

User Manual Elevator Drive



Power Range:

3-phase 230V series: 5.5kW~22kW (7.5~30HP) 3-phase 460V series: 5.5kW~22kW (7.5~30HP)



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DELTA

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User Manual

Elevator Drive

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Thank you for choosing DELTA's high-performance VFD-VL Series. The VFD-VL Series is manufactured with high-quality components and materials and incorporates 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-VL 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 question, please contact your dealer.

PLEASE READ PRIOR TO INSTALLATION FOR SAFETY.



- 1. 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, even if the power has been turned off. To prevent personal injury, please ensure that power has turned off before opening the AC motor drive and wait ten minutes for the capacitors to discharge to safe voltage levels.
- 3. Never reassemble internal components or wiring.
- 4. The AC motor drive may be destroyed beyond repair if incorrect cables are connected to the input/output terminals. Never connect the AC motor drive output terminals U/T1, V/T2, and W/T3 directly to the AC mains circuit power supply.
- Ground the VFD-VL using the ground terminal. The grounding method must comply with the laws of the country where the AC motor drive is to be installed. Refer to the Basic Wiring Diagram.
- VFD-VL series is used only to control variable speed of 3-phase induction motors, NOT for 1phase motors or other purpose.
- 7. VFD-VL series shall NOT be used for life support equipment or any life safety situation.



- DO NOT use Hi-pot test for internal components. The semi-conductor used in AC motor drive easily damage by high-voltage.
- There are highly sensitive MOS 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.
- 3. Only qualified persons are allowed to install, wire and maintain AC motor drives.



- 1. Some parameters settings can cause the motor to run immediately after applying power.
- 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.
- Only use AC motor drives within specification. Failure to comply may result in fire, explosion or electric shock.
- To prevent personal injury, please keep children and unqualified people away from the equipment.
- 5. When the motor cable between AC motor drive and motor is too long, the layer insulation of the motor may be damaged. Please use a frequency inverter duty motor or add an AC output reactor to prevent damage to the motor. Refer to appendix B Reactor for details.
- 6. The rated voltage for AC motor drive must be \leq 240V (\leq 480V for 460V models) and the mains supply current capacity must be \leq 5000A RMS (\leq 10000A RMS for the \geq 40hp (30kW) models)

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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:



- 1. Store in a clean and dry location free from direct sunlight or corrosive fumes.
- 2. Store within an ambient temperature range of -20 °C to +60 °C.
- 3. Store within a relative humidity range of 0% to 90% and non-condensing environment.
- 4. 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.

The VFD-VL is able to control Induction Motors (IM) and Permanent Magnet Motors (PM). In the manual throughout the abbreviations IM and PM are used.

VLE3.1, SW V1.07

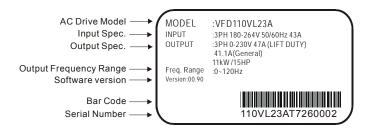
1.1 Receiving and Inspection

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:

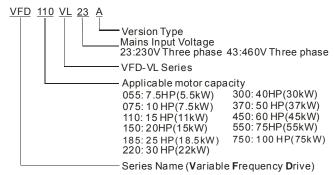
- Check to make sure that the package includes an AC motor drive, the User Manual/Quick Start and CD.
- Inspect the unit to assure it was not damaged during shipment.
- Make sure that the part number indicated on the nameplate corresponds with the part number of your order.

