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Industrial Automation Headquarters

Delta Electronics, Inc.
Taoyuan Technology Center
18 Xinglong Road, Taoyuan District,
Taoyuan City 33068, Taiwan (R.O.C.)
TEL: 886-3-362-6301 / FAX: 886-3-371-6301

Asia

Delta Electronics (Jiangsu) Ltd.
Wujiang Plant 3
1688 Jiangxing East Road,
Wujiang Economic Development Zone
Wujiang City, Jiang Su Province, P.R.C. 215200
TEL: 86-512-6340-3008 / FAX: 86-769-6340-7290

Delta Greentech (China) Co., Ltd.
238 Min-Xia Road, Pudong District,
ShangHai, P.R.C. 201209
TEL: 86-21-58635678 / FAX: 86-21-58630003

Delta Electronics (Japan), Inc.
Tokyo Office
2-1-14 Minato-ku Shibadaimon,
Tokyo 105-0012, Japan
TEL: 81-3-5733-1111 / FAX: 81-3-5733-1211

Delta Electronics (Korea), Inc.
1511, Byucksan Digital Valley 6-cha, Gasan-dong,
Geumcheon-gu, Seoul, Korea, 153-704
TEL: 82-2-515-5303 / FAX: 82-2-515-5302

Delta Electronics Int'l (S) Pte Ltd.
4 Kaki Bukit Ave 1, #05-05, Singapore 417939
TEL: 65-6747-5155 / FAX: 65-6744-9228

Delta Electronics (India) Pvt. Ltd.
Plot No 43 Sector 35, HSIIDC
Gurgaon, PIN 122001, Haryana, India
TEL : 91-124-4874900 / FAX : 91-124-4874945

Americas

Delta Products Corporation (USA)
Raleigh Office
P.O. Box 12173,5101 Davis Drive,
Research Triangle Park, NC 27709, U.S.A.
TEL: 1-919-767-3800 / FAX: 1-919-767-8080

Delta Greentech (Brasil) S.A.
Sao Paulo Office
Rua Itapeva, 26 - 3° andar Edificio Itapeva One-Bela Vista
01332-000-São Paulo-SP-Brazil
TEL: 55 11 3568-3855 / FAX: 55 11 3568-3865

Europe

Deltronics (The Netherlands) B.V.
Eindhoven Office
De Witbogt 20, 5652 AG Eindhoven, The Netherlands
TEL: 31-40-2592850 / FAX: 31-40-2592851

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Delta Door Control Drive & Motor VFD-DD Series User Manual

Delta Door Control Drive & Motor
VFD-DD Series User Manual

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Preface

Firmware Version 2.01

Thank you for choosing DELTA's high-performance VFD-D D Series. The VFD-DD Series is manufactured with high-quality components and materials and incorporate the latest microprocessor technology available.

This manual is to be used for the installation, parameter setting, troubleshooting, and daily maintenance of the AC motor drive. To guarantee safe operation of the equipment, read the following safety guidelines before connecting power to the AC motor drive. Keep this operating manual at hand and distribute to all users for reference.

To ensure the safety of operators and equipment, only qualified personnel familiar with AC motor drive are to do installation, start-up and maintenance. Always read this manual thoroughly before using VFD-M-D series AC Motor Drive, especially the WARNING, DANGER and CAUTION notes. Failure to comply may result in personal injury and equipment damage. If you have any questions, please contact your dealer.

PLEASE READ PRIOR TO INSTALLATION FOR SAFETY.

- ☑ AC input power must be disconnected before any wiring to the AC motor drive is made.
- ☑ A charge may still remain in the DC-link capacitors with hazardous voltages, when the power is turned off.
- ☑ There are highly sensitive CMOS IC components on the printed circuit boards. These components are especially sensitive to static electricity. To prevent damage to these components, do not touch these components or the circuit boards with metal objects or your bare hands.
- ☑ Ground the VFD-DD drive using the ground terminal. The grounding method must comply with the local standard of the country which the drive is installed.
- ☑ VFD-DD series can only be used for variable speed control of 3-phase induction motors, it should NOT be applied to 1-phase motors or other purpose.
- ☑ VFD-DD series is a specific drive for elevator door and other automatic door control. It should not be installed in a location that may cause personal injury.
- ☑ To prevent personal injury, please keep children and unqualified people away from the equipments.

WARNING

- ☑ Do NOT connect AC main power directly to the drive's output terminals U/T1, V/T2 and W/T3.
- ☑ DO NOT use Hi-pot test for internal components. The semi-conductor used in the AC motor drive is easily damaged by high-pressure.
- ☑ A charge may still remain in the main circuit terminals with hazardous voltages, even when motor has come to stop.
- ☑ Only the qualified technicians are allowed to install, wire and maintain AC motor drive.
- ☑ Be aware of the motor that it may rotates as soon as the RUN key is pressed using an external digital keypad, DO NOT stand next to the motor.

CAUTION

- ☑ DO NOT install the AC motor drive in a place subjected to high temperature, direct sunlight, high humidity, excessive vibration, corrosive gases or liquids, or airborne dust or metallic particles.
- ☑ Follow the installation instructions when installing the AC motor drive. Failure to comply may result in fire, explosion or electric shock.
- ☑ When the motor cable between the AC motor drive and motor is too long, the layer insulation of the motor may be damaged.
- ☑ The rated voltage for the AC motor drive must be ≤ 240V and the mains supply current capacity must be ≤ 5000A RMS.
- ☑ If the AC motor drive is stored in no charge condition for more than 3 months, the ambient temperature should not be higher than 30 °C. Storage longer than one year is not recommended, it could result in the degradation of the electrolytic capacitors.
- ☑ Pay attention to the following when transporting and installing this package (including wooden crate, wood stave and carton box)
  1. If you need to sterilize, deworm the wooden crate or carton box, please do not use steamed smoking sterilization or you will damage the VFD.
  2. Please use other ways to sterilize or deworm.
  3. You may use high temperature to sterilize or deworm. Leave the packaging materials in an environment of over 56℃ for 30 minutes.
  4. It is strictly forbidden to use steamed smoking sterilization. The warranty does not covered VFD damaged by steamed smoking sterilization.

- Some of the graphics shown in this manual are the inner part of the drive after the cover is removed, when VFD-DD is in operation status, please make sure the cover and wiring are in the specified space as the manual indicates for personal safety.
- The drive customers received may be slightly different than the figures shown in the manual, this condition is normal and will cause no influences to the customer rights.

- Delta is always improving our products for greater efficiency; the content of this document may be modified or changed without prior notice. Please contact your local distributors or visit our website to download the most updated version at http://www.delta.com.tw/industrialautomation/.
- The AC motor drive may also be called as “drive”, all drive mentioned in this manual refers to the AC motor drive.

Table of Content

Publication History

Please include the Issue Edition and the Firmware Version, both shown below, when contacting technical support regarding this publication.

Issue Edition: 02.

Firmware Version: 1.xx

Issue date: October 2015

Publication History
CH01 01. Modify nameplate information. 02. Modify the model name. 03. Modify the serial number. 04. Modify <Dimensions of Motor> in <1-3 Dimensions>. 05 Add a new model VFD002DD21F in Page1-7.
CH02 01. Modify the wiring diagram in <2-1 Wiring Diagram>.
CH03 01. Modify Figure 3-1 in <3-1 Operation Method>.
CH04 **01. Pr00-04: Modify #18 as Actual feedback frequency of encoder when malfunction; #20 as Actual output frequency (H.) when malfunction.** 02. Pr00-11: Remove <02~10kHz (for VFDXXXDDXXE model only). 03. Pr01-05: Modify the factory setting as Pr00-00=0: 24.01; Pr00-00= 2: 14.41. 04. Pr01-07: Modify the factory setting as Pr00-00= 0: 248.4; Pr00-00= 2: 149.1. 05. Pr01-29: Support FOCPM control. 06. Pr01-30: Support FOCPM control. 07. Pr02-12: Modify the setting as: 27: Obstruction when open door; 28: Over Torque Detect 1 (OT1, Pr06-27~ Pr06-29). 08. Pr03-03: Modify the setting as 1: Fault and ramp to stop; 2: Fault and stop operation. 09. Pr03-09: Modify the setting as 1: Fault and ramp to stop; 2: Fault and stop operation. 10. Pr03-05 ~Pr03-09: Not support SVC control. 11. Pr03-09: Support FOCPM control. 12. Pr03-10 ~Pr03-13: Not support VF, VFPG and SVC control. 13. Pr04-01, Pr04-04, Pr04-06: Not support VF, SVC control. 14. Pr04-24: Support FOCPM control. 15. Pr04-25: Modify the setting as 0.0~200.0%. 16. Add new parameters Pr04-26 ~ Pr04-30. 17. Pr05-01, Pr05-04, Pr05-06: Not support VF, SVC control. 18. Pr05-24: Support FOCPM control. 19. Pr05-25~ Pr05-34: Not support VF, VFPG, SVC control. 20. Pr06-08: Modify as <Low Voltage Level>. 21. Pr06-10: Add Bit8= 0, Bit8= 1, (Not support VF/SVC) 22. Pr06-10: Bit9= 0: Reserved, Bit9= 1: Reserved. 23. Pr06-11 #3: Door open and close limit signal (Support all control mode) 24. Pr06-11: Not support VF, SVC control. 25. Pr06-12: Modify the factory setting as 80. 26. Pr06-17~ Pr06-22: Modify as 23~25: Reserved, 27~29: Reserved, 26: ot1. 27. Pr-06-25: Modify a description of this parameter as < After fault occurs (oc, ov and Lv), …>. 28. Pr06-29: Modify the setting as 0.1~60.0sec. 29. Pr07-00: Modify as <Reverse Running Control (Kp) of Zero Speed>, Factory Setting: 100.0. 30. Pr07-01: Modify as <Reverse Running Control (KI) of Zero Speed>, Factory Setting:

1.000

31. Pr07-02: Modify as <Reverse Running Control (Kp)1 of Low Speed>, Factory setting: 100.0
32. Pr07-03: Modify as <Reverse Running Control (KI) 1 of Low Speed, Factory setting: 1.000.
33. Pr07-04: Modify as <Reverse Running Control (Kp)2 of High Speed>, Factory Setting = 100.0
34. Pr07-05: Modify as <Reverse Running Control (KI) 2 of High Speed>, Factory Setting: 1.000.
35. Pr07-06: Modify as < Low Speed/ High Speed Switch Frequency, Maximum frequency: 120.00Hz>.
36. Pr07-07: Modify as< ASR Low Pass Filter Gain>.
37. Pr07-08: Modify as < Zero Speed/ Low Speed Width Adjustment>.
38. Pr07-09, Modify as < Low Speed/ High Speed Width Adjustment>.
39. Pr07-10: Modify as <Gear Ratio>
40. Pr07-11: Modify the setting as 1~1000% and the factory setting as 500.
41. Pr07-12, Pr07-13, Pr07-14: Modify the factory setting as 10.
42. Pr07-16: Modify the factory setting as 14.
43. Add new Pr07-17, Forward Running Control (Kp) of Zero Speed
44. Add new Pr07-18, Forward Running Control (KI) of Zero Speed.
45. Add new Pr07-19, Forward Running Control (Kp)1 of Low Speed
46. Add new Pr07-20, Forward Running Control (KI) 1 of Low Speed
47. Add new Pr07-21, Forward Running Control (Kp) 2 of High Speed
48. Add new Pr07-22, Forward Running Control (KI) 2 of High Speed
49. Pr07-00~ Pr07-22: Not support VF, VFPG, SVC control
50. Page4-55: Modify the description of RS485 on this page.
51. Pr09-02: Modify setting as 1: Fault and ramp to stop
52. Page4-24, Pr00-01: Modify setting as 00.00=0: 1.50A, 00.00=2: 2.50A
53. Page4-25, Pr00-07: Modify an explanation as “password has been correctly entered in Pr.0-06”.
54. Page4-38, Pr03-03: Modify setting as 1: Fault and ramp to stop; 2: Fault and stop operation
55. Page4-38, Pr03-09: Modify the setting as 1: Fault and ramp to stop; 2: Fault and stop operation.

CH06

01. Section 6-1, remove fault code < occ > .

Appendix A

01. Overload capacity: Modify as 150% for 120 sec..

Issue Edition: 03

Firmware Version: 2.xx

Issue date: November 2015

Publication History

CH01

1. Modify the model name information

CH02

1. 2-3 Control Circuit Terminal: Modify the torque as 5 kgf-cm (4.34 lbf-in), and the wire gauge as 28-12 AWG (0.5-2.5mm^2)
2. Add 2-4 PG Circuit Terminal

CH04

1. Pr00-14: Add the following explanations.

- 🕮 The Demo Mode is for displaying or testing.
- 🕮 The Demo Mode can be triggered by multi-function input terminals (Set Pr02-01 to Pr02-05 as 10: Demo Mode).
- 🕮 The Demo Mode can also be controlled via Multi-function output terminals (Set Pr02-10 to Pr02-12 as 12 for Demo Indication or 13 for Demo Complete).
- 🕮 Door Open/Close Holding Time before Next Demo can be set by Pr06-13.
- 🕮 Times of Door Open/Close in Demo Mode (L) is recorded by Pr06-14 (from single digit to thousands digit). Times of Door Open/Close in Demo Mode (H) can also be recorded by Pr06-15 (from ten thousands digit to ten millions digit.

2. Pr05-33: Modify the setting as 0~10.0 sec.
3. Pr06-16: Remove the ↗ sign.
4. Pr06-22: Modify #69 as < Door open/ close time-out (DOT)>
5. Pr06-23, Modify the factory setting as 0.
6. Pr06-25, Modify the factory setting as 10.
7. Group 07: Add the following explanation at the beginning of this group.
   About forward/ reverse running: When the CLOSE light on the digital keypad comes on, that indicates the motor is running forward. When the OPEN light on the digital keypad comes on, that indicates the motor is running reversely. However the indication of these two lights has nothing to do with the open/close of the elevator doors.
8. Pr07-01, Pr07-03, Pr07-18, Pr07-20: Modify the factory setting as 0.1

CH06

1. Chapter 6-1 Common Problems and Solutions: Modify the description of <dot> as <Door open/close time-out>.

Chapter 1 Introduction

The AC motor drive should be kept in the shipping carton or crate before installation. In order to retain the warranty coverage, the AC motor drive should be stored properly when it is not to be used for an extended period of time. Storage conditions are:

- ☑ Store in a clean and dry location free from direct sunlight or corrosive fumes.
- ☑ Store within an ambient temperature range of -20 °C to +60 °C.
- ☑ Store within a relative humidity range of 0% to 90% and non-condensing environment.
- ☑ Store within an air pressure range of 86 kPA to 106kPA.
- ☑ DO NOT place on the ground directly. It should be stored properly. Moreover, if the surrounding environment is humid, you should put exsiccator in the package.
- ☑ DO NOT store in an area with rapid changes in temperature. It may cause condensation and frost.
- ☑ If the AC motor drive is stored for more than 3 months, the temperature should not be higher than 30 °C. Storage longer than one year is not recommended, it could result in the degradation of the electrolytic capacitors.
- ☑ When the AC motor drive is not used for longer time after installation on building sites or places with humidity and dust, it's best to move the AC motor drive to an environment as stated above.

1-1 Receiving and Inspection

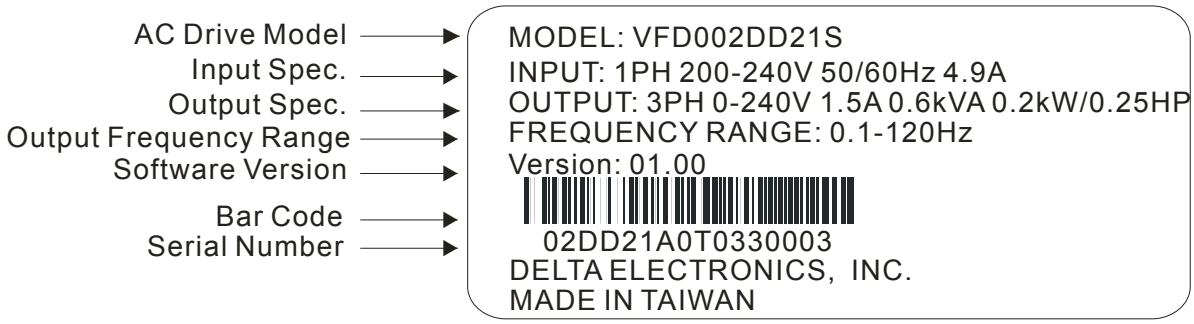
This VFD-VL AC motor drive has gone through rigorous quality control tests at the factory before shipment. After receiving the AC motor drive, please check for the following:

- ☑ Check to make sure that the package includes an AC motor drive, the User Manual/Quick Start and CD.
- ☑ Inspect the unit to assure it was not damaged during shipment.
- ☑ Make sure that the part number indicated on the nameplate corresponds with the part number of your order.

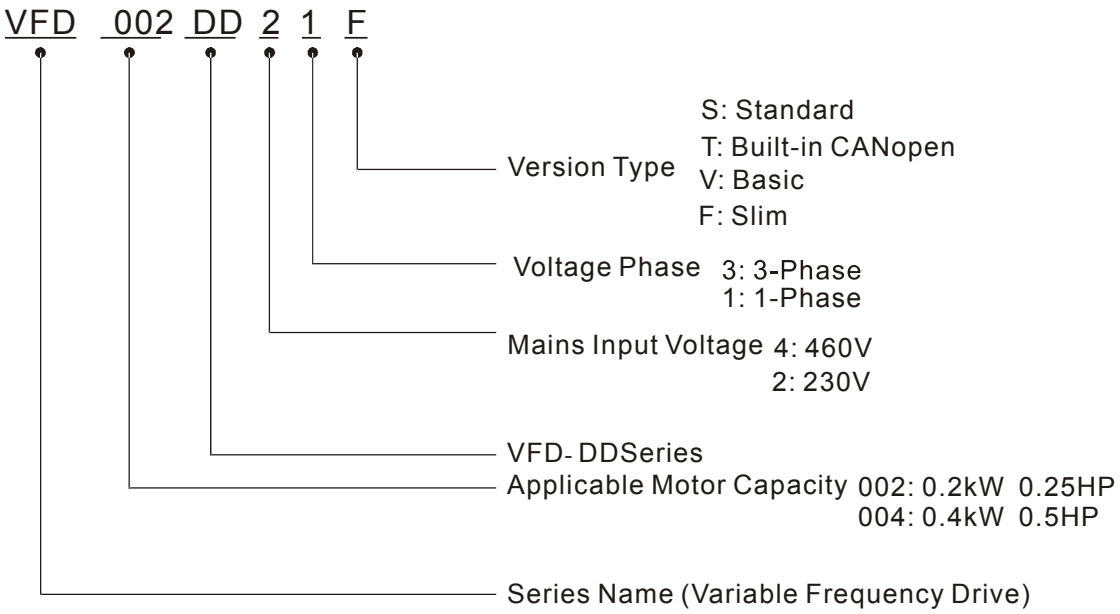
If the nameplate information does not correspond with your purchase order or if there are any problems, please contact your local distributor.

Nameplate Information:

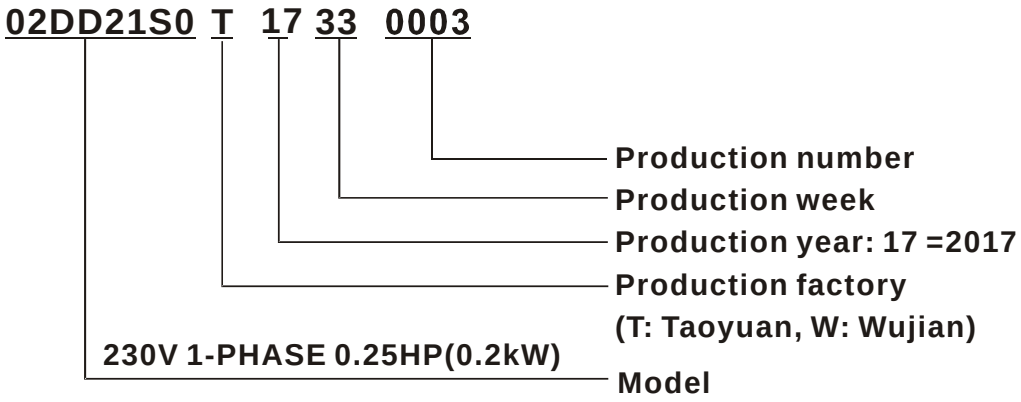
Example for 0.2kW/0.25HP 230V 1-Phase AC motor drive



Model Name:



Serial Number:



1-2 Preparation for Installation and Wiring

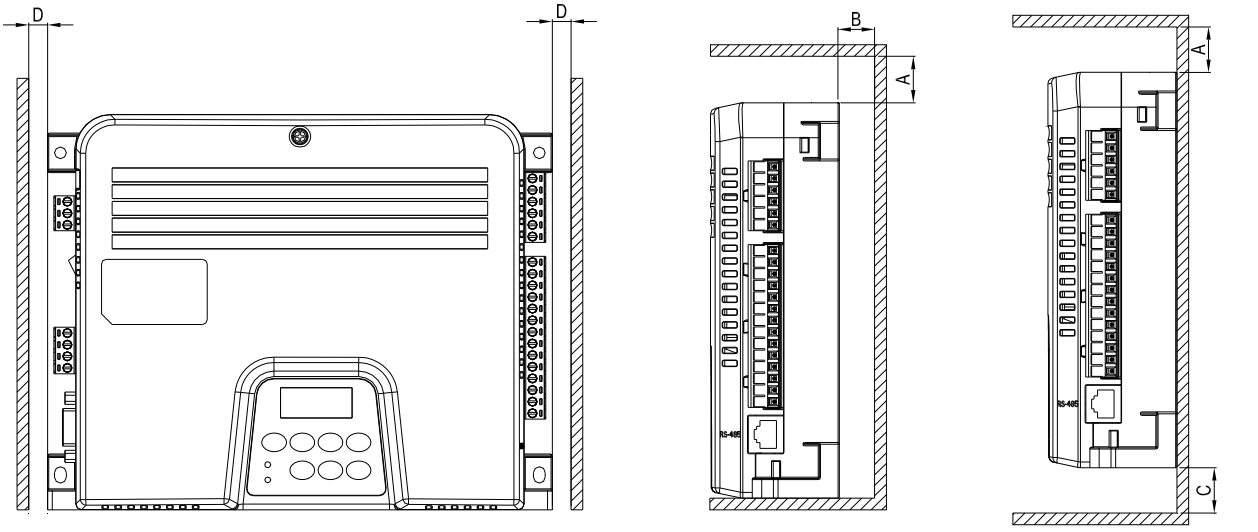
Install the AC motor drive in an environment with the following conditions:

Operation	Air Temperature:	-10 ~ +45°C (14 ~ 113°F)
	Relative Humidity:	<90%, no condensation allowed
	Atmosphere pressure:	86 ~ 106 kPa
	Installation Site Altitude:	<1000m
	Vibration:	<20Hz: 9.80 m/s^2 (1G) max 20 ~ 50Hz: 5.88 m/s^2 (0.6G) max
Storage Transportation	Temperature:	-20°C ~ +60°C (-4°F ~ 140°F)
	Relative Humidity:	<90%, no condensation allowed
	Atmosphere pressure:	86 ~ 106 kPa
	Vibration:	<20Hz: 9.80 m/s^2 (1G) max 20 ~ 50Hz: 5.88 m/s^2 (0.6G) max
Pollution Degree	2: can be used in a factory type environment.	

Minimum Mounting Clearances

☑ The drive installation can be on a platform or on the wall. The left and middle figures show the drive installation on a platform from the front and the side-view. The right figure shows wall mounting. Both platform mounting and wall mounting are required to keep minimum mounting clearances for good ventilation.

A	B	C	D
20mm	15mm	20mm	8mm



CAUTION!

1. Mount the AC motor drive vertically on a flat vertical surface by using bolts or screws. Other directions are not allowed.
2. The AC motor drive will generate heat during operation. Allow sufficient space around the unit for heat dissipation. When the AC motor drive is installed in a confined space (e.g. cabinet), the surrounding temperature must be with good ventilation. DO NOT install the AC motor drive in a space with bad ventilation.
3. The heat sink temperature may rise to 90°C when running. The material on which the AC motor drive is mounted must be noncombustible and be able to withstand this high temperature.
4. When installing multiple AC motor drives in the same cabinet, they should be adjacent in a row with enough space in-between. When installing one AC motor drive below another one, use a metal separation barrier between the AC motor drives to prevent mutual heating.

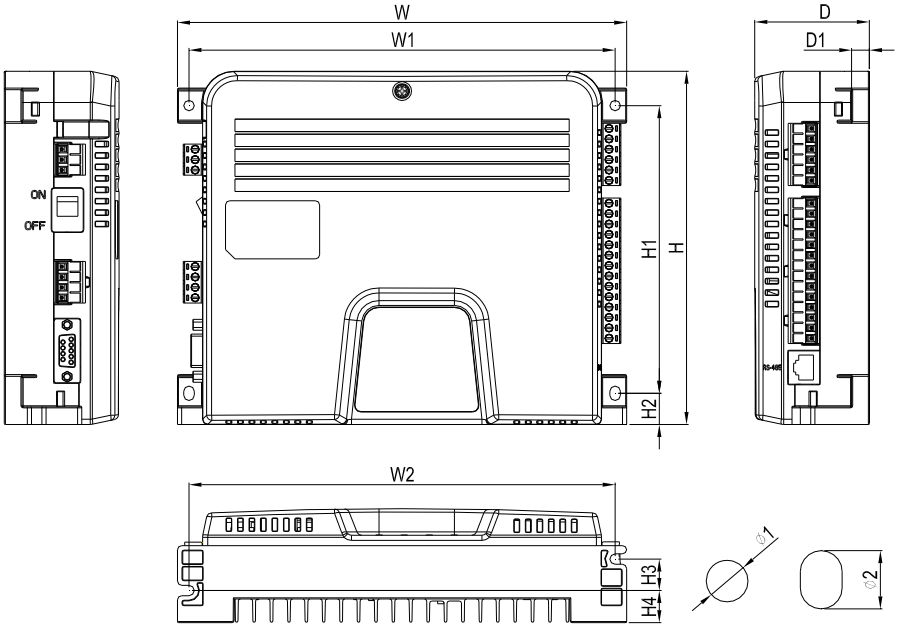
NOTE

Prevent fiber particles, scraps of paper, saw dust, metal particles, etc. from adhering to the heatsink.

It is strongly recommend mounting the AC motor drive to inflammable materials such as metal for fire prevention.

1-3 Dimensions

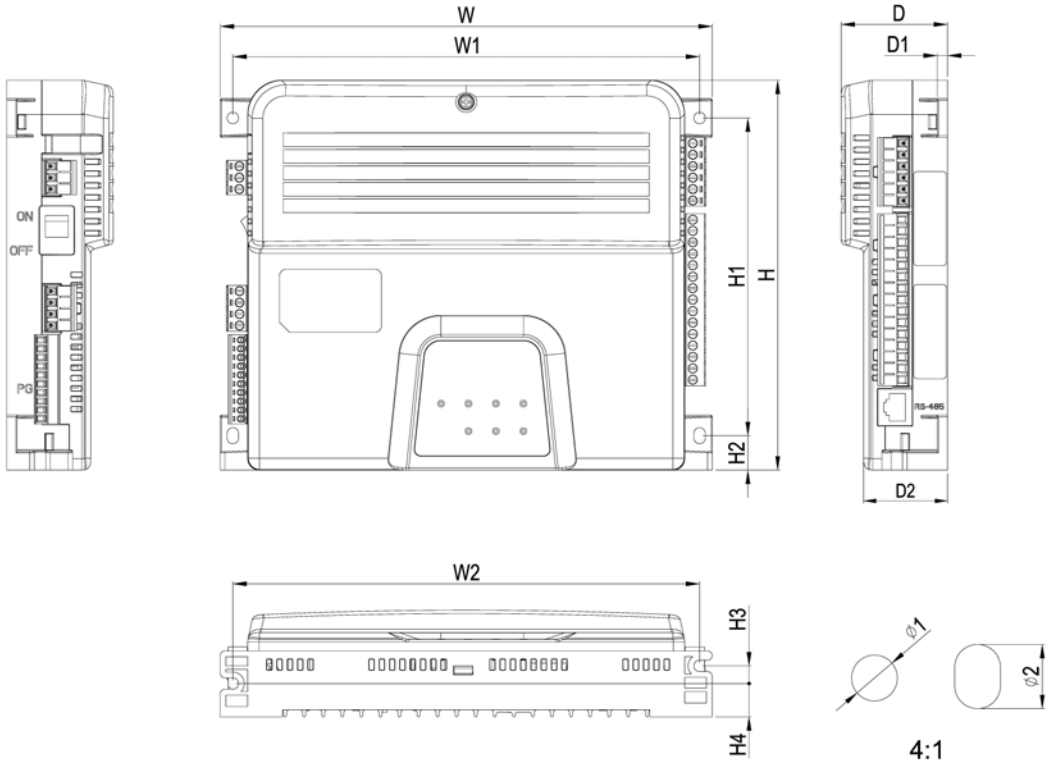
VFD002DD21S; VFD002DD21T; VFD004DD21S; VFD004DD21T; VFD002DD21V; VFD004DD21V



Unit: mm [inch]

W	W1	W2	H	H1	H2	H3	H4	D	D1	Φ1	Φ2
215.0 [8.46]	204.0 [8.03]	204.0 [8.03]	170.0 [6.69]	138.5 [5.45]	15.0 [0.59]	15.1 [0.59]	15.5 [0.61]	55.0 [2.17]	8.5 [0.34]	5.0 [0.20]	7.0 [0.28]

VFD002DD21F:

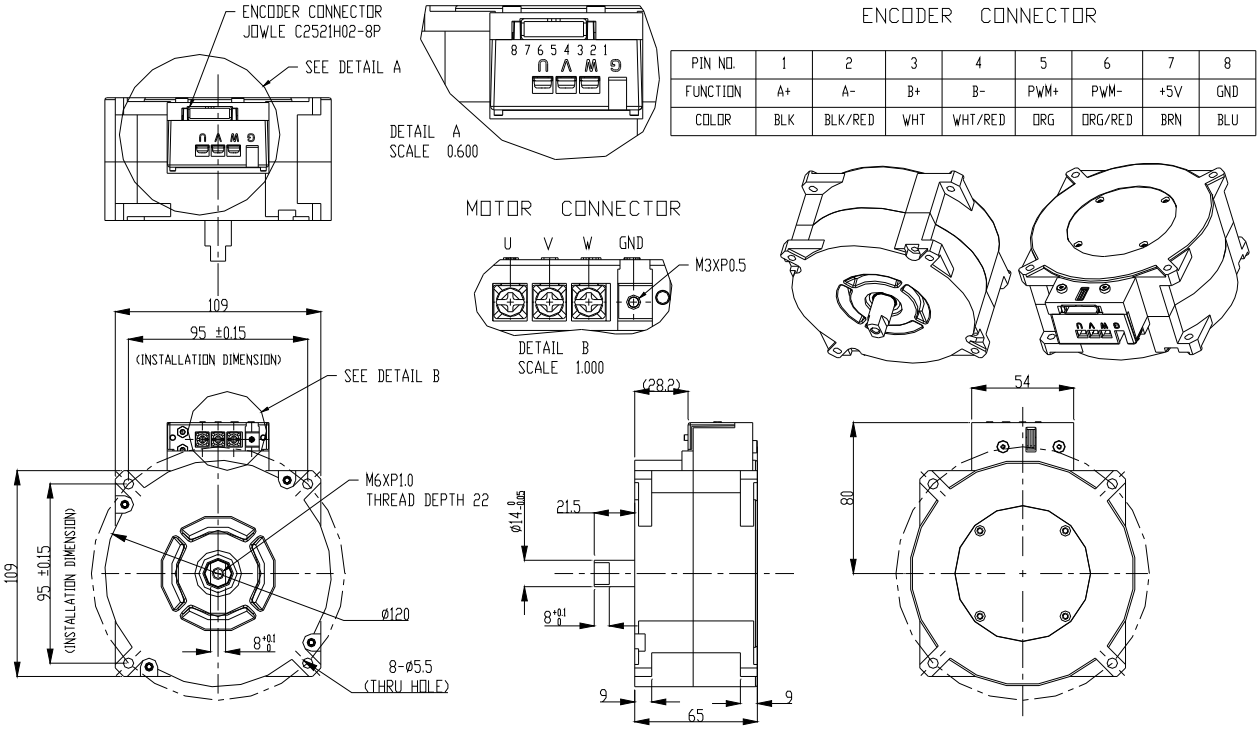


DIMENSIONAL UNIT:mm[inch]

W	W1	W2	H	H1	H2	H3	H4	D	D1	D2	ø1	ø2
215.0[8.46]	204.0[8.03]	204.0[8.03]	170.0[6.69]	138.5[5.45]	15.0[0.59]	7.7 [0.30]	14.5 [0.57]	46.5 [1.83]	4.5 [0.17]	36.7 [1.44]	5.0[0.20]	7.0[0.28]

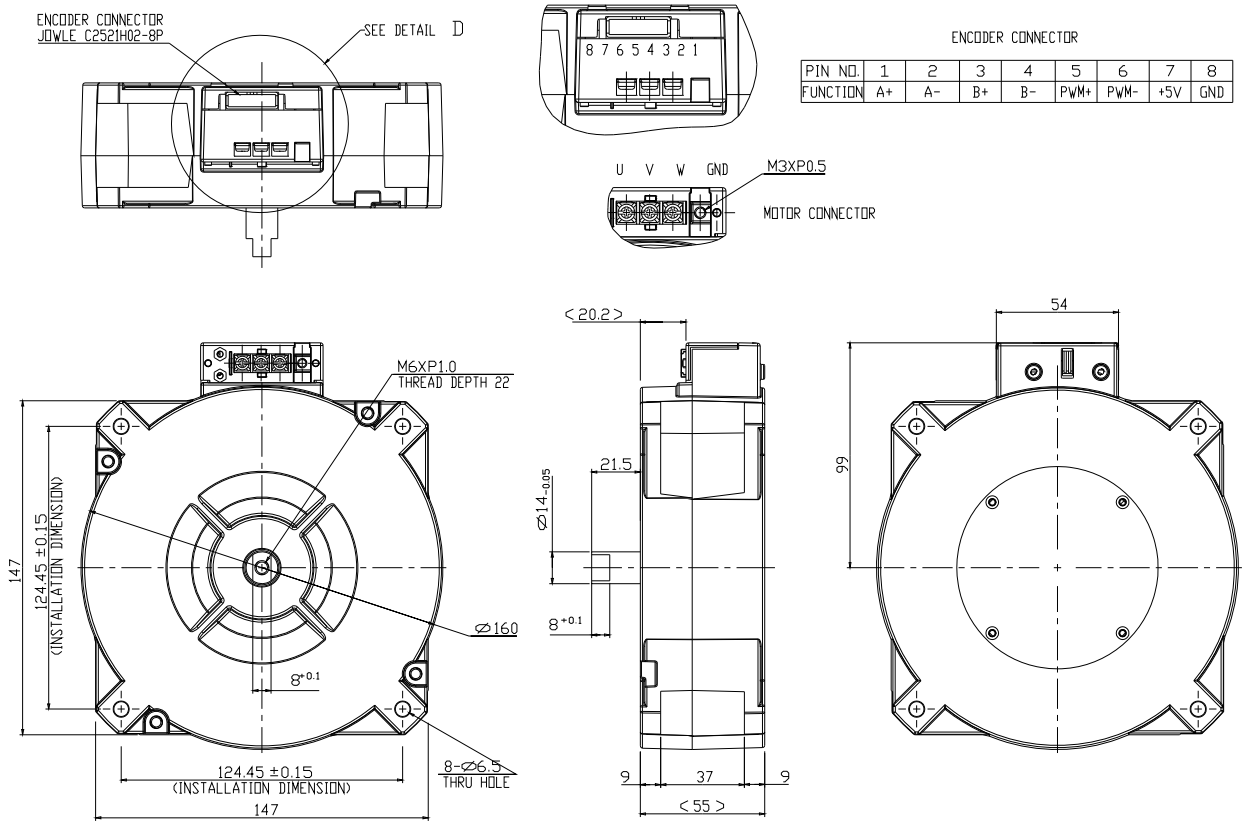
Dimensions of Motor

ECMD-B91207M_



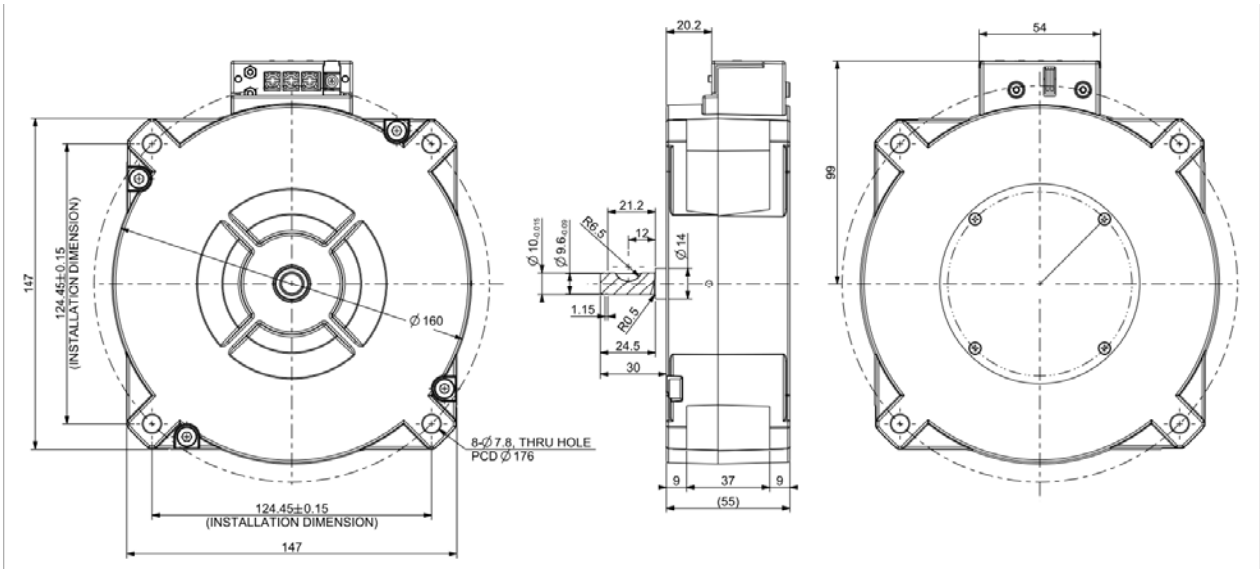
ENCODER CONNECTOR								
PIN NO.	1	2	3	4	5	6	7	8
FUNCTION	A+	A-	B+	B-	PWM+	PWM-	+5V	GND
COLOR	BLK	BLK/RED	WHT	WHT/RED	ORG	ORG/RED	BRN	BLU

ECMD-B91608M_/B81610MS



ENCODER CONNECTOR								
PIN NO.	1	2	3	4	5	6	7	8
FUNCTION	A+	A-	B+	B-	PWM+	PWM-	+5V	GND

ECMD-B8160MG



Chapter 2 Wiring

After removing the front cover, examine if the power and control terminals are clearly noted. Please read following precautions before wiring.

