-reference terminal 3 15: Multi-reference terminal 4 16: Terminal 1 for acceleration/deceleration time selection 17: Terminal 2 for acceleration/deceleration time selection 18: Frequency source switchover 19: UP and DOWN setting clear (terminal, operating panel) 20: Command source switchover terminal 1 21: Acceleration/Deceleration prohibited 22: PID pause 23: PLC status reset 24: Swing pause 25: Counter input 26: Counter reset 27: Length count input 28: Length reset 29: Torque control prohibited 30: Pulse input (enabled only for DI5) 31: Reserved 32: Immediate DC braking 33: Normally closed (NC) input of external fault 34: Frequency modification forbidden 35: Reverse PID action direction 36: External STOP terminal 1	N.A	1	-
F4-01	DI2 function selection (Standard on-board)		N.A	2	-
F4-02	DI3 function selection (Standard on-board)		N.A	12	-
F4-03	DI4 function selection (Standard on-board)		N.A	13	-
F4-04	DI5 function selection (Standard on-board)		N.A	14	-
F4-05	DI6 function selection (On-board expansion card)		N.A	0	8
F4-06	DI7 function selection (On-board expansion card)		N.A	0	15
F4-07	DI8 function selection (On-board expansion card)		N.A	0	-
F4-08	PTC function enable (On-board expansion card)		N.A	0	-

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F4-08	PTC function enable (On-board expansion card)	37: Command source switchover terminal 2 38: PID integral pause 39: Switchover between main frequency source X and preset frequency 40: Switchover between auxiliary frequency source Y and preset frequency 41: Motor selection terminal 1 42: Motor selection terminal 2 43: PID parameter switchover 44: User defined fault 1 45: User defined fault 2 46: Speed control/Torque control switchover 47: Emergency stop 48: External STOP terminal 2 49: Deceleration DC braking 50: Clear the current running time 51: Switchover between two-line mode and three-line mode 52 to 59: Reserved			-
F4-10	DI filter time	0.000 to 1.000	s	0.010	-
F4-11	Terminal command mode	0: Two-line mode 1 1: Two-line mode 2 2: Three-line mode 1 3: Three-line mode 2	N.A	0	-
F4-12	Terminal UP/DOWN rate	0.01 to 65.535	Hz/s	1.00	-
F4-13	AI curve 1 minimum input	0.00 to F4-15	V	0.00	-
F4-14	Corresponding setting of AI curve 1 minimum input	-100.00 to 100.00	%	0.0	-
F4-15	AI curve 1 maximum input	F4-13 to 10.00V	V	5.00	-
F4-16	Corresponding setting of AI curve 1 maximum input	-100.00 to 100.00	%	100.0	-
F4-17	AI1 filter time	0.00 to 10.00	s	0.10	-

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F4-38	DI active mode selection (Normal: low level active) DI5 active mode: 0: Normal 1: Opposite DI4 active mode: 0: Normal 1: Opposite DI3 active mode: 0: Normal 1: Opposite DI2 active mode: 0: Normal 1: Opposite DI1 active mode: 0: Normal 1: Opposite	7-segment 00000 to 11111 (binary)	N.A	00000	-
F4-39	DI active mode selection 2 DI8 active mode: 0: Normal 1: Opposite DI7 active mode: 0: Normal 1: Opposite DI6 active mode: 0: Normal 1: Opposite	7-segment 00000 to 11111 (binary)	N.A	00000	-

Group F5: output terminals

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F5-00	FM terminal output mode	0: High-speed pulse output (FMP) 1: ON/OFF output (FMR)	N.A	1	-
F5-01	FMR function (open-collector output terminal) Attention! Set F5-00 = 1 when FM is used as MC or Brake output.	0: No output 1: AC drive running 2: Fault output (stop) 3: Frequency-level detection FDT1 output 4: Frequency reached 5: Zero-speed running (no output at stop) 6: Motor overload pre-warning 7: AC drive overload pre-warning 8: Set count value reached	N.A	2	-