1.1.1 Nameplate Information

Example for 15HP/11kW 230V 3-Phase AC motor drive



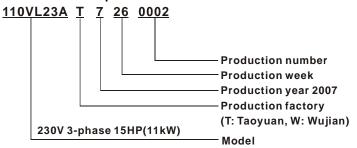
1.1.2 Model Explanation



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1.1.3 Series Number Explanation



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

1.1.4 Drive Frames and Appearances





40-100HP/30-75kW(Frame E)



Frame	Power range	Models				
С	7.5-15HP (5.5-11kW)	VFD055VL23A/43A, VFD075VL23A/43A, VFD110VL23A/43A				
D	20-30HP (15-22kW)	VFD150VL23A/43A, VFD185VL23A/43A, VFD220VL23A/43A				
E (E1)	40-60hp (30-45kW)	VFD300VL43A, VFD370VL43A, VFD450V43A				
E (E2) 40-100hp (30-75kW)		VFD300VL23A, VFD370VL23A, VFD550VL43A, VFD750VL43A				

Please refer to Chapter 1.3 for exact dimensions.

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1.1.5 Drive Features

Communication Port





Internal structure

Removable fan







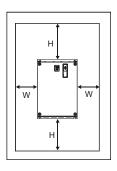
1.2 Preparation for Installation and Wiring

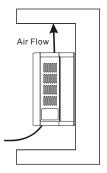
1.2.1 Ambient Conditions

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

	Air Temperature:	-10 ~ +45°C (14 ~ 113°F)				
	Relative Humidity:	<90%, no condensation allowed				
Operation	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				
	Temperature:	-20°C ~ +60°C (-4°F ~ 140°F)				
Storage	Relative Humidity:	<90%, no condensation allowed				
Transportation	Atmosphere pressure:	86 ~ 106 kPa				
	Vibration:	<20Hz: 9.80 m/s² (1G) max 20 ~ 50Hz: 5.88 m/s² (0.6G) max				
Pollution Degree	2: good for a factory type environment.					

Minimum Mounting Clearances





HP	W mm (inch)	H mm (inch)
7.5-20HP	75 (3)	175 (7)
25-75HP	75 (3)	200 (8)
100HP	75 (3)	250 (10)

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- 1 Operating, storing or transporting the AC motor drive outside these conditions may cause damage to the AC motor drive.
- 2 Failure to observe these precautions may void the warranty!
- 3 Mount the AC motor drive vertically on a flat vertical surface object by screws. Other directions are not allowed
- 4 The AC motor drive will generate heat during operation. Allow sufficient space around the unit for heat dissipation.
- 5. 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.
- 6 When AC motor drive is installed in a confined space (e.g. cabinet), the surrounding temperature must be within 10 ~ 40°C with good ventilation. DO NOT install the AC motor drive in a space with bad ventilation.
- 7 Prevent fiber particles, scraps of paper, saw dust, metal particles, etc. from adhering to the heatsink
- 8. When installing multiple AC more 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 between the AC motor drives to prevent mutual heating.

1.2.2 Remove Front Cover

7.5-15HP/5.5-11kW(frame C) & 20-30HP/15-22kW(frame D)

After removing the screws, please push the front cover to open it. For the open cover direction, please refer to the following picture.





40-100HP/30-75kW (frame E)

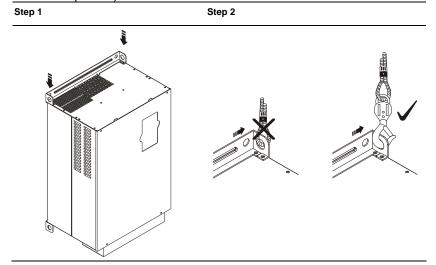
After removing the screws, please push the front cover to open it. For the open cover direction, please refer to the following picture.



1.2.3 Lifting

Please carry only fully assembled AC motor drives as shown in the following.

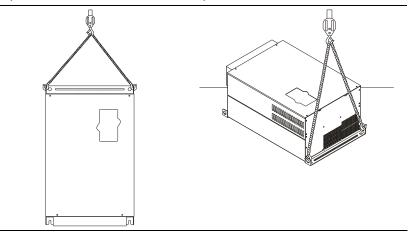
For 40-100HP (Frame E)



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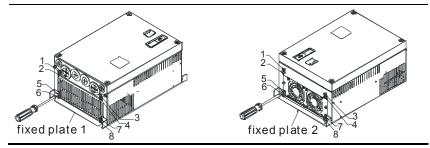






1.2.4 Flange Mounting

Step 1: Please take out the 16 screws (8 screws for each top and bottom side of the drive) and remove the fixed plate 1 and fixed plate 2) as shown in the following figures.