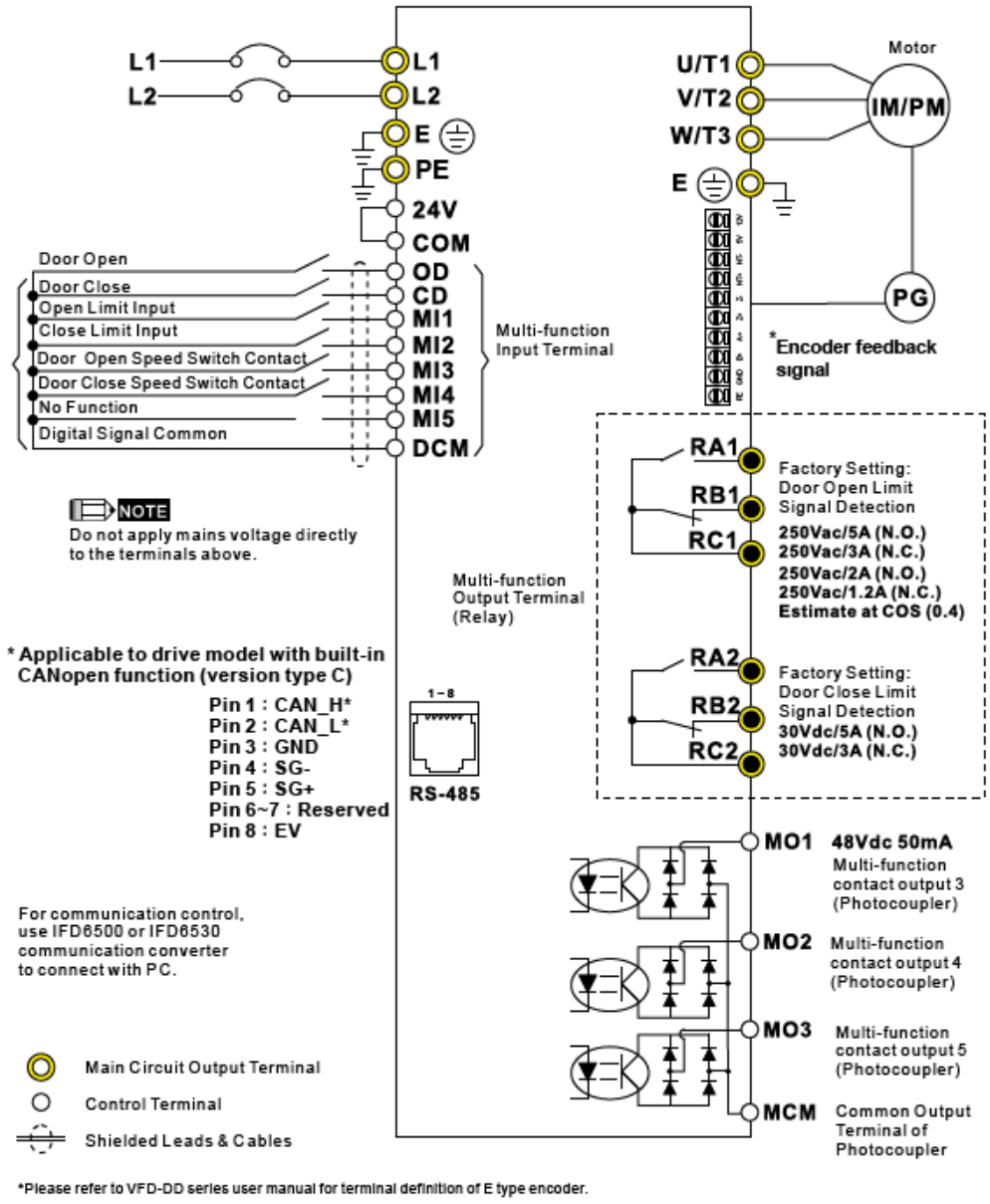
- ☑ Make sure that power is only applied to the R/L1, S/L2, and T/L3 terminals. Failure to comply may result in damage to the equipments. The voltage and current should lie within the range as indicated on the nameplate (Chapter 1-1).
- ☑ All the units must be grounded directly to a common ground terminal to prevent lightning strike or electric shock.
- ☑ Please make sure to fasten the screw of the main circuit terminals to prevent sparks which is made by the loose screws due to vibration

 **DANGER**	☑ It is crucial to turn off the AC motor drive power before any wiring installation is made. A charge may still remain in the DC bus capacitors with hazardous voltages even if the power has been turned off therefore it is suggested for users to measure the remaining voltage before wiring. For your personnel safety, please do not perform any wiring before the voltage drops to a safe level < 25 Vdc. Wiring installation with remaining voltage condition may cause sparks and short circuit. ☑ Only qualified personnel familiar with AC motor drives is allowed to perform installation, wiring and commissioning. Make sure the power is turned off before wiring to prevent electric shock.
 **CAUTION**	☑ When wiring, choose the wires with specification that complies with local regulation for personnel safety. ☑ Check following items after finishing the wiring: 1. Are all connections correct? 2. No loose wires? 3. No short-circuits between terminals or to ground?

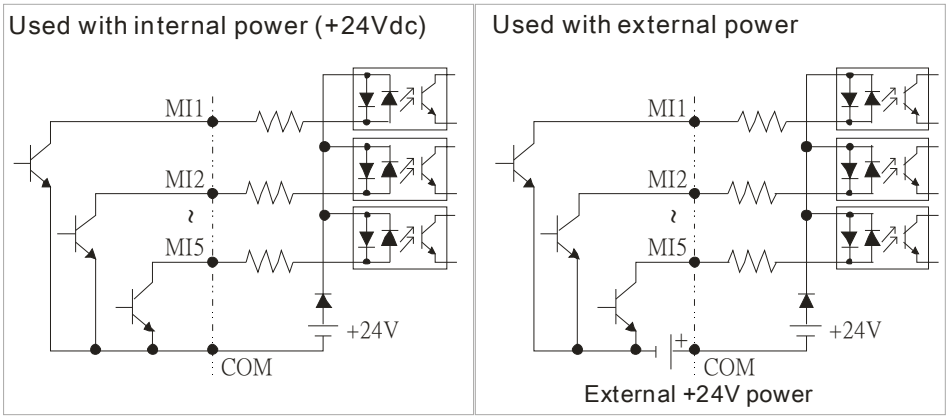
2-1 Wiring Diagram

When wiring for an AC motor drive, user needs to connect wires to two sections, main circuit and control circuit. Please properly connect wires to your AC motor drive according to the circuit diagram provide in the following pages.

VFD-DD Basic Wiring Diagram:



Wiring/Terminals Setting:



CAUTION!

- ☑ The wiring of main circuit and control circuit should be separated to prevent erroneous actions.
- ☑ Please use shield wire for the control wiring and not to expose the peeled-off net in front of the terminal.
- ☑ Please use the shield wire or tube for the power wiring and ground the two ends of the shield wire or tube.
- ☑ Damaged insulation of wiring may cause personal injury or damage to circuits/equipment if it comes in contact with high voltage.
- ☑ The AC motor drive, motor and wiring may cause interference. To prevent the equipment damage, please take care of the erroneous actions of the surrounding sensors and the equipment.
- ☑ When the AC drive output terminals U/T1, V/T2, and W/T3 are connected to the motor terminals U/T1, V/T2, and W/T3, respectively. To permanently reverse the direction of motor rotation, switch over any of the two motor leads.
- ☑ With long motor cables, high capacitive switching current peaks can cause over-current, high leakage current or lower current readout accuracy. For usage of long motor cables use an AC output reactor.
- ☑ The AC motor drive, electric welding machine and the greater horsepower motor should be grounded separately.
- ☑ Use ground leads that comply with local regulations and keep them as short as possible.

CAUTION	☑ The wiring of main circuit and control circuit should be separated to prevent erroneous actions. ☑ Please use shield wire for the control wiring and not to expose the peeled-off net in front of the terminal. ☑ Please use the shield wire or tube for the power wiring and ground the two ends of the shield wire or tube. ☑ Damaged insulation of wiring may cause personal injury or damage to circuits/equipment if it comes in contact with high voltage. ☑ The AC motor drive, motor and wiring may cause interference. To prevent the equipment damage, please take care of the erroneous actions of the surrounding sensors and the equipment. ☑ The AC drive output terminals U/T1, V/T2, and W/T3 should connect to the motor terminals U/T1, V/T2, and W/T3 respectively. To reverse the direction of motor rotation, please switch over any of the two motor leads. ☑ With long motor cables, high capacitive switching current peaks can cause over-current, high leakage current or lower current readout accuracy. For longer motor cables use an AC output reactor. ☑ The AC motor drive, electric welding machine and the greater horsepower motor should be grounded separately. ☑ Use ground leads that comply with local regulations and keep them as short as possible. ☑ To ensure the safety of personnel, proper operation, and to reduce

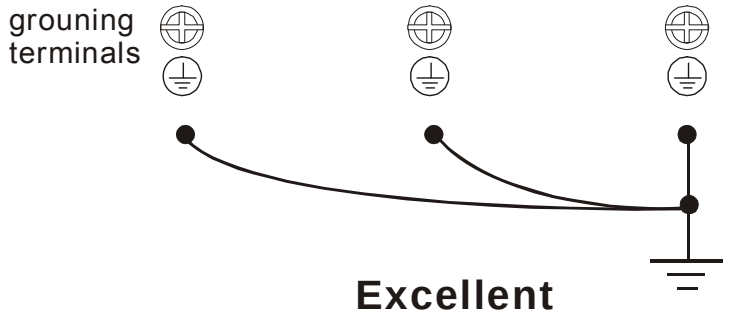
electromagnetic radiation, the motor drive must be grounded during installation.

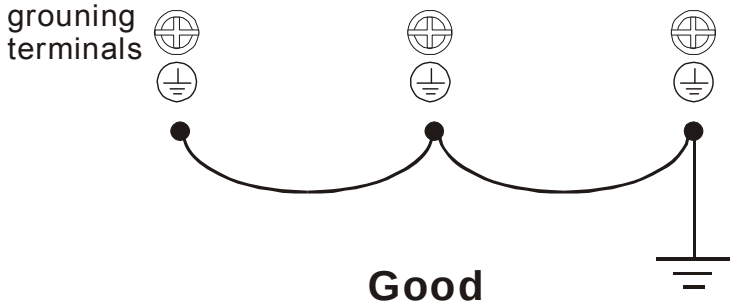
☑ The diameter of the cables must meet the size specified by safety regulations.

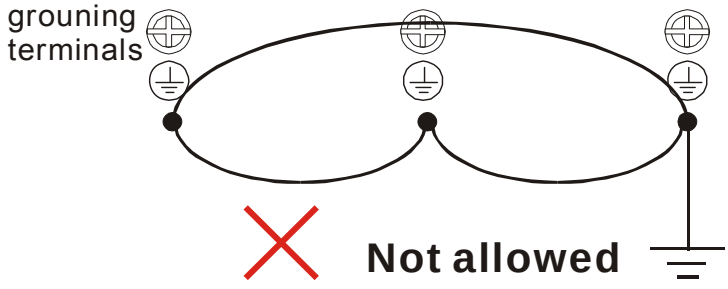
☑ The earthing cable must be connected to the ground of the motor drive to meet safety regulations

☑ The earthing cable can only be used as the ground for equipment when the aforementioned points are met.

☑ Multiple AC drives can be installed in one location. All the units should be grounded directly to a common ground terminal, as shown in the figure below. **Ensure there are no ground loops.**

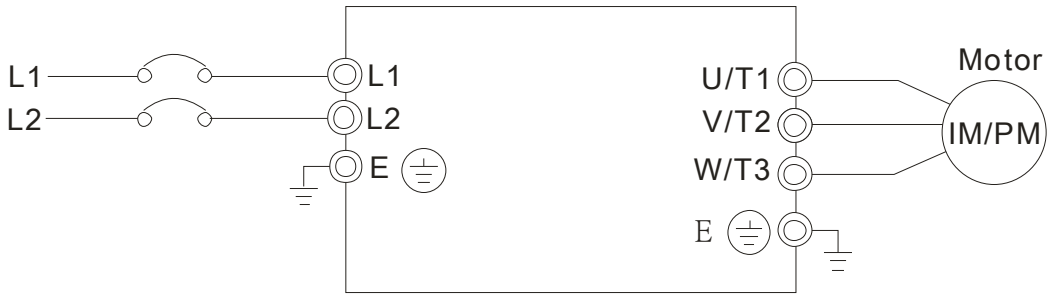






2-2 Main Circuit Terminal

Main Circuit Terminal



Wire Gauge	Torque	Wire Type
14-12 AWG. (2.075-3.332mm^2)	5.2kgf-cm (4.5in-lbf)	Stranded copper only, 75°C

Terminal Symbol	Explanation of Terminal Functions
L1, L2	AC line input terminals
U/T1, V/T2, W/T3	AC drive output terminals for connecting 3-phase induction motor
⏚ E	Earth connection, please comply with local regulations.

CAUTION

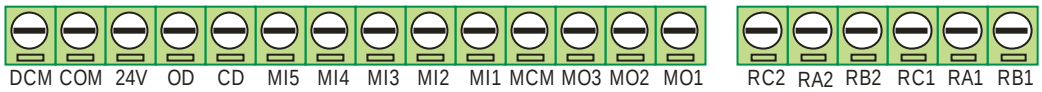
Mains power terminals：

- ☑ Power can be connected to either L1 or L2.
- ☑ Please make sure to fasten the screw of the main circuit terminals to prevent sparks which is made by the loose screws due to vibration
- ☑ Please use voltage and current within the regulation shown in Appendix A.
- ☑ For the AC motor drive built-in with a general type of GFCI (Ground Fault Circuit Interrupter), it is suggested to select a current sensor with sensitivity of 200mA, and not less than 0.1-second detection time to avoid nuisance tripping. When selecting a GFCI that is specially designed for an AC motor drive, please select the current sensor with sensitivity of 30mA or above.
- ☑ Please use the shield wire or tube for the power wiring and ground the two ends of the shield wire or tube.
- ☑ Do NOT run/stop AC motor drives by turning the power ON/OFF. Run/stop AC motor drives by RUN/STOP command via control terminals or keypad. If you still need to run/stop AC drives by turning power ON/OFF, it is recommended to do so only ONCE per hour.

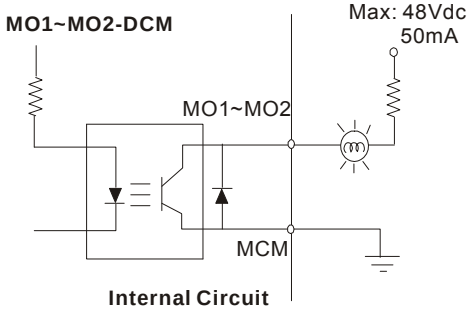
Output terminals for main circuit：

- ☑ When it needs to install the filter at the output side of terminals U/T1, V/T2, W/T3 on the AC motor drive. Please use inductance filter. Do not use phase-compensation capacitors or L-C (Inductance-Capacitance) or R-C (Resistance-Capacitance), unless approved by Delta.
- ☑ DO NOT connect phase-compensation capacitors or surge absorbers at the output terminals of AC motor drives.
- ☑ Use a well-insulated motor, suitable for inverter operation.

2-3 Control Circuit Terminal



Torque	Wire Gauge
5 kgf-cm (4.34 lbf-in)	28-12 AWG (0.5-2.5mm^2)

Terminal Symbol	Terminal Function	Factory Setting (NPN Mode)
OD	Door Open to Stop	OD-DCM: ON: Open ; OFF: Decelerate to stop
CD	Door Close to Stop	CD-DCM: ON: Close; OFF: Decelerate to stop
MI1	Multi-function Input 1	Refer to Pr. 02-01~02-05 for programming of Multi-function Inputs 1~5. ON: the input voltage is 24Vdc(Max: 30Vdc), input impedance is 3.75kΩ OFF: leakage current tolerance is 10μA.
MI2	Multi-function Input 2	
MI3	Multi-function Input 3	
MI4	Multi-function Input 4	
MI5	Multi-function Input 5	
COM	Digital control signal common	Common for digital inputs
+E24V	Digital Signal Common	+24V 80mA
DCM	Digital Signal Common	Common for digital inputs
RA1	Multi-function Relay1 output (N.O.) a	Resistive Load: 5A(N.O.)/3A(N.C.) 240VAC 5A(N.O.)/3A(N.C.) 24VDC Inductive Load: 1.5A(N.O.)/0.5A(N.C.) 240VAC 1.5A(N.O.)/0.5A(N.C.) 24VDC To output any monitoring signal including in operation, frequency attained, overload indicator…etc., refer to Pr.02-08~02-12 for MO selection.
RB1	Multi-function Relay1 output (N.C.) b	
RC1	Multi-function Relay1 common	
RA2	Multi-function Relay2 output (N.O.) a	
RB2	Multi-function Relay2 common	
RC2	Multi-function Output 1 (Photocoupler)	
MO1	Multi-function Output 1 (Photocoupler)	To output any monitoring signal including in operation, frequency attained, overload indicator…etc, refer to Pr.03-01for MO selection.
MO2	Multi-function Output 2 (Photocoupler)	
MO3	Multi-function Output 3 (Photocoupler)	
MCM	Multi-function output common	Max 48Vdc 50mA

* Analog control signal wiring size: 18 AWG (0.75 mm^2) with shielded wire.

Digital Inputs (FWD, REV, MI1~MI8, COM)

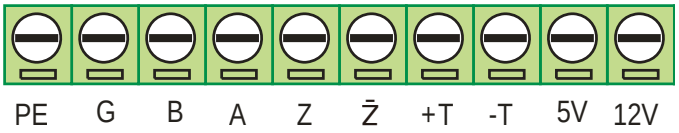
☑ When using contacts or switches to control the digital inputs, please use high quality components to avoid contact bounce.

Digital Outputs (MO1, MO2, MO3, MCM)

☑ Make sure to connect the digital outputs to the right polarity, see wiring diagrams.

☑ When connecting a relay to the digital outputs, connect a surge absorber or fly-back diode across the coil and check the polarity.

2-4 PG Circuit Terminal



Torque	Wire Gauge
2.0 kgf-cm (1.77 lbf-in)	28-14 AWG (0.5-1.5mm^2)

Terminal Symbol	Terminal Function	Factory Setting (NPN Mode)
PE	Grounding	Use a shielded cable to prevent interference. Connect shielded cable to this pin.
G	GND	Power source and input signal common
B	PG B	Input Signal of the corresponding Encoders: Line Driver, Open Collector, push-pull。 Voltage of the corresponding encoder: +5~+12V Maximum Input Frequency: 30kHz
A	PG A	
Z	PG PWM	Input Signal of the corresponding Encoders: Differential, Push-pull, Line Driver, Open Collector. Note that when using an Open Collector, a pull-up resistor needs to be added. 5V: Recommended pull-up resistors: 100~220W, above 1/2W 12V: Recommended pull-up 510W~1.35kW, above 1/2W Voltage of the corresponding encoder: +5~+12V Maximum Input Frequency: 300kHz
Z̄	PG PWM	
+T	Motor NTC+	The recommended NTC thermistor of TKS for 100°C overheat protection is ntse0103fz.
-T	Motor NTC-	
5V	5V out	Maximum Output Voltage: +5V±5% Maximum Output Current: 200mA
12V	12V out	Maximum Output Voltage: +12V ± 5% Maximum Output Current: 200mA

Chapter 3 Keypad and Start-up

3-1 Operation Method

3-2 Keypad Descriptions

CAUTION	☑ Make sure that the wiring is correct. In particular, check that the output terminals U/T1, V/T2, W/T3 are NOT connected to power and that the drive is well grounded. ☑ Verify that no other equipment is connected to the AC motor ☑ Do NOT operate the AC motor drive with humid hands. ☑ Verify that there are no short-circuits between terminals and from terminals to ground or mains power. ☑ Check if all connections are proper, there should be no loose terminals, connectors or screws. ☑ Make sure that the front cover is well installed before applying power.
WARNING	☑ When AC motor drive and motor are not function properly, stops operation immediately and follow malfunction diagnosis to verify the reason of fault. Do not touch U/T1, V/T2, and W/T3 before the main power L1, L2 are turned off or electric shock may occur.

3-1 Operation Method

The factory setting of VFD-DD series AC motor drive's operation method is set to external terminal control. But it is just one of the operation methods. The operation method can be via communication, control terminals settings or optional digital keypad. Please choose a suitable method depending on application and operation rule.

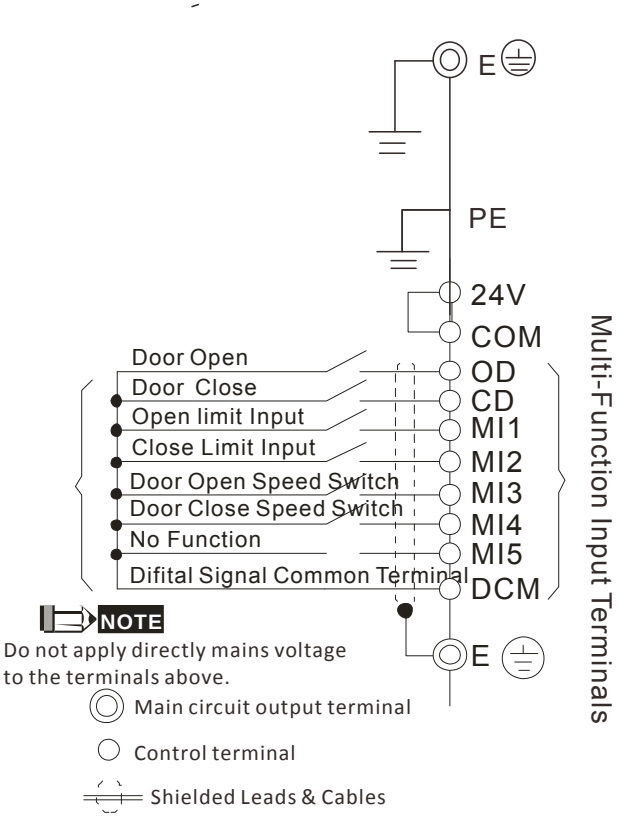
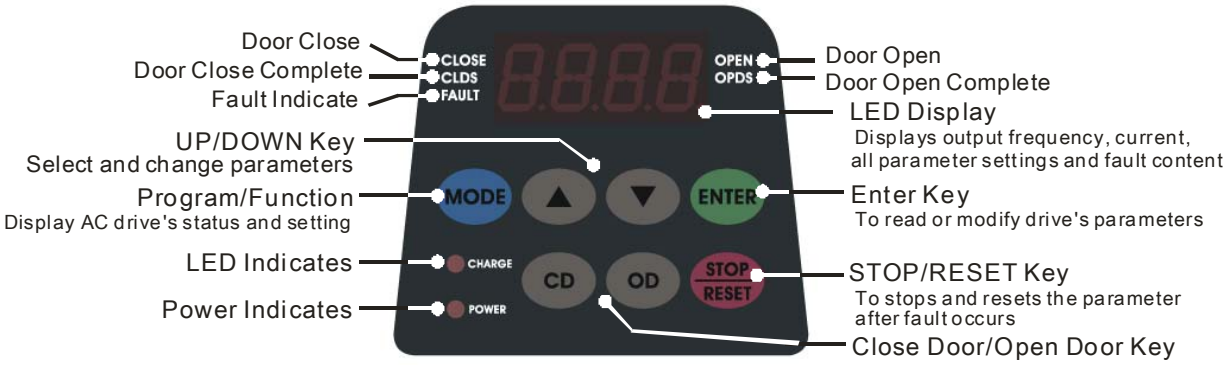
<table>
<tr><th>Operation Method</th><th>Frequency Source</th><th>Operation Command Source</th></tr>
<tr><td>Operate from communication</td><td colspan="2">Please refer to the communication address 2000H and 2119H settings in the communication address definition.</td></tr>
<tr><td>Control Terminals-Operate from external signal</td><td colspan="2"> 

Figure 3-1</td></tr>
<tr><td rowspan="2">Digital Keypad</td><td colspan="2"> 

Figure 3-2</td></tr>
<tr><td>UP/DOWN key</td><td>RUN, STOP/RESET key</td></tr>
</table>

3-2 Keypad Descriptions

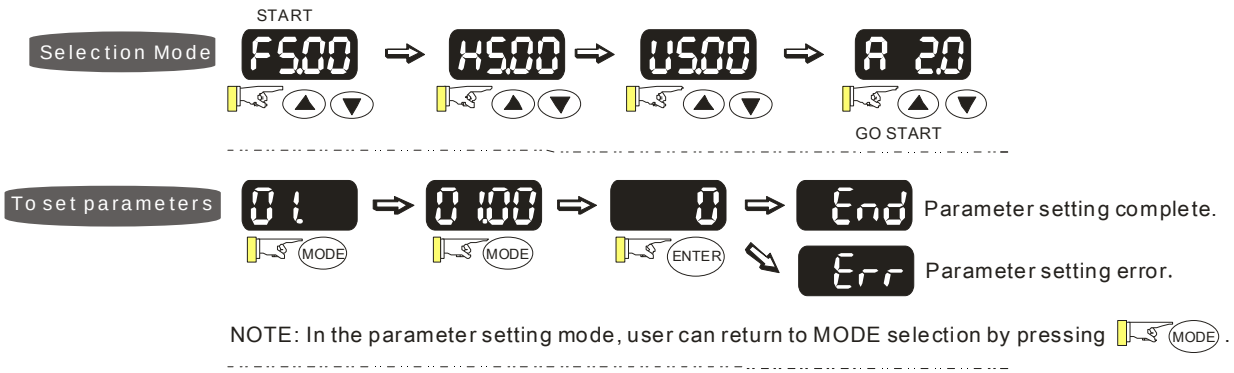
Descriptions of Digital Keypad Outlook



Descriptions of Display Items

Display Message	Descriptions
F 50.00	Displays the AC drive Master Frequency.
H 50.00	Displays the actual output frequency present at the motor.
U 600	User defined unit (where U = F x Pr.0-04)
A 5.0	Displays the output current present at terminals U/T1, V/T2, and W/T3.
C 50	Display counting value
0200	Display the selected parameter
10	Displays the actual stored value of the selected parameter.
EF	External Fault.
End	Display “End” for approximately 1 second if input has been accepted and saved automatically.
Err	Display “Err”, if the input is invalid.

How to Operate the Digital Keypad



Chapter 4 Parameter Settings

4-1 Summary of Parameter Settings

4-2 Summary of Detailed Parameter Settings

The VFD-DD parameters are divided into 12 groups by property for easy setting. Most of the parameter settings can be done before start-up and readjustment of the parameter will not be needed.

Group 00: System Parameters

Group 01: Motor Parameters

Group 02: Input/Output Parameters

Group 03: Feedback Parameters

Group 04: Door Open Parameters

Group 05: Door Close Parameters

Group 06: Protection and Special Parameters

Group 07: Control Parameters

Group 08: Multi-step Speed Parameters

Group 09: Communication Parameters

Group 10: User-defined Parameters

Group 11: View User-defined Parameters

4-1 Summary of Parameter Settings

00 System Parameters

↗: This parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
00.00	Identity Code of AC motor drive	0: 200W 2: 400W	Read only	○	○	○	○	○
00.01	Rated Current Display of AC motor drive	0: 1.50A 2: 2.50A	Read only	○	○	○	○	○
00.02	Parameter Reset	0: No function 1: Parameters locked 2: Advanced parameter setting 3: The built-in keypad is limited to read and write Group 11 only 6: Reset all the parameters to the factory settings of the door drive 8: Keypad locked 9: Reserved 10: All parameters are reset to Delta's factory setting (60Hz, 230V) 11: Copy all parameters	0	○	○	○	○	○
↗00.03	Start-up Display Selection	0: Display the frequency command value (F) 1: Display the actual output frequency (H) 2: Display the content of user-defined unit (U) 3: Display the output current (A)	0	○	○	○	○	○

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
✓00.04	Content of Multi Function Display	0: Display output current (A) 1: Display actual frequency (Hz) 2: Display DC-BUS voltage (U) 3: Display output voltage(E) 4: Display power factor angle (n.) 5: Display output power (kW) 6: Display motor angle speed (HU) 7: Display the drive's estimated output torque (kg-m) 8: Display PG pulse input position 9: Display the electrical angle 10: Display IGBT temperature(oC) 11: Display digital input ON/OFF status 12: Display digital output ON/OFF status 13: Display current multi-step speed 14: Display the corresponding CPU pin status of digital input 15: Display the corresponding CPU pin status of digital input 16:Actual output voltage when malfunction 17: Actual DC-BUS voltage when malfunction 18: Actual feedback frequency of encoder when malfunction 19: Actual output current when malfunction 20: Actual output frequency (H.) when malfunction 21: Door width in % or step speed 22: Door width(pulse) 23: Over modulation indication	2	○	○	○	○	○
00.05	Software version	Read only(Different versions will display differently)	#.##	○	○	○	○	○
✓00.06	Password Input	0~9999 0~2:times of wrong password	0	○	○	○	○	○
✓00.07	Password Set	0~9999 0: No password set or successful input in Pr.00-06 1: Password has been set	0	○	○	○	○	○
00.08	Control Method	0: V/f control 1: V/f Control + Encoder (VFPG) 2: Sensorless vector control (SVC) 3: FOC vector control + Encoder (FOCPG) 4: PG torque control (TQCPG) 8: FOC PM control (FOCPM)	8	○	○	○	○	○
00.09	Door Control Mode	0: Distance control mode 1: Reserved 2: Multi-step speed control mode 3: Speed control mode	3	○	○	○	○	○

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
00.10	Output Direction	0: Runs in same direction as setting 1: Runs in different direction than setting	0	○	○	○	○	○
✓00.11	Carrier Frequency Selection	02~15 kHz	10	○	○	○	○	○
✓00.12	Auto Voltage Regulation (AVR) Function	0: Enable AVR 1: Disable AVR 2: Disable AVR when deceleration stop	0	○	○	○	○	○
✓00.13	Source of the Master Frequency Command	0: by digital keypad input 1: by external terminal 2: by RS-485 serial communication 3: Combine digital keypad and RS-485 communication interfaces	1	○	○	○	○	○
00.14	Demo Mode	0: Disable 1: Display demo action	0	○	○	○	○	○
✓00.15	Frequency Testing Command	0~120.00 Hz	0	○	○	○	○	○

01 Motor Parameters

↗: This parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
01.00	Motor Auto Tuning (PM)	0: No function 1: Auto-tuning of PM motor parameters (brake locked) 2: Auto-tuning of magnetic pole's angle WITHOUT load (Pr01-09) 5: Auto-tuning of magnetic pole's angle WITH load(Pr01-09, high frequency injection)	0					○
01.01	Full-load Current of motor (PM)	(20~120%)*00.01 Amps	90% x 00,01 Amps					○
01.02	Rated power of Motor (PM)	0.00~655.35kW	0.07					○
01.03	Rated speed of Motor (rpm) (PM)	0~65535	350					○
01.04	Number of Motor Poles (PM)	2~96	10					○
01.05	Rs of Motor parameter (PM)	0.0~655.35Ω	00.00=0: 24.01; 00.00=2: 14.41					○
01.06	Ld of Motor Parameter (PM)	0.0~6553.5mH	169.4					○
01.07	Lq of Motor Parameter (PM)	0.0~6553.5mH	00.00=0: 248.4 00.00=2: 149.1					○
01.08	Back Electromotive Force (PM)	0.0~6553.5Vrms	0.0					○
01.09	PM magnetic pole and PG offset angle	0.0~360.0°	360.0					○
01.10	Magnetic Pole Re-orientation (PM)	0:No function 1:Reset magnetic pole position	0					○
01.11	Motor Auto Tuning (IM)	0: No function 1: Rolling test 2: Static test 3: Reserved 4: Reserved	0			○	○	
01.12	Full-load Current of Motor (IM)	(20~120%)*00.01 Amps	1.00	○	○	○	○	
01.13	Rated power of Motor (IM)	0.00~655.35kW	0.16			○	○	
01.14	Rated speed of Motor (rpm) (IM)	0~65535	250		○	○	○	
01.15	Number of Motor Poles (IM)	2~48	16	○	○	○	○	

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
01.16	No-load Current of Motor (IM)	00~ Pr.01.12 factory setting	#.##		○	○	○	
01.17	Rs of Motor (IM)	0.000~65.535Ω	0.000			○	○	
01.18	Rr of Motor (IM)	0.000~65.535Ω	0.000			○	○	
01.19	Lm of Motor (IM)	0.0~6553.5mH	0.0			○	○	
01.20	Lx of Motor (IM)	0.0~6553.5mH	0.0			○	○	
✓01.21	Torque Compensation Time Constant	0.001~10.000sec	0.020			○		
✓01.22	Slip Compensation Time Constant	0.001~10.000sec	0.100			○		
✓01.23	Torque Compensation Gain	00～10	0	○	○			
✓01.24	Slip Compensation Gain	0.00～10.00	0.00	○	○	○		
✓01.25	Slip Deviation Level	00~1000% (0:Disable)	0		○	○	○	
✓01.26	Detection Time of Slip Deviation	0.0~10.0sec	1.0		○	○	○	
✓01.27	Over Slip Treatment	0: Warn and keep operation 1: Warn and ramp to stop 2: Warn and coast to stop	0		○	○	○	
✓01.28	Hunting Gain	00~10000 (0:Disable)	2000	○	○	○		
01.29	Accumulative Motor Operation Time (Min.)	0~1439	0	○	○	○	○	○
01.30	Accumulative Motor Operation Time (day)	0~65535	0	○	○	○	○	○
01.31	Maximum Output Frequency	10.00~120.00Hz	29.17	○	○	○	○	○
01.32	Output Frequency 1 (Base frequency /Motor rated frequency)	0.00~120.00Hz	29.17	○	○	○	○	○
01.33	Output Voltage 1(Base voltage/Motor rated voltage)	0.0V~240.0V	220.0	○	○	○	○	○
01.34	Output Frequency 2	0.00~120.00Hz	0.50	○	○			
✓01.35	Output Voltage 2	0.0V~240.0V	5.0	○	○			
01.36	Output Frequency 3	0.00~120.00Hz	0.50	○	○			
✓01.37	Output Voltage 3	0.0V~240.0V	5.0	○	○			
01.38	Output Frequency 4	0.00~120.00Hz	0.00	○	○	○	○	
✓01.39	Output Voltage 4	0.0V~240.0V	0.0	○	○			

02 Input/Output Parameters

↗: This parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
02.00	2-wire/3-wire Operation Control	0: 2-wire mode 1 (when power is on, operation begins) 1: 2-wire mode 1 (when power is on, no operation) 2: 2-wire mode 2 (when power is on, operation begins) 3: 2-wire mode 2 (when power is on, no operation)	0	○	○	○	○	○
02.01	Multi-Function Input 1 (MI1)	0: No function	14	○	○	○	○	○
02.02	Multi-Function Input 2 (MI2)	1: Multi-step speed command 1	15	○	○	○	○	○
02.03	Multi-Function Input 3 (MI3)	2: Multi-step speed command 2	16	○	○	○	○	○
02.04	Multi-Function Input 4 (MI4)	3: Multi-step speed command 3	17	○	○	○	○	○
02.05	Multi-Function Input 5 (MI5)	4: Multi-step speed command 4	0	○	○	○	○	○
		5: Fault reset		○	○	○	○	○
		6: Low speed operation		○	○	○	○	○
		7: OD/CD command for low speed operation		○	○	○	○	○
		8: 1st, 2nd acceleration/deceleration time selection		○	○	○	○	○
		9: Force stop (NO) input		○	○	○	○	○
		10: Demo mode		○	○	○	○	○
		11: Emergency stop (NO) input		○	○	○	○	○
		12: Source of operation command (Keypad/External terminals)		○	○	○	○	○
		13: Parameter lock enable (NC)		○	○	○	○	○
		14: Door open complete signal		○	○	○	○	○
		15: Door close complete signal		○	○	○	○	○
		16: Door open speed switch signal		○	○	○	○	○
		17: Door close speed switch signal		○	○	○	○	○
		18: Open allowance signal		○	○	○	○	○
		19: Screen signal input		○	○	○	○	○
		20: Door curve signal input for 2nd set door open/close		○	○	○	○	○
		21: Reset signal input		○	○	○	○	○
		22: Input system security circuit confirmation signal (DCC)		○	○	○	○	○
		23: Input enforced door closing signal (NUD)		○	○	○	○	○
		24: Auto-tuning on door width		○	○	○	○	○
↗02.06	Digital Terminal Input Debouncing Time	0.001~30.000sec	0.005	○	○	○	○	○
↗02.07	Digital Input Operation Direction	0~65535	0	○	○	○	○	○

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
✓02.08	Multi-function Output (Relay1)	0: No function	16	○	○	○	○	○
✓02.09	Multi-function Output (Relay2)	1: AC drive in operation	17	○	○	○	○	○
✓02.10	Multi-function Output (MO1)	2: Zero speed frequency signal (including STOP)	0	○	○	○	○	○
✓02.11	Multi-function Output (MO2)	3: AC drive ready	0	○	○	○	○	○
✓02.12	Multi-function Output (MO3) (Communication)	4: Low voltage warning(Lv)	0	○	○	○	○	○
		5: Fault indication		○	○	○	○	○
		6: Overhead warning (Pr.06.09)		○	○	○	○	○
		8: Warning indication		○	○	○	○	○
		9: Over voltage warning		○	○	○	○	○
		10: OD command		○	○	○	○	○
		11: CD command		○	○	○	○	○
		12: Demo Indication		○	○	○	○	○
		13: Demo complete		○	○	○	○	○
		14: Emergency stop indication		○	○	○	○	○
		15: Force stop indication		○	○	○	○	○
		16: Door close complete (limit) signal output		○	○	○	○	○
		17: Door open complete (limit) signal output		○	○	○	○	○
		18: Door close error		○	○	○	○	○
		19: Position Complete Signal		○	○	○	○	○
		20: Position Detection 1(for door close only)		○	○	○	○	○
		21: Position Detection 2(for door close only)		○	○	○	○	○
		22: Position Detection 3(for door close only))		○	○	○	○	○
		23: Position Detection 1(for door open only)		○	○	○	○	○
		24: Position Detection 2(for door open only)		○	○	○	○	○
		25: Position Detection 3(for door open only)		○	○	○	○	○
		26: PG feedback error		○	○	○	○	○
		27: Obstruction when opening door		○	○	○	○	○
		28: Over Torque Detect 1 (OT1, Pr06-27~Pr06-29)		○	○	○	○	○
✓02.13	Multi-function Output Direction	0~65535	0	○	○	○	○	○
✓02.14	Position Detection Signal 1	0.0~100.0%	25.0	○	○	○	○	○
✓02.15	Position Detection Signal 2	0.0~100.0%	12.5	○	○	○	○	○