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F5-02	Relay function (T/A-T/BT/C)	9: Designated count value reached 10: Length reached 11: PLC cycle complete 12: Accumulated running time reached 13: Frequency limited 14: Torque limited 15: Ready for RUN 16: AI1 larger than AI2 17: Frequency upper limit reached 18: Frequency lower limit reached (no output at stop) 19: Undervoltage state output 20: Communication setting 21-22: Reserved 23: Zero-speed running 2 (having output at stop) 24: Cumulative power-on time reached 25: Frequency-level detection FDT2 output 26: Frequency 1 reached 27: Frequency 2 reached 28: Current 1 reached 29: Current 2 reached 30: Timing reached 31: AI1 input limit exceeded 32: Load becoming 0 33: Reverse running 34: Zero current state 35: Module temperature reached 36: Software current limit exceeded 37: Frequency lower limit reached (having output at stop) 38: Alarm output 39: Motor overheat warning 40: Current running time reached 41: Fault output (There is no output if it is the coast-to-stop fault and if undervoltage occurs.) 42: Brake output 43: MC (Magnetic contactor) output 44: Rescue Operation output	N.A	43	-
F5-03	Extension card relay function (BK+/BK-)		N.A	42	-
F5-04	DO1 function selection (open-collector output terminal)		N.A	0	-
F5-05	Extension card relay function (MC+/MC-)		N.A	0	-

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F5-07	AO1 function selection	0: Running frequency 1: Set frequency 2: Output current 3: Output torque (absolute value)	N.A	3	-

Group F6: start and stop control

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F6-00	Start mode	0: Direct start 1: Rotational speed tracking restart 2: Pre-excited start (asynchronous motor)	N.A	0	-
F6-03	Startup frequency	0.01 to 10.00	Hz	0.20	-
F6-04	Startup frequency active set time	0.0 to 100.0	s	0.5	-
F6-05	DC injection 1 level	0 to 150	%	70	-
F6-06	DC injection 1 active set time	0.0 to 5.0	s	0.5	-
F6-07	Acceleration/ Deceleration mode	0: Linear acceleration/ deceleration 3: S-curve acceleration/ deceleration C	N.A	3	-
F6-08	Time proportion of S-curve at Accel start	0.0% to min. [(100.0% - F6-09), 80%]	%	80.0	-
F6-09	Time proportion of S-curve at Accel end	0.0% to min. [(100.0% - F6-08), 80%]	%	20.0	-
F6-10	Stop mode	0: Decelerate to stop 1: Coast to stop	N.A	0	-
F6-11	DC injection 2 frequency threshold	0.00 Hz to max. frequency	Hz	0.10	-
F6-12	DC Injection 2 delay ON set time	0.0 to 36.0	s	0.0	-
F6-13	DC injection 2 level	0 to 150	%	70	-
F6-14	DC injection 2 active set time	0.0 to 5.0	s	0.5	-
F6-26	Time proportion of S-curve at Decel start	0.0% to min. [(100.0% - F6-27), 80%]	%	50.0	-
F6-27	Time proportion of S-curve at Decel end	0.0% to min. [(100.0% - F6-26), 80%]	%	50.0	-

Group F7: product and software version checking

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F7-08	Product number	N.A	N.A	380.00	display
F7-10	Performance software version	N.A	N.A	-	display
F7-11	Functional software version	N.A	N.A	-	display
F7-15	Performance software temporary version	N.A	N.A	-	display
F7-16	Functional software temporary version	N.A	N.A	-	display