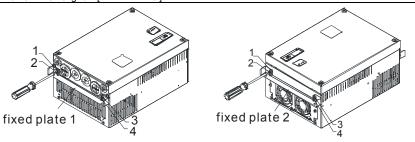


Step 2: place the 8 screws back in to secure the fixed plate 1 and fixed plate 2 (as shown in the following figures) with the following torque.

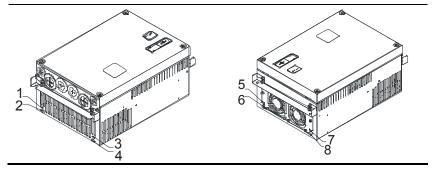
Frame C: 14-17kgf-cm [12.2-14.8in-lbf]

Frame D: 20-25kgf-cm [17.4-21.7in-lbf]

Frame E: 20-25kgf-cm [17.4-21.7in-lbf]



Step 3: Please notice that it doesn't need to put those 8 screws shown in the following figures back to the drive. Moreover, please make sure that these 2 different fixed plates are put in the correct side as shown in the figures.

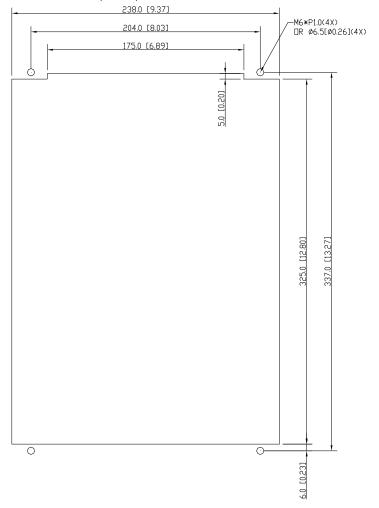


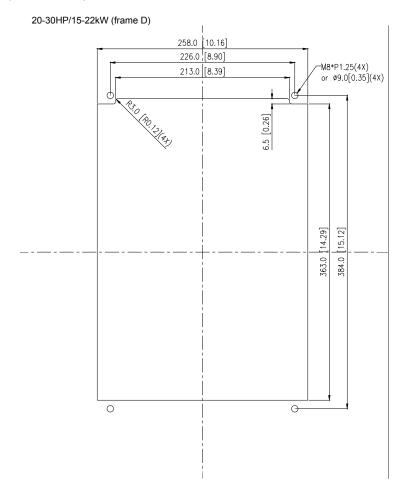
1-10 VLE3.1, SW V1.07



1.2.5 Cutout Dimensions

7.5-15HP/5.5-11kW (frame C)



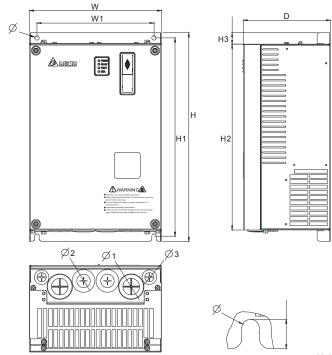


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1.3 Dimensions

Frame C



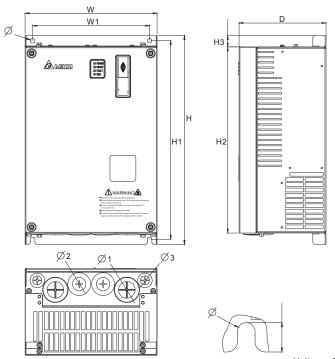
Unit: mm [inch]