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
✓02.16	Position Detection Signal 3	0.0~100.0%	7.5	○	○	○	○	○

03 Feedback Parameters

↗This parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
03.00	Encoder (PG) Signal Type	0: No function 1: ABZ 7: PWM pulse	7		○		○	○
03.01	Encoder pulse	1~25000	256		○		○	○
03.02	Encoder Input Type Setting	0: Disable 1: Phase A leads in a forward run command and phase B leads in a reverse run command 2: Phase B leads in a forward run command and phase A leads in a reverse run command 3: Phase A is a pulse input and phase B is a direction input. (low input=reverse direction, high input=forward direction) 4: Phase A is a pulse input and phase B is a direction input. (low input=forward direction, high input=reverse direction) 5: Single-phase input	1		○		○	○
↗03.03	Encoder Feedback Fault Treatment (PGF1, PGF2)	0: Warn and keep operation 1: Fault and ramp to stop 2: Fault and stop operation	2		○		○	○
↗03.04	Detection Time for Encoder Feedback Fault	0.0~10.0sec	5.0		○		○	○
↗03.05	Encoder Stall Level (PGF3)	0~120% (0:Disable)	115		○		○	○
↗03-06	Encoder Stall Detection Time	0.0～2.0sec	0.10		○		○	○
↗03.07	Encoder Slip Range (PGF4)	0~50% (0:Disable)	50		○		○	○
↗03.08	Encoder Slip Detection Time	0.0～10.0sec	0.50		○		○	○
↗03.09	Encoder Stall and Slip Error Treatment	0: Warn and keep operation 1: Fault and ramp to stop 2: Fault and coast to stop	2		○		○	○
03.10	Door Width Auto-tuning Frequency	0.10~120.00Hz	5.0	○	○	○	○	○
03.11	Door Width Auto-tuning	0: Disable 1: Enable	0				○	○
03.12	Door Width Pulse (Unit:1)	1~9999	8800				○	○
03.13	Door Width Pulse (Unit:10000)	0~9999 (Unit:10000)	0				○	○
03.14	When a PG fault occurs, DC current will be automatically generated to brake the motor.	0.00 ~ 5.00 sec (0: disable)	1.00				○	○

04 Door Open Parameters

↗This parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
↗04.00	Door Open by Initial Speed	0.00~120.0Hz	2.00	○	○	○	○	○
↗04.01	Door Open Distance by Initial Speed	0~65535 (Unit: pulses number)	100		○		○	○
↗04.02	Door Open Time by Initial Speed	0~20.0s	1.0	○	○	○	○	○
↗04.03	Door Open High Speed 1	0.00~120.0Hz	15.00	○	○	○	○	○
↗04.04	Door Open by Final Speed Begins	0.0~100.0% (Door width setting in %)	90.0		○		○	○
↗04.05	Door Open Final Speed	0.00~120.0Hz	2.00	○	○	○	○	○
↗04.06	Door Open by Holding Speed Begins	0.0~100.0% (Door width setting in %)	95.0		○		○	○
↗04.07	Door Open Holding Speed	0.00~120.0Hz	2.00	○	○	○	○	○
↗04.08	Door Open Acceleration Time 1	0.1~3600sec	1.0	○	○	○	○	○
↗04.09	Door Open Deceleration Time 1	0.1~3600sec	1.0	○	○	○	○	○
↗04.10	Door Open Holding Torque Level	0.0~150.0% (AC drive's rated current)	85.0	○	○	○	○	○
↗04.11	Door Open Holding Torque	0.0~100.0% (AC drive's rated current)	60.0	○	○	○	○	○
↗04.12	Response Time of Door Open Holding Torque	0.01~10.00sec	0.20	○	○	○	○	○
↗04.13	Door Open High Speed 2	0.00~400.0Hz	30.00	○	○	○	○	○
↗04.14	Door Open Acceleration Time 2	0.1~3600sec	1.0	○	○	○	○	○
↗04.15	Door Open Deceleration Time 2	0.1~3600sec	1.0	○	○	○	○	○
↗04.16	Door Open Holding Torque 2	0.0~150.0% (AC drive's rated current)	0.0	○	○	○	○	○
04.17	Door Open Time-out Setting	0.0~180.0sec (0.0 sec: Disable)	0.0	○	○	○	○	○
↗04.18	Holding Time for OD (Open Door)Terminal	0.0~999.9sec (999.9 sec for always holding)	999.9	○	○	○	○	○
↗04.19	Door Open Acceleration Time of S1 Curve	0.0~10.0sec	0.0	○	○	○	○	○
↗04.20	Door Open Acceleration Time of S2 Curve	0.0~10.0sec	0.0	○	○	○	○	○
↗04.21	Door Open DC Brake Current Level	00~100%	0	○	○	○		
↗04.22	Door Open DC Brake Time when Startup	0.0~60.0sec	0.0	○	○	○	○	○
↗04.23	Door Open DC Brake Time when Stopping	0.0~60.0sec	0.0	○	○	○	○	○
↗04.24	Door Open DC Brake Starting Frequency	0.00~120.00Hz	0.00	○	○	○	○	○

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
04.25	Current Level when unable to open the door	0.0~150.0% (rated motor current) 0.0:No function	100.0	○	○	○	○	○
04.26	Level of Current for Acceleration Area when unable to open the door	0.0~200.0%	150.0				○	○
04.27	Detection time when unable to open the door	0.1~5.0 sec	0.3				○	○
04.28	Level of Torque when unable to open the door	0.0~100.0% (rated motor current)	60.0				○	○
04.29	Deceleration time when unable to open the door	0.1~10 sec	0.2				○	○
04.30	Acceleration coverage when unable to open the door	0.0~ 100.0%	30.0				○	○

05 Door Close Parameters

↗This parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
↗05.00	Door Close Initial Speed	0.00~120.0Hz	2.00	○	○	○	○	○
↗05.01	Door Close Distance by Initial Speed	0~65535 (Unit: pulses number)	0		○		○	○
↗05.02	Door Close Time by Initial Speed	0~20.0s	0	○	○	○	○	○
↗05.03	Door Close High Speed 1	0.00~120.0Hz	14.00	○	○	○	○	○
↗05.04	Door Close by Final Speed Begins	0.0~100.0% (Door width setting in %)	15.0		○		○	○
↗05.05	Door Close Final Speed	0.00~120.0Hz	1.7	○	○	○	○	○
↗05.06	Door Close by Holding Speed Begins	0.0~100.0% (Door width setting in %)	5.0		○		○	○
↗05.07	Door Close Holding Speed	0.00~120.0Hz	1.3	○	○	○	○	○
↗05.08	Door Close Acceleration Time 1	0.1~3600sec	2.0	○	○	○	○	○
↗05.09	Door Close Deceleration Time 1	0.1~3600sec	2.0	○	○	○	○	○
↗05.10	Door Close Holding Torque Level 1	0.0~150.0% (Drive's rated current)	80.0	○	○	○	○	○
↗05.11	Door Close Holding Torque 1	0.0~100.0% (Drive's rated current)	30.0	○	○	○	○	○
↗05.12	Response Time of Door Close Holding Torque	0.01~10.00sec	0.20	○	○	○	○	○
↗05.13	Door Close High Speed 2	0.00~120.0Hz	30.00	○	○	○		
↗05.14	Door Close Acceleration Time 2	0.1~3600sec	2.0	○	○	○	○	○
↗05.15	Door Close Deceleration Time 2	0.1~3600sec	2.0	○	○	○	○	○
↗05.16	Door Close Holding Torque Level 2	0.0~150.0% (Ac drive's rated current)	0.0	○	○	○	○	○
↗05.17	Door Close Time-out Setting	0.0~180.0sec (0.0sec:Disable)	0.0	○	○	○	○	○
↗05.18	Holding Time for CD (Close Door)Terminal	0.0~999.9sec (999.9sec is always holding)	999.9	○	○	○	○	○
↗05.19	Door Close Acceleration Time of S1 Curve	0.0~10.0sec	0.0	○	○	○	○	○
↗05.20	Door Close Acceleration Time of S2 Curve	0.0~10.0sec	0.0	○	○	○	○	○
↗05.21	Door Close DC Brake Current Level	0~100%	0	○	○	○		
↗05.22	Door Close DC Brake Time when Startup	0.0~60.0sec	0.0	○	○	○	○	○

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
✓05.23	Door Close DC Brake Time when Stopping	0.0~60.0sec	0.0	○	○	○	○	○
✓05.24	Door Close DC Brake Starting Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
05.25	Door Re-open Current Level 1	0.0~150.0% (AC drive's rated current)	100.0				○	○
✓05.26	Door Re-open Current Level 1 for Acceleration Area	100~200% (100% is Pr.05.25 setting)	150				○	○
✓05.27	Door Re-open Current Level 1 for Low Speed Area	0.0~150.0%(Drive's rated current)	100.0				○	○
05.28	Door Re-open Current Level 2	0.0~150.0%(Drive's rated current)	100.0				○	○
✓05.29	Door Re-open Current Level 2 for Acceleration Area	0.0~150.0% (Drive's rated current)	150				○	○
✓05.30	Door Re-open Current Level 2 for Low Speed Area	100~200%(100% is Pr.05.29 setting)	100.0				○	○
✓05.31	Undetected Area when unable to open doors	1.0~99.0%(Total door width=100%; range between 0%~Pr.05.31 is excluded from low speed detection area)	2.0				○	○
✓05.32	Door Re-open Acceleration Boundary	8.0~97.0%(Total door width =100%; range between Pr.05.32~100% is the acceleration area)	70.0				○	○
✓05.33	Door Close Error Deceleration Time	0.1 ~ 10.0 sec	0.8				○	○
✓05.34	Door Re-open Detection Time	0~10.0sec	0.2				○	○

06 Protection and Special Parameters

↗This parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
↗06.00	Software Braking Level	350.0~450.0Vdc	380.0	○	○	○	○	○
06.01	Reserved							
↗06.02	Current Boundary	0～250% (rated current of motor drive)	200				○	○
↗06.03	Forward Motor Torque Limit	0～250% (rated current of motor drive)	200				○	○
↗06.04	Forward Regenerative Torque Limit	0～250% (rated current of motor drive)	200				○	○
↗06.05	Reverse Motor Torque Limit	0～250% (rated current of motor drive)	200				○	○
↗06.06	Reverse Regenerative Torque Limit	0～250% (rated current of motor drive)	200				○	○
↗06.07	Emergency/Force Stop Deceleration Method	0:Coast to stop 1: Decelerate by 1st decel. time 2: Decelerate by 2nd decel. time 3:By Pr.05.33 setting	3	○	○	○	○	○
↗06.08	Low Voltage Level	160.0~270.0Vdc	180.0	○	○	○	○	○
↗06.09	High Temperature Overheat Warning (OH)	0.0~110.0°C	85.0	○	○	○	○	○
06.10	Action after door re-open/re-close	Bit 0=0:Not detecting incorrect open/close limit Bit 0=1:Detects incorrect open/close limit Bit 1=0:Door re-open when door close error occur (Not for VF/SVC) Bit 1=1:Door will not re-open when door close error occur(Not for VF/SVC) Bit 2=0:Enable S-Curve when door re-open (Not for VF/SVC) Bit 2=1:Disable S-Curve when door re-open(Not for VF/SVC) Bit 3=0: When door open complete, will not reset door position to 100.0%. Bit 3=1:When door open complete, resets door position to 100.0% Bit4=0 Door opening in position not supported, limited signal will be output after the torque is enabled. Bit4=1 Door opening in position is supported, limited signal will be output after the torque is enabled. Bit5=0 Reset LVn error automatically, MO terminal sends error signal Bit5=1 Reset LVn error automatically, MO terminal sends error signal	0x3Ah	○	○	○	○	○

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
		Bit6=0 OD and CD signal are input at the same time, but without reaction. Bit6=1 OD and CD signal are input at the same time and with door opening Bit7=0 When the running signal come from an external terminal. Pressing OD and CD buttons to return to running status is not supported when the drive is stopped. Bit7=1 When the running signal come from an external terminal. Pressing OD and CD buttons to return to running status is supported when the drive is stopped. Bit8=0 Functions related to unable to open the door are NOT supported(Not for VF/SVC) Bit8=1 Functions related to unable to open the door are supported(Not for VF/SVC) Bit9=0, Position memory is NOT supported when unable to open the door Bit9=1, Position memory is supported when unable to open the door						
✓06.11	Position Control Mode	0: No limit signal, detect by PG number and current level. 1: Door open limit signal only, door close by PG number or current level detection. 2: Door close limit signal only，door open by PG number or current level detection. 3: Door open and close limit signal (Support all control mode) 4: Detect by PG number and also accept external door open/close limit signal 5: No limit signal, detected by PG number or current level. (For Pr.00-09=3 speed control mode)	0	○	○	○	○	○
✓06.12	Stall Current Level of Position Mode	0.0~200.0% (rated current of motor)	80.0	○	○	○	○	○
✓06.13	Door Open/Close Holding Time Before Next Demo	0.0~99.99sec	2.0	○	○	○	○	○
06.14	Times of Door Open/Close in Demo Mode (L)	0~9999	0	○	○	○	○	○
06.15	Times of Door Open/Close in Demo Mode (H)	0~9999	0	○	○	○	○	○
06.16	Clear Demo Mode Door Open/Close Record	0: Disable 1: Clear (Pr.06.14 and Pr.06.15)	0	○	○	○	○	○

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
06.17	Present Fault Record	0: No fault	0	○	○	○	○	○
06.18	2nd Most Recent Fault Record	1: Over-current during acceleration (ocA)	0	○	○	○	○	○
06.19	3rd Most Recent Fault Record	2: Over-current during deceleration (ocd)	0	○	○	○	○	○
06.20	4th Most Recent Fault Record	3: Over-current during steady speed (ocn)	0	○	○	○	○	○
06.21	5th Most Recent Fault Record	4: Reserved	0	○	○	○	○	○
06.22	6th Sixth Most Recent Fault Record	5: Reserved	0	○	○	○	○	○
		6: Over-current at stop (ocS)	0	○	○	○	○	○
		7: Over voltage during acceleration (ovA)	0	○	○	○	○	○
		8 Over voltage during deceleration (ovd)	0	○	○	○	○	○
		9: Over voltage during steady speed (ovn)	0	○	○	○	○	○
		10: Over voltage at stop (ovS)	0	○	○	○	○	○
		11: Low voltage during acceleration (LvA)	0	○	○	○	○	○
		12: Low voltage during deceleration (Lvd)	0	○	○	○	○	○
		13: Low voltage during steady speed (Lvn)	0	○	○	○	○	○
		14:Low voltage at stop (LvS)	0	○	○	○	○	○
		15:Phase loss protection (PHL)	0	○	○	○	○	○
		16:IGBT overheat (oH1)	0	○	○	○	○	○
		17:Reserved	0	○	○	○	○	○
		18: IGBT overheat protection circuit error (tH1o)	0	○	○	○	○	○
		19~20: Reserved	0	○	○	○	○	○
		21: 150% 1Min, AC drive overload (oL)	0	○	○	○	○	○
		22: Motor overload (EoL1)	0	○	○	○	○	○
		23~25: Reserved 26: ot1 27~29: Reserved	0	○	○	○	○	○
		30: Memory write-in error (cF1)	0	○	○	○	○	○
		31: Memory read-out error (cF2)	0	○	○	○	○	○
		32: Isum current detection error (cd0)	0	○	○	○	○	○
		33: U-phase current detection error (cd1)	0	○	○	○	○	○
		34: V-phase current detection error (cd2)	0	○	○	○	○	○
		35: W-phase current detection error (cd3)	0	○	○	○	○	○
		36: Clamp current detection error (Hd0)	0	○	○	○	○	○
		37: Over-current detection error (Hd1)	0	○	○	○	○	○

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
		38: Over-voltage detection error (Hd2)	0	○	○	○	○	○
		39: Ground current detection error (Hd3)	0	○	○	○	○	○
		40: Auto tuning error (AuE)	0	○	○	○	○	○
		41: Reserved	0	○	○	○	○	○
		42: PG feedback error (PGF1)	0	○	○	○	○	○
		43: PG feedback loss (PGF2)	0	○	○	○	○	○
		44: PG feedback stall (PGF3)	0	○	○	○	○	○
		45: PG slip error (PGF4)	0	○	○	○	○	○
		46~48:Reserved	0	○	○	○	○	○
		49:External fault signal input	0	○	○	○	○	○
		50~51: Reserved	0	○	○	○	○	○
		52:Password error (PcodE)	0	○	○	○	○	○
		53:Software error (ccodE)	0	○	○	○	○	○
		54:Communication time-out (cE1)	0	○	○	○	○	○
		55: Communication time-out (cE2)	0	○	○	○	○	○
		56: Communication time-out (cE3)	0	○	○	○	○	○
		57: Communication time-out (cE4)	0	○	○	○	○	○
		58 Communication time-out (cE10)	0	○	○	○	○	○
		59:PU time-out (cP10)	0	○	○	○	○	○
		60~67: Reserved	0	○	○	○	○	○
		68: Door open/close complete signal error	0	○	○	○	○	○
		69:Door open/ close time-out (DOT)	0	○	○	○	○	○
✓06.23	Electronic Thermal Overload Relay Selection	0: Special motor for AC drive 1: Standard motor 2: Disable	0					
✓06.24	Electronic Thermal Characteristic	30.0~600.0sec	60.0	○	○	○	○	○
✓06.25	Auto Restart After Fault	0~10	10	○	○	○	○	○
✓06.26	Auto Reset Time for Restart after Fault	0.1~600.0	60.0	○	○	○	○	○
06.27	Over-torque Detection Selection (OT1)	0: disable 1: over-torque detection during constant speed operation, continue to operate after detection 2: over-torque detection during constant speed operation, stop operation after detection 3: over-torque detection during operation, continue to operate after detection 4: over-torque detection during operation, stop operation after detection	0	○	○	○	○	○
06.28	Over-torque Detection Level (OT1)	10~250% (100%: motor drive's rated current)	150	○	○	○	○	○

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
06.29	Over-torque Detection Time (OT1)	0.1~60.0 sec	0.1	○	○	○	○	○

07 Control Parameters

✓This parameter can be set during operation.

About forward/ reverse running: When the CLOSE light on the digital keypad comes on, that indicates the motor is running forward. When the OPEN light on the digital keypad comes on, that indicates the motor is running reversely. However the indication of these two lights has nothing to do with the open/close of the elevator doors.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
✓07.00	Reverse Running Control (Kp) of Zero Speed	0.0~500.0%	100.0	○	○	○	○	○
✓07.01	Reverse Running Control (KI) of Zero Speed	0.000~10.000sec	0.010	○	○	○	○	○
✓07.02	Reverse Running Control (Kp)1 of Low Speed	0.0~500.0%	100.0	○	○	○	○	○
✓07.03	Reverse Running Control (KI) 1 of Low Speed	0.000~10.000sec	0.010	○	○	○	○	○
✓07.04	Reverse Running Control (Kp)2 of High Speed	0.0~500.0%	100.0	○	○	○	○	○
✓07.05	Reverse Running Control (KI) 2 of High Speed	0.000~10.000sec	1.000	○	○	○	○	○
✓07.06	Low Speed/ High Speed Switch Frequency	0.00~120.00Hz (0:Disable)	2.00	○	○	○	○	○
✓07.07	ASR Low Pass Filter Gain	0.000~0.350sec	0.008	○	○	○	○	○
✓07.08	Zero Speed/ Low Speed Width Adjustment	0.00~120.00Hz	2.00		○		○	○
✓07.09	Low Speed/ High Speed Width Adjustment	0.00~120.00Hz	5.00		○		○	○
07.10	Gear Ratio	1~100	1				○	○
07.11	Inertia Ratio	1~1000%	500				○	○
07.12	Zero-speed Bandwidth	0~40Hz	10				○	○
07.13	Low-speed Bandwidth	0~40Hz	10				○	○
07.14	High-speed Bandwidth	0~40Hz	10				○	○
07.15	PDFF Gain Value	0~200%	0				○	○
07.16	Gain for Speed Feed Forward	0~500	14				○	○
✓07.17	Forward Running Control (Kp) of Zero Speed	0.0~500.0%	100.0				○	○
✓07.18	Forward Running Control (KI) of Zero Speed	0.000~10.000 sec	0.010	○	○	○	○	○
✓07.19	Forward Running Control (Kp)1 of Low Speed	0.0~500.0%	100.0	○	○	○	○	○
✓07.20	Forward Running Control (KI) 1 of Low Speed	0.000~10.000 sec	0.010	○	○	○	○	○
✓07.21	Forward Running Control (Kp) 2 of High Speed	0.0~500.0%	100.0	○	○	○	○	○
✓07.22	Forward Running Control (KI) 2 of High Speed	0.000~10.000 sec	1.000	○	○	○	○	○

08 Multi-step Speed Parameter

↗This parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	FOCPM
↗08.00	Zero Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.01	1st Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.02	2nd Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.03	3rd Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.04	4th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.05	5th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.06	6th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.07	7th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.08	8th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.09	9th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.10	10th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.11	11th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.12	12th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.13	13th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.14	14th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○
↗08.15	15th Step Speed Frequency	0.00~120.00Hz	0.00	○	○	○	○	○

09 Communication Parameters

↗This parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFP	SVC	FOC	FOC
↗09.00	Communication Address	01~254	1	○	○	○	○	○
↗09.01	Transmission Speed	4.8～115.2Kbps	19.2	○	○	○	○	○
↗09.02	Transmission Fault Treatment	0: Warn and keep operation 1: Fault and ramp to stop 2: Reserved 3: No action and no display	3	○	○	○	○	○
↗09.03	Time-out Detection	0.0～100.0sec	0.0	○	○	○	○	○
↗09.04	Communication Protocol	0: 7N1 (ASCII) 1: 7N2 (ASCII) 2: 7E1 (ASCII) 3: 7O1 (ASCII) 4: 7E2 (ASCII) 5: 7O2 (ASCII) 6: 8N1 (ASCII) 7: 8N2 (ASCII) 8: 8E1 (ASCII) 9: 8O1 (ASCII) 10: 8E2 (ASCII) 11: 8O2 (ASCII) 12: 8N1 (RTU) 13: 8N2 (RTU) 14: 8E1 (RTU) 15: 8O1 (RTU) 16: 8E2 (RTU) 17: 8O2 (RTU)	13	○	○	○	○	○
↗09.05	Response Delay Time	0.0~200.0ms	2.0	○	○	○	○	○

10 User-defined Parameters

↗This parameter can be set during operation.

Group 10 shows the explanation for the “User-defined Parameters” from Group 00~09

Parameter	Explanation	Settings	Factory Setting	VF	VFP	SVC	FOC	FOC
↗10.00	Start-up Display Selection	Same as Pr00.03	Read only	○	○	○	○	○
↗10.01	Maximum Operation Frequency	Same as Pr01.31	Read only	○	○	○	○	○
↗10.02	Motor Rated Frequency	Same as Pr01. 32	Read only	○	○	○	○	○
↗10.03	Motor Rated Voltage	Same as Pr 0133	Read only	○	○	○	○	○
↗10.04	2nd Output Frequency (Mid-point frequency)	Same as Pr 0134	Read only	○	○	○	○	○
↗10.05	2nd Output Voltage (Mid-point voltage)	Same as Pr 01.35	Read only	○	○	○	○	○
↗10.06	3rd Output Frequency (Mid-point frequency)	Same as Pr 01.36	Read only	○	○	○	○	○
↗10.07	3rd Output Voltage (Mid-point voltage)	Same as Pr 01.37	Read only	○	○	○	○	○
↗10.08	4th Output Frequency (Low Frequency)	Same as Pr 01.38	Read only	○	○	○	○	○
↗10.09	4th Output Voltage (Low Voltage)	Same as Pr 01.39	Read only	○	○	○	○	○
↗10.10	Door Open Acceleration Time 1	Same as Pr 04.08	Read only	○	○	○	○	○
↗10.11	Door Open Deceleration Time 1	Same as Pr 04.09	Read only	○	○	○	○	○
↗10.12	Door Close Acceleration Time 2	Same as Pr 05.08	Read only	○	○	○	○	○
↗10.13	Door Close Deceleration Time 2	Same as Pr 05.09	Read only	○	○	○	○	○
↗10.14	Frequency Testing	Same as Pr 00.15	Read only	○	○	○	○	○
↗10.15	Door Open Time by Initial Speed	Same as Pr 04.02	Read only	○	○	○	○	○
↗10.16	Door Open by Initial Speed	Same as Pr 04.00	Read only	○	○	○	○	○
↗1017	Door Open High Speed	Same as Pr 04.03	Read only	○	○	○	○	○
↗10.18	Door Open Final Speed	Same as Pr 04.05	Read only	○	○	○	○	○
↗10.19	Door Open Holding Torque Level	Same as Pr 04.10	Read only	○	○	○	○	○
↗10.20	Door Open Holding Torque	Same as Pr 04.11	Read only	○	○	○	○	○
↗10.21	Door Close High Speed	Same as Pr 05.03	Read only	○	○	○	○	○
↗10.22	Door Close Final Speed	Same as Pr 05.05	Read only	○	○	○	○	○

Parameter	Explanation	Settings	Factory Setting	VF	VFP	SVC	FOC	FOC
↗10.23	Door Close Holding Torque Level	Same as Pr 05.10	Read only	○	○	○	○	○
↗10.24	Door Close Holding Torque	Same as Pr 05.11	Read only	○	○	○	○	○
↗10.25	Multi-function Input Terminal Direction	Same as Pr 02.07	Read only	○	○	○	○	○
↗10.26	Multi-function Input 1	Same as Pr02.01	Read only	○	○	○	○	○
↗10.27	Multi-function Input 2	Same as Pr 02.02	Read only	○	○	○	○	○
↗10.28	Multi-function Input 3	Same as Pr 02.03	Read only	○	○	○	○	○
↗10.29	Multi-function Input 4	Same as Pr 02.04	Read only	○	○	○	○	○
↗10.30	Multi-function Output RY1	Same as Pr 02.08	Read only	○	○	○	○	○
↗10.31	Multi-function Output RY2	Same as Pr 02.09	Read only	○	○	○	○	○

11 View User-defined Parameters

This parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFP	SVC	FOC	FOC
11.00 ~ 11.31	View User-defined Parameters	Pr. 00.00~09.05	-	○	○	○	○	○

4-2 Description of Parameter Settings

00 System Parameter

✓This parameter can be set during operation.

00.00 Identity Code of AC Motor Drive

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: Read only

Settings 0: 200W

1: 400W

00.01 Rated Current Display of AC Motor Drive

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: Read only

Settings 00.00=0: 1.50A

00.00=2: 2.50A

- Pr. 00-00 displays the identity code of the AC motor drive. The capacity, rated current, rated voltage and the max. carrier frequency relate to the identity code. Users can use the following table to check how the rated current, rated voltage and max. carrier frequency of the AC motor drive corresponds to the identity code.
- Pr.00-01 displays the rated current of the AC motor drive. By reading this parameter the user can check if the AC motor drive is correct.

00.02 Parameter Reset

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0: No function

1: Parameters locked

2: Advanced parameter setting

6: Reset all the parameters to the factory settings of the door drive

8: Keypad locked

9: Reserved

10: All parameters are reset to Delta's factory setting (6Hz, 230V)

11: Copy all parameters

- When it is set to 1, all parameters are read only except Pr.00-00~00-07 and it can be used with password setting for password protection.
- When Pr.00-02=10, all parameters are reset to Delta's factory setting. If password lock was used, unlock it first. After Pr.00-02 set to 10, password will also be cleared and reset to Delta's factory setting.
- When Pr.00-02=08, the digital keypad will be locked and only Pr.00-02, Pr.00-07 0can be set.
- When Pr.00-02 = 6, all the parameters are reset to the factory settings of the door drive's manufacturer. If password lock was used, unlock it. Then set Pr00-02=6 to have all the parameters back to the factory seeting. The password will also be cleared. If the manufacturer of the door drive did not input any factory setting, a fault code "Err" will pop up when Pr00-02= 6.
- When Pr.00-02=3, The built-in keypad is limited to read and write Group 11 only
- Contact your supplier,if you don't know how to set up parameters.
- Set Pr00-02=10 to back to the factory setting.

🕮 If the door drive is locked by a password, you need to unlock the password before setting the parameters back to the factory setting.

00.03 Start-up Display Selection

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0: Display the frequency command value (F)
1: Display the actual output frequency (H)
2: Display the content of user-defined unit (U)
3: Display the output current (A)

🕮 This parameter determines the start-up display page after power is applied to the drive.

00.04 Content of Multi Function Display

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 2

Settings 0: Display output current (A)
1: Display actual frequency (Hz)
2: Display DC-BUS voltage (U)
3: Display output voltage(E)
4: Display power factor angle (n.)
5: Display output power (kW)
6: Display motor angle speed (HU)
7: Display the drive's estimated output torque (kg-m)
8: Display PG pulse input position
9: Display the electrical angle
10: Display IGBT temperature(oC)
11: Display digital input ON/OFF status
12: Display digital output ON/OFF status
13: Display current multi-step speed
14: Display the corresponding CPU pin status of digital input
15: Display the corresponding CPU pin status of digital input
16:Actual output voltage when malfunction
17: Actual DC-BUS voltage when malfunction
18: Actual feedback frequency of encoder when malfunction
19: Actual output current when malfunction
20: Actual output frequency (H.) when malfunction
21: Door width in % or step speed
22: Door width(pulse)
23: Over modulation indication

🕮 ※Description to function 08

$$[(\frac{rpm}{60}XPPR)/1000]X10=Pulse/10ms$$

rpm= motor speed; PPR= (Encoder) pulse number per turn; 1000 (1sec= 1000ms); 10: encoder pulses per10ms

🕮 On this page, press ▲ to display the content of Pr.00.04 (setting 0~23) accordingly.

00.05 Software version

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: #. ##

Settings Read only (Different versions will display differently)

00.06 Password Input

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0~9999
0~2:times of wrong password

00.07 Password Set

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0~9999

0: No password set or successful input in Pr.00-06

1: Password has been set

🕮 The function of this parameter is to input the password that is set in Pr.0-07. Input the correct password here to enable changing parameters. You are limited to a maximum of 3 attempts. After 3 consecutive failed attempts, a blinking “PcdE” will show up to force the user to restart the AC motor drive in order to try again to input the correct password.

🕮 To set a password to protect your parameter settings.
If the display shows 00, no password is set or password has been correctly entered in Pr.0-06. All parameters can then be changed, including Pr.0-07.
The first time you can set a password directly. After successful setting of password the display will show 01.
Be sure to record the password for later use.
To cancel the parameter lock, set the parameter to 00 after inputting correct password into Pr. 0-07.
The password consists of min. 1 digit and max. 4 digits.

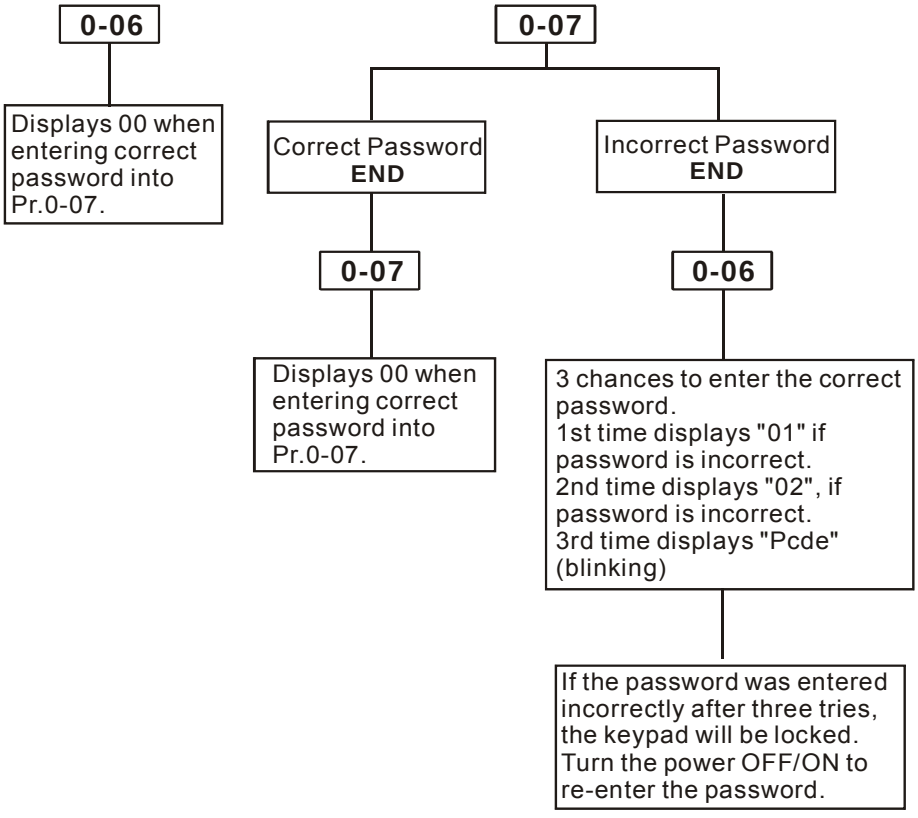
🕮 How to make the password valid again after decoding by Pr.0-07:

Method 1: Re-input original password into Pr.0-07 (Or you can enter a new password if you want to use a new one).

Method 2: After rebooting, password function will be recovered

Method 3: Input any number or character in Pr.00-07, but not password. (The display screen will show END whether the password entered in Pr.00-07 is accurate or not.)

Password Decode Flow Chart



00.08 Control Method

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 8

Settings 0: V/f control
1: V/f Control + Encoder (VFPG)
2: Sensorless vector control (SVC)
3: FOC vector control + Encoder (FOCPG)
4: PG torque control (TQCPG)
8: FOC PM control (FOCPM)

🕮 This parameter is used to select the control mode of AC motor drives.

0: V/f control: user can design proportion of V/f as required and can control multiple motors simultaneously.

1: V/f control + Encoder (VFPG): user can use optional PG card with encoder for the closed-loop speed control.

2: Sensorless vector control (SVC): get the optimal control by the auto-tuning of motor parameters.

3: FOC vector control+ encoder (FOCPG): besides torque increases, the speed control will be more accurate (1:1000).

4: FOC PM control + encoder (FOCPM): besides torque increases, the speed control will be more accurate (1:1000).

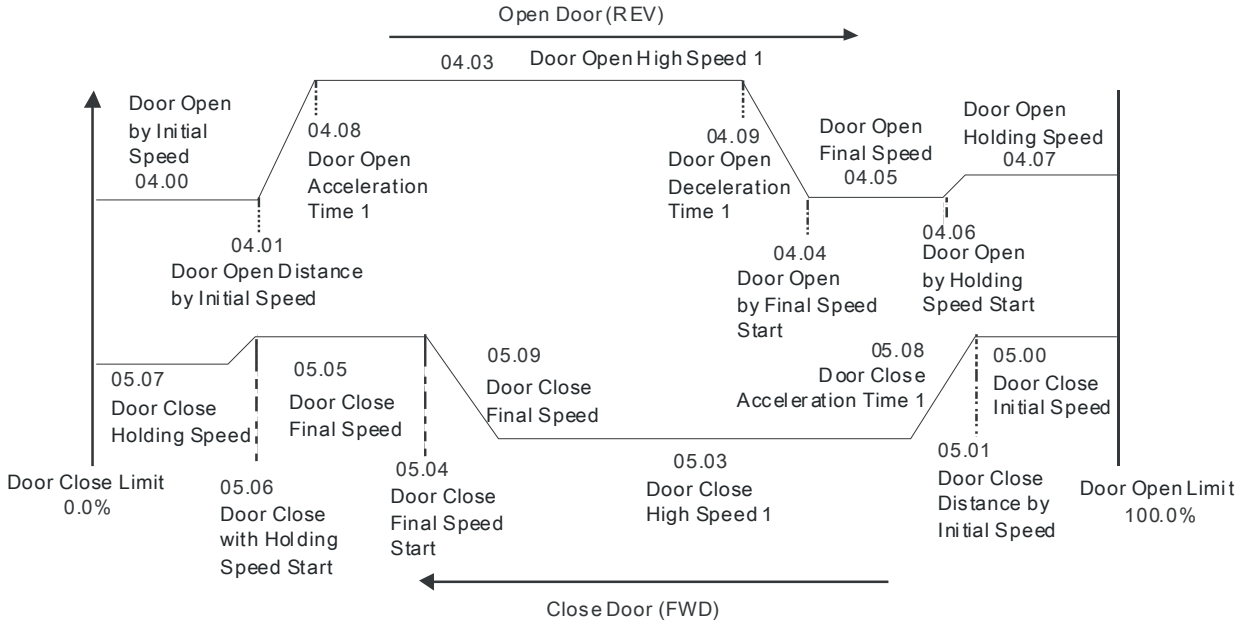
00.09 Door Control Mode

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 3

Settings 0: Distance control mode
1: Reserved
2: Multi-step speed control mode
3: Speed control mode

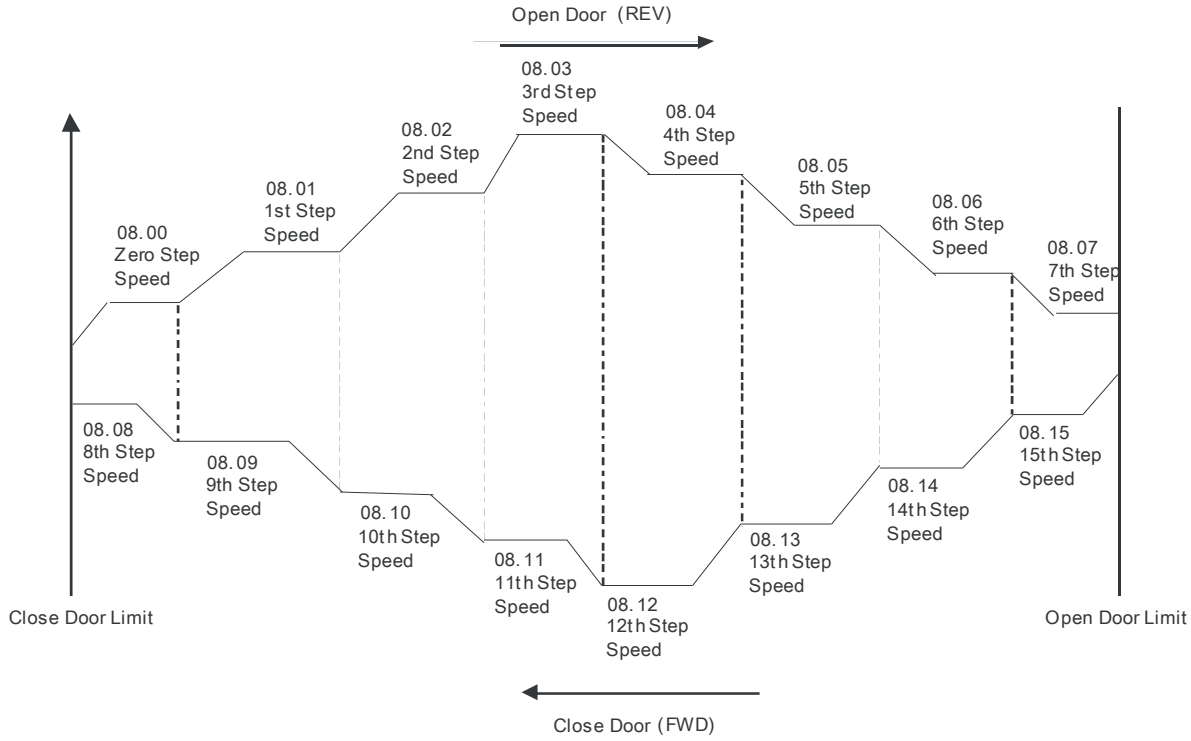
🕮 0: Distance control mode

Set encoder PG pulses accurately to ensure precise door width estimation. Door width is measured and stored by Auto-tuning. It operates the door for speed switch and completed position by counting the PG pulses. In this mode, position function will be executed whenever power again and operates with low speed to the 0% or 100% door width by the operation direction.