Group F8: auxiliary functions

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F8-04	Stop stage deceleration time	0.0 to 6500.0	s	2.0	-
F8-26	Frequency switchover point between deceleration time 1 and deceleration time 2	0.00 to max. frequency	Hz	0.00	-
F8-55	Brake release current threshold	0 to 200	%	20	-
F8-56	Brake release frequency threshold	0.00 to 25.00	Hz	0.20	-
F8-57	Brake release delay ON set time	0.0 to 5.0	s	0.2	-
F8-58	Brake apply frequency threshold	0.00 to 25.00	Hz	0.20	-
F8-59	Brake apply delay OFF set time	0.0 to 5.0	s	0.2	-
F8-60	Drive run delay ON set time	0.20 to 10.00	s	0.20	-
F8-61	MC contactor delay OFF set time	0.00 to 10.00	s	0.20	-
F8-62	Current threshold in UPS mode	0.0 to 200.0	%	100.0	-
F8-63	Acceleration time in UPS mode	0.0 to 20.0	s	3.0	-

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F8-64	Deceleration time in UPS mode	0.0 to 20.0	s	3.0	-
F8-65	Brake apply keep frequency set time	0.00 to 10.00	s	0.50	-
F8-66	Time proportion of S-curve at Stop stage start	0.0% to Min. [(100.0% - F8-67), 80%]	%	20.0	-
F8-67	Time proportion of S-curve at Stop stage end	0.0% to Min. [(100.0% - F8-66), 80%]	%	30.0	-
F8-68	UPS input phase mode selection	0: Three phase UPS 1: Single-/Two-phase UPS	N.A	0	-
F8-69	Single-/Two-phase UPS under voltage point	60.0 to 140.0	%	60.0	60% is 210V
F8-70	ON delay time for rescue operation	0.0 to 20.0	s	0.0	-
F8-71	Regeneration load slip	50% to 200%	%	100	-
F8-72	Rescue operation	0: Disable 1: Enable	N.A	0	-
F8-73	Rescue direction check time	0.0 to 10.0	s	1.0	-
F8-75	Rescue mode under voltage error display	0: Disable 1: Enable	N.A	0	-
F8-76	Reference speed terminal	0: Direction 1: Speed	N.A	0	-
F8-77	Change control mode	0: Disable 1: Enable	N.A	0	-
F8-78	V/F mode multi-point percentage	0% to 100%	%	100	-
F8-79	OFF delay time for rescue operation	0.0 to 240.0	s	0.0	-
F8-80	Short-floor function	0: Disable 1: Enable	N.A	0	-
F8-81	High frequency limit	F8-82 to F0-10	Hz	40.00	-
F8-82	Low frequency limit	0.00 to F8-81	Hz	30.00	-
F8-83	Short-floor running time	0.0 to 10.0	s	4.0	-
F8-84	Short-floor frequency delay time	0.0 to 4.0	s	0.0	-

Group F9: fault and protection

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F9-00	Motor thermal protection enable selection	0: Disable motor thermal protection 1: Enable motor thermal protection	N.A	1	-
F9-01	Motor thermal protection coefficient	0.1 to 10.00	N.A	1.00	-
F9-02	Motor thermal protection pre-warning coefficient	50 to 99	%	80	-
F9-07	Grounding fault detection enable	0: Disable 1: Enable detection upon power-on 2: Enable detection upon power-on and upon start	N.A	2	-
F9-08	Braking operation voltage level	700 to 800	V	750	-
F9-09	Fault auto reset times	0 to 20	N.A	0	-
F9-11	Time interval of fault auto reset	0.1 to100.0	s	1.0	-
F9-13	Drive output phase loss detection enable	0: Disable 1: Enable detection during running 2: Enable detection upon start and during running	N.A	2	-
F9-14	1st fault type	0 to 51	N.A	N.A	-
F9-15	2nd fault type	0 to 51	N.A	N.A	-
F9-16	3rd (latest) fault type	0 to 51	N.A	N.A	-
F9-17	Frequency upon 3rd fault	N.A.	Hz	N.A	-
F9-18	Current upon 3rd fault	N.A.	A	N.A	-
F9-19	Bus voltage upon 3rd fault	N.A.	V	N.A	-
F9-20	Input terminal status upon 3rd fault	N.A.	N.A	N.A	-
F9-21	Output terminal status upon 3rd fault	N.A.	N.A	N.A	-
F9-22	AC drive status upon 3rd fault	N.A	N.A	N.A	-