Frame	w	W1	Н	H1	H2	Н3	D	Ø	Ø1	Ø2	Ø3	
С	235 [9.25]	204 [8.03]	350 [13.78]	337 [13.27]	320 [12.60]	-	136 [5.35]	6.5 [0.26]	-	34 [1.34]	22 [0.87]	



Frame C: VFD055VL23A/43A, VFD075VL23A/43A, VFD110VL23A/43A

Frame D



Unit: mm [inch]

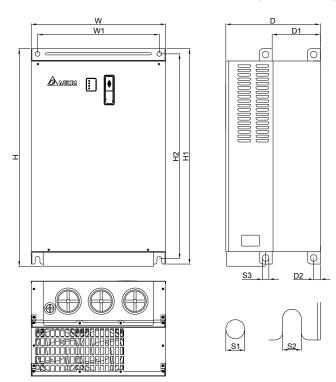
Frame	W	W1	Н	H1	H2	Н3	D	Ø	Ø1	Ø2	Ø3
D	255.0 [10.04]	226.0 [8.90]	403.8 [15.90]	384.0 [15.12]	360.0 [14.17]	21.9 [0.86]	168.0 [6.61]	8.5 [0.33]	44 [1.73]	34 [1.34]	22 [0.87]



Frame D: VFD150VL23A/43A, VFD185VL23A/43A, VFD220VL23A/43A

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Frame E



Unit: mm [inch]

Fran	ne	w	W1	н	H1	H2	D	D1	D2	S1	S2	S3
E1		370.0	335.0	-	589.0	560.0	260.0	132.5	18.0	13.0	13.0	18.0
	'	[14.57]	[13.19]		[23.19]	[22.05]	[10.24]	[5.22]	[0.71]	[0.51]	[0.51]	[0.71]
E2		370.0	335.0	595.0	589.0	560.0	260.0	132.5	18.0	13.0	13.0	18.0
	2	[14.57]	[13.19]	[23.43]	[23.19]	[22.05]	[10.24]	[5.22]	[0.71]	[0.51]	[0.51]	[0.71]



Frame E1: VFD300VL43A, VFD370VL43A, VFD450VL43A

Frame E2: VFD300VL23A, VFD370VL23A, VFD550VL43A, VFD750VL43A

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Chapter 2 Installation and Wiring

After removing the front cover (see chapter 1.2.2 for details), check if the power and control terminals are clear. Be sure to observe the following precautions when wiring.



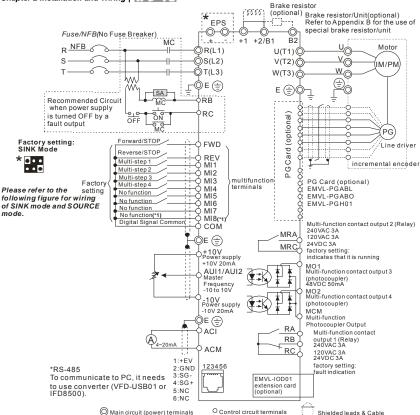
- Make sure that power is only applied to the R/L1, S/L2, T/L3 terminals. Failure to comply may result in damage to the equipment. The voltage and current should lie within the range as indicated on the nameplate.
- 2. Check the following items after finishing the wiring:
 - A. Are all connections correct?
 - B. No loose wires?
 - C. No short-circuits between terminals or to ground?



- A charge may still remain in the DC bus capacitors with hazardous voltages even if the power
 has been turned off. To prevent personal injury, please ensure that the power is turned off and
 wait ten minutes for the capacitors to discharge to safe voltage levels before opening the AC
 motor drive.
- All the units must be grounded directly to a common ground terminal to prevent lightning strike or electric shock
- Only qualified personnel familiar with AC motor drives is allowed to perform installation, wiring and commissioning.
- 4. Make sure that the power is off before doing any wiring to prevent electric shock.