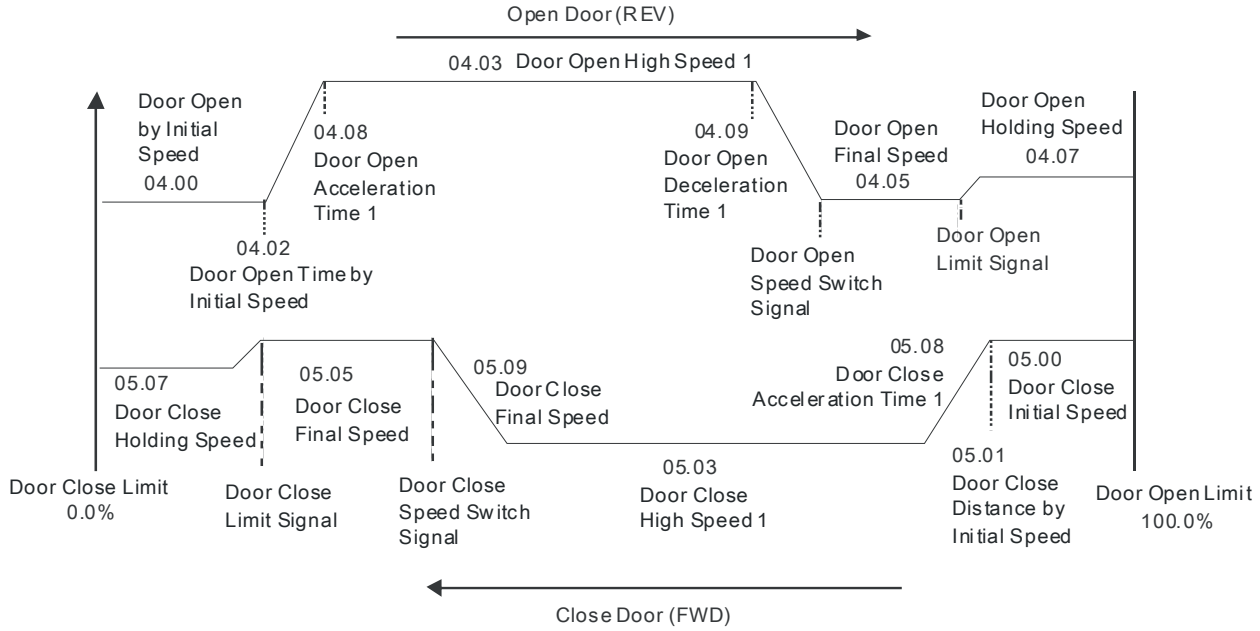
🕮 2: Multi-step control mode

The drive is controlled by Sensorless control. For operating the door, it uses three multi-input (level trigger) and operation direction (FWD/REV) to deal with speed switch and limit switch to deal with completed position. (4th logic signal: open: 0; close: 1).



🕮 3: Speed Control mode

For operating the door, it switches speed by external signal and uses limit switch to deal with completed position. The signals must be edge trigger. In this mode, it needs to run the door to the close complete position after power on again or AC motor drive stops.



00.10 Output Direction

Control mode **VF VFPG SVC FOCPG FOCPM FOCPM** Factory setting: 0

Settings 0: Runs in same direction as setting
1: Runs in different direction than setting

00.11 PWM Carrier Frequency Selection

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 10

Settings 2~15kHz

This parameter determines the PWM carrier frequency of the AC motor drive.

Carrier Frequency	Acoustic Noise	Electromagnetic Noise or leakage current	Heat Dissipation	Current Wave
1kHz	Significant	Minimal	Minimal	Minimal
8kHz	↕	↕	↕	↕
15kHz	Minimal	Significant	Significant	Significant

From the table, we see that the PWM carrier frequency has a significant influence on the electromagnetic noise, AC motor drive heat dissipation, and motor acoustic noise. If noises from ambient environment is greater than motor noise, lower PWM carrier frequency will help to lower the temperature of AC motor drive. When PWM carrier frequency is high, though the drive will operate more quietly, but wiring and interference may have problem.

00.12 Auto Voltage Regulation (AVR) Function

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0: Enable AVR
1: Disable AVR
2: Disable AVR when deceleration stop

The rated voltage of the motor is usually AC220V/200V 60Hz/50Hz and the input voltage of the AC motor drive may vary between 180V to 264 VAC 50Hz/60Hz. Therefore, when the AC motor drive is used without AVR function, the output voltage will be the same as the input voltage. When the

motor runs at voltages exceeding the rated voltage with 12% - 20%, its lifetime will be shorter and it can be damaged due to higher temperature, failing insulation and unstable torque output.

- AVR function automatically regulates the AC motor drive output voltage to the Maximum Output Voltage (Pr.1-02). For instance, if Pr.1-02 is set at 200 VAC and the input voltage is at 200V to 264VAC, then the Maximum Output Voltage will automatically be reduced to a maximum of 200 VAC.
- When motor stops with deceleration, it will shorten deceleration time. When setting this parameter to 02 with auto acceleration/deceleration, it will offer a quicker deceleration.

00.13 Source of the Master Frequency Command

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 1

Settings 0: by digital keypad input
1: by external terminal
2: by RS-485 serial communication
3: Combine digital keypad and RS-485 communication interfaces

- This parameter is used to set the source of the operation command.

00.14 Demo Mode

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0: Disable
1: Display demo action

- The Demo Mode is for displaying or testing.
- The Demo Mode can be triggered by multi-function input terminals (Set Pr02-01 to Pr02-05 as 10: Demo Mode).
- The Demo Mode can also be controlled via Multi-function output terminals (Set Pr02-10 to Pr02-12 as 12 for Demo Indication or 13 for Demo Complete).
- Door Open/Close Holding Time before Next Demo can be set by Pr06-13.
- Times of Door Open/Close in Demo Mode (L) is recorded by Pr06-14 (from single digit to thousands digit). Times of Door Open/Close in Demo Mode (H) can also be recorded by Pr06-15 (from ten thousands digit to ten millions digit.
- Disable or enable clearing Demo Mode door open/close record by set up Pr06-16

00.15 Frequency Testing Command

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0~120.00Hz

- When Pr.00-15 is not 0, door will move in testing frequency, other commands to door will stop.

01 Motor Parameters

✓This parameter can be set during operation.

01.00 Motor Auto Tuning (PM)

Control mode **FOCPM** Factory setting: 0

Settings 0: No function
1: Auto-tuning of PM motor parameters (brake locked)
2: Auto-tuning of magnetic pole's angle WITHOUT load (Pr.01-09)
5: Auto-tuning of magnetc pole's angle WITH load (Pr01-09)

🕮 When the motor is unable to unload, set Pr01-00 =5 to meausure PM magnetic pole and PG offset ange(Pr01-09). But while measuring, note that:

01) This method works when motor is unable to load or when it is without load. But when the motor is able to unload, set Pr01-00 =2 to have a better control efficiency.

02) If the brake is controlled by the motor drive, the motor drive will follow usual sequence to finish the tuning after wiring is done and brake parameters are set.

🕮 When Pr.01-00 = 2, auto-tune for PG offset angle. Please follow the following 3 rules:

1. Unload before Auto-tuning begins.
2. If the brake is control by AC motor drive, the drive can complete tuning process after wiring and brake control parameters are set.
3. If the brake is control by host controller, maker sure brake is at release status when tuning.

🕮 When Pr.01-00=1, begins auto-tuning for PM motor by press the【Run】key. After auto-tuning process is completed, the measured value will automatically be written into Pr. 01.05, Pr.01.07 (Rs、Lq) and Pr.01.08 (Back EMF).

🕮 AUTO-Tuning Process (static rolling) :

1. Make sure the drive is properly installed and all parameter settings are set to the factory setting.
2. Motor: input accurate motor value into Pr.01.01, 01.02, 01.03, 01.04 and adjust the accel. /decel. time according to your motor capacity.
3. Set Pr.01-00=1 and press the "RUN" key on the digital keypad. The motor should now begin auto-tuning. (Note: It is important to fix the motor stably to prevent shaking.)
4. When auto-tuning is complete, check if measured values are written into Pr.01.05 and 01.07.

NOTE

☑ The input rated speed can not be greater than or equal to 120f/p.

☑ When auto-tuning is in process, an "Auto-tuning" message will show on the digital keypad. Once the process is complete, the "Auto-tuning" message will be cleared and the measured values will be written into Pr.01-09.

☑ When auto-tuning is in process, if an error occurs or the drive is stopped manually, an "Auto Tuning Err" message will appear on the digital keypad and it indicates auto-tuning failure, please check if the wirings of the drive are proper. When "PG Fbk Error" occurs, please reset Pr.03-02 (if it is originally set to 1, change it to 2). When "PG Fbk Loss" occurs, please check if the Z phase pulse feedback is normal.

01.01 Full-load Current of motor (PM)

Control mode **FOCPM**

Unit: Amper

Factory setting: 90% x 00,01Amps

Settings (20~120%)*00.01 Amps

🕮 This value should be set according to the rated frequency of the motor as indicated on the motor nameplate. The factory setting is 90% X rated current.

Example: If rated current for 400W model is 2.5A. The current range for user will be 0.5~3.0A. (2.5*20%=0.5; 2.5*120%=3.0)

01.02 Rated Power of Motor (PM)

Control mode **FOCPM**

Factory setting: 0.07

Settings 0.00~655.35 kW

🕮 This parameter sets motor's rated power. Factory setting will be the drive's power.

01.03 Rated Speed of PM Motor (rpm)

Control mode **FOCPM**

Factory setting: 350

Settings 0~65535

🕮 This parameter sets motor's rated speed and it must be set according to the specification shown on the nameplate.

01.04 Number of Motor Poles (PM)

Control mode **FOCPM**

Factory setting: 10

Settings 2~96

🕮 This parameter sets number of motor poles (odd value is invalid).

01.05 Rs of Motor parameter (PM)

Control mode **FOCPM**

Factory setting:
00-00=0: 24.01
00-00=2: 14.41

Settings 0.0~655.35Ω

01.06 Ld of Motor Parameter (PM)

Control mode **FOCPM**

Factory setting: 169.4

Settings 0.0~6553.5mH

01.07 Lq of Motor Parameter (PM)

Control mode **FOCPM**

Factory setting:
00.00=0: 248.4
00.00=2: 149.1

Settings 0.0~6553.5mH

01.08 Back Electromotive Force (PM)

Control mode **FOCPM**

Factory setting: 0.0

Settings 0.0~6553.5Vrms

🕮 This parameter is used to set back electromotive force (phase-phase RMS value) when the motor is operated in the rated speed.

🕮 It can get RMS value by Pr.01-00=1 (Motor Auto Tuning)

01.09 PM Magnetic Pole and PG Offset Angle

Control mode **FOCPM** Factory setting: 360.0

Settings 0.0~360.0°

🕮 This parameter is to measure the PG offset angle of PM motor.

01.10 Magnetic Pole Re-orientation (PM)

Control mode **FOCPM** Factory setting: 0

Settings 0:No function
1:Reset magnetic pole position

🕮 This function is used to search magnetic pole position and is only available on permanent magnet motor.

🕮 When encoder origin-adjustment function (Pr.01-09= 360.0) is not available, the motor operation efficiency can only achieve up to 86% of its best efficiency. In this case, if user needs to improve the operation efficiency, reapply power or set Pr.01-10=1 to measure magnetic pole position again.

01.11 Motor Auto Tuning (IM)

Control mode **SVC FOCPG** Factory setting: 0

Settings 0: No function
1: Rolling test
2: Static test
3: Reserved
4: Reserved

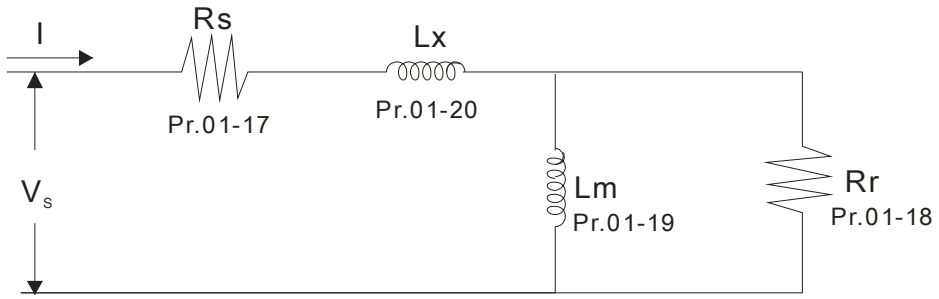
🕮 Set Pr.01-11 to 1 or 2, Press 【Run】to begin auto tuning. The measured value will be written into Pr.1-17 to Pr.01-20 (Rs, Rr, Lm, Lx, no-load current).

🕮 AUTO-Tuning Process (rolling test):

1. Make sure that all the parameters are set to factory settings and the motor wiring is correct.
2. Make sure the motor has no-load before executing auto-tuning and the shaft is not connected to any belt or gear motor. It is recommended to perform auto-tuning in static test if the motor can't separate from the load.
3.

	Pr. of Motor
Motor Rated Frequency	01-32
Motor Rated Voltage	01-33
Motor Full-load Current	01-12
Motor Rated Power	01-13
Motor Rated Speed	01-14
Motor Pole Numbers	01-15

4. Set Pr.01-11=1 and press【Run】, the drive will begin auto-tuning. Please be aware of the motor that it starts spinning as【Run】 is pressed.
5. When auto-tuning is completed, please check if the measured values are written into Pr.01-16 ~01-20).
6. Mechanical equivalent circuit



※ When Pr.01-11 is set to 2 (static test), user needs to write no-load current value of motor into Pr.01-16.

NOTE

- ☑ In torque/vector control mode, it is not recommended to have motors run in parallel.
- ☑ It is not recommended to use torque/vector control mode if motor rated power exceeds the rated power of the AC motor drive.
- ☑ The no-load current is usually 20~50% X rated current.
- ☑ The rated speed can not be greater than or equal to 120f/p (f=rated frequency Pr.01-32; P: number of motor poles Pr.01-15).

01.12 Full-load Current of Motor (IM)

Control mode **VF VFPG SVC FOCPG** Unit: Amper
Factory setting: 1.00

Settings (20~120%)*00.01 Amps

🕮 This value should be set according to the rated frequency of the motor as indicated on the motor nameplate. The factory setting is 90% X rated current.

Example: If rated current for 400W model is 2.5A. The current range for user will be 0.5~3.0A.

(2.5*20%=0.5 2.5*120%=3.0)

01.13 Rated power of Motor (IM)

Control mode **SVC FOCPG** Factory setting: 0.06

Settings 0.00~655.35 kW

🕮 This parameter sets motor's rated power. Factory setting will be the drive's power.

01.14 Rated speed of IM Motor (rpm)

Control mode **VFPG SVC FOCPG** Factory setting: 250

Settings 0~65535

🕮 This parameter sets motor's rated speed and it must be set according to the specification shown on the nameplate.

01.15 Number of Motor Poles (IM)

Control mode **VF VFPG SVC FOCPG** Factory setting: 16

Settings 2~96

🕮 This parameter sets number of motor poles (odd value is invalid).

01.16 No-load Current of Motor (IM)

Control mode **VFPG SVC FOCPG** Factory setting: #. ##

Settings 00~ Pr.01.12 factory setting

🕮 Factory setting of the drive's rated current is 40%.

01.17 Rs of Motor (IM)

Control mode **SVC FOCPG** Factory setting: 0.000

Settings 0.000~65.535Ω

01.18 Rr of Motor (IM)

Control mode **SVC FOCPG** Factory setting: 0.000

Settings 0.0~65.535Ω

01.19 Lm of Motor (IM)

Control mode **SVC FOCPG** Factory setting: 0.0

Settings 0.0~6553.5mH

01.20 Lx of Motor (IM)

Control mode **SVC FOCPG** Factory setting: 0.0

Settings 0.0~6553.5mH

01.21 Torque Compensation Time Constant

Control mode **SVC** Factory setting: 0.020

Settings 0.001~10.000sec

01.22 Slip Compensation Time Constant

Control mode **SVC** Factory setting: 0.100

Settings 0.001~10.000sec

- The slip compensation response time can be set by Pr.01-21 and Pr.01-22 and maximum up to 10 sec.
- When Pr.01-21 and Pr.01-22 are set to 10 sec, it is the slowest response time the drive supports. If the response time is set too quick, the system may be unstable.

01.23 Torque Compensation Gain

Control mode **VF VFPG** Factory setting: 0

Settings 0～10

- This parameter sets the amount of additional voltage output during operation to get greater torque.

01.24 Slip Compensation Gain

Control mode **VF VFPG SVC** Factory setting: 0.00

Settings 0.00～10.00

- When AC motor drive drives the induction motor, slips increase as load increase. This parameter can be used to set compensation frequency and reduce the slip to close the synchronous speed when the motor runs in the rated current to raise the drive accuracy. When drive's output current is greater than the motor current at no-load, the drive will compensate the frequency according to the setting in this parameter. When actual speed is slower than expected, increase the value in Pr.01-24; if actual speed is faster than expected, lower the value in Pr.01-24.
- This parameter is valid for SVC mode only.

01.25 Slip Deviation Level

Control mode **VFPG SVC FOCPG** Factory setting: 0

Settings 00~1000% (0:Disable)

01.26 Detection Time of Slip Deviation

Control mode **VFPG SVC FOCPG** Factory setting: 1.0

Settings 0.0~10.0sec

01.27 Over Slip Treatment

Control mode **VFPG SVC FOCPG** Factory setting: 0

Settings 0: Warn and keep operation
1: Warn and ramp to stop
2: Warn and coast to stop

📖 Pr.01-25 to Pr.01-27 is used to set the allowable slip level/time and over slip treatment when the drive is running.

01.28 Hunting Gain

Control mode **VF VFPG SVC** Factory setting: 2000

Settings 0~10000 (0: No action)

📖 The motor will have current wave motion in some specific area. It can improve this situation by setting this parameter. (When it is high frequency or run with PG, it can be set to 0. when the current wave motion happens in the low frequency, please increase the value in Pr.01-28.)

01.29 Accumulative Motor Operation Time (Min.)

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0~1439

01.30 Accumulative Motor Operation Time (day)

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0~65535

📖 This parameter records the motor running time. When Pr.01-29 and Pr.01-30 are set to 00, it clears the setting to 0. Operation time will not be recorded if it is shorter than 60 sec.

01.31 Maximum Output Frequency

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 29.17

Settings 10.00~120.00Hz

📖 This parameter determines the AC motor drive's Maximum Output Frequency. All the AC motor drive frequency command sources (analog inputs 0 to +10V, 4 to 20mA, 0 to 20mAand ±10V) are scaled to correspond to the output frequency range.

01.32 Output Frequency 1(Base frequency /Motor rated frequency)

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 29.17

Settings 0.00~120.00Hz

📖 This value should be set according to the rated frequency of the motor as indicated on the motor nameplate. If the motor is 60Hz, the setting should be 60Hz. If the motor is 50Hz, it should be set to 50Hz.

01.33 Output Voltage 1(Base voltage/Motor rated voltage)

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 220.0

Settings 0.0V~240.0V

📖 This value should be set according to the rated voltage of the motor as indicated on the motor nameplate. If the motor is 220V, the setting should be 220.0. If the motor is 200V, it should be set to 200.0.

📖 There are many motor types in the market and the power system for each country is also difference. The economic and convenience method to solve this problem is to install the AC motor drive. There is no problem to use with the different voltage and frequency and also can amplify the original characteristic and life of the motor.

01.34 Output Frequency 2

Control mode **VF** **VFPG** Factory setting: 0.50

Settings 0.00~120.00Hz

01.35 Output Voltage 2

Control mode **VF** **VFPG** Factory setting: 5.0

Settings 0.0V~240.0V

01.36 Output Frequency 3

Control mode **VF** **VFPG** Factory setting: 0.50

Settings 0.00~120.00Hz

01.37 Output Voltage 3

Control mode **VF** **VFPG** Factory setting: 5.0

Settings 0.0V~240.0V

01.38 Output Frequency 4

Control mode **VF** **VFPG** **SVC** **FOCPG** Factory setting: 0.00

Settings 0.00~120.00Hz

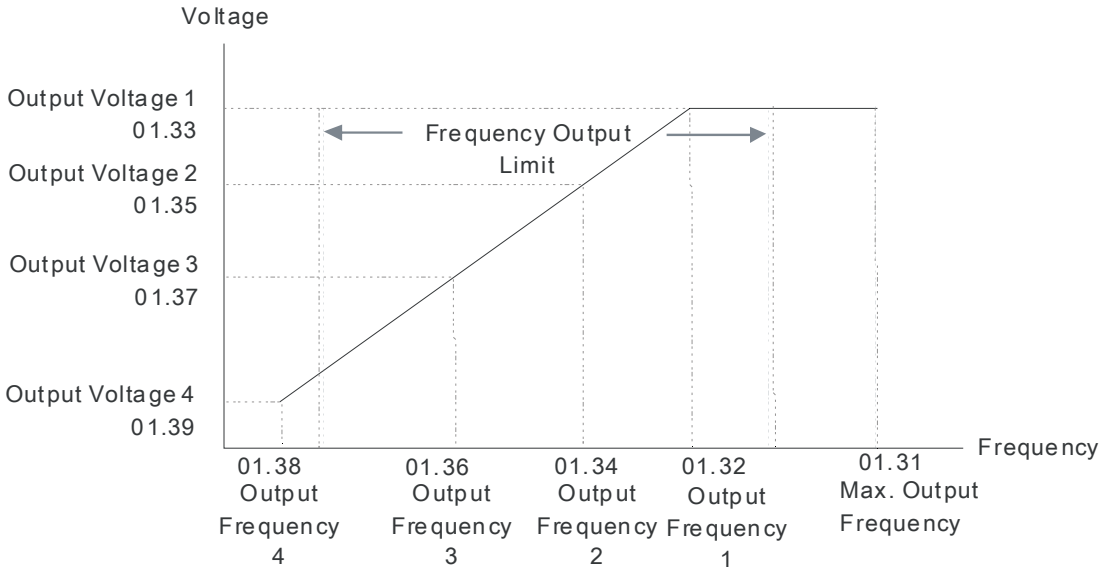
01.39 Output Voltage 4

Control mode **VF** **VFPG** Factory setting: 0.0

Settings 0.0V~240.0V

🕮 V/f curve setting is usually set by the motor's allowable loading characteristics. Pay special attention to the motor's heat dissipation, dynamic balance, and bearing lubricity, if the loading characteristics exceed the loading limit of the motor.

🕮 The frequency setting of V/F curve must be set according to this rule, Pr. 01.32≥01.34≥01.36≥01.38. There is no limit for the voltage setting, but a high voltage at low frequency may cause motor damage, overheat, and stall prevention or over-current protection. Therefore, please use the low voltage at the low frequency to prevent motor damage.



V/F Curve

02 Input/ Output Parameters

This parameter can be set during operation.

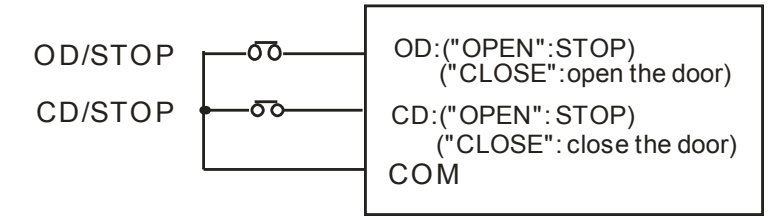
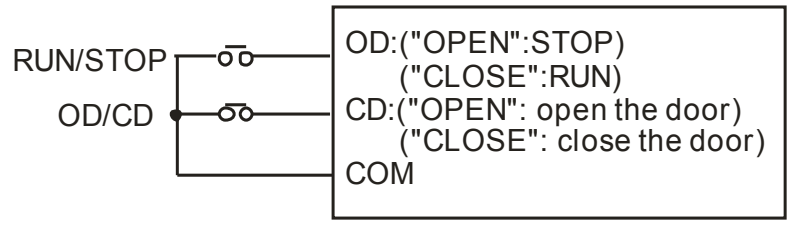
02.00 2-wire/3-wire Operation Control

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0 FWD/STOP
1 FWD/STOP, REV/STOP (Line Start Lockout)
2 RUN/STOP, REV/FWD
3 RUN/STOP, REV/FWD (Line Start Lockout)

When line start lockout is enabled, the drive will not run once applying the power. The Line Start Lockout feature doesn't guarantee the motor will never start under this condition. It is possible the motor may be set in motion by a malfunctioning switch. This parameter sets the drive's lock when power is applied.

This parameter sets three different control modes by external control:

Pr.02-00	Control Circuits of the External Terminal
Setting: 0, 1 2-wrie operation control (1) Open the door/STOP Close the door/STOP	
Setting: 2, 3 2-wrie operation control (1) Open the door/Close the door RUN/STOP	

02.01 Multi-Function Input 1 (MI1)

Factory setting: 14

02.02 Multi-Function Input 2 (MI2)

Factory setting: 15

02.03 Multi-Function Input 3 (MI3)

Factory setting: 16

02.04 Multi-Function Input 4 (MI4)

Factory setting: 17

02.05 Multi-Function Input 5 (MI5)

Factory setting: 0

Settings	Control mode	VF	VFPG	SVC	FOCPG	FOCPM
0: No function		○	○	○	○	○
1: Multi-step speed command 1		○	○	○	○	○
2: Multi-step speed command 2		○	○	○	○	○
3: Multi-step speed command 3		○	○	○	○	○
4: Multi-step speed command 4		○	○	○	○	○
5: Fault reset		○	○	○	○	○
6: Low speed operation		○	○	○	○	○

7: OD/CD command for low speed operation	○	○	○	○	○
8: 1st, 2nd acceleration/deceleration time selection	○	○	○	○	○
9: Force stop (NO) input	○	○	○	○	○
10: Demo mode	○	○	○	○	○
11: Emergency stop (NO) input	○	○	○	○	○
12: Source of operation command (Keypad/External terminals)	○	○	○	○	○
13: Parameter lock enable (NC)	○	○	○	○	○
14: Door open complete signal	○	○	○	○	○
15: Door close complete signal	○	○	○	○	○
16: Door open speed switch signal	○	○	○	○	○
17: Door close speed switch signal	○	○	○	○	○
18: Open allowance signal	○	○	○	○	○
19: Screen signal input	○	○	○	○	○
20: Door curve signal input for 2nd set door open/close	○	○	○	○	○
21: Reset signal input	○	○	○	○	○
22: Input system security circuit confirmation signal (DCC)	○	○	○	○	○
23: Input enforced door closing signal (NUD)	○	○	○	○	○
24: Auto-tuning on door width	○	○	○	○	○

🕮 This parameter selects the functions for each multi-function terminal.

Summary of Function Settings:

Settings	Functions	Descriptions
0	No function	Any unused terminals should be programmed to 0 to ensure they have no effect on operation.
1	Multi-step speed command 1	When door control mode (Pr.00-09)is set 2 (multi-step speed control), these four inputs can be used for 16 step speed frequencies
2	Multi-step speed command 2	
3	Multi-step speed command 3	
4	Multi-step speed command 4	
5	Fault reset	Reset drive setting after fault is cleared.
6	Low speed operation	Before using this function, please make sure that AC motor drive is stop. At this moment, key “STOP” on the digital keypad is still valid. When this contact is OFF, motor will stop by deceleration time of low speed operation.
7	OD/CD command for low speed operation	ON: open the door (OD) OFF: closer the door (CD) This command will be effective only when external terminal for low speed operation is active.
8	1st, 2nd acceleration/deceleration time selection	When signal is input, the AC motor drive can switch between 1st and 2nd acceleration/deceleration time
9	Force stop (NO) input	This parameter has the same function as the “STOP” command and no error message will be displayed. It does not require a RESET but a new RUN command is needed for the drive to run again.
10	Demo mode	When this setting is enabled, the output frequency of AC motor drive will run by open/close curve repeatedly till this setting is disabled. It will get the best open/close curve by this action.
11	Emergency stop (NO) input	When setting to 11, the Multi-Function Input Terminal can be used to stop the AC motor drive in case of malfunction in the application. It will display “EF”. Please “RESET” after the fault has been cleared.
12	Source of operation command (Keypad/External terminals)	ON: Operation command via Ext. Terminals OFF: Operation command via Keypad Pr.00-14 is disabled if this parameter is set to 13.

13	Parameter lock enable (NC)	When this setting is enabled, all parameter reading value will be 00. This setting must be disabled in order to read the parameter content.
14	Door open complete signal	When Pr.06-11 is set to 01 or 03, drive will open the door to the completed position by this signal.
15	Door close complete signal	When Pr.06-11 is set to 02 or 03, drive will close the door to the completed position by this signal.
16	Door open speed switch signal	When door control mode (pr.00-09) is set to 3 speed control mode, this terminal can be used for switching speed.
17	Door close speed switch signal	When door control mode (pr.00-09) is set to 3 speed control mode, this terminal can be used for switching speed.
18	Open allowance signal	When this setting is enabled, it allows opening the door. It also can be used for the signal of door zone.
19	Screen signal input	
20	Door curve signal input for 2nd step door open/close	When this setting is ON, it will run the curve of 2nd step door open/close.
21	Reset signal input	When parameter is set to 21, the drive re-positioning begins.
22	Input system security circuit confirmation signal (DCC)	When the motor drive receives this signal then any door closing signal will not be input. And the door will remain at the actuation position
23	Input enforced door closing signal (NUD)	When the motor drive receives this signal, it will close at low speed (Pr03-10), but does not respond to stop closing door function.
24	Auto-tuning on door width	When the motor drive receives this signal, the auto-tuning on door width will strart. It is the same function as Pr03-11=1.

02.06 Digital Terminal Input Debouncing Time (MD-5-13)

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.005

Settings 0.001~30.000sec

This parameter is to delay the signals on digital input terminals. 1 unit is 2.5 msec. The delay time is to debounce noisy signals that could cause the digital terminals to malfunction but response time maybe a bit slower.

02.07 Digital Input Operation Direction

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0～65535

This parameter is used to set the input signal level.

Bit 0 is CD terminal, bit 1 is OD terminal and bit 2~bit 6 areMI1~MI5。

User can change the terminal status ON/OFF by communicating.

For example, MI1 is set to 1 (multi-step speed command 1), MI2 is set to 2 (multi-step speed command 2). Then the forward + 2nd step speed command=1001(binary) =9 (Decimal). Only need to set Pr.02-07=9 by communication and it can forward with 2nd step speed. It doesn't need to wire any multi-function terminal.

bit6	bit5	bit4	bit3	bit2	bit1	bit0
MI5	MI4	MI3	MI2	MI1	OD	CD

02.08 Multi-function Output (Relay1)

Factory setting: 16

02.09 Multi-function Output (Relay2)

Factory setting: 17

02.10 Multi-function Output (MO1)

Factory setting: 0

02.11 Multi-function Output (MO2)

Factory setting: 0

02.12 Multi-function Output (MO3)

Factory setting: 0

Settings	Control mode	VF	VFPG	SVC	FOCPG	FOCPM
0: No function		○	○	○	○	○
1: AC drive in operation		○	○	○	○	○
2: Zero speed frequency signal (including STOP)		○	○	○	○	○
3: AC drive ready		○	○	○	○	○
4: Low voltage warning(Lv)		○	○	○	○	○
5: Fault indication		○	○	○	○	○
6: Overhead warning (Pr.06.09)		○	○	○	○	○
8: Warning indication		○	○	○	○	○
9: Over voltage warning		○	○	○	○	○
10: OD command		○	○	○	○	○
11: CD command		○	○	○	○	○
12: Demo Indication		○	○	○	○	○
13: Demo complete		○	○	○	○	○
14: Emergency stop indication		○	○	○	○	○
15: Force stop indication		○	○	○	○	○
16: Door open complete (limit) signal output		○	○	○	○	○
17: Door close complete (limit) signal output		○	○	○	○	○
18: Door Close Error		○	○	○	○	○
19: Position Complete Signal		○	○	○	○	○
20: Position Detection 1(for door close only)		○	○	○	○	○
21: Position Detection 2(for door close only)		○	○	○	○	○
22: Position Detection 3(for door close only)		○	○	○	○	○
23: Position Detection 1(for door open only)		○	○	○	○	○
24: Position Detection 2(for door open only)		○	○	○	○	○
25: Position Detection 3(for door open only)		○	○	○	○	○
26: PG feedback error		○	○	○	○	○
27: Obstruction when opening door						
28: Over Torque Detect 1 (OT1, Pr06-27 ~ Pr06-28)						

📖 These parameters can be used for external terminal output

Summary of Function Settings

Settings	Functions	Descriptions
0	No function	MO has no function.
1	AC drive in operation	The drive is ON when it receives voltage or operation command.
2	Zero speed frequency signal (including STOP)	Zero speed output signals (including STOP).
3	AC drive ready	Active when the drive is ON and no abnormality detected or abnormality is cleared.
4	Low voltage warning(Lv)	Active when the detected input voltage is too low.
5	Fault indication	Active when fault occurs.
6	Overhead warning (Pr.06.09)	Active when IGBT or heat sink overheats to prevent OH turn off the drive. When temperature higher than 85℃= ON, lower than <80℃= OFF.
8	Warning indication	Active when warning is detected.
9	Over voltage warning	Active when over-voltage is detected.
10	OD command	Active when the operation direction is door open.
11	CD command	Active when the operation direction is door close.
12	Demo Indication	Active when the drive is in demo mode.
13	Demo complete	Active when each time door open/close is complete in demo mode (contact closed for 0.5s only).
14	Emergency stop indication	Active when emergency stop is detected.
15	Force stop indication	Active when force stop is detected.
16	Door open complete (limit) signal output	Active when position mode (Pr.06-11) is set to “no door open limit signal” and the door width is greater than the setting in Pr.04-06. Active when position mode (Pr.06-11) is set to door open limit signal allow and one of MI (Pr.02-01~02-05) is set to 14.
17	Door close complete (limit) signal output	Active when position mode (Pr.06-11) is set to “no door close limit signal” and the door width is less than Pr.05-06 setting during the door close. Active when position mode (Pr.06-11) is set to door close limit signal allow and one of MI (Pr.02-01~02-05) is set to 15.
18	Door close error	Active when door close error. (Includes door reopen and not reopen).
19	Position complete signal	Active when positioning is completed after drive power is on or PGEr. This function is valid when Pr.00-10=00.
20	Position Detection 1(for door close only)	Active when door close width is lower than Pr.02-14 (valid when door close).
21	Position Detection 2(for door close only)	Active when door close width is lower than Pr.02-15 (valid when door close).
22	Position Detection 3(for door close only))	Active when door close width is lower than Pr.02-16 (valid when door close).
23	Position Detection 1(for door open only)	Active when door close width is lower than Pr.02-14 (valid when door open).
24	Position Detection 2(for door open only)	Active when door close width is lower than Pr.02-15 (valid when door open).
25	Position Detection 3(for door open only)	Active when door close width is lower than Pr.02-16 (valid when door open).
26	PG feedback error	Active when PG feedback signal error is detected
27	Output signal when encounter an obstruction while opening door	Active when unable to open elevator doors.

28	Over Torque Detect 1 (OT1)	When output current is higher than the over-torque detection level (OT1, Pr06-28), and longer than the over-torque detection time (OT1, Pr06-29), the over-torque detection follows the setting at Pr06-27.

02.13 Digital Output Direction

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 00～65535

This parameter is set via bit setting. If a bit is 1, the corresponding output acts in the opposite way.
Example:
If Pr02-08=1 (operation indication) and Pr.02-13=0, Relay 1 RA-RC is closed when the drive runs and is open when the drive is stopped.
If Pr02-08=1 and Pr02-13=1, Relay 1 RA-RC is open when the drive runs and is closed when the drive is stopped.

02.14 Position Detection Signal 1

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 25.0

Settings 0.0~100.0%

02.15 Position Detection Signal 2

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 12.5

Settings 0.0~100.0%

02.16 Position Detection Signal 3

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 7.5

Settings 0.0~100.0%

When Pr.02-12 (multi-function output terminal) is set to 16~18, it will output a signal once the door is in position that Pr.02-14~02-16 set.

03 Feedback Parameter

This parameter can be set during operation.

03.00 Encoder (PG) Signal Type

Control mode **VFPG** **FOCPG** **FOCPM** Factory setting: 7

Settings 0: No function

1: ABZ

7: PWM pulse

- Detection of the magnetic pole: Setting 1: The AC motor drive will output short circuit to detect the position of the magnetic pole. At this moment, the motor will generate a little noise.
- Reference table for encoder and tuning

Setting of PG signal type	Encoder (PG) Signal type	Pr.01-00=01	Pr.01-00=03
03.00=1	A, B, Z	Motor will run	Motor will run
03.00=7	PWM	Motor will run	Motor will run

03.01 Encoder pulse

Control mode **VFPG** **FOCPG** **FOCPM** Factory setting: 256

Settings 1~25000

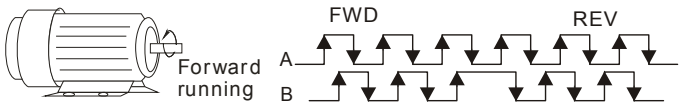
- A Pulse Generator (PG) or encoder is used as a sensor that provides a feedback signal of the motor speed. This parameter defines the number of pulses for each cycle of the PG control (PPR).