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
F9-23	Power-on time upon 3rd fault	N.A	N.A	N.A	-
F9-56	Temperature sensor type	0: No temperature sensor 1: PT100	N.A	0	-
F9-57	Motor overheat protection threshold	0~200	℃	110	-

Group FC: multi-reference

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
FC-00	Reference 0	0.0 to 100.0	%	10.0%	-
FC-01	Reference 1	0.0 to 100.0	%	100.0%	-
FC-02	Reference 2	0.0 to 100.0	%	11.0%	-
FC-03	Reference 3	0.0 to 100.0	%	12.0%	-
FC-04	Reference 4	0.0 to 100.0	%	40.0%	-
FC-05	Reference 5	0.0 to 100.0	%	13.0%	-
FC-06	Reference 6	0.0 to 100.0	%	14.0%	-
FC-07	Reference 7	0.0 to 100.0	%	15.0%	-
FC-08	UPS reference frequency	0.0 to 20.0	%	10.0%	-

Attention!	F4-02 to F4-04 and F4-06 Multi-Reference				
Preset Reference Selector	-	F4-02	F4-03	F4-04	F4-06
FC-00 : Reference 0	0	OFF	OFF	OFF	OFF
FC-01 : Reference 1	1	ON	OFF	OFF	OFF
FC-02 : Reference 2	2	OFF	ON	OFF	OFF
FC-03 : Reference 3	3	ON	ON	OFF	OFF
FC-04 : Reference 4	4	OFF	OFF	ON	OFF
FC-05 : Reference 5	5	ON	OFF	ON	OFF
FC-06 : Reference 6	6	OFF	ON	ON	OFF
FC-07 : Reference 7	7	ON	ON	ON	OFF

Group FF: drive parameters

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
FF-00	Factory password	0 to 65535	N.A	0	-
FF-01	Drive code	1 to 537	N.A	Model dependent	-
FF-02	G/P type selection	1: G type 2: P type	N.A	1	-
FF-03	Drive rated power	0 to 6553.5	N.A	Model dependent	display

Group FP: function code management

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
FP-00	User password	0 to 65535	N.A	0	-
FP-01	Parameter initialization	0: No operation 01: Restore factory settings except motor parameters 02: Clear records 04: Restore user backup parameters 501: Back up current user parameters	N.A	0	-
FP-03	Parameter display selection	7-segment 0 0	N.A	0	-
	Modified parameters: 0: No display 1: Display				
	Customized parameters: 0: No display 1: Display				

Group A5: control optimization

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
A5-06	Undervoltage threshold	60.0 to 140.0	%	130.0	100% is 350V
A5-09	Overvoltage tripping level	200.0 to 2500.0	V	810	-

Group U0: monitoring

Parameter	Parameter Name	Setting Range	Unit	Default	Commission
U0-00	Running frequency	N.A	Hz	N.A	-
U0-01	Set frequency	N.A	Hz	N.A	-
U0-02	Bus voltage	N.A	V	N.A	-
U0-03	Output voltage	N.A	V	N.A	-
U0-04	Output current	N.A	A	N.A	-
U0-05	Output power	N.A	kW	N.A	-
U0-06	Output torque	N.A	%	N.A	-
U0-07	DI state	N.A	N.A	N.A	-
U0-08	DO state	N.A	N.A	N.A	-
U0-09	AI1 voltage	N.A	V	N.A	-
U0-10	AI2 voltage	N.A	V	N.A	-
U0-11	AI3 voltage	N.A	V	N.A	-
U0-34	The temperature sensor real-value display	N.A	°C	N.A	-
U0-41	DI state visual display	N.A	N.A	N.A	-
U0-42	DO state visual display	N.A	N.A	N.A	-
U0-65	Torque upper limit	N.A	%	N.A	-
U0-66	Remember current before UPS	N.A	A	N.A	-

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