2.1 Wiring

Users must connect wires according to the circuit diagrams on the following pages. Do not plug a modem or telephone line to the RS-485 communication port or permanent damage may result. Pins 1 & 2 are the power supply for the optional copy keypad only and should not be used for RS-485 communication



- * Terminal EPS is emergency power input terminal, refer to the following figure for details.
- * For PG card, refer to Appendix B for details.
- (*1) When JP1 on the control board is inserted, MI8 functions acc. to Pr02-08.
 When JP1 on the control board is removed, MI8 is always "enable", independent of Pr02-08.

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Figure 2 Wiring/Terminals setting for SINK(NPN) mode and SOURCE(PNP) mode

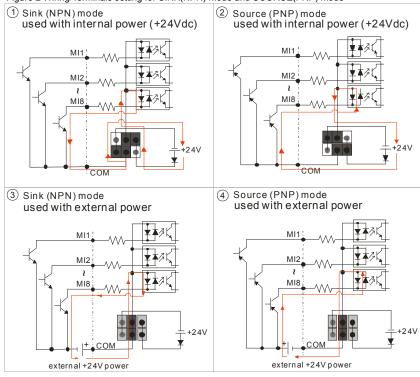
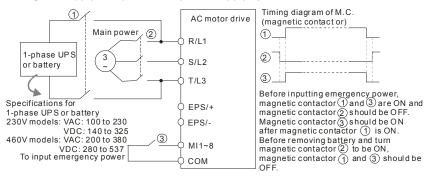
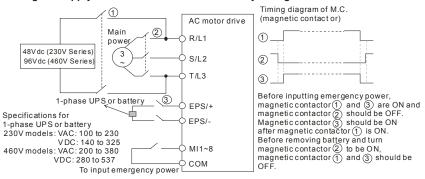
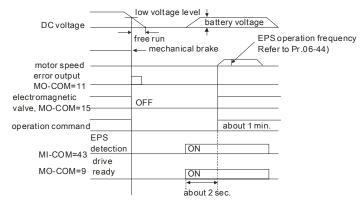


Figure 3 Apply to 1-phase UPS power supply system



Chapter 2 Installation and Wiring | 1/22 AVI | Figure 4 Apply to two batteries with main battery voltage is lower than 280 Vdc





Notes for the emergency power supply:

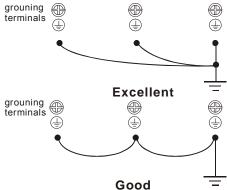
- 1 Fan doesn't run
- 2. Parameter setting can't save and will lose when the power is applied again after power off
- Operate by Pr.06-44 setting
- 4. No protections for low voltage and phase loss
- 5. Display DC-BUS voltage by Pr.06-29

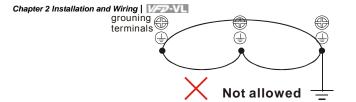


- 1. The wiring of main circuit and control circuit should be separated to prevent erroneous actions.
- Please use shield wire for the control wiring and not to expose the peeled-off net in front of the terminal.

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- 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 longer motor cables use an AC output reactor
- The AC motor drive, electric welding machine and the greater horsepower motor should be grounded separately.
- 9. Use ground leads that comply with local regulations and keep them as short as possible.
- No brake resistor is built in the VFD-VL series, it can install brake resistor for those occasions
 that use higher load inertia or frequent start/stop. Refer to Appendix B for details.
- Multiple VFD-VL units 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.