03.02 Encoder Input Type Setting

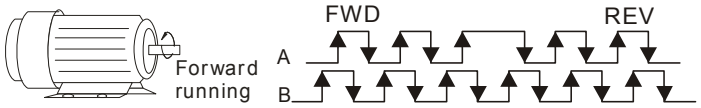
Control mode **VFPG** **FOCPG** **FOCPM** Factory setting: 1

Settings 0: Disable

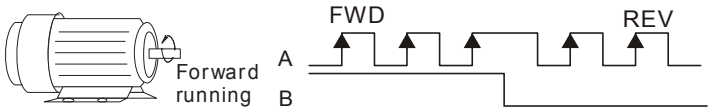
1: Phase A leads in a forward run command and phase B leads in a reverse run command



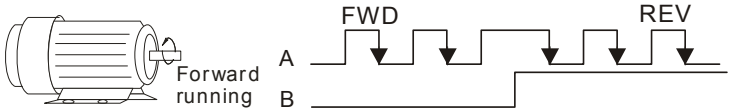
2: Phase B leads in a forward run command and phase A leads in a reverse run command



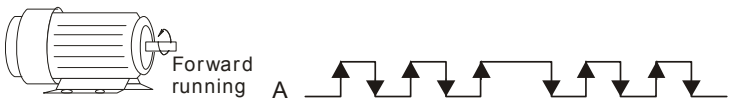
3: Phase A is a pulse input and phase B is a direction input. (low input=reverse direction, high input=forward direction)



4: Phase A is a pulse input and phase B is a direction input. (low input=forward direction, high input=reverse direction)



5: Single-phase input



- It is helpful for the stable control by inputting correct pulse type.

03.03 Encoder Feedback Fault Treatment (PGF1, PGF2)

Control mode **VFPG** **FOCPG** Factory setting: 2

Settings 0: Warn and keep operation
1: Fault and ramp to stop
2: Fault and stop operation

03.04 Detection Time for Encoder Feedback Fault

Control mode **VFPG** **FOCPG** **FOCPM** Factory setting: 5.0

Settings 0.0~10.0sec

When PG loss, encoder signal error, pulse signal setting error or signal error, if time exceeds the detection time for encoder feedback fault (Pr.03-04), the PG signal error will occur. Refer to the Pr.03-03 for encoder feedback fault treatment.

03.05 Encoder Stall Level (PGF3)

Control mode **VFPG** **FOCPG** **FOCPM** Factory setting: 115

Settings 0~120% (0: disable)

This parameter determines the maximum encoder feedback signal allowed before a fault occurs. (max. output frequency Pr.01-31 =100%)

03.06 Encoder Stall Detection Time

Control mode **VFPG** **FOCPG** **FOCPM** Factory setting: 0.10

Settings 0.0～2.0sec
Encoder feedback error (Max. output frequency Pr.01-31=100%)

03.07 Encoder Slip Range (PGF4)

Control mode **VFPG** **FOCPG** **FOCPM** Factory setting: 50

Settings 0~50% (0:disable)
Encoder feedback error (Max. output frequency Pr.01-31=100%)

03.08 Encoder Slip Detection Time

Control mode **VFPG** **FOCPG** **FOCPM** Factory setting: 0.50

Settings 0.0～10.0sec
Encoder feedback error (Max. output frequency Pr.01-31=100%)

03.09 Encoder Stall and Slip Error Treatment

Control mode **VFPG** **FOCPG** **FOCPM** Factory setting: 2

Settings Encoder PG signal feedback error (Max. output frequency Pr.01-31=100%)
0: Warn and keep operation
1: Fault and ramp to stop
2: Fault and coast to stop

When the value of (rotation speed – motor frequency) exceeds Pr.03-07 setting, detection time exceeds Pr.03-08 or motor frequency exceeds Pr.03-05 setting, it will start to accumulate time. If detection time exceeds Pr.10-06, the encoder feedback signal error will occur. Refer to Pr.03-09 encoder stall and slip error treatment.

03.10 Door Width Auto-tuning Frequency

Control mode **FOCPG** **FOCPM** Factory setting: 5.0

Settings 0.10~120.00Hz

This parameter is the frequency of motor when using door width auto-tuning function.

03.11 Door Width Auto-tuning

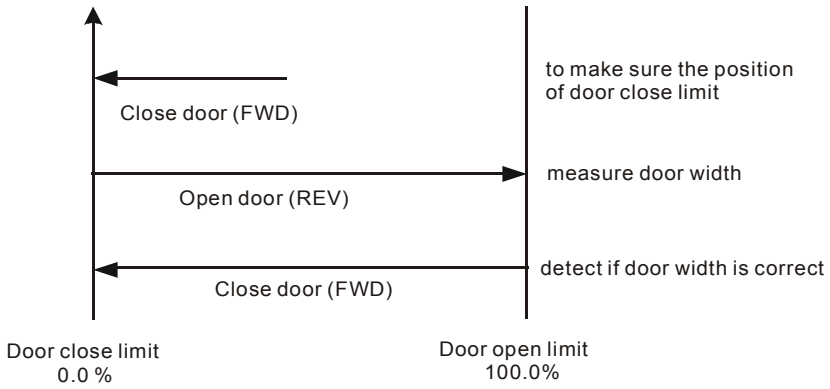
Control mode **FOCPG FOCPM** Factory setting: 0

Settings 0: Disable
1: Enable

🕮 The door width will be difference due to its application. For example, the door of the freight elevator is much wider than passenger elevator. Therefore, it needs to have door width auto tuning function to measure the correct door width for the correct position and door open/close. This parameter is suitable for the condition when door control mode is set to distance control mode (Pr.00-10=0).

🕮 The procedure for the door width auto-tuning function:

1. Close the door and make sure it reaches its close complete position, and then open the door to measure the door width and close the door again to double check the door width.
2. After door width auto-tuning is complete, the measured value will write into Pr.03-12 and Pr.03-13 automatically.



03.12 Door Width Pulses (Unit:1)

Control mode **FOCPG FOCPM** Factory setting: 8800

Settings 1~9999

03.13 Door Width Pulses (Unit:10000)

Control mode **FOCPG FOCPM** Factory setting: 0

Settings 0~9999 (Unit:10000)

🕮 After door width auto tuning (Pr.03-11=1) is completed, door width pulses will write into Pr.03-12 and Pr.03-13 automatically. User can also manually input door width pulses into Pr.03-12 and Pr.03-13.

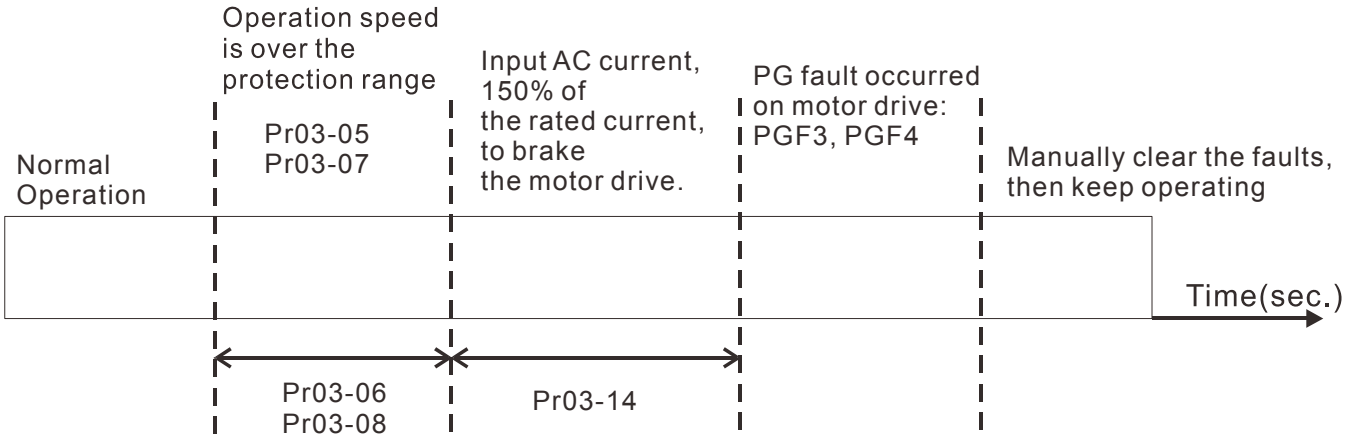
03.14 When a PG fault occurs, DC current will be automatically generated to brake the motor.

Control mode **FOCPG FOCPM** Factory settingn1.00

Settings: 0.00~5.00 sec (0: diable)

🕮 When a PG fault occurs, a DC current, 150% of the rated current, will be generated to brake the motor within the time set at Pr03-14.

🕮 When a PG fault occurs, refer to the diagram below for the DC current braking sequence.


Operation speed
is over the
protection range
Pr03-05
Pr03-07
Input AC current,
150% of
the rated current,
to brake
the motor drive.
PG fault occurred
on motor drive:
PGF3, PGF4
Manually clear the faults,
then keep operating
Normal
Operation
Time(sec.)
Pr03-06
Pr03-08
Pr03-14

04 Door Open Parameters

✓ This parameter can be set during operation.

✓ 04.00 Door Open by Initial Speed

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 2.00

Settings 0.00~120.0Hz

✓ 04.01 Door Open Distance by Initial Speed

Control mode **VFPG FOCPG FOCPM** Factory setting: 100

Settings 0~65535 (pulses number)

✓ 04.02 Door Open Time by Initial Speed

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 1.0

Settings 0~20.0s

✓ 04.03 Door Open High Speed 1

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 15.00

Settings 0.00~120.0Hz

✓ 04.04 Door Open by Final Speed Begins

Control mode **VFPG FOCPG FOCPM** Factory setting: 90.0

Settings 0.0~100.0% (Door width setting in %)

✓ 04.05 Door Open Final Speed

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 2.00

Settings 0.00~120.0Hz

✓ 04.06 Door Open by Holding Speed Begins

Control mode **VFPG FOCPG FOCPM** Factory setting: 95.0

Settings 0.0~100.0% (Door width setting in %)

✓ 04.07 Door Open Holding Speed

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 2.00

Settings 0.00~120.0Hz

✓ 04.08 Door Open Acceleration Time 1

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 1.0

Settings 0.1~3600sec

✓ 04.09 Door Open Deceleration Time 1

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 1.0

Settings 0.1~3600sec

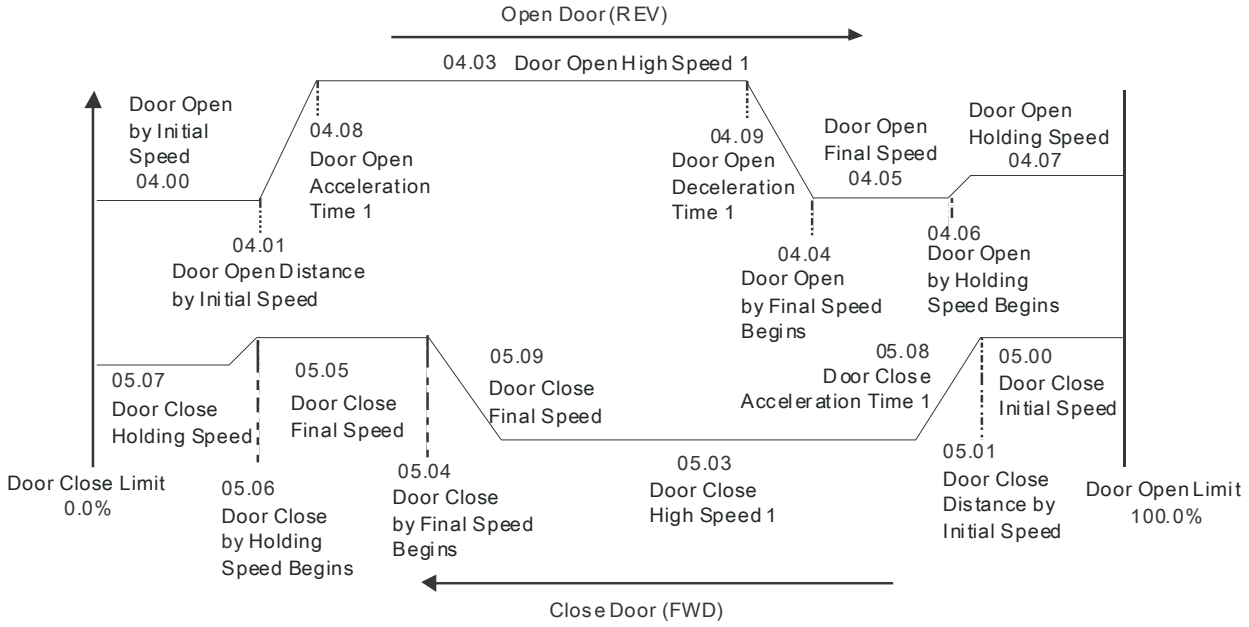
✓ 04.10 Door Open Holding Torque Level

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 85.0

Settings 0.0~150.0% (AC drive's rated current)

🕮 Door open distance (Pr.04-01) is set in pulses number but when converting into %; it must be smaller than the setting in Pr.04-04. Door close completely is 0% and door open completely is 100%.

🕮 Please refer to the diagram below and adjust door open/close curve to your requirement.



04.11 Door Open Holding Torque

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 60.0

Settings 0.0~100.0% (AC drive's rated current)

04.12 Response Time of Door Open Holding Torque

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.20

Settings 0.01~10.00sec

When the door is in the open complete position, it needs holding torque to keep the door still in complete position. To prevent motor overload, holding torque should be set within a limit.

04.13 Door Open High Speed 2

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 30.00

Settings 0.00~400.0Hz

04.14 Door Open Acceleration Time 2

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 1.0

Settings 0.1~3600sec

04.15 Door Open Deceleration Time 2

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 1.0

Settings 0.1~3600sec

04.16 Door Open Holding Torque 2

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0~150.0% (AC drive's rated current)

04.17 Door Open Time-out Setting

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0~180.0sec (0.0 sec: Disable)

04.18 Holding Time for OD (Open Door)Terminal

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 999.9

Settings 0.0~999.9sec (999.9 sec for always holding)

This parameter is used to clear the OD terminal signal (door open signal) when door open complete. During the holding period, AC Motor Drive will still be in RUN status. After holding time, AC Motor Drive will STOP. The holding time is valid only when door open has reached the complete position.

🕮 Within the holding time, when CD command (door close command) is given, the drive will begin door close action.

🕮 When Pr.04-18 set to 999.9, OD terminal is executing a permanent holding command, user can only terminate this command by using the STOP/RESET key on digital keypad.

04.19 Door Open Acceleration Time of S1 Curve

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0~10.0sec

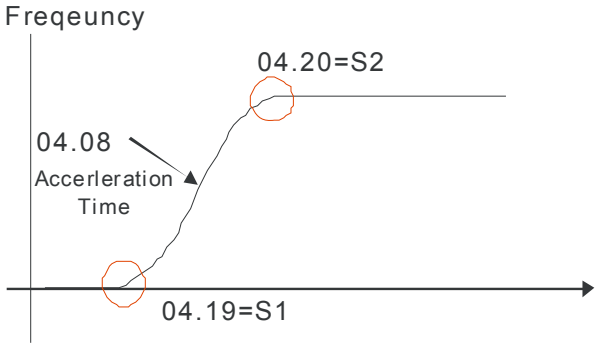
04.20 Door Open Acceleration Time of S2 Curve

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0~10.0sec

🕮 This parameter is used to ensure smooth acceleration and deceleration via S-curve, different setting will create different S-curve. When this function is activated, the drive will create a smooth acceleration and deceleration curve by original acceleration and deceleration time. Setting Pr.04-19=0.0 or Pr.04-20=0.0 will create a linear acceleration and deceleration curve.

🕮 Actual acceleration time = the selected acceleration time for door open + (Pr.04.19 + Pr.04.20)/2



04.21 Door Open DC Brake Current Level

Control mode **VF VFPG SVC** Factory setting: 0

Settings 0~100%

🕮 This parameter sets the level of DC Brake Current output to the motor during start-up and stopping. When setting DC Brake Current, the Rated Current (Pr.00-01) is regarded as 100%. It is recommended to start with a low DC Brake Current Level and then increase until proper holding torque has been attained. Do not set Pr.04-21 greater than rated current in order to prevent motor damage. Also for your personal safety, do not use DC braking for door holding action.

🕮 When AC motor drive is in FOCPG/FOCPM control mode, DC brake functions are ready to use, no additional setting is required.

04.22 Door Open DC Brake Time when Startup

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0~60.0sec

🕮 This parameter determines the duration of the DC Brake current after a RUN command.

04.23 Door Open DC Brake Time when Stopping

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0~60.0sec

🕮 This parameter determines the duration of the DC Brake current during braking.

04.24 Door Open DC Brake Starting Frequency

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.00

Settings 0.00~120.00Hz

🕮 During the period AC motor drive decelerating to stop, this parameter sets the DC brake starting frequency If Pr.04-24 is lower than Pr.01-09 (starting frequency), DC brake will regards lowest frequency as starting frequency.

04-25 Level of Current when unable to open the door

Control Mode **FOCPG FOCPM** Factory Setting: 100.0

Settings 0.0~150.0% (rated motor current)

🕮 To determine current's level at non-accelerating area when detecting unable to open the door.

04-26 Level of Current for Acceleration Area when unable to open the door

Control Mode **FOCPG FOCPM** Factory setting: 150.0

Settings 0.0~200.0% (rated motor current)

🕮 To determine current's level at acceleration zone when detecting unable to open the door.

04-27 Detection time when unable to open the door

Control Mode **FOCPG FOCPM** Factory setting: 0.3

Settings 0.0~5.0 sec

🕮 When the value of the current is over the setting at Pr04-25 or Pr04-26 and when the elapsed time is longer than the setting at Pr04-27, it is determined as unable to open the door.

🕮 When the setting value is higher than the factory value, the output of the motor will increase as the setting value increases. So make sure there is no slippage phenomenon between the motor and the belt to avoid any fault occurred on opening/closing doors.

04-28 Level of Torque when unable to open the door

Control Mode **FOCPG FOCPM** Factory setting: 60.0

Settings 0.0~100.0%

🕮 To determine level of torque of motor's rated current when detecting unable to open the door.

04-29 Deceleration time when unable to open the door

Control Mode **FOCPG FOCPM** Factory setting: 0.2

Settings 0.1~10 sec

🕮 To estimate the time of deceleration after detecting unable to open the door

04-30 Acceleration coverage when unable to open the door

Control Mode **FOCPG FOCPM** Factory setting: 30.0

Settings 0.0~100.0%

🕮 To determine the area of acceleration from 0% of door width to the setting value of Pr04-30 when detecting unable to open the door.

05 Door Close Parameters

✓This parameter can be set during operation.

✓ 05.00 Door Close initial Speed

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 2.00

Settings 0.00~120.0Hz

✓ 05.01 Door Close Distance by Initial Speed

Control mode VFPG FOCPG FOCPM Factory setting: 0

Settings 0~65535 (Unit: pulses number)

✓ 05.02 Door Close Time by Initial Speed

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0.0~20.0s

✓ 05.03 Door Close High Speed 1

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 14.00

Settings 0.00~120.0Hz

✓ 05.04 Door Close by Final Speed Begins

Control mode **VFPG FOCPG FOCPM** Factory setting: 15.0

Settings 0.0~100.0% (0.0%=door completely close, 100.0%= door completely open)

✓ 05.05 Door Close Final Speed

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 1.7

Settings 0.00~120.0Hz

✓ 05.06 Door Close by Holding Speed begins

Control mode **VFPG FOCPG FOCPM** Factory setting: 5.0

Settings 0.0~100.0% (0.0%=door completely close, 100.0%= door completely open)

✓ 05.07 Door Close Holding Speed

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 1.3

Settings 0.00~120.0Hz

✓ 05.08 Door Close Acceleration Time 1

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 2.0

Settings 0.1~3600sec

✓ 05.09 Door Close Deceleration Time 1

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 2.0

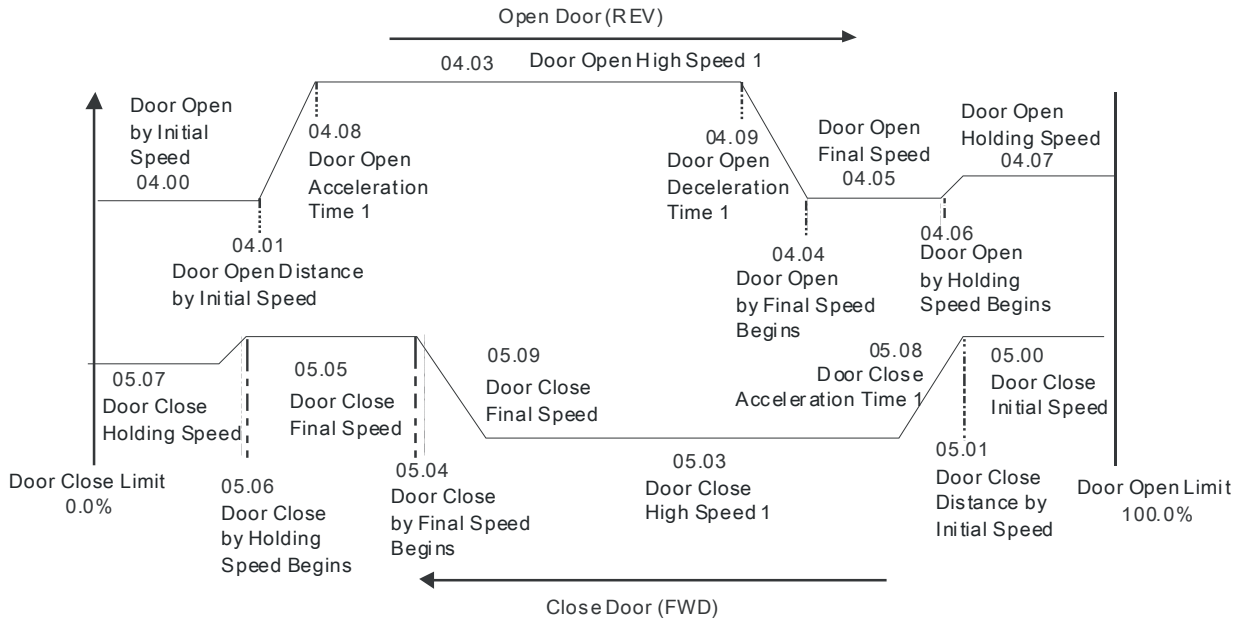
Settings 0.1~3600sec

✓ 05.10 Door Close Holding Torque Level

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 80.0

Settings 0.0~150.0% (Drive's rated current)

🕮 Please refer to the diagram below and adjust door open/close curve to your requirement.



05.11 Door Close Holding Torque

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 30.0

Settings 0.0~100.0% (Drive's rated current)

05.12 Response Time of Door Close Holding Torque

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.20

Settings 0.01~10.00sec

When the door is in the close complete position, it needs holding torque to keep the door still in complete position. To prevent motor overload, holding torque should be set within a limit.

05.13 Door Close High Speed 2

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 30.00

Settings 0.00~120.0Hz

05.14 Door Close Acceleration Time 2

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 2.0

Settings 0.1~3600sec

05.15 Door Close Deceleration Time 2

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 2.0

Settings 0.1~3600sec

05.16 Door Close Holding Torque Level 2

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0~150.0% (Ac drive's rated current)

05.17 Door Close Time-out Setting

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0~180.0sec (0.0sec:Disable)

When the time for door closing is longer than the setting in Pr.05-17, door will re-open.

05.18 Holding Time for CD (Close Door)Terminal

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 999.9

Settings 0.0~999.9sec (999.9sec is always holding)

This parameter is used to clear the CD terminal signal (door close signal) when door open complete. During the holding period, AC Motor Drive will still be in RUN status. After holding time, AC Motor Drive will STOP. The holding time is valid only when door open has reached the complete position.

- Within the holding time, when OD command (door open command) is given, the drive will begin door close action.
- When Pr.05-18 set to 999.9, CD terminal is executing a permanent holding command, user can only terminate this command by using the STOP/RESET key on digital keypad.

05.19 Door Close Acceleration Time of S1 Curve

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

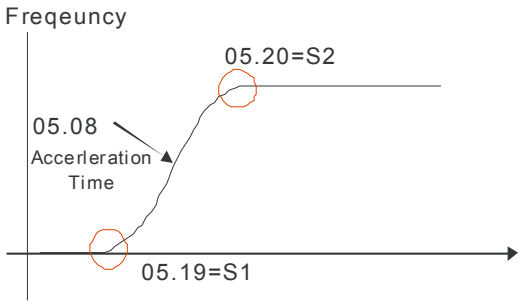
Settings 0.0~10.0sec

05.20 Door Close Acceleration Time of S2 Curve

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0~10.0sec

- This parameter is used to ensure smooth acceleration and deceleration via S-curve, different setting will create different S-curve. When this function is activated, the drive will create a smooth acceleration and deceleration curve by original acceleration and deceleration time. Setting Pr.05-19=0.0 or Pr.05-20=0.0 will create a linear acceleration and deceleration curve.
- Actual acceleration time = the selected acceleration time for door close + (Pr.05.19 + Pr.05.20)/2



05.21 Door Close DC Brake Current Level

Control mode **VF VFPG SVC** Factory setting: 0

Settings 00~100%

- This parameter sets the level of DC Brake Current output to the motor during start-up and stopping. When setting DC Brake Current, the Rated Current (Pr.00-01) is regarded as 100%. It is recommended to start with a low DC Brake Current Level and then increase until proper holding torque has been attained. Do not set Pr.05-21 greater than rated current in order to prevent motor damage. Also for your personal safety, do not use DC braking for door holding action.
- When AC motor drive is in FOCPG/FOCPM control mode, DC brake functions are ready to use, no additional setting is required.

05.22 Door Close DC Brake Time when Startup

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0~60.0sec

- This parameter determines the duration of the DC Brake current after a RUN command.

05.23 Door Close DC Brake Time when Stopping

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0~60.0sec

- This parameter determines the duration of the DC Brake current during braking.

05.24 Door Close DC Brake Starting Frequency

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.00

Settings 0.00~120.00Hz

📖 During the period AC motor drive decelerating to stop, this parameter sets the DC brake starting frequency If Pr.05-24 is lower than Pr.01-09 (starting frequency), DC brake will regards lowest frequency as starting frequency.

05.25 Door Re-open Current Level 1

Control mode **FOCPG FOCPM** Factory setting: 100.0

Settings 0.0~150.0% (AC drive's rated current)

05.26 Door Re-open Current Level 1 for Acceleration Area

Control mode **FOCPG FOCPM** Factory setting: 150

Settings 100~200% (100% is Pr.05-25 setting)

05.27 Door Re-open Current Level 1 for Low Speed Area

Control mode **FOCPG FOCPM** Factory setting: 100.0

Settings 0.0~150.0%(Drive's rated current)

📖 Pr.05-25~05-27 is setting for door open/close curve set 1. When one of MI (Pr.02-01~02-05) is set to 25, door open/close curve switch to 2nd set.

05.28 Door Re-open Current Level 2

Control mode **FOCPG FOCPM** Factory setting: 100.0

Settings 0.0~150.0%(Drive's rated current)

05.29 Door Re-open Current Level 2 for Acceleration Area

Control mode **FOCPG FOCPM** Factory setting: 150

Settings 0.0~150.0% (Drive's rated current)

05.30 Door Re-open Current Level 2 for Low Speed Area

Control mode **FOCPG FOCPM** Factory setting: 100

Settings 100~200%(100% is the setting in Pr.05-29)

📖 Pr.05-28~05-30 is setting for door open/close curve set 2. When one of MI (Pr.02-01~02-05) is set to 25, door open/close curve switch to 2nd set.

05.31 Undetected Area when unable to open doors

Control mode **FOCPG FOCPM** Factory setting: 2.0

Settings 1.0~99.0%(Total door width=100%; range between 0%~Pr.05.31 is excluded from low speed detection area)

05.32 Door Re-open Acceleration Boundary

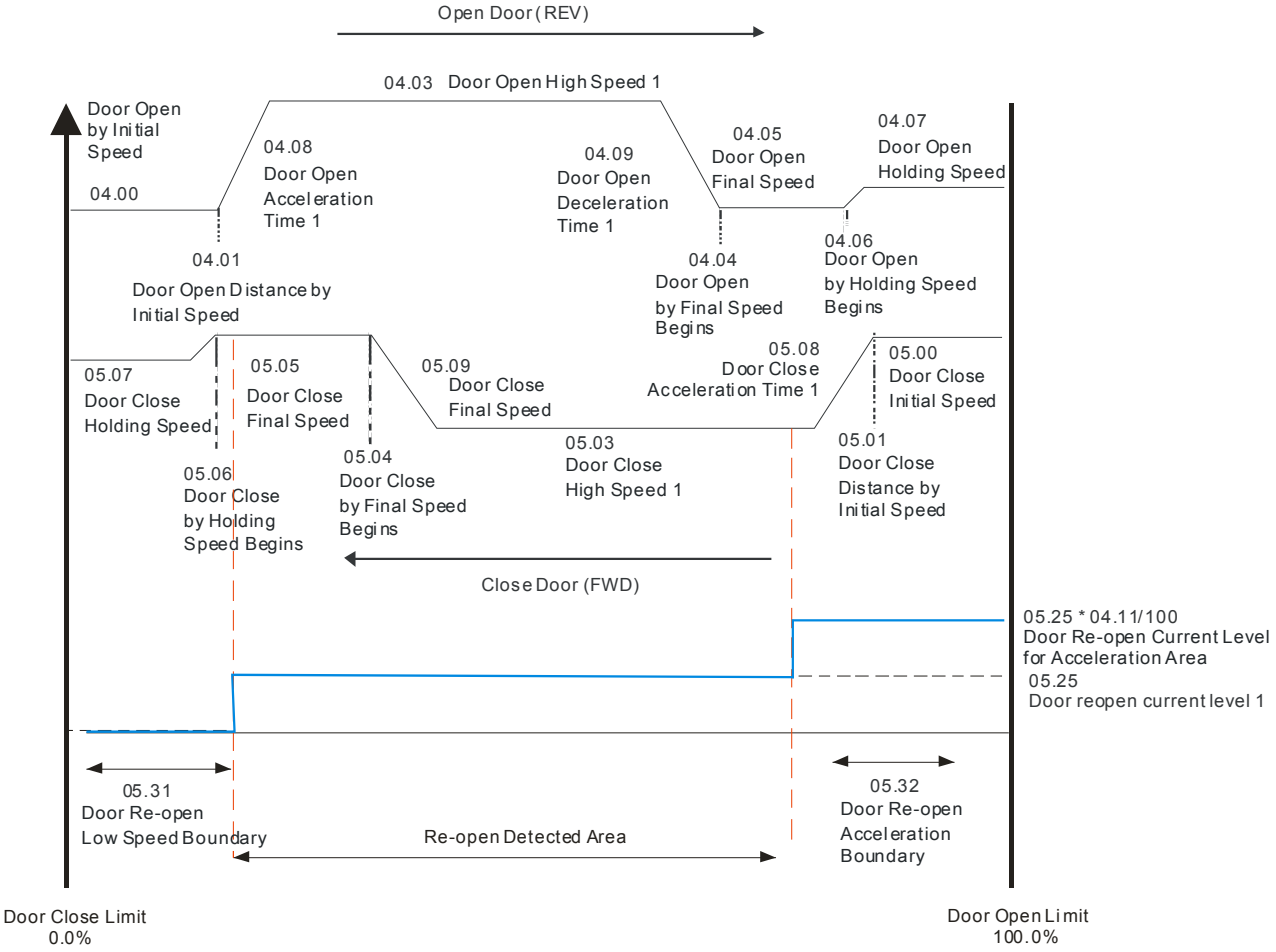
Control mode **FOCPG FOCPM** Factory setting: 70.0

Settings 8.0~97.0% (Total door width =100%; range between Pr.05.32~100% is the acceleration area)

📖 During the door close, it will re-close from the open complete position to the close complete position when there is an obstacle (the stall current exceeds Pr. 05.25/05.26/05.28/05.29). Door close command will be ignored when the drive is perform re-opening and will be valid again after door completely open is reached.

📖 Pr.05-33 sets the time for decelerating to 0 Hz when door close error occurs. It is recommended to set a minimum value less than the current limit in order for door to re-open in shortest time to ensure passenger's safety.

Larger current is required at the beginning of door open and door close, so it needs to have larger re-open current level in the acceleration area. Please refer to the following figure for setting reopen current and acceleration area:



05.33 Door Close Error Deceleration Time

Control mode **FOCPG FOCPM** Factory setting: 0.8

Settings 0.1 ~10.0sec

05.34 Door Re-open Detection Time

Control mode **FOCPG FOCPM** Factory setting: 0.2

Settings 0~10.0sec

06 Protection and Special Parameters

✍This parameter can be set during operation.

✍ 06.00 Software Braking Level

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 380.0

Settings 350.0~450.0Vdc

🕮 This parameter sets the software braking level, please refer to the DC voltage range on DC bus as reference.

06.01 Reserved

✍ 06.02 Current Boundary (rated current of motor drive)

Control mode **FOCPG FOCPM** Factory setting: 200

Settings 0~250%

🕮 This parameter sets the maximum output current of AC drive.

✍ 06.03 Forward Motor Torque Limit (rated current of motor drive)

Control mode **FOCPG FOCPM** Factory setting: 200

Settings 0~250%

✍ 06.04 Forward Regenerative Torque Limit (rated current of motor drive)

Control mode **FOCPG FOCPM** Factory setting: 200

Settings 0~250%

✍ 06.05 Reverse Motor Torque Limit (rated current of motor drive)

Control mode **FOCPG FOCPM** Factory setting: 200

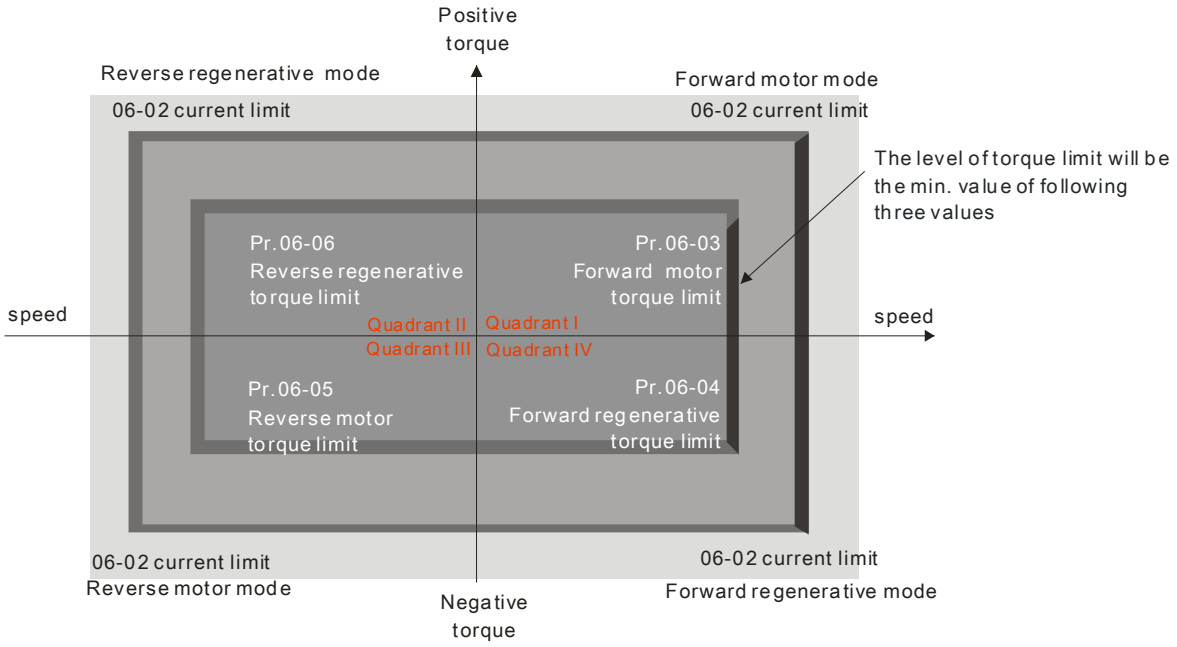
Settings 0~250%

✍ 06.06 Reverse Regenerative Torque Limit (rated current of motor drive)

Control mode **FOCPG FOCPM** Factory setting: 200

Settings 0~250%

🕮 Motor rated torque is 100%. The diagram below refers to the torque limit setting in Pr.06-03 to Pr.06-06.



06.07 Emergency/Force Stop Deceleration Method

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 3

Settings 0:Coast to stop

1: Decelerate by 1st decel. time

2: Decelerate by 2nd decel. time

3:By Pr.05.33 setting

🕮 When multi-function input terminal (MI) is set to 09 or 11, this parameter is active and the drive will operate as the setting in Pr.06-07.

06.08 Low Voltage Level

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 180.0

Settings 160.0~270.0Vdc

06.09 High Temperature Overheat Warning (OH)

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 85.0

Settings 0.0~110.0℃

06.10 Action after door re-open/re-close

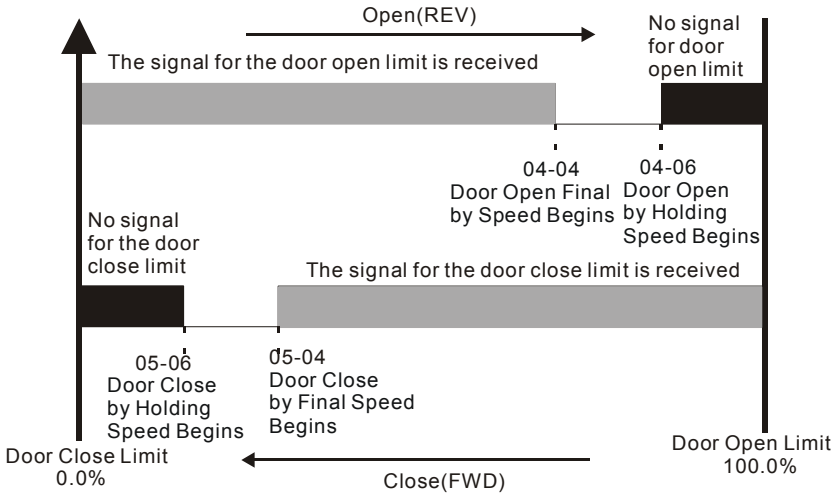
Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0x3Ah

Settings Bit0=0: Disable to detect the incorrect open/close limit function.
Bit0=1: Enable to detect the incorrect open/close limit function.
Bit1=0: Enable to re-open when door close error. (Not for VF/SVC)
Bit1=1: Disable to re-open when door close error. (Not for VF/SVC)
Bit2=0: Enable S-Curve when re-open. (Not for VF/SVC)
Bit2=1: Disable S-Curve when re-open. (Not for VF/SVC)
Bit3=0: Disable to reset door width to 100.0% after door open completed.
Bit3=1: Enable to reset door width to 100.0% after door open completed.
Bit4=0: Door opening in position not supported, limited signal will be output after the torque is enabled.
Bit4=1: Door opening in position is supported, limited signal will be output after the torque is enabled.
Bit5=0: Reset LVn error automatically, MO terminal sends error signal.
Bit5=1: Reset LVn error automatically, MO terminal sends error signal.
Bit6=0: OD and CD signal are input at the same time, but without reaction.
Bit6=1: OD and CD signal are input at the same time and with door.
Bit7=0 When the running signal come from an external terminal.
Pressing OD and CD buttons to return to running status is not supported when the drive is stopped.
Bit7=1 When the running signal come from an external terminal.
Pressing OD and CD buttons to return to running status is supported when the drive is stopped.
Bit8 =0: Functions related to unable to open the door are NOT supported. (Not for VF/SVC)
Bit8 = 1, Functions related to unable to open the door are supported. (Not for VF/SVC)
Bit9=0, Position memory is NOT supported when unable to open the door
Bit9=1, Position memory is supported when unable to open the door

🕮 The factory setting 0x3Ah means Bit1, Bit3, Bit4 and Bit5 =1 wheile other Bits =0.