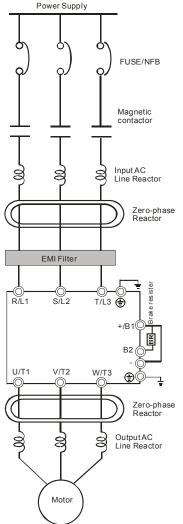




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2.2 External Wiring

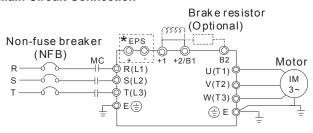


Items	Explanations				
Power supply	Please follow the specific power supply requirements shown in Appendix A.				
Fuse/NFB (Optional)	There may be an inrush current during power up. Please check the chart of Appendix B and select the correct fuse with rated current. Use of an NFB is optional.				
Magnetic contactor (Optional)	Please do not use a Magnetic contactor as the I/O switch of the AC motor drive, as it will reduce the operating life cycle of the AC drive.				
Input AC Line Reactor (Optional)	Used to improve the input power factor, to reduce harmonics and provide protection from AC line disturbances₅ (surges, switching spikes, short interruptions, etc.). AC line reactor should be installed when the power supply capacity is 500kVA or more and exceeds 6 times the inverter capacity, or the mains wiring distance ≤ 10m.				
Zero-phase Reactor (Ferrite Core Common Choke) (Optional)	Zero phase reactors are used to reduce radio noise especially when audio equipment is installed near the inverter. Effective for noise reduction on both the input and output sides. Attenuation quality is good for a wide range from AM band to 10MHz. Appendix B specifies the zero phase reactor. (RF220X00A)				
EMI filter (Optional)	To reduce electromagnetic interference, please refer to Appendix B for more details.				
Brake Resistor (Optional)	Used to reduce the deceleration time of the motor. Please refer to the chart in Appendix B for specific Brake Resistors.				
Output AC Line Reactor (Optional)	Motor surge voltage amplitude depends on motor cable length. For applications with long motor cable (>20m), it is necessary to install a reactor at the inverter output side.				



2.3 Main Circuit

2.3.1 Main Circuit Connection



Terminal Symbol	Explanation of Terminal Function
EPS (+, -)	For emergency power or backup power supply
R/L1, S/L2, T/L3	AC line input terminals
U/T1, V/T2, W/T3	AC drive output terminals for connecting 3-phase induction motor
+1, +2/B1	Connections for DC Choke (optional). Please remove jumper when installation. (It is built in DC choke for models 22kW and above)
+2/B1, B2	Connections for Brake Resistor (optional)
<u>_</u>	Earth connection, please comply with local regulations.

Mains power terminals (R/L1, S/L2, T/L3)

- Connect these terminals (R/L1, S/L2, T/L3) via a non-fuse breaker or earth leakage breaker to 3-phase AC power (some models to 1-phase AC power) for circuit protection. It is unnecessary to consider phase-sequence.
- It is recommended to add a magnetic contactor (MC) in the power input wiring to cut off power quickly and reduce malfunction when activating the protection function of AC motor drives. Both ends of the MC should have an R-C surge absorber.
- 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.
- When using a general GFCI (Ground Fault Circuit Interrupter), select a current sensor with sensitivity of 200mA or above, and not less than 0.1-second operation

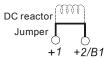
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- time to avoid nuisance tripping. For the specific GFCI of the AC motor drive, please select a current sensor with sensitivity of 30mA or above.
- Do NOT run/stop AC motor drives by turning the power ON/OFF. Run/stop AC motor drives by RUN/STOP command 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.
- Do NOT connect 3-phase models to a 1-phase power source.

Output terminals for main circuit (U, V, W)

- 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 well-insulated motor, suitable for inverter operation.

Terminals [+1, +2] for connecting DC reactor, terminals [+1, +2/B1] for connecting brake resistor



- To improve power factor and reduce harmonics connect a DC reactor between terminals [+1, +2/B1]. Please remove the jumper before connecting the DC reactor.
- Models above 22kW don't have a built-in brake chopper. Please connect an external optional brake resistor.
- When not used, please leave the terminals [+2/B1, -] open.
- Short-circuiting [B2] or [-] to [+2/B1] can damage the AC motor drive.

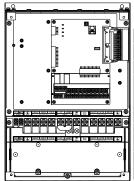
VLE3.1, SW V1.07



2.3.2 Main Circuit Terminals

Frame C



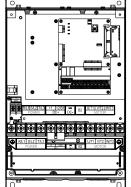


R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, (+1, +2/B1, -, B2

ı	Models	Wire	Torque	Wire Type
	VFD055VL23A	10-6 AWG.		
1	VFD110VL43A	(5.3-13.3mm ²)		
	VFD055VL43A	12-6 AWG.	30kgf-cm (26in-lbf)	Stranded copper only, 75°C
0	VFD075VL43A	(3.3-13.3mm ²)		
Ĭ	VFD075VL23A	8-6 AWG. (8.4-13.3mm ²)		
	VFD110VL23A	6 AWG. (13.3mm ²)		
=				

Frame D

Main circuit terminals



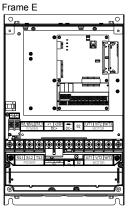
R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, (+1, +2, -

Models	Wire	Torque	Wire Type
VFD150VL43A	8-2 AWG.		
VFD185VL43A	(8.4-33.6mm ²)		
VFD150VL23A	4-2 AWG.		
VIDISOVEZSA	(21.1-33.6mm ²)		
VFD185VL23A	3-2 AWG.	50Kgf-cm (43.4 lbf-in)	Stranded copper only, 75 °C
VIDIOSVEZSA	(26.7-33.6mm ²)		
VFD220VL43A	6-2 AWG		
VI BZZOVE T SA	(13.3-33.6mm ²)		
VFD220VL23A	3-2 AWG		
VI BZZOVEZSA	(26.7-33.6mm ²)		

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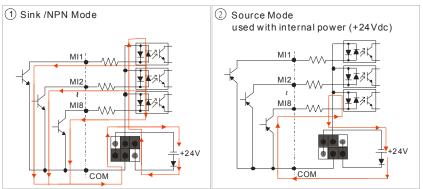
Main circuit terminals

R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, , +1, +2, -

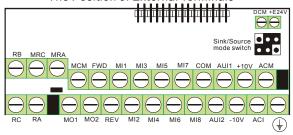


Models	Wire	Torque	Wire Type
VFD300VL43A			
VFD370VL43A		57kgf-cm	
VFD450VL43A		(49in-lbf)	Stranded
VFD300VL23A	4-2 AWG. (21.2-33.6mm2)		copper only,
VFD370VL23A	,	200kgf-cm	75 0
VFD550VL43A		(173in-lbf)	
VFD750VL43A			

2.4 Control Terminals



The Position of External Terminals



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Terminal Symbol	Terminal Function	Factory Settings (SINK) ON: Connect to DCM	
FWD	Forward-Stop Command	ON: RUN in FWD direction	
	1 orward-Stop Command	OFF: Stop acc. to Stop Method	
REV	Reverse-Stop Command	ON: RUN in REV direction	
		OFF: Stop acc. to Stop Method	
MI1	Multi-function Input 1		
MI2	Multi-function Input 2	D. (t. D. 00 04 t. D. 00 00 (
MI3	Multi-function Input 3	Refer to Pr.02-01 to Pr.02-08 for programming the Multi-function Inputs.	
MI4	Multi-function Input 4	ON: input voltage is 24Vdc (Max. 30Vdc), input impedance is 3.75kΩ	
MI5	Multi-function Input 5	OFF: leakage current tolerance is 10µA.	
MI6	Multi-function Input 6	MI8: when JP1 is inserted, this function is disabled.	
MI7	Multi-function Input 7		
MI8	Multi-function Input 8		
COM	Digital Signal Common	Common for digital inputs and used for SINK mode	
+E24V	Digital Signal Common (Source)	+24V 80mA	
DCM	Digital Signal Common (Sink)	Common for digital inputs and used for SINK mode	
RA	Multi-function Relay Output 1 (N.O.) a	Resistive Load:	
RB	Multi-function Relay Output 1 (N.C.) b	5A(N.O.)/3A(N.C.) 240VAC 5A(N.O.)/3A(N.C.) 24VDC	
RC	Multi-function Relay Common	Inductive Load: 1.5A(N.O.)/0.5A(N.C.) 240VAC	
MRA	Multi-function Relay Output 2 (N.O.) a	1.5A(N.O.)/0.5A(N.C.) 24VDC To output monitor signal, including in operation, frequency arrival, overload and etc.	
MRC	Multi-function Relay Common	Refer to Pr.02-11~02-12 for programming	
+10V	Detection at a Device Co.	40 +40V/DC 20mA (variable proints 2.5) above	
-10V	Potentiometer Power Supply	-10~+10VDC 20mA (variable resistor 3-5kohm)	
MCM	Multi-function Output Common (Photocoupler)	Max. 48VDC 50mA	