🕮 When Bit 0=1, if the drive is in distance control mode, it is able to detect the door open/close error; in addition, when MO (multi-function output terminal) is set to 8, the drive will output door open/close error warning.

🕮 In Distance Control Mode, the detection method for the incorrect door open/close limit is shown as follows.



1. Incorrect door close limit:
   a. The signal for the door open limit is received before Pr.05-04 setting.
   b. The signal for the door open limit isn't received after Pr.05-06setting.

2. Incorrect door open limit:
   a. The signal for the door close limit is received before Pr.04-04 setting.
   b. The signal for the door close limit isn't received after Pr.04-06 setting.

🕮 When bit 1=1, the drive will not re-open the door when it detects a door closing torque higher than Pr.05-25 (05-28).

🕮 When bit 3=1 and the drive is in torque holding status after door open completely, the door width is auto-reset to 100.0%.

06.11 Position Control Mode

Control mode VF **VFPG** SVC **FOCPG** **FOCPM** Factory setting: 0

Settings
0: No limit signal, detect by PG number and current level.
1: Door open limit signal only, door close by PG number or current level detection.
2: Door close limit signal only，door open by PG number or current level detection.
3: Door open and close limit signal. (Support all control mode)
4: Detect by PG number and also accept external door open/close limit signal
5: No limit signal, detected by PG number or current level. (For Pr.00-09=3 speed control mode)

🕮 When Pr.06-11 setting is 1 to 5 and Pr. 06-12 is NOT set to 0, the AC drive will regard this setting as open/close complete position if following two conditions are met:

A. It has open/close limit signal.

B. When the stall current level exceeds Pr.06-12.

🕮 When this parameter is set to 0 "No limit signal", the door open/close complete position can be check by following two methods:.

A. When Pr. 06-12 is set to 0: When PG feedback frequency is almost 0 due to motor stall, it is regarded as open/close complete position.

B. When Pr. 06-12 is NOT set to 0: When current exceeds this level due to motor stall, it is regarded as open/close complete position.

NOTE

1. It is recommended to use method B for the transmission mechanism skids easily.
2. This function works in distance control mode only. For multi-step control mode, please use door open/close limit signal to verify if door reaches its open/close complete position.

06.12 Stall Current Level of Position Mode

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 80.0

Settings 0.0~200.0% (rated current of **motor**)

This parameter sets the stall current level for open/close complete position and is to be used with Pr.06-11.

06.13 Door Open/Close Holding Time Before Next Demo

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 2.0

Settings 0.0~99.99sec

During demonstration in demo mode, this parameter sets the door holding time before it goes on to the next demonstration.

06.14 Times of Door Opened/Closed in Demo Mode (L)

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0~9999

06.15 Times of Door Opened/Closed in Demo Mode (H)

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0~9999

When executing demo mode, it records the number of times the door opened or closed. It counts as one when door action from open to close.

06.16 Clear Demo Mode Door Open/Close Record

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0: Disable
1: Clear (Pr.06.14 and Pr.06.15)

When Pr.06-16 is set to 1, door open/close counting will be cleared and reset to 0.

06.17 Present Fault Record
06.18 2nd Most Recent Fault Record
06.19 3rd Most Recent Fault Record
06.20 4th Most Recent Fault Record
06.21 5th Most Recent Fault Record
06.22 6th Sixth Most Recent Fault Record

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 00

Settings 0: No fault
1: Over-current during acceleration (ocA)
2: Over-current during deceleration (ocd)
3: Over-current during steady speed (ocn)
4: Reserved
5: Reserved
6:Over-current at stop (ocS)
7:Over voltage during acceleration (ovA)
8 Over voltage during deceleration (ovd)
9:Over voltage during steady speed (ovn)
10:Over voltage at stop (ovS)
11:Low voltage during acceleration (LvA)
12:Low voltage during deceleration (Lvd)
13:Low voltage during steady speed (Lvn)
14:Low voltage at stop (LvS)
15:Phase loss protection (PHL)
16:IGBT overheat (oH1)

17: Reserved
18:IGBT overheat protection circuit error (tH1o)
19~20: Reserved
21: 150% 1Min, AC drive overload (oL)
22:Motor overload (EoL1)
23~25: Reserved
26：ot1
27~29: Reserved
30: Memory write-in error (cF1)
31: Memory read-out error (cF2)
32: Isum current detection error (cd0)
33 U-phase current detection error (cd1)
34 V-phase current detection error (cd2)
35 W-phase current detection error (cd3)
Clamp current detection error (Hd0)
37 Over-current detection error (Hd1)
38 Over-voltage detection error (Hd2)
39 Ground current detection error (Hd3)
40 Auto tuning error (AuE)
41: Reserved
42: PG feedback error (PGF1)
43 PG feedback loss (PGF2)
44 PG feedback stall (PGF3)
45 PG slip error (PGF4)
46~48: Reserved
49:External fault signal input
50~51: Reserved
52:Password error (PcodE)
53:Software error (ccodE)
54:Communication time-out (cE1)
55: Communication time-out (cE2)
56: Communication time-out (cE3)
57: Communication time-out (cE4)
58 Communication time-out (cE10)
59:PU time-out (cP10)
60~67: Reserved
68: Door open/close complete signal error
69:Door open/ close time-out (DOT)

🕮 The drive is forced to stop each time fault occurs and will be recorded. When fault occurs at STOP status, LV warning will be given but will not be recorded. When fault occurs at RUN, LV error will be given and will be recorded.

06.23 Electronic Thermal Overload Relay Selection

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings 0: Special motor for AC drive
1: Standard motor
2: Disable

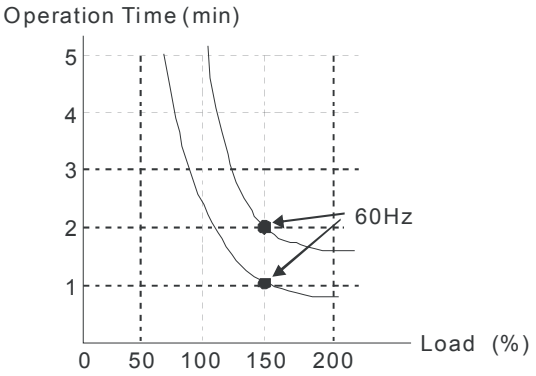
🕮 This parameter sets the boundary of the drive's output power. This function is used to protect the motor from overloading or overheating when it operates in low speed.

06.24 Electronic Thermal Characteristic

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 60.0

Settings 30.0~600.0sec

The parameter determines the time required for activating the electronic thermal protection function. The protection function regards to the drive's output frequency, current and operation time. The graph below shows the curves for 150% output power in a time limit set in Pr.06-23.



06.25 Auto Restart After Fault

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 10

Settings 0~10

After fault occurs (oc, ov and Lv), the AC motor drive can be reset/restarted automatically up to 10 times.

Setting this parameter to 0 will disable the reset/restart operation after any fault has occurred. When enabled, the AC motor drive will restart with speed search, which starts at the frequency before the fault.

If the drive execute reset/restart after fault more than the numbers of time set in Pr.06-25 and the limit is reached within the time period in Pr.06-26, the drive will stop execute reset/restart after fault function. User will need to input RESET manually for the drive to continue operation.

06.26 Auto Reset Time for Restart after Fault

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 60.0

Settings 0.1~600.0sec

When a reset/restart after fault occurs, the drive will regards Pr.06-26 as a time boundary and begin counting the numbers of faults occur within this time period. Within the period, if numbers of faults occurred did not exceed the setting in Pr.06-25, the counting will be cleared and starts from 0 when next fault occurs.

06.27 Over-torque Detection Selection (OT1)

Control Mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0

Settings **0:** disable
1: over-torque detection during constant speed operation, continue to operate after detection
2: over-torque detection during constant speed operation, stop operation after detection
3: over-torque detection during operation, continue to operate after detection
4: over-torque detection during operation, stop operation after detection

06.28 Over-torque Detection Level (OT1)

Control Mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 150

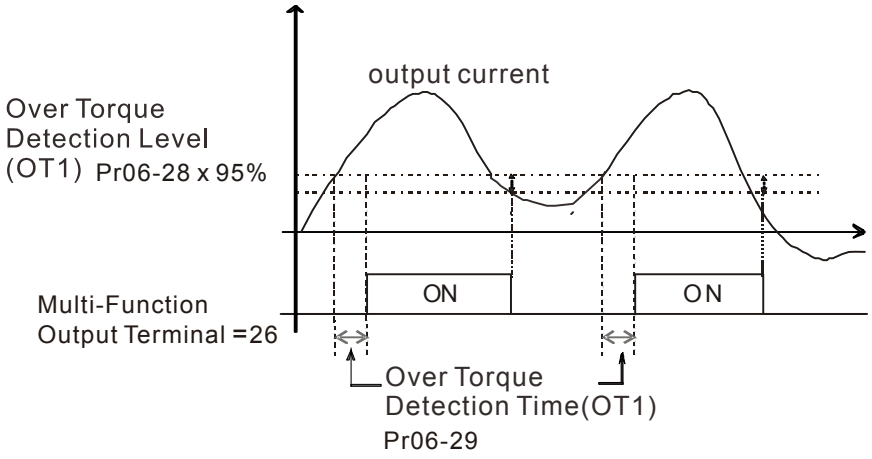
Settings 10~250% (100%: motor drive's rated current)

06.29 Over-torque Detection Time (OT1)

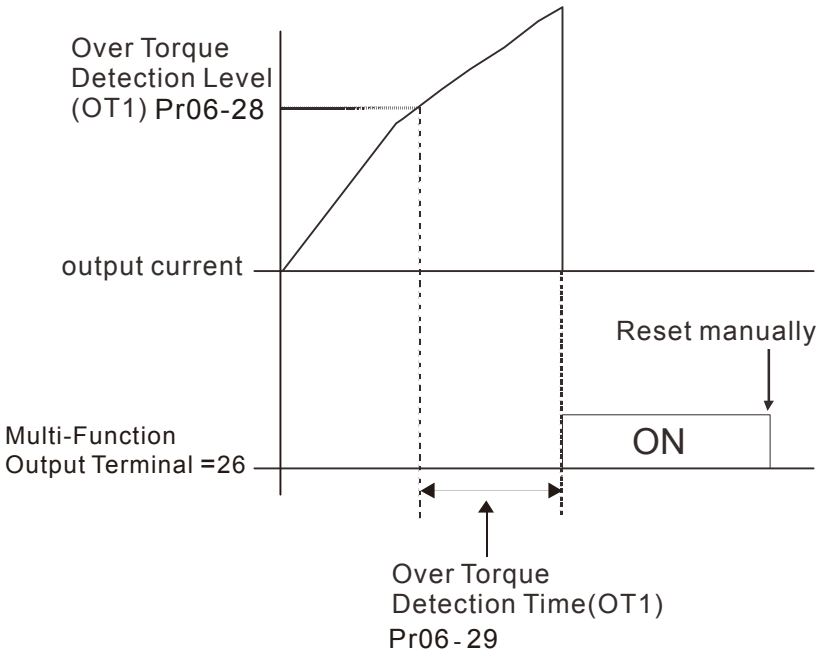
Control Mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.1

Settings 0.1~60.0 sec

- When the output current exceeds the over-torque detection level (Pr06-28) and also exceeds Pr06-29, the over torque detection will follow the setting of Pr06-27.
- When Pr06-27 is set to 1 or 3, the ot1 warning will be displayed after Over Torque Detection but the motor drive will keep running. The warning will be off only until the output current is smaller than the 5% of the over-torque detection level (Pr06-28).



- When Pr06-27 is set to 2 or 4, the ot1 fault will be displayed after Over Torque Detection. Then the motor drive stop running until it is manually reset.



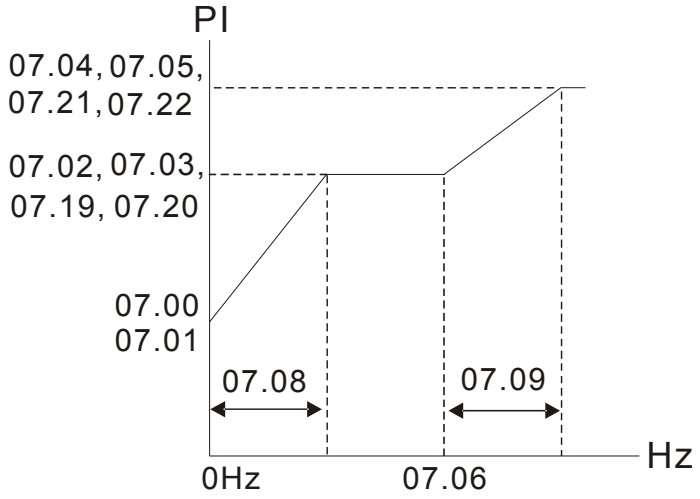
07 Control Parameters

This parameter can be set during operation.

About forward/ reverse running: When the CLOSE light on the digital keypad comes on, that indicates the motor is running forward. When the OPEN light on the digital keypad comes on, that indicates the motor is running reversely. However the indication of these two lights has nothing to do with the open/close of the elevator doors.

07.00	Reverse Running Control (Kp) of Zero Speed	
Control mode	**FOCPG FOCPM**	Factory setting: 100.0
Settings	0.0~500.0%	
07.01	Reverse Running Control (KI) of Zero Speed	
Control mode	**FOCPG FOCPM**	Factory setting: 0.1
Settings	0.000~10.000sec	
07.02	Reverse Running Control (Kp)1 of Low Speed	
Control mode	**FOCPG FOCPM**	Factory setting: 100.0
Settings	0.0~500.0%	
07.03	Reverse Running Control (KI) 1 of Low Speed	
Control mode	**FOCPG FOCPM**	Factory setting: 0.1
Settings	0.000~10.000sec	
07.04	Reverse Running Control (Kp)2 of High Speed	
Control mode	**FOCPG FOCPM**	Factory setting: 100.0
Settings	0.0~500.0%	
07.05	Reverse Running Control (KI) 2 of High Speed	
Control mode	**FOCPG FOCPM**	Factory setting: 1.000
Settings	0.000~10.000sec	
07.06	Low Speed/ High Speed Switch Frequency	
Control mode	**FOCPG FOCPM**	Factory setting: 2.00
Settings	0.00~120.00Hz (0: disable)	

- Kp determines Proportional control and associated gain (P). KI determines integral control and associated gain (I).
- When integral time is set to 0, it is disabled. Pr.07-06 defines the switch frequency for Low Speed ASR (Pr.07-02, 07-03, 07-19, 07-20) and High Speed ASR (Pr.07-04, Pr.07-05, 07-21, 07-22).



07.07 ASR Low Pass Filter Gain

Control mode **FOCPG FOCPM** Factory setting: 0.008

Settings 0.000~0.350sec

🕮 This parameter defines the filter time of the ASR command.

07.08 Zero Speed/ Low Speed Width Adjustment

Control mode **FOCPG FOCPM** Factory setting: 2.00

Settings 0.00~120.00Hz

07.09 Low Speed/ High Speed Width Adjustment

Control mode **FOCPG FOCPM** Factory setting: 5.00

Settings 0.00~120.00Hz

🕮 These parameters set the slope width from zero speed to low speed and from Pr.07-06 to high speed.

07.10 Gear Ratio

Control mode **FOCPG FOCPM** Factory setting: 1

Settings 1~100

07.11 Inertia Ratio

Control mode **FOCPG FOCPM** Factory setting: 500

Settings 1~1000%

🕮 This parameter can be used to adjust inertia ratio of load.

07.12 Zero-speed Bandwidth

Control mode **FOCPG FOCPM** Factory setting: 10

Settings 0~40Hz

07.13 Low-speed Bandwidth

Control mode **FOCPG FOCPM** Factory setting: 10

Settings 0~40Hz

07.14 High-speed Bandwidth

Control mode **FOCPG FOCPM** Factory setting: 10

Settings 0~40Hz

🕮 After estimating inertia, user can adjust parameters Pr.07-12, 07-13, and 07-14 separately by speed response. The larger value of the setting, the faster response you will get. Pr.07-06 is switches the frequency of low-speed/high-speed bandwidth.

07.15 PDFF Gain Value

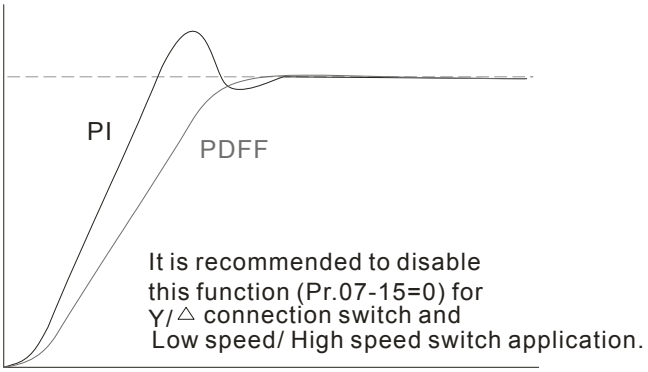
Control mode **FOCPG FOCPM** Factory setting: 0

Settings 0~200%

🕮 Pr. 07-15, 07-16 is used to reduce overshoot situation. Please adjust PDFF gain value by actual situation. .

🕮 Besides traditional PI control, it also provides PDFF function to reduce overshoot for speed control.

1. Get system inertia
2. Adjust Pr.07-15 and 07-16 (When larger number is set, the suppressed overshoot function will be better. But it needs to be used with the actual condition)



07.16 Gain for Speed Feed Forward

Control mode **FOCPG FOCPM** Factory setting: 70

Settings 0~500

07.17 Forward Running Control (Kp) of Zero Speed

Control Mode **FOCPG FOCPM** Factory setting: 100.0

Settings 0.0~500.0%

07.18 Forward Running Control (KI) of Zero Speed

Control Mode **FOCPG FOCPM** Factory setting: 0.1

Settings 0.000~10.00 sec

07.19 Forward Running Control (Kp)1 of Low Speed

Control Mode **FOCPG FOCPM** Factory setting: 100.0

Settings 0.0~500.0%

07.20 Forward Running Control (KI) 1 of Low Speed

Control Mode **FOCPG FOCPM** Factory setting: 0.1

Settings 0.000~10.00 sec

07.21 Forward Running Control (Kp) 2 of High Speed

Control Mode **FOCPG FOCPM** Factory setting: 100.0

Settings 0.0~500.0%

07.22 Forward Running Control (KI) 2 of High Speed

Control Mode **FOCPG FOCPM** Factory setting: 1.000

Settings 0.000~10.00 sec

08 Multi-step Speed Parameter

This parameter can be set during operation.

08.00	Zero Step Speed Frequency
08.01	1st Step Speed Frequency
08.02	2nd Step Speed Frequency
08.03	3rd Step Speed Frequency
08.04	4th Step Speed Frequency
08.05	5th Step Speed Frequency
08.06	6th Step Speed Frequency
08.07	7th Step Speed Frequency
08.08	8th Step Speed Frequency
08.09	9th Step Speed Frequency
08.10	10th Step Speed Frequency
08.11	11th Step Speed Frequency
08.12	12th Step Speed Frequency
08.13	13th Step Speed Frequency
08.14	14th Step Speed Frequency
08.15	15th Step Speed Frequency

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.00

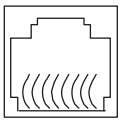
Settings 0.00~120.00Hz

The Multi-Function Input Terminals (refer to Pr.02-01 to 02-05) are used to select one of the AC motor drive Multi-step speeds. The speeds (frequencies) are determined by Pr.08-00 to 08-15 as shown above.

09 Communication Parameters

✓This parameter can be set during operation.

When the motor drive is controlled by a RS-485 serial communication interface, a converter, IFD6500 or IFD6530 should be connected between the motor drive and PC.



Serial Interface
PIN1, 2, 6, 7: Reserved
PIN3:GND
PIN4:SG-
PIN5:SG+
PIN8:+EV

✓ 09.00 Communication Address

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 1

Settings 01~254

🕮 If the AC motor drive is controlled by RS-485 serial communication, the communication address for this drive must be set via this parameter. And the communication address for each AC motor drive must be different and unique.

✓ 09.01 Transmission Speed

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 19.2

Settings 4.8～115.2Kbps

🕮 This parameter is used to set the transmission speed between the RS485 master (PLC, PC, etc.) and AC motor drive. RS-485 communication can also be used to change the drive's parameter and control the drive's operation status.

✓ 09.02 Transmission Fault Treatment

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 3

Settings
Warn and keep operating
Fault and RAMP to stop
Reserved
No action and no display

🕮 This parameter is used to set the reaction to transmission errors occur.

✓ 09.03 Time-out Detection

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 0.0

Settings 0.0～100.0sec

🕮 This parameter is used to set the duration of communication and keypad time-out.

09.04 Communication Protocol

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 13

Settings
0: 7N1 (ASCII)
1: 7N2 (ASCII)
2: 7E1 (ASCII)
3: 7O1 (ASCII)
4: 7E2 (ASCII)
5: 7O2 (ASCII)
6: 8N1 (ASCII)
7: 8N2 (ASCII)
8: 8E1 (ASCII)
9: 8O1 (ASCII)
10: 8E2 (ASCII)
11: 8O2 (ASCII)
12: 8N1 (RTU)
13: 8N2 (RTU)
14: 8E1 (RTU)
15: 8O1 (RTU)
16: 8E2 (RTU)
17: 8O2 (RTU)

🕮 1. Control by PC or PLC

★A VFD-VL can be set up to communicate on Modbus networks using one of the following modes: ASCII (American Standard Code for Information Interchange) or RTU (Remote Terminal Unit). Users can select the desired mode along with the serial port communication protocol in Pr.09-04.

★Code Description:

ASCII mode:

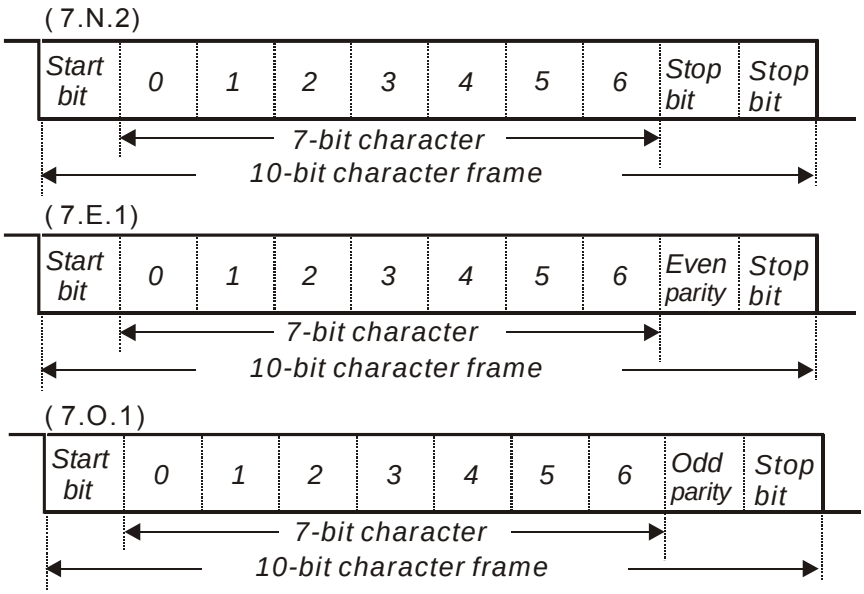
Each 8-bit data is the combination of two ASCII characters. For example, a 1-byte data: 64 Hex, shown as '64' in ASCII, consists of '6' (36Hex) and '4' (34Hex).

Character	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H

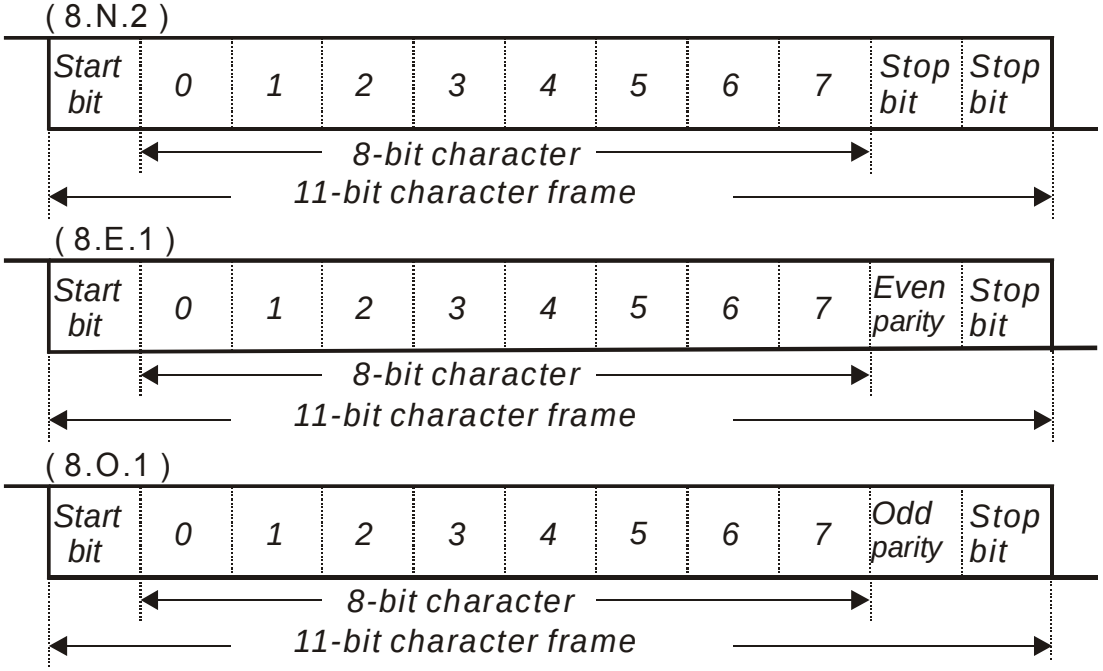
Character	'8'	'9'	'A'	'B'	'C'	'D'	'E'	'F'
ASCII code	38H	39H	41H	42H	43H	44H	45H	46H

🕮 2. Data Format

10-bit character frame (For ASCII):



11-bit character frame (For RTU):



📖 3.1 Communication Protocol

Communication Data Frame:

ASCII mode:

STX	Start character ':' (3AH)
Address Hi	Communication address:
Address Lo	8-bit address consists of 2 ASCII codes
Function Hi	Command code:
Function Lo	8-bit command consists of 2 ASCII codes
DATA (n-1)	Contents of data:
…….	Nx8-bit data consist of 2n ASCII codes
DATA 0	n<=16, maximum of 32 ASCII codes
LRC CHK Hi	LRC check sum:
LRC CHK Lo	8-bit check sum consists of 2 ASCII codes
END Hi	End characters:
END Lo	END1= CR (0DH), END0= LF(0AH)

RTU mode:

START	A silent interval of more than 10 ms
Address	Communication address: 8-bit address
Function	Command code: 8-bit command
DATA (n-1)	Contents of data:
…….	n×8-bit data, n<=16
DATA 0	
CRC CHK Low	CRC check sum:
CRC CHK High	16-bit check sum consists of 2 8-bit characters
END	A silent interval of more than 10 ms

🕮 3.2 Address (Communication Address)

Valid communication addresses are in the range of 0 to 254. A communication address equal to 0, means broadcast to all AC drives (AMD). In this case, the AMD will not reply any message to the master device.

00H: broadcast to all AC drives

01H: AC drive of address 01

0FH: AC drive of address 15

10H: AC drive of address 16

:

FEH: AC drive of address 254

For example, communications to AMD with address 16 decimal (10H):

ASCII mode: Address='1','0' => '1'=31H, '0'=30H

RTU mode: Address=10H

🕮 3.3 Function (Function code) and DATA (data characters)

The format of data characters depends on the function code.

03H: read data from register

06H: write single register

Example: reading continuous 2 data from register address 2102H, AMD address is 01H.

ASCII mode:

Command message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'3'
Starting address	'2'
	'1'
	'0'
	'2'
Number of data (count by word)	'0'
	'0'
	'0'
	'2'
LRC Check	'D'
	'7'
END	CR
	LF

Response message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'3'
Number of data (count by byte)	'0'
	'4'
Content of starting address 2102H	'1'
	'7'
	'7'
	'0'
Content of address 2103H	'0'
	'0'
	'0'
	'0'
LRC Check	'7'
	'1'
END	CR
	LF

RTU mode:

Command message:

Address	01H
Function	03H
Starting data address	21H
	02H
Number of data (count by world)	00H
	02H
CRC CHK Low	6FH
CRC CHK High	F7H

Response message:

Address	01H
Function	03H
Number of data (count by byte)	04H
Content of data address 2102H	17H
	70H
Content of data address 2103H	00H
	00H
CRC CHK Low	FEH
CRC CHK High	5CH

06H: single write, write single data to register.

Example: writing data 6000(1770H) to register 0100H. AMD address is 01H.

ASCII mode:

Command message:		Response message:	
STX	':'	STX	':'
Address	'0'	Address	'0'
	'1'		'1'
Function	'0'	Function	'0'
	'6'		'6'
Data address	'0'	Data address	'0'
	'1'		'1'
	'0'		'0'
	'0'		'0'
Data content	'1'	Data content	'1'
	'7'		'7'
	'7'		'7'
	'0'		'0'
LRC Check	'7'	LRC Check	'7'
	'1'		'1'
END	CR	END	CR
	LF		LF

RTU mode:

Command message:		Response message:	
Address	01H	Address	01H
Function	06H	Function	06H
Data address	01H	Data address	01H
	00H		00H
Data content	17H	Data content	17H
	70H		70H
CRC CHK Low	86H	CRC CHK Low	86H
CRC CHK High	22H	CRC CHK High	22H

10H: write multiple registers (write multiple data to registers)

Example: Set the multi-step speed,

Pr.04-00=50.00 (1388H), Pr.04-01=40.00 (0FA0H). AC drive address is 01H.

ASCII Mode:

Command message:		Response message:	
STX	':'	STX	':'
ADR 1	'0'	ADR 1	'0'
ADR 0	'1'	ADR 0	'1'
CMD 1	'1'	CMD 1	'1'
CMD 0	'0'	CMD 0	'0'
Starting data address	'0'	Starting data address	'0'
	'5'		'5'
	'0'		'0'
	'0'		'0'
Number of data (count by word)	'0'	Number of data (count by word)	'0'
	'0'		'0'
	'0'		'0'
	'2'		'2'
Number of data (count by byte)	'0'	LRC Check	'E'
	'4'		'8'
The first data content	'1'	END	CR
	'3'		LF
	'8'		
	'8'		
The second data content	'0'		
	'F'		

	‘A’
	‘0’
LRC Check	‘9’
	‘A’
END	CR
	LF

RTU mode:

Command message:

ADR	01H
CMD1	10H
Starting data address	05H 00H
Number of data (count by word)	00H 02H
Number of data (count by byte)	04
The first data content	13H 88H
The second data content	0FH A0H
CRC Check Low	‘9’
CRC Check High	‘A’

Response message:

ADR	01H
CMD 1	10H
Starting data address	05H 00H
Number of data (count by word)	00H 02H
CRC Check Low	41H
CRC Check High	04H

Check sum

ASCII mode:

LRC (Longitudinal Redundancy Check) is calculated by summing up, module 256 and the values of the bytes from ADR1 to last data character then calculating the hexadecimal representation of the 2’s-complement negation of the sum.

For example,

01H+03H+21H+02H+00H+02H=29H, the 2’s-complement negation of 29H is D7H.

RTU mode:

CRC (Cyclical Redundancy Check) is calculated by the following steps:

Step 1: Load a 16-bit register (called CRC register) with FFFFH.

Step 2: Exclusive OR the first 8-bit byte of the command message with the low order byte of the 16-bit CRC register, putting the result in the CRC registers.

Step 3: Examine the LSB of CRC register.

Step 4: If the LSB of CRC register is 0, shift the CRC register one bit to the right with MSB zero filling, then repeat step 3. If the LSB of CRC register is 1, shift the CRC register one bit to the right with MSB zero filling, Exclusive OR the CRC register with the polynomial value A001H, then repeat step 3.

Step 5: Repeat step 3 and 4 until eight shifts have been performed. When this is done, a complete 8-bit byte will have been processed.

Step 6: Repeat step 2 to 5 for the next 8-bit byte of the command message. Continue doing this until all bytes have been processed. The final contents of the CRC register are the CRC value. When transmitting the CRC value in the message, the upper and lower bytes of the CRC value must be swapped, i.e. the lower order byte will be transmitted first.

The following is an example of CRC generation using C language. The function takes two arguments:

Unsigned char* data ← a pointer to the message buffer

Unsigned char length ← the quantity of bytes in the message buffer

The function returns the CRC value as a type of unsigned integer.

```
Unsigned int crc_chk (unsigned char* data, unsigned char length)

{
   int j;
   unsigned int reg_crc=0Xffff;
   while (length--){
      reg_crc ^= *data++;
      for (j=0; j<8; j++) {
      if (reg_crc & 0x01) {    /* LSB(b0)=1 */
         reg_crc=(reg_crc>>1) ^ 0Xa001;
      }else{
         reg_crc=reg_crc >>1;
      }
   }
}

return reg_crc;                          // return register CRC
```

🕮 Address list

Content	Address	Function	
AC drive Parameters	GGnnH	GG means parameter group, nn means parameter number, for example, the address of Pr.04-01 is 0401H.	
Drive Command	2000H	Bit0~3	0: No function
			1: Stop
			2: Run
			3: opening door is prohibited
		Bit4~5	00B: No function
			01B: OD
			10B: CD
			11B: Change direction
		Bit6~7	00B: 1st accel/decel
			01B: 2nd accel/decel
			10B: 3rd accel/decel
			11B: 4th accel/decel
		Bit08~11	000B: master speed

			0001B: 1st accel/decel.
			0010B: 2nd accel/decel
			0011B: 3rd accel/decel
			0100B: 4th accel/decel
			0101B: 5th accel/decel
			0110B: 6th accel/decel
			0111B: 7th accel/decel
			1000B: 8th accel/decel
			1001B: 9th accel/decel
			1010B: 10th accel/decel
			1011B: 11th accel/decel
			1100B: 12th accel/decel
			1101B: 13th accel/decel
			1110B: 14th accel/decel
			1111B: 15th accel/decel
		Bit12	1: enable bit06-11 function
		Bit13~14	00B: No function
			01B: operated by digital keypad
			10B: operated by Pr.00-21 setting
			11B: change operation source
		Bit15	Reserved
	2001H	Frequency command	
	2002H	Bit0	1: EF (external fault) on
		Bit1	1: Reset
		Bit2	1: B.B. ON
		Bit3~5	Reserved
Status monitor Read only	2100H	Error code: refer to Pr.06-16 to Pr.06-21	
	2119H	Bit0	00: Stop
		Bit1	01: deceleration
		Bit2	opening door is prohibited,
		Bit3	00: CD command, OD output
		Bit4	01: CD command, OD output 10: OD command, CD output 11: Reserved
		Bit5~7	Reserved
		Bit8	1: Master frequency Controlled by communication interface
		Bit9	1: Master frequency controlled by analog/external terminals signal
		Bit10	1: Operation command controlled by communication interface
		Bit11	1: Parameters have been locked
		Bit12	1: enable to copy parameter from keypad
		Bit13~15	Reserved
	2102H	Frequency command (F)	
	2103H	Output frequency (H)	
	2104H	Output current (AXXX.X)	
	2105H	DC-BUS Voltage (UXXX.X)	
	2106H	Output voltage (EXXX.X)	
	2107H	Current step number of Multi-Step Speed Operation	
	2116H	Multi-function display (Pr.00-04)	
	2120H	Frequency command when malfunction	
	2121H	Output frequency when malfunction	
	2122H	Output current when malfunction	
	2123H	Motor frequency when malfunction	
	2124H	Output voltage when malfunction	
	2125H	DC-bus voltage when malfunction	
	2126H	Output power when malfunction	
	2127H	Output torque when malfunction	
	2128H	IGBT Temperature of Power Module at Present Fault	

	2129H	Input status of multi-function terminal when malfunction (format is the same as Pr.00-04=16)
	212AH	Output status of multi-function terminal when malfunction (format is the same as Pr.00-04=17)
	212BH	Drive status when malfunction (format is the same as 2119H)
	2201H	Pr.00-04 user-defined setting
	2203H	Reserved
	2204H	Reserved
	2205H	Reserved
	2206H	Display temperature of IGBT (oC)
	2207H	Reserved
	2208H	Digital input state
	2209H	Digital output state

🕮 Exception response:

The AC motor drive is expected to return a normal response after receiving command messages from the master device. The following depicts the conditions when no normal response is replied to the master device.

The AC motor drive does not receive the messages due to a communication error; thus, the AC motor drive has no response. The master device will eventually process a timeout condition.

The AC motor drive receives the messages without a communication error, but cannot handle them. An exception response will be returned to the master device and an error message “CExx” will be displayed on the keypad of AC motor drive. The xx of “CExx” is a decimal code equal to the exception code that is described below.

In the exception response, the most significant bit of the original command code is set to 1, and an exception code which explains the condition that caused the exception is returned.

Example:

ASCII mode:

STX	‘:’
Address	‘0’
	‘1’
Function	‘8’
	‘6’
Exception code	‘0’
	‘2’
LRC CHK	‘7’
	‘7’
END	CR
	LF

RTU mode:

Address	01H
Function	86H
Exception code	02H
CRC CHK Low	C3H
CRC CHK High	A1H

The explanation of exception codes:

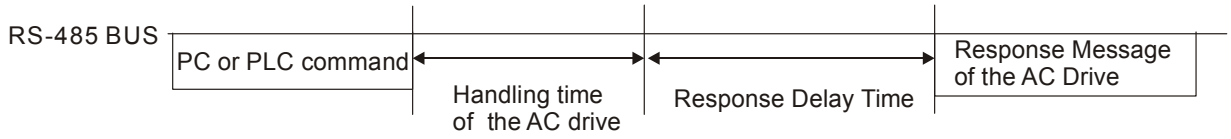
Exception code	Explanation
1	Illegal data value: The data value received in the command message is not available for the AC drive.
2	Illegal data address: The data address received in the command message is not available for the AC motor drive.
3	Parameters are locked: parameters can’t be changed
4	Parameters can’t be changed during operation
10	Communication time-out.

09.05 Response Delay Time

Control mode **VF VFPG SVC FOCPG FOCPM** Factory setting: 2.0

Settings 0.0~200.0ms

This parameter is the response delay time after AC drive receives communication command as shown in the following.



10 User-defined Parameters

✓This parameter can be set during operation.

✓ 10.00 Start-up Display Selection

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 00.03

✓ 10.01 Maximum Operation Frequency

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 01.31

✓ 10.02 Motor Rated Frequency

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 01.32

✓ 10.03 Motor Rated Voltage

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 01.33

✓ 10.04 2nd Output Frequency (Mid-point frequency)

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 01.34

✓ 10.05 2nd Output Voltage (Mid-point voltage)

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 01.35

✓ 10.06 3rd Output Frequency (Mid-point frequency)

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 01.36

✓ 10.07 3rd Output Voltage (Mid-point voltage)

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 01.37

✓ 10.08 4th Output Frequency (Low Frequency)

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 01.38

✓ 10.09 4th Output Voltage (Low Voltage)

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 01.39

10.10 Door Open Acceleration Time 1

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 04.08

10.11 Door Open Deceleration Time 1

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 04.09

10.12 Door Close Acceleration Time 2

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 05.08

10.13 Door Close Deceleration Time 2

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 05.09

10.14 Frequency Testing

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 00.15

10.15 Door Open Time by Initial Speed

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 04.02

10.16 Door Open by Initial Speed

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 04.00

10.17 Door Open High Speed

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 04.03

10.18 Door Open Final Speed

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 04.05

10.19 Door Open Holding Torque Level

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 04,10

10.20 Door Open Holding Torque

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 04.11

10.21 Door Close High Speed

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 05.03

10.22 Door Close Final Speed

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 05.05

10.23 Door Close Holding Torque Level

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 05.10

10.24 Door Close Holding Torque

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address 0511

10.25 Multi-function Input Terminal Direction

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 02.07

10.26 Multi-function Input 1

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 02.01

10.27 Multi-function Input 2

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 02.02

10.28 Multi-function Input 3

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 02.03

10.29 Multi-function Input 4

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 02.04

10.30 Multi-function Output RY1

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 02.08

10.31 Multi-function Output RY2

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

Display address Same as Pr 02.09

10.00 ~ 10.31 View User-defined Parameters

Control mode **VF VFPG SVC FOCPG TQCPG FOCPM** Factory setting: #. ##

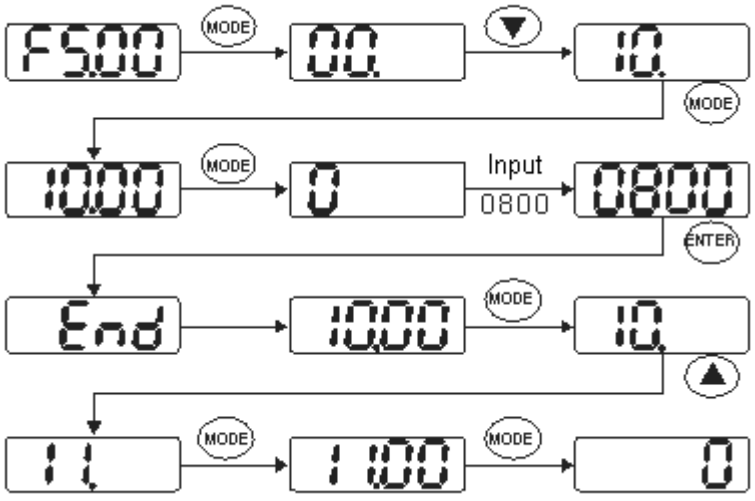
Settings -

This parameter group is open for users to define parameters from group 00 to group 09, it can saves 32 parameters. The saved value can also be the parameter addresses (but the hexadecimal value needs to be converted to decimal value).

How to set user-defined parameter:

Example 1:

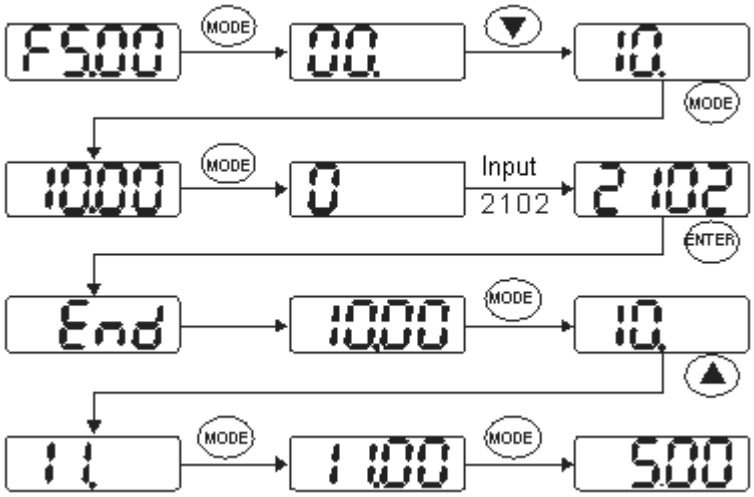
On the digital keypad, enter Pr.10.00 and the setting is 0800, after the setting is complete, Pr.11-00 will display the setting of Pr.08-00. Please follow the diagram below for using the digital keypad.



Example 2:

If it needs to enter the parameter address 2102H and 211BH by digital keypad, please follow the instruction shown on the diagram below.

The setting method of 2102H, please follow the steps shown in the diagram:

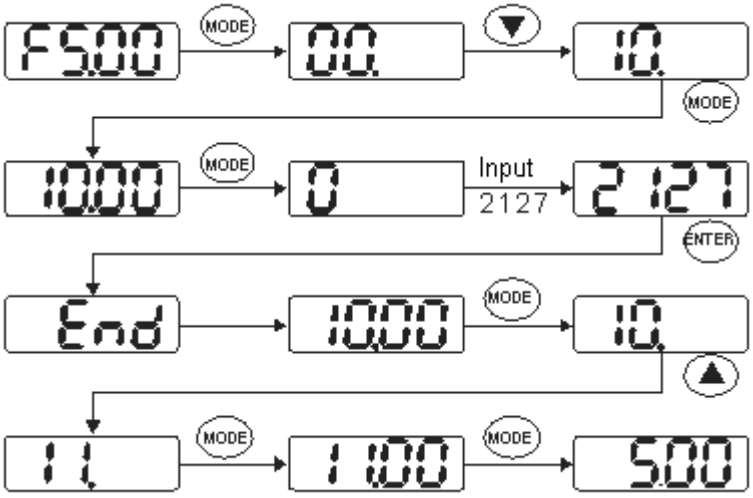


The setting method of 211BH

Convert 211BH (hexadecimal) into decimal value:

2 1 1 B

$1 \times 16^1 + 11 \times 16^0 = 16 + 11 = 27$ Enter 2127



11 View User-defined Parameters

This parameter can be set during operation.

11.00 ~ 11.31	View User-defined Parameters

Control mode **VF** **VFPG** **SVC** **FOCPG** **TQCPG** **FOCPM** Factory setting: #. ##

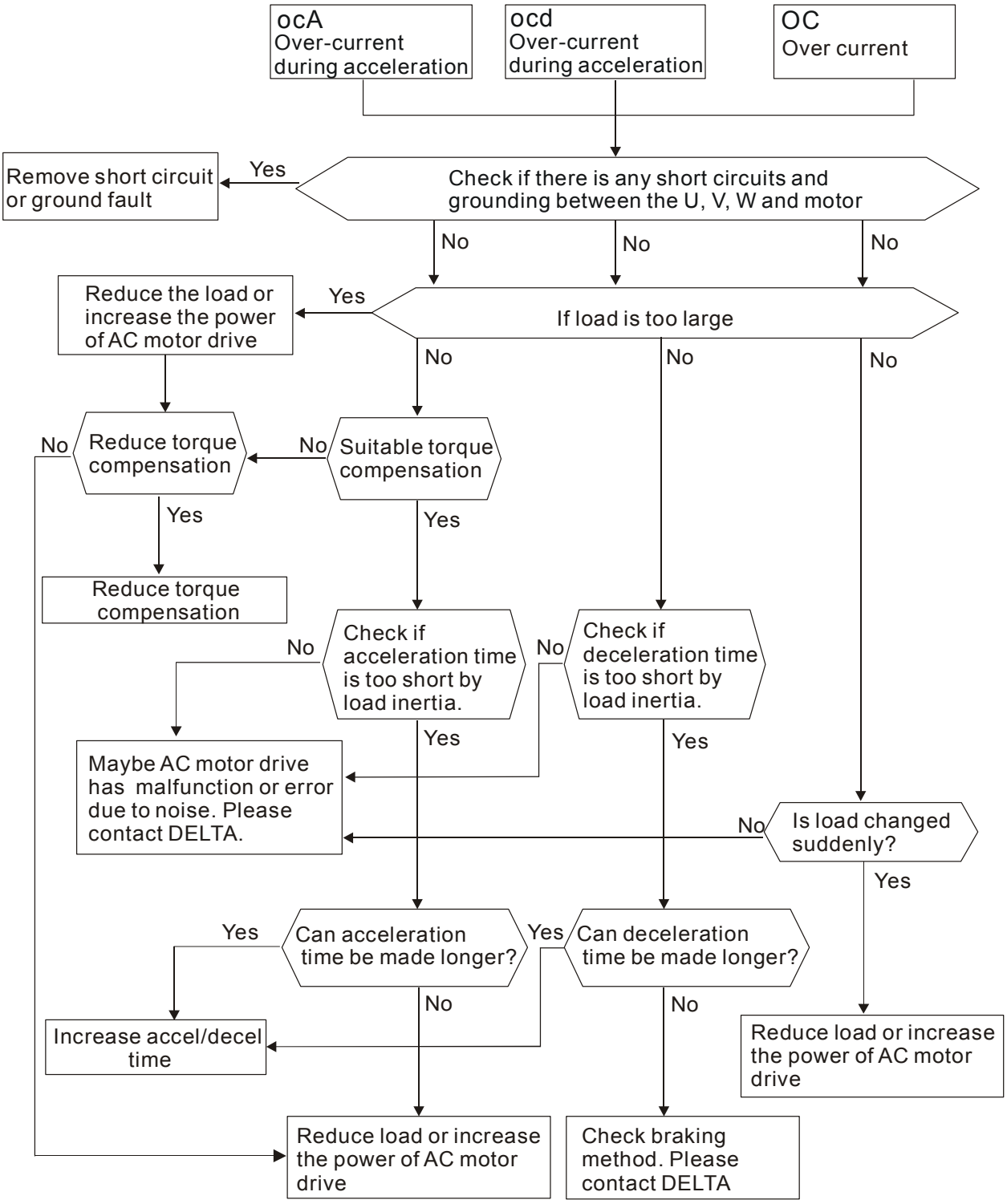
Settings -

📖 Please refer to the parameter groups shown in group 10.

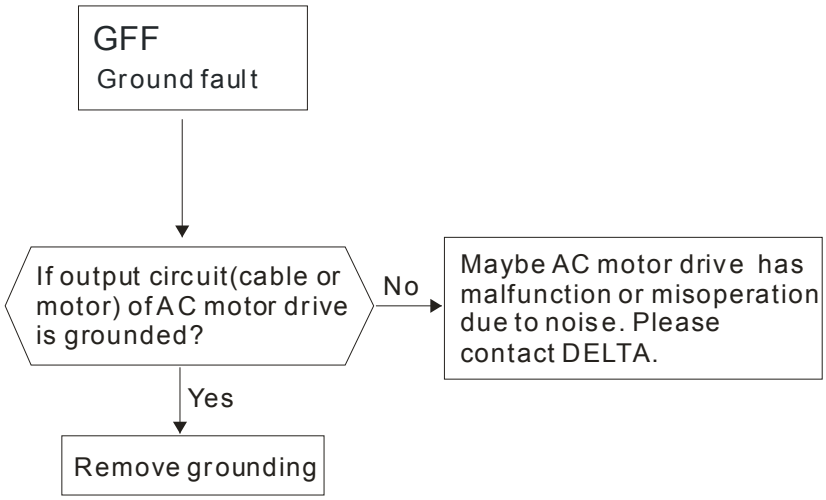
Chapter 5 Troubleshooting

☑ It is crucial for technician to properly inspect the machine to prevent incidents.

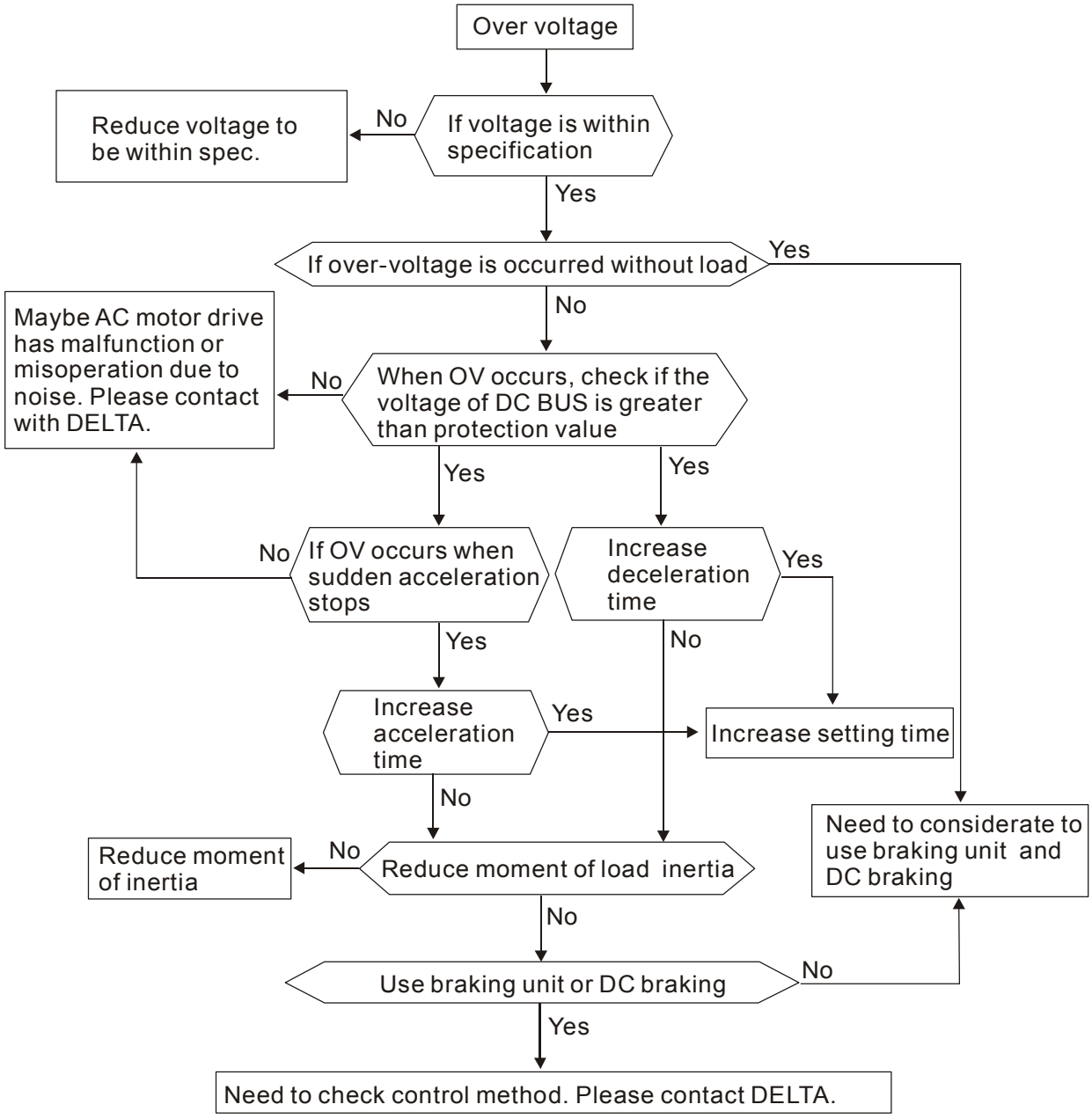
5-1 Over Current (oc)



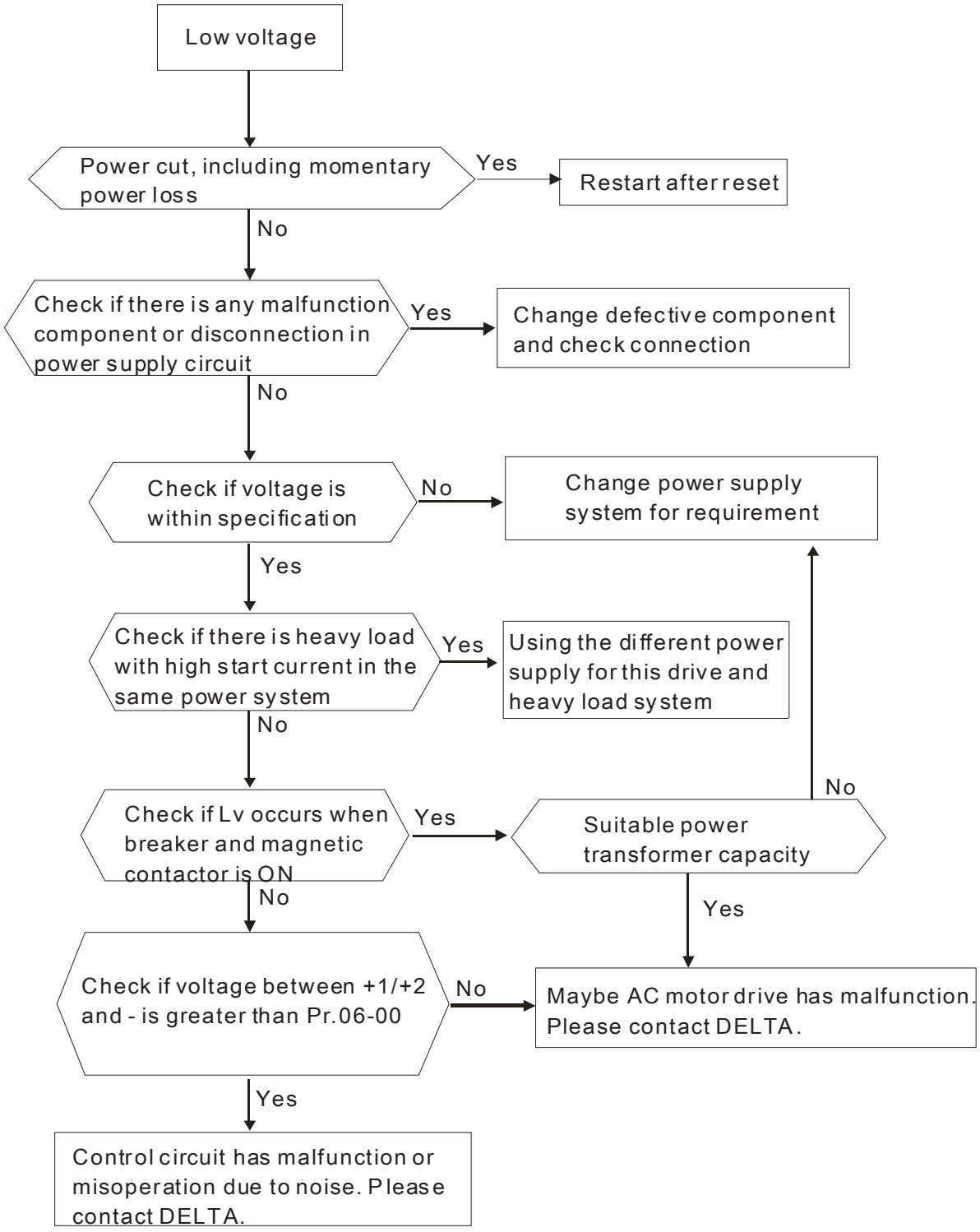
5-2 Ground Fault (GFF)



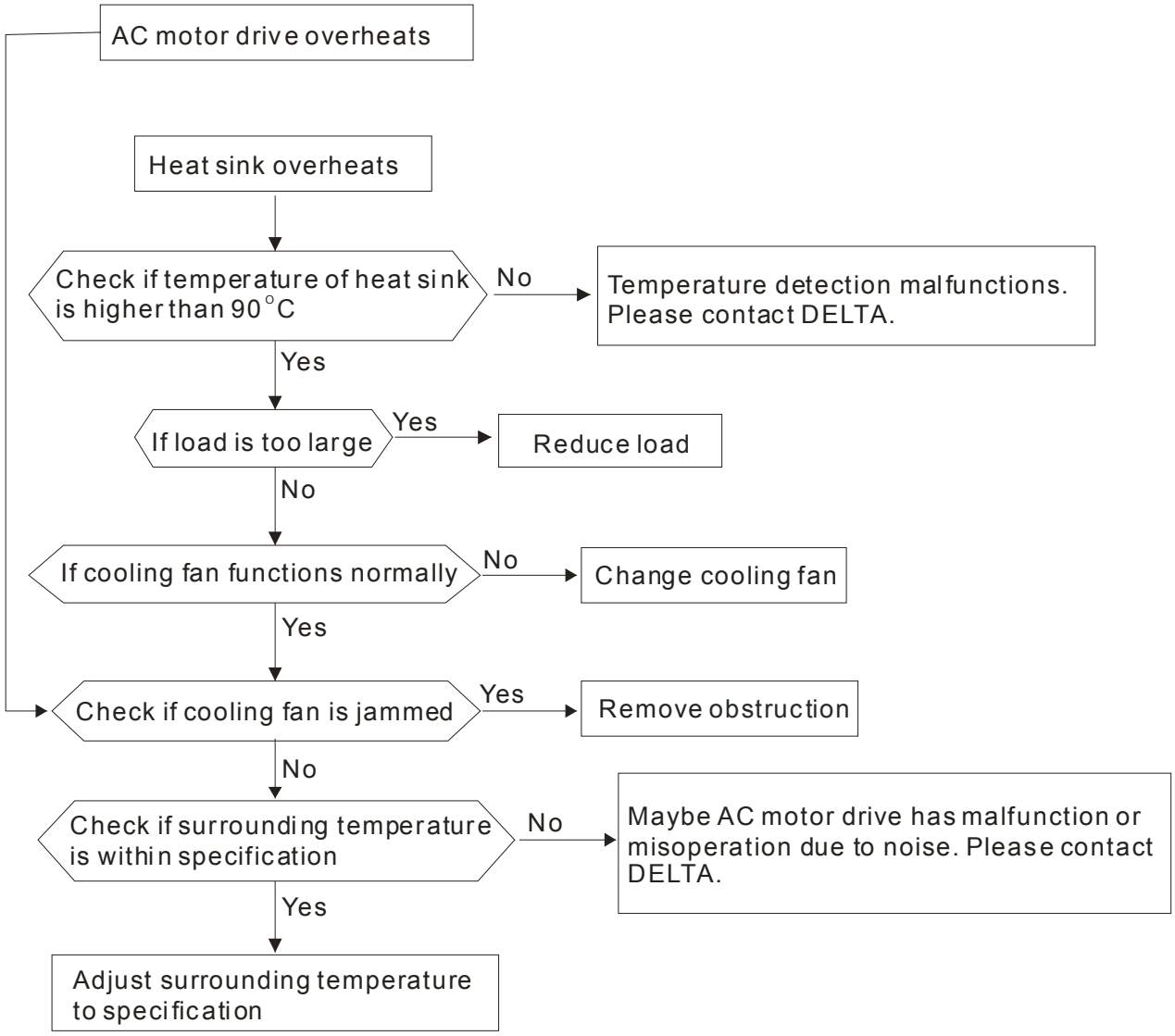
5-3 Over Voltage (ov)



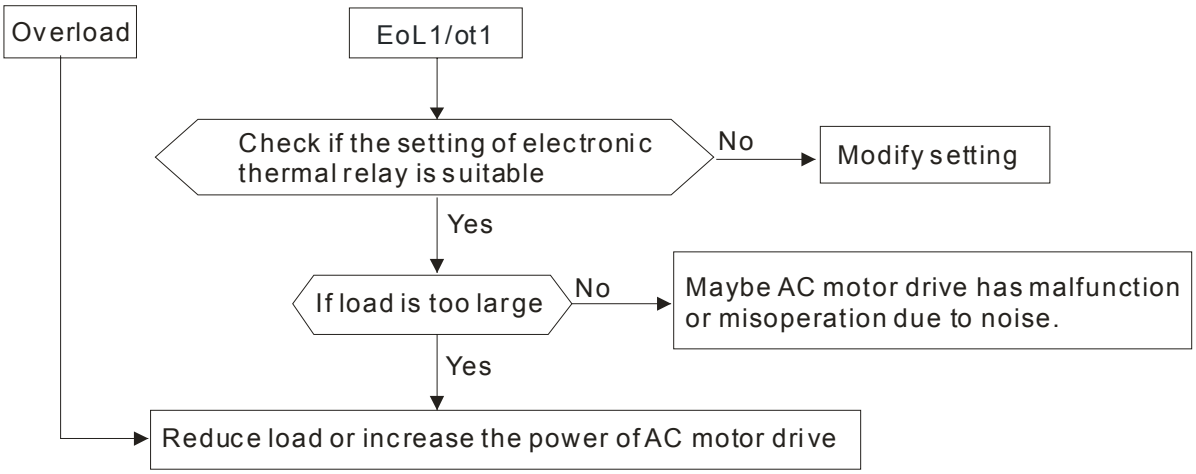
5-4 Low Voltage (Lv)



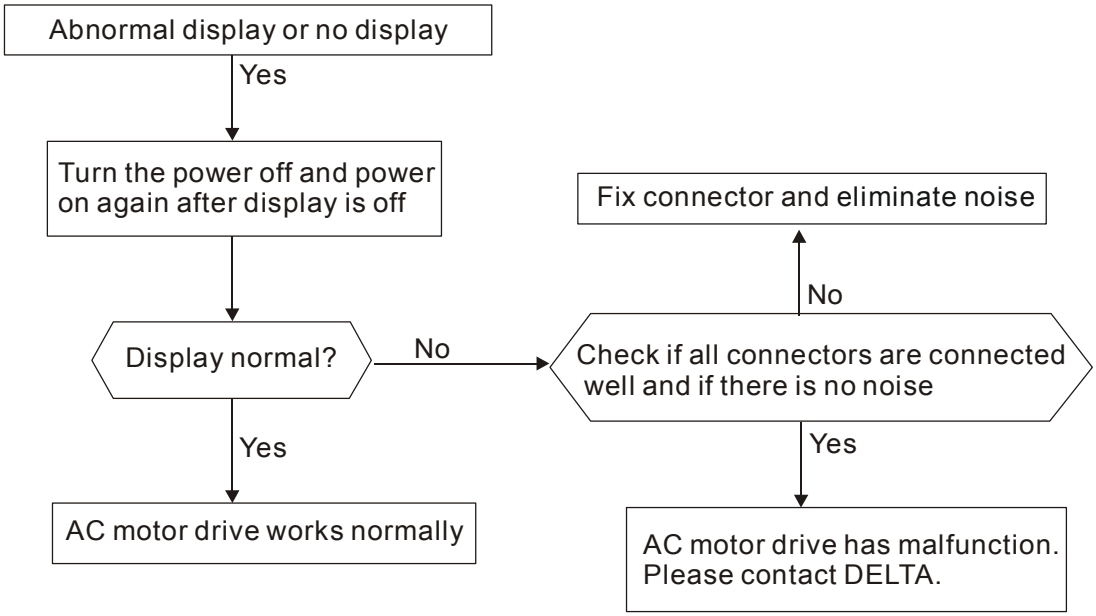
5-5 Over Heat (oH1)



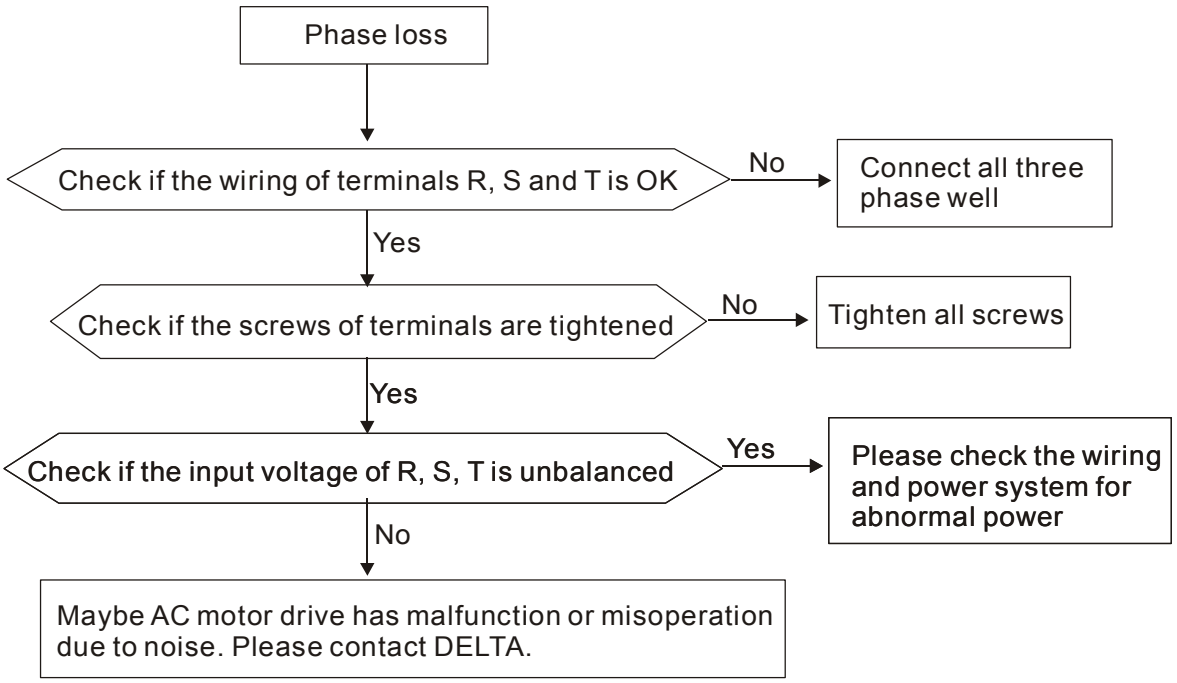
5-6 Overload (oL)



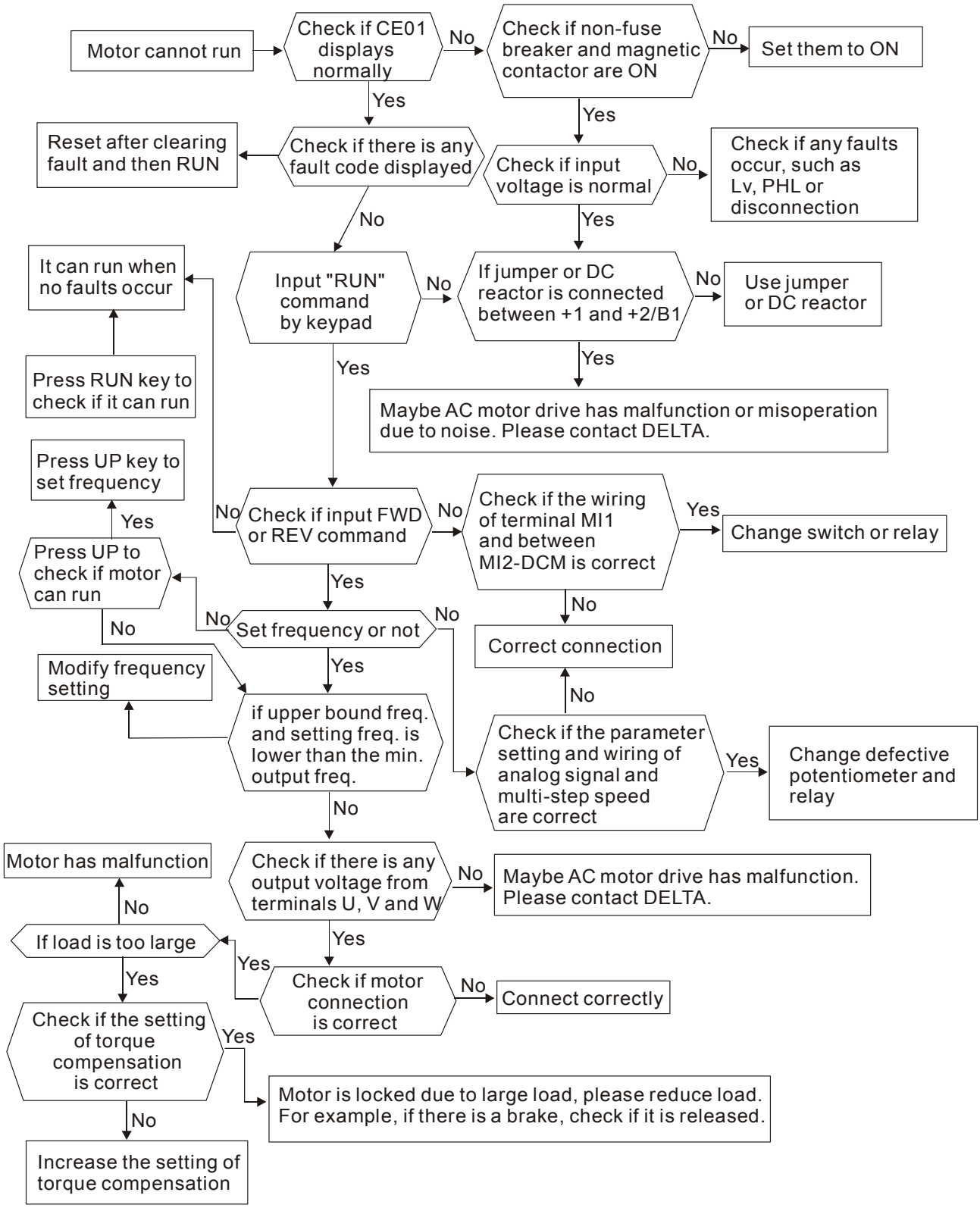
5-7 Digital Keypad Display is Abnormal



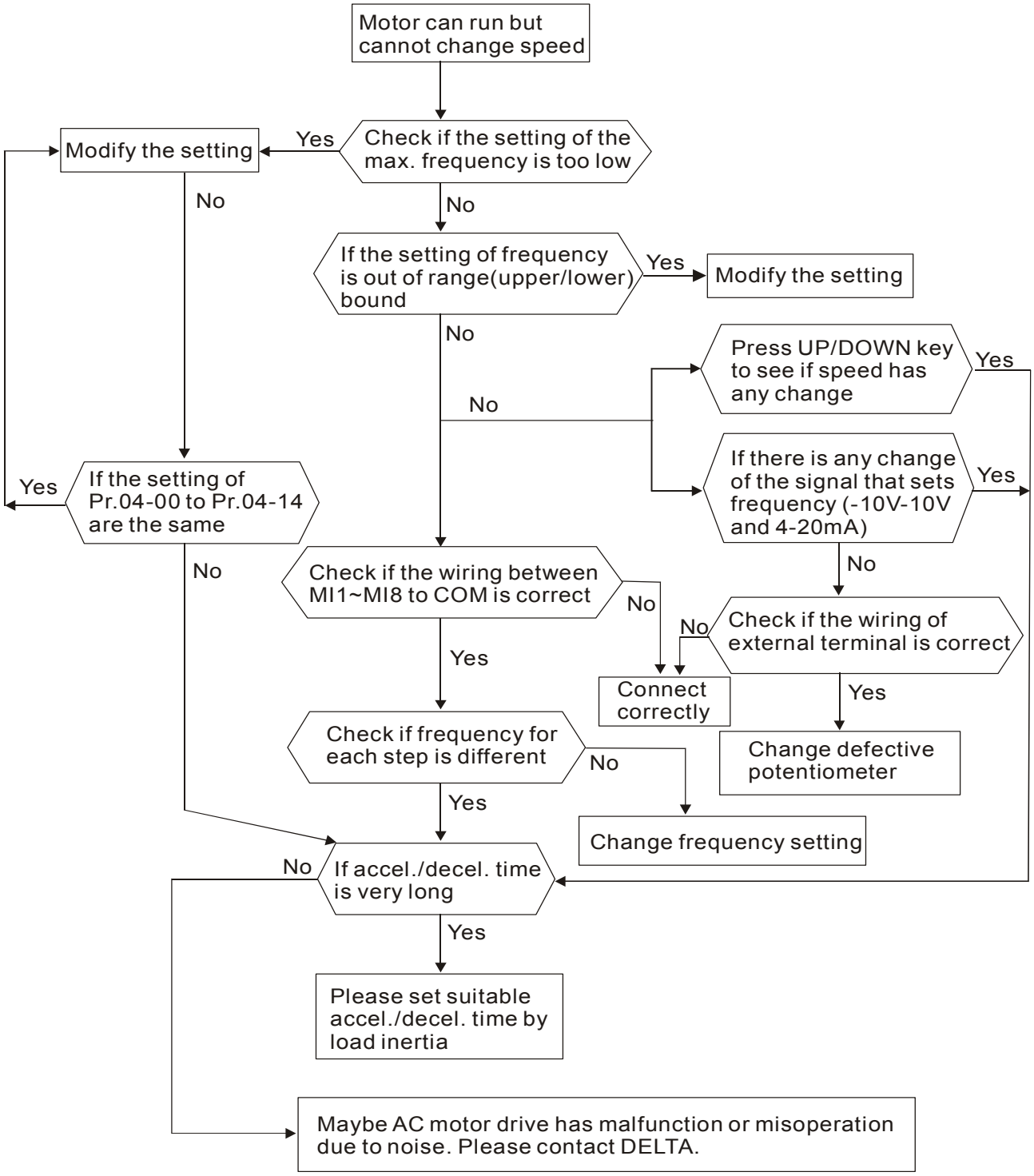
5-8 Phase Loss (PHL)



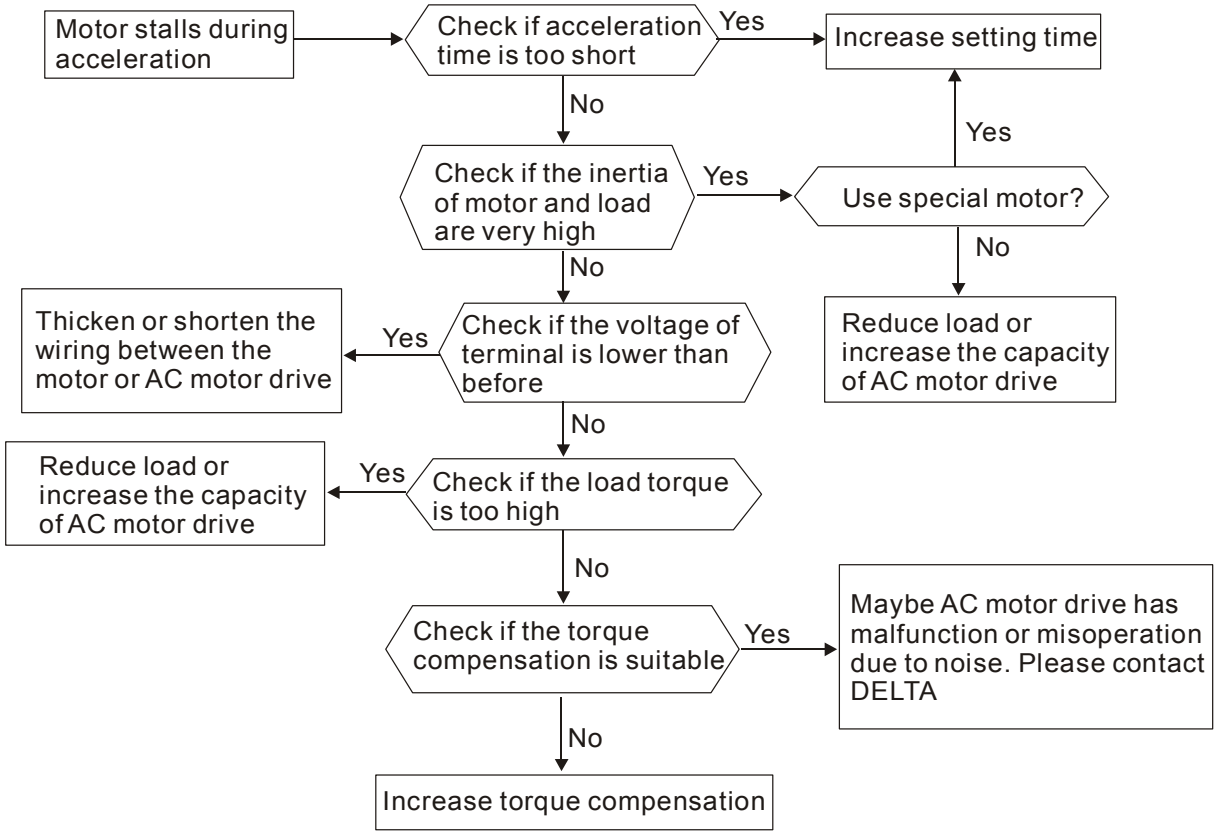
5-9 Motor is not Running



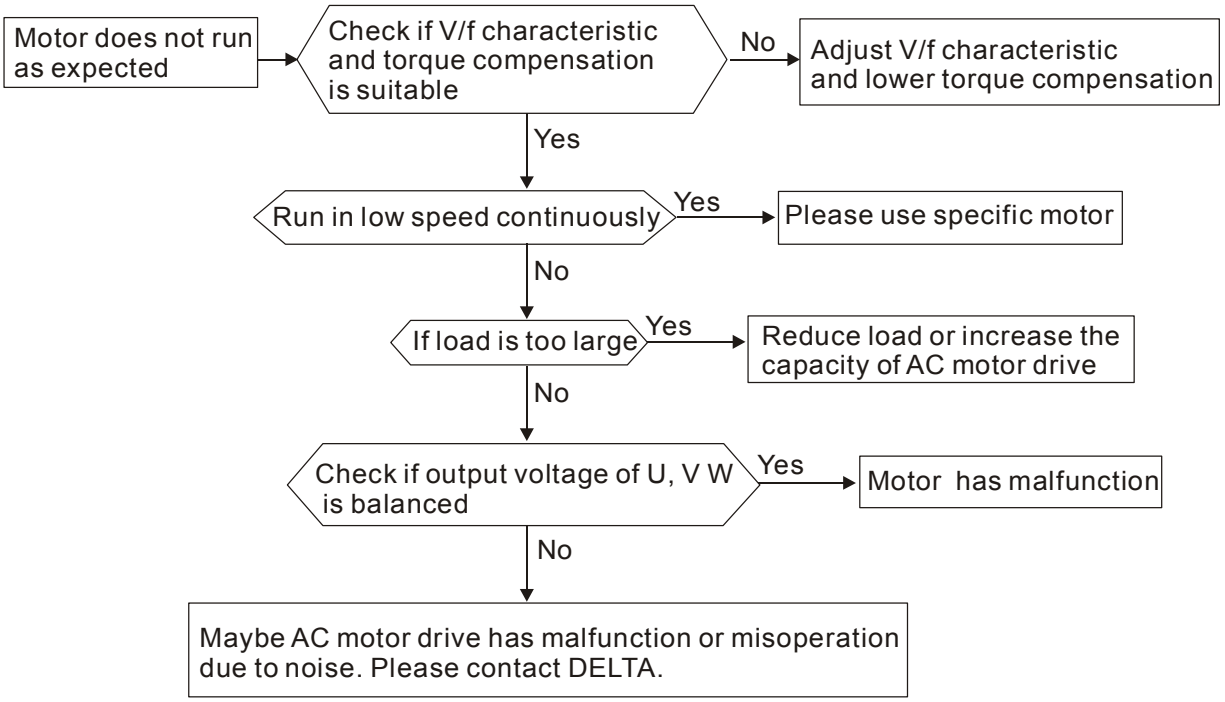
5-10 Fail to Adjust Motor Speed



5-11 Motor Stalls during Acceleration



5-12 Motor Run Error



5-13 Electromagnetic/Induction Noise

There are many noises surround the AC motor drives and invade it by radiation or power circuit. It may cause the misoperation of control circuit and even damage the AC motor drive. Of course, that is a solution to increase the noise tolerance of AC motor drive. But it is not the best one due to the limit. Therefore, solve it from the outside as following will be the best.

1. Add surge killer on the relay or contact to suppress switching surge between ON/OFF.
2. Shorten the wiring length of the control circuit or serial circuit and separate from the main circuit wiring.
3. Comply with the wiring regulation for those shielded wire and use isolation amplifier for long wire.
4. The grounding terminal should comply with the local regulation and ground independently, i.e. not to have common ground with electric welding machine and power equipment.
5. Connect a noise filter at the input terminal of the AC motor drive to prevent noise from power circuit.

In a word, three-level solutions for electromagnetic noise are “no product”, “no spread” and “no receive”.

5.14 Environmental Condition

Since AC motor drive is an electronic device, you should comply with the environmental condition stated in the appendix A. Following are the remedial measures for necessary.

1. To prevent vibration, anti-vibration spacer is the last choice. The vibration tolerance must be within the specification. The vibration effect is equal to the mechanical stress and it cannot occur frequently, continuously or repeatedly to prevent damaging AC motor drive.
2. Store in a clean and dry location free from corrosive fumes/dust to prevent rustiness, poor contact. It also may cause short by low insulation in a humid location. The solution is to use both paint and dust-proof. For particular occasion, use the enclosure with whole-seal structure.
3. The surrounding temperature should be within the specification. Too high or low temperature will affect the lifetime and reliability. For semiconductor components, damage will occur once any specification is out of range. Therefore, it is necessary to clean and periodical check for the air cleaner and cooling fan besides having cooler and sunshade. In additional, the microcomputer may not work in extreme low temperature and needs to have heater.
4. Store within a relative humidity range of 0% to 90% and non-condensing environment. Do not turn off the air conditioner and have exsiccator for it.

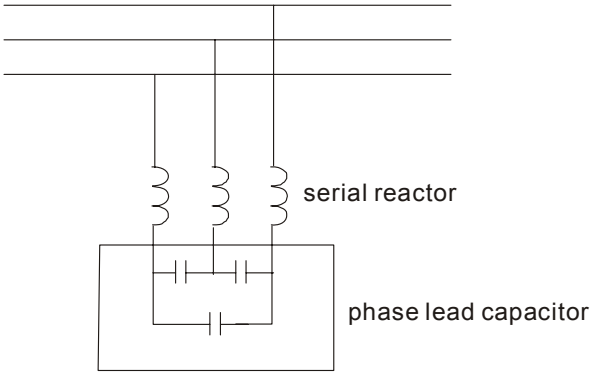
5.15 Prevent Interfere to Other Machines

AC motor drive may affect the operation of other machine due to many reasons. The solutions are as follows.

High Harmonic at Power Side

If there is high harmonic at power side during running, the improved methods are:

1. Separate power system: use transformer for AC motor drive.
2. Use reactor at the power input terminal of AC motor drive or decrease high harmonic by multiple circuit.
3. If there is phase lead capacitor, it should use serial reactor to prevent capacitor damage from high harmonic.



Motor Temperature Rises

When the motor is induction motor with ventilation-cooling-type used in variety speed operation, bad cooling will happen in the low speed. Therefore, it may overheat. Besides, high harmonic is in output waveform to increase copper loss and iron loss. Following measures should be used by load situation and operation range when necessary.

1. Use the motor with independent power ventilation or increase the horsepower.
2. Use inverter duty motor.
3. Do NOT run in the low speed

Chapter 6 Warning Codes & Fault Codes

6-1 Common Problems and Solutions

6-2 Maintenance and Inspectations

The AC motor drive has a comprehensive fault diagnostic system that includes several different alarms and fault messages. Once a fault is detected, the corresponding protective functions will be activated. The following faults are displayed as shown on the AC motor drive digital keypad display. The six most recent faults can be read from the digital keypad or communication.

The AC motor drive is made up by numerous components, such as electronic components, including IC, resistor, capacity, transistor, and cooling fan, relay, etc. These components can't be used permanently. They have limited-life even under normal operation. Preventive maintenance is required to operate this AC motor drive in its optimal condition, and to ensure a long life.

Basic check-up items to detect if there were any abnormalities during operation are:

	☑ Wait 5 seconds after a fault has been cleared before performing reset via keypad of input terminal. ☑ Only qualified personnel can install, wire and maintain AC motor drives. Do not wear any metallic accessory such as watches or rings when installing the drives. Please use proper insulated tools only. ☑ Never reassemble internal components or wiring. ☑ Make sure that installation environment comply with regulations without abnormal noise, vibration and smell.

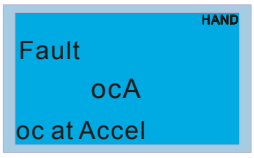
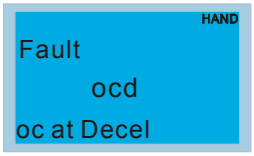
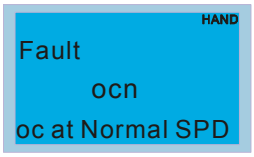
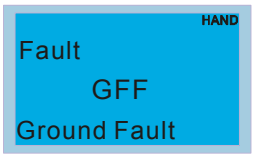
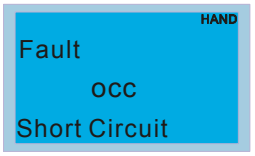
6-1 Common Problems and Solutions

Warning codes displayed on the digital keypad.

ID	7-segment display	Display on the KPC-CC01 keypad	Descriptions
1	CE01	CE01 HAND Warning CE01 Comm. Cmd. Err	Communication command defected Cause Communication error
2	CE02	CE02 HAND Warning CE02 Data Adrr. Err	Address of data defected Cause Communication error
3	CE03	CE03 HAND Warning CE03 Data Length Err	Length of communication data defected Cause Communication error Communication error
4	CE04	CE04 HAND Warning CE04 Wrong Writing	Communications being written in a read only address. Cause Communication error
5	CE10	CE10 HAND Warning CE10 Comm. Time Out	Modbus transmission time-out Cause Communication error
6	CP10	CP10 HAND Warning CP10 Keypad time out	Keypad KPC-CC01 transmission time-out Cause Communication error
7	SE1	SE1 HAND Warning SE1 Keypad Copy Err	Keypad copying parameter error 1 Cause Keypad simulation error, including communication delays, communication error (keypad received error FF86) and parameter value error.
8	SE2	SE2 HAND Warning SE2 Keypad Copy Fail	Keypad copying parameter fail error 2 Cause keypad simulation done but parameter write error
9	oH1	oH1 HAND Warning oH1 IGBT Over Heat	IGBT over-heating warning Cause The temperature of the IGBT are over the factory setting 90˚C (Pr06-14).

ID	7-segment display	Display on the KPC-CC01 keypad	Descriptions
15	PGF 1	PGF1 HAND Warning PGF1 PGFBK warn	PG card feedback error Cause When Pr10-03 = 0 (factory setting = 2), a warning message will be displayed instead of a fault message while an error occurs.
16	PGF2	PGF2 HAND Warning PGF2 PGFBK Loss	PG feedback loss warning Cause Pr10-03 = 0 (factory setting = 2), a warning message will be displayed instead of a fault message while an error occurs.
17	PGF3	PGF3 HAND Warning PGF3 PGFBK Stall	PG feedback stall warning Cause Pr10-09 = 0 (factory setting = 2), a warning message will be displayed instead of a fault message while an error occurs.
18	PGF4	PGF4 HAND Warning PGF4 PG Slip Err	PG slip warning Cause Pr10-09 = 0 (factory setting = 2), a warning message will be displayed instead of a fault message while an error occurs.
25	tUn	tUn HAND Warning tUn Motor Pr. Tune	Motor Pr. Tune Cause Motor's parameters or the magnetic pole angle are doing auto-tuning.
27	dtU	dtU HAND Warning dtU Door Tune	Door Tune Cause Door drive is doing door width auto tuning.,
28	PS	PS HAND Warning PS Limit SW_WARN	Limit SW_WARN Cause When Pr06-10 bit0 =1, Incorrect open/close limit is detected

Fault codes displayed on the keypad:

ID	7-segment display	Display on the KPC-CC01 keypad	Descriptions
1	ocA		Over-current during acceleration (Output current exceeds triple rated current during acceleration.) corrective action 1. Short-circuit at motor output: Check for possible poor insulation at the output. 2. Acceleration Time is too short: Increase the Acceleration Time. 3. AC motor drive output power is too small: Replace the AC motor drive with a higher power model.
2	ocd		Over-current during deceleration (Output current exceeds triple rated current during deceleration.) corrective action 1. Short-circuit at motor output: Check for possible poor insulation at the output. 2. Deceleration Time is too short: Increase the Deceleration Time. 3. AC motor drive output power is too small: Replace the AC motor drive with a higher power model.
3	ocn		Over-current during steady state operation (Output current exceeds triple rated current during constant speed.) corrective action 1. Short-circuit at motor output: Check for possible poor insulation at the output. 2. Sudden increase in motor loading: Check for possible motor stall. 3. AC motor drive output power is too small: Replace the AC motor drive with a higher power model.
4	GFF		Ground fault corrective action When (one of) the output terminal(s) is grounded, short circuit current is more than 50% of AC motor drive rated current, the AC motor drive power module may be damaged. **NOTE:** The short circuit protection is to protect the AC motor drive, not to protect the user. 1. Check the wiring connections between the AC motor drive and motor for possible short circuits, also to ground. 2. Check whether the IGBT power module is damaged. 3. Check for possible poor insulation at the output.
5	occ		Short-circuit is detected between upper bridge and lower bridge of the IGBT module corrective action Return to the factory.

6.1.1 Reset

There are three methods to reset the AC motor drive after the fault is corrected:

1. Press STOP RESET key on KPC-CC01.
2. Set external terminal to “RESET” and then set the contact ON.
3. Send “RESET” command by communication.

NOTE

Make sure that RUN command or signal is OFF before executing RESET to prevent damage or personal injury due to immediate operation.

6.2 Maintenance and Inspections

Before the check-up, always turn off the AC input power and remove the cover. Wait at least 10 minutes after all display lamps have gone out, and then confirm that the capacitors have fully discharged by measuring the voltage between DC+ and DC-. The voltage between DC+ and DC-should be less than 25VDC.

- **Ambient environment**

Check Items	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Check the ambient temperature, humidity, vibration and see if there are any dust, gas, oil or water drops	Visual inspection and measurement with equipment with standard specification	○		
If there are any dangerous objects	Visual inspection	○		

- **Voltage**

Check Items	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Check if the voltage of main circuit and control circuit is correct	Measure with multimeter with standard specification	○		

- **Keypad**

Check Items	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Is the display clear for reading	Visual inspection	○		
Any missing characters	Visual inspection	○		

■ **Mechanical parts**

Check Items	**Methods and Criterion**	**Maintenance Period**		
		Daily	Half Year	One Year
If there is any abnormal sound or vibration	Visual and aural inspection		○	
If there are any loose screws	Tighten the screws		○	
If any part is deformed or damaged	Visual inspection		○	
If there is any color change by overheating	Visual inspection		○	
If there is any dust or dirt	Visual inspection		○	

■ **Main circuit**

Check Items	**Methods and Criterion**	**Maintenance Period**		
		Daily	Half Year	One Year
If there are any loose or missing screws	Tighten or replace the screw	○		
If machine or insulator is deformed, cracked, damaged or with color change due to overheating or ageing	Visual inspection **NOTE: Please ignore the color change of copper plate**		○	
If there is any dust or dirt	Visual inspection		○	

■ **Terminals and wiring of main circuit**

Check Items	**Methods and Criterion**	**Maintenance Period**		
		Daily	Half Year	One Year
If the terminal or the plate is color change or deformation due to overheat	Visual inspection		○	
If the insulator of wiring is damaged or color change	Visual inspection		○	
If there is any damage	Visual inspection	○		

- **DC capacity of main circuit**

Check Items	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
If there is any leak of liquid, color change, crack or deformation	Visual inspection	○		
If the safety valve is not removed? If valve is inflated?	Visual inspection	○		
Measure static capacity when required		○		

- **Resistor of main circuit**

Check Items	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
If there is any peculiar smell or insulator cracks due to overheat	Visual inspection, smell	○		
If there is any disconnection	Visual inspection	○		
If connection is damaged?	Measure with multimeter with standard specification	○		

- **Transformer and reactor of main circuit**

Check Items	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
If there is any abnormal vibration or peculiar smell	Visual, aural inspection and smell	○		

- **Magnetic contactor and relay of main circuit**

Check Items	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
If there are any loose screws	Visual and aural inspection	○		
If the contact works correctly	Visual inspection	○		

- **Printed circuit board and connector of main circuit**

Check Items	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
If there are any loose screws and connectors	Tighten the screws and press the connectors firmly in place.		○	
If there is any peculiar smell and color change	Visual and smell inspection		○	
If there is any crack, damage, deformation or corrosion	Visual inspection		○	
If there is any liquid is leaked or deformation in capacity	Visual inspection		○	

- **Cooling fan of cooling system**

Check Items	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
If there is any abnormal sound or vibration	Visual, aural inspection and turn the fan with hand (turn off the power before operation) to see if it rotates smoothly		○	
If there is any loose screw	Tighten the screw		○	
If there is any color change due to overheat	Change fan		○	

- **Ventilation channel of cooling system**

Check Items	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
If there is any obstruction in the heat sink, air intake or air outlet	Visual inspection		○	

NOTE

Please use the neutral cloth for clean and use dust cleaner to remove dust when necessary.

Appendix A Specifications

VDD-DD series provide our customers 230V-200W model and 230V-400W model, choose the one that fits your need. The table below facilitates our customers' purchase.

Drive Specifications

Model VFD-_ _ _DD		002	004
Applicable Motor Output(W)		200	400
Output Rating	Rated Output Capacity (kVA)	0.6	1.0
	Rated Output Current (A)	1.5	2.5
	Maximum Output Voltage (V)	Proportional to Input Voltage	
	Output Frequency (Hz)	0.00~120.00Hz	
	Carrier Frequency (kHz)	10 kHz	
	Rated Input Current (A)	4.9A	6.5A
Input Rating	Voltage Tolerance	Single phase 200~ 240V (-20%~+10%) (160~264V)	
	Frequency Tolerance	50/60Hz ±5% (47~63Hz)	
Cooling Method		200W natural cool /400W natural cool	
Frame Size		W170mm*L215*H55mm	

Common Characteristics

Control Characteristics	Control Method		1: V/F, 2: VF+PG, 3: SVC, 4: FOC+PG, 6:PM FOC+PG
	Starting Torque		Starting torque at 0.5Hz is more than 150%, at 0 Hz is FOC+PG control mode
	Speed Control Range		1:100(external PG installation can achieve 1:1000)
	Speed Control Accuracy		±0.5% (external PG installation can achieve ±0.02%)
	Speed Response Ability		5Hz (vector control can attain 30Hz)
	Max. Output Frequency (Hz)		0.00 to 120.00 Hz
	Output Frequency Accuracy		Digital command ±0.005%
	Frequency Setting Resolution		Digital command ±0.01Hz
	Torque Limit		200% torque current as maximum
	Accel/Decel Time		0.00~600.00 sec
	V/F Curve Pattern		Adjustable V/F curve of 4 independent points
	Brake Torque		50% ED for 3 seconds, during every 30 seconds (optional)
Operating Characteristics	Frequency Setting Signal	Keypad	By parameter setting
		External Signal	Multi-function input selection 1~5 (15 step speeds; At low speed), parameter setting on serial communication port (RS-485)
	Operation Setting Signal	Keypad	Set by RUN, STOP key
		External Signal	2 wires (OD, CD, RUN), At low speed operation, RS-485 serial interface, demo mode
	Multi-Function Input Signal		Multi-step speed selection MI1~MI15, At low speed, first to second accel/decel switches, demo mode, force stop, emergency stop, operation command source, parameter lock, driver reset, open/close limit signal, door open prohibited signal, force open signal, reposition, 2nd step open/close curve selection

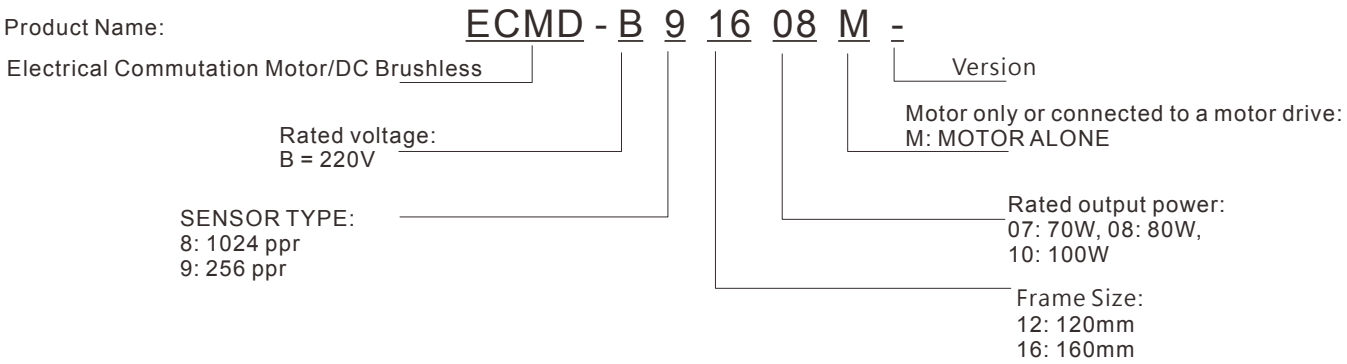
	Multi-Function Output Signal	(RC1,RA1,RB1) , (RC2,RA2,RB2) ,(MO1,MO2,MO3 and MCM) AC drive operating, frequency attained, fault indication, over torque, over voltage, operation mode, alarm indication, demo mode indication, overheat alarm, drive is ready, emergency stop, braking signal, zero speed indication, PG indication error, position detection, limit signal, re-open/close indication, position finished
Communication Interface		Built-in MODBUS, customize CAN Bus
Alarm Output Contact		Contact “ON” when malfunctions occurs (relay with a “C” or “A” contact, or 2 open collector outputs)
Operation Function		AVR, 6 set fault records, opening door is prohibited, DC brake, auto torque/slip compensation, auto tuning, adjustable carrier frequency, output frequency upper and lower limits, parameter reset, vector control, MODBUS communication, abnormal reset, abnormal re-start, PG feedback control, fan control, demo mode, door width auto-tuning
Protection Function		Over voltage, over current, under current, external fault, overload, ground fault, overload, overheating, electronic thermal, PG feedback error, external limit signal error, re-open/re-close
Digital Keypad		7 function keys, 4-digit 7-segment LED, 4 status LEDs, master frequency, output frequency, output current, custom units, parameter values for setup, review and faults, RUN, STOP, RESET, FWD/REV
EMI Filter built in		Corresponding to EN55011 CLASS A (economy versions are not included)
Protection Characteristics	Motor Protection	Electronic thermal relay protection
	Over Current Protection	The current forces 180% of the over-current protection and 240% of the rated current
	Overload Capacity	150% for 120 seconds; 180% for 10 seconds
	Voltage Protection	Over-voltage level: Vdc>400; low-voltage level: Vdc<200
	Over-voltage Protection for Input Power	Varistor (MOV)
	Overheat Protection	Built-in temperature sensor
Environment	Enclosure Rating	IP20
	Operation Temperature	-10°C ~40°C
	Ambient Temperature	-20°C ~60°C
	Ambient Humidity	Below 90% RH (non-condensing)
	Vibration	1.0G less than 20Hz, 0.6G at 20~60 Hz
	Installation Location	Altitude 1,000m or lower, keep from corrosive gasses, liquid and dust
Certifications		UL, CE *1 (IEC 61800-3)

*1 To comply with EMC regulation (IEC61000-3-2& 4), it is required to install an input reactor or other equipment.

Motor Specifications

Model #		ECMD-B91207M_	ECMD-B91608M_	ECMD-B81610M_
Rated Specifications	Rated Output Power (W)	70	80	100
	Rated Voltage (V)	220	220	220
	Rated Torque (N-m)	2.0	3.0	3.5
	Rated Speed (rpm)	350	250	280
	Rated Current (A)	0.7	1.0	0.95
	Number of Poles	10	16	16
Motor Specifications	Resolution of Encoder	10 bit (256ppr)	10 bit (256ppr)	12 bit (1024ppr)
	Continuous Stall Torque (N-m)	2.0	3.0	3.5
	Maximum Momentary Torque(N-m)	5.0	5.0	5.5
	Maximum Speed (rpm)	750	600	500
	Maximum Momentary Current (A)	2.5	2.5	2.5
	Rotor Moment of Inertia ($kg.m^2$)	$3.0*10^{-4}$	$4.9*10^{-4}$	$4.9*10^{-4}$
	Armature Resistance (ohm)	18.7	15.8	24.3
	Armature Inductance (mH)	195	177	273
	Mechanical Time Constant (ms)	1.96	2.42	2.13
	Electrical Time Constant (ms)	10.4	11.2	11.2
	Insulation Class	B		
	Insulation Resistance	10MΩ DC500V		
	Insulation Strength	1.5kVAC, 1min.		
	Max. Radial Shaft Load (N)	98		
	Max. Thrust Shaft Load (N)	49		
	Weight(kg)	2.5	3.0	3.0
Environment Specifications	Maximum Winding Temperature(°C)	130°C		
	Operating Temperature (°C)	5~45°C		
	Storage Temperature(°C)	-10~50°C		
	Operating Humidity(%RH)	20~95%RH(non-condensing)		
	Storage Humidity(%RH)	20~95%RH(non-condensing)		
	IP Rating	IP20(standard); IP43 (optional)		

Motor Model


Product Name:
ECMD - B 9 16 08 M -
Electrical Commutation Motor/DC Brushless
Version
Motor only or connected to a motor drive:
M: MOTOR ALONE
Rated voltage:
B = 220V
Rated output power:
07: 70W, 08: 80W,
10: 100W
SENSOR TYPE:
8: 1024 ppr
9: 256 ppr
Frame Size:
12: 120mm
16: 160mm

Appendix B
How to Select AC Motor Drive

The choice of the right AC motor drive for the application is very important and has great influence on its lifetime. If the capacity of AC motor drive is too large, it cannot offer complete protection to the motor and motor maybe damaged. If the capacity of AC motor drive is too small, it cannot offer the required performance and the AC motor drive maybe damaged due to overloading.

But by simply selecting the AC motor drive of the same capacity as the motor, user application requirements cannot be met completely. Therefore, a designer should consider all the conditions, including load type, load speed, load characteristic, operation method, rated output, rated speed, power and the change of load capacity. The following table lists the factors you need to consider, depending on your requirements.

Item		**Related Specification**			
		Speed and torque characteristics	Time ratings	Overload capacity	Starting torque
Load type	Friction load and weight load Liquid (viscous) load Inertia load Load with power transmission	●			●
Load speed and torque characteristics	Constant torque Constant output Decreasing torque Decreasing output	●	●		
Load characteristics	Constant load Shock load Repetitive load High starting torque Low starting torque	●	●	●	●
Operation Method	Continuous operation, Short-time operation Long-time operation at medium/low speeds		●	●	
Rated Output	Maximum output current (instantaneous) Constant output current (continuous)	●		●	
Rated Speed	Maximum frequency, Base frequency	●			
Input Power	Power supply transformer capacity Percentage impedance Voltage fluctuations and unbalance Number of phases, single phase protection Frequency			●	●
Load Capacity Changes	Mechanical friction, losses in wiring			●	●
	Duty cycle modification		●		

B-1 Capacity Formulas

1. When one AC motor drive operates one motor

The starting capacity should be less than 1.5x rated capacity of AC motor drive

The starting capacity=

$$\frac{k \times N}{973 \times \eta \times \cos\varphi}\left(T_L + \frac{GD^2}{375} \times \frac{N}{t_A}\right) \leq 1.5 \times the\_capacity\_of\_AC\_motor\_drive(kVA)$$

2. When one AC motor drive operates more than one motor

2.1 The starting capacity should be less than the rated capacity of AC motor drive

- *Acceleration time ≦60 seconds*

  The starting capacity=

$$\frac{k \times N}{\eta \times \cos\varphi}\left[n_T + n_S(k_{S-1})\right] = P_{C1}\left[1 + \frac{n_s}{n_T}(k_{s-1})\right] \leq 1.5 \times the\_capacity\_of\_AC\_motor\_drive(kVA)$$

- *Acceleration time ≧60 seconds*

  The starting capacity=

$$\frac{k \times N}{\eta \times \cos\varphi}\left[n_T + n_S(k_{S-1})\right] = P_{C1}\left[1 + \frac{n_s}{n_T}(k_{s-1})\right] \leq the\_capacity\_of\_AC\_motor\_drive(kVA)$$

2.2 The current should be less than the rated current of AC motor drive(A)

- *Acceleration time ≦60 seconds*

$$n_T + I_M\left[1 + \frac{n_S}{n_T}(k_S - 1)\right] \leq 1.5 \times the\_rated\_current\_of\_AC\_motor\_drive(A)$$

- *Acceleration time ≧60 seconds*

$$n_T + I_M\left[1 + \frac{n_S}{n_T}(k_S - 1)\right] \leq the\_rated\_current\_of\_AC\_motor\_drive(A)$$

2.3 When it is running continuously

- The *requirement* of load capacity should be less than the capacity of AC motor drive(kVA)

  The requirement of load capacity=

$$\frac{k \times P_M}{\eta \times \cos\varphi} \leq the\_capacity\_of\_AC\_motor\_drive(kVA)$$

- *The motor capacity should be less than the capacity of AC motor drive*

$$k \times \sqrt{3} \times V_M \times I_M \times 10^{-3} \leq the\_capacity\_of\_AC\_motor\_drive(kVA)$$

■ *The current should be less than the rated current of AC motor drive(A)*

$$k \times I_M \leq the\_rated\_current\_of\_AC\_motor\_drive(A)$$

Symbol explanation

P_M : Motor shaft output for load (kW)

η : Motor efficiency (normally, approx. 0.85)

cos φ : Motor power factor (normally, approx. 0.75)

V_M : Motor rated voltage(V)

I_M : Motor rated current(A), for commercial power

k : Correction factor calculated from current distortion factor (1.05 - 1.1, depending on PWM method)

P_{c1} : Continuous motor capacity (kVA)

k_S : Starting current/rated current of motor

n_T : Number of motors in parallel

n_S : Number of simultaneously started motors

GD^2 : Total inertia (GD^2) calculated back to motor shaft (kg m^2)

T_L : Load torque

t_A : Motor acceleration time

N : Motor speed

B-2 General Precautions

Drives Selection

1. When the AC Motor Drive is connected directly to a large-capacity power transformer (600kVA or above) or when a phase lead capacitor is switched, excess peak currents may occur in the power input circuit and the converter section may be damaged. To avoid this, use an AC input reactor (optional) before AC Motor Drive mains input to reduce the current and improve the input power efficiency.
2. When a special motor is used or more than one motor is driven in parallel with a single AC Motor Drive, select the AC Motor Drive current ≥1.25x(Sum of the motor rated currents).
3. The starting and accel./decel. characteristics of a motor are limited by the rated current and the overload protection of the AC Motor Drive. Compared to running the motor D.O.L. (Direct On-Line), a lower starting torque output with AC Motor Drive can be expected. If higher starting torque is required (such as for elevators, mixers, tooling machines, etc.) use an AC Motor Drive of higher capacity or increase the capacities for both the motor and the AC Motor Drive.

Parameter Settings

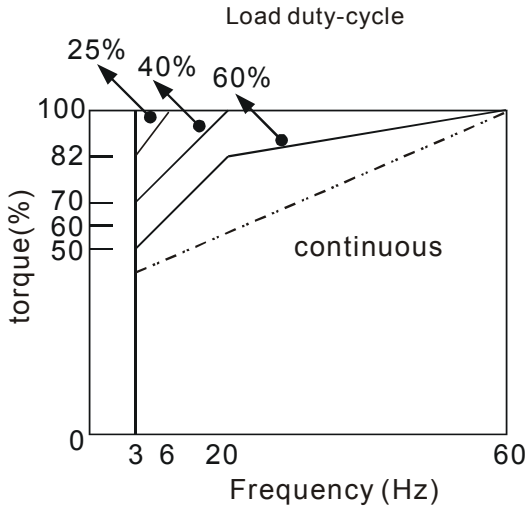
1. The AC Motor Drive can be driven at an output frequency up to 400Hz (less for some models) with the digital keypad. Setting errors may create a dangerous situation. For safety, the use of the upper limit frequency function is strongly recommended.
2. High DC brake operating voltages and long operation time (at low frequencies) may cause overheating of the motor. In that case, forced external motor cooling is recommended.
3. Motor accel./decel. time is determined by motor rated torque, load torque, and load inertia.

B-3 How to Choose a Suitable Motor

Standard motor

When using the AC Motor Drive to operate a standard 3-phase induction motor, take the following precautions:

1. The energy loss is greater than for an inverter duty motor.
2. Avoid running motor at low speed for a long time. Under this condition, the motor temperature may rise above the motor rating due to limited airflow produced by the motor's fan. Consider external forced motor cooling.
3. When the standard motor operates at low speed for long time, the output load must be decreased.
4. The load tolerance of a standard motor is as follows:



5. If 100% continuous torque is required at low speed, it may be necessary to use a special inverter duty motor.
6. Motor dynamic balance and rotor endurance should be considered once the operating speed exceeds the rated speed (60Hz) of a standard motor.
7. Motor torque characteristics vary when an AC Motor Drive instead of commercial power supply drives the motor. Check the load torque characteristics of the machine to be connected.
8. Because of the high carrier frequency PWM control of the VFD series, pay attention to the following motor vibration problems:
   - Resonant mechanical vibration: anti-vibration (damping) rubbers should be used to mount equipment that runs at varying speed.
   - Motor imbalance: special care is required for operation at 50 or 60 Hz and higher frequency.
   - To avoid resonances, use the Skip frequencies.
9. The motor fan will be very noisy when the motor speed exceeds 50 or 60Hz.

Special motors:

1. Pole-changing (Dahlander) motor:
   The rated current is differs from that of a standard motor. Please check before operation and select the capacity of the AC motor drive carefully. When changing the pole number the motor needs to be stopped first. If over current occurs during operation or regenerative voltage is too high, please let the motor free run to stop (coast).
2. Submersible motor:
   The rated current is higher than that of a standard motor. Please check before operation and choose the capacity of the AC motor drive carefully. With long motor cable between AC motor drive and motor, available motor torque is reduced.
3. Explosion-proof (Ex) motor:
   Needs to be installed in a safe place and the wiring should comply with the (Ex) requirements. Delta AC Motor Drives are not suitable for (Ex) areas with special precautions.
4. Gear reduction motor:
   The lubricating method of reduction gearbox and speed range for continuous operation will be different and depending on brand. The lubricating function for operating long time at low speed and for high-speed operation needs to be considered carefully.
5. Synchronous motor:
   The rated current and starting current are higher than for standard motors. Please check before operation and choose the capacity of the AC motor drive carefully. When the AC motor drive operates more than one motor, please pay attention to starting and changing the motor.

Power Transmission Mechanism

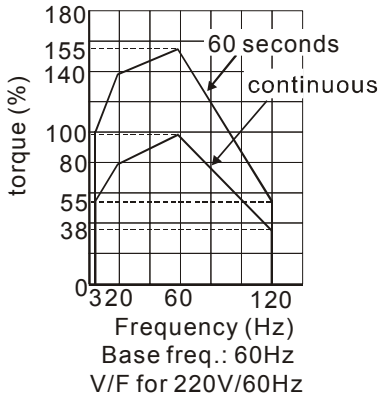
Pay attention to reduced lubrication when operating gear reduction motors, gearboxes, belts and chains, etc. over longer periods at low speeds. At high speeds of 50/60Hz and above, lifetime reducing noises and vibrations may occur.

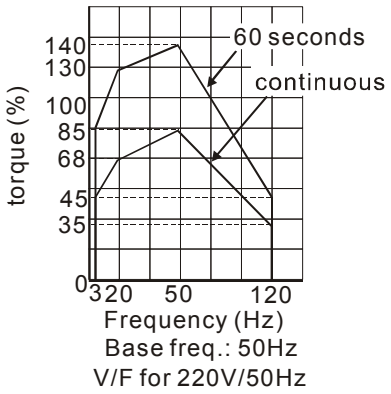
Motor torque

The torque characteristics of a motor operated by an AC motor drive and commercial mains power are different.

Below you'll find the torque-speed characteristics of a standard motor (4-pole, 15kW):

AC motor drive





Motor