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Terminal Symbol	Terminal Function	Factory Settings (SINK) ON: Connect to DCM
MO1	Multi-function Output 1 (Photocoupler)	The AC motor drive output every monitor signal, such as operational, frequency attained, overload, etc. by open collector transistor. Refer to Pr.03.01 multi-function output terminals for
MO2	Multi-function Output 2 (Photocoupler)	details. Max: 48Vdc/50m A MO2 Internal circuit MCM
ACI	Analog current Input ACI Circuit ACI	Impedance: 250Ω Resolution: 12 bits Range: 4 ~ 20mA/0~10V = 0 ~ Max. Output Frequency (Pr.01-00) Set-up: Pr.03-00 ~ Pr.03-02
AUI1/ AUI2	Auxiliary analog voltage input	Impedance: $2m\Omega$ Resolution: 12 bits Range: $-10 \sim +10 \text{VDC} = 0 \sim \text{Max. Output Frequency} $ (Pr.01-00) Set-up: $-10 \sim +10 \text{VDC} = 0 \sim \text{Max. Output Frequency} $
ACM	Analog control signal (common)	Common for ACI, AUI1, AUI2

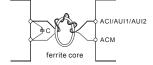
*Control signal wiring size: 18 AWG (0.75 mm²) with shielded wire.

Analog input terminals (ACI, AUI1, AUI2, ACM)

Analog input signals are easily affected by external noise. Use shielded wiring and keep it as short as possible (<20m) with proper grounding. If the noise is inductive, connecting the shield to terminal ACM can bring improvement.

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If the analog input signals are affected by noise from the AC motor drive, please connect a capacitor and ferrite core as indicated in the following diagrams:



wind each wires 3 times or more around the core

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

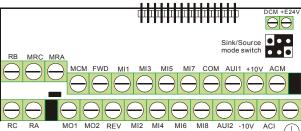
When using contacts or switches to control the digital inputs, please use high quality components to avoid contact bounce.

Digital outputs (MO1, MO2, 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.

The specification for the control terminals

The Position of External Terminals



Frame	To	orque	Wire
CDE	8 kgf-cm (6.9 in-lbf)		22-14 AWG (0.3-2.1mm ²)
C, D, E	Terminal: 0V/24V	1.6 kgf-com(1.4 in-lbf)	30-16 AWG (0.051-1.3mm ²)



Frame C: VFD055VL23A/43A, VFD075VL23A/43A, VFD110VL23A/43A

Frame D: VFD150VL23A/43A, VFD185VL23A/43A, VFD220VL23A/43A

Frame E: VFD300VL23A/43A, VFD370VL23A/43A, VFD450VL43A, VFD550VL43A, VFD750VL43A

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Chapter 3 Operation and Start Up

A	 Make sure that the wiring is correct. In particular, check that 	t
	the output terminals U/T1, V/T2, W/T3 are NOT connected	to
CAUTION	power and that the drive is well grounded.	
071011011	Verify that no other equipment is connected to the AC motor	or
	Do NOT operate the AC motor drive with humid hands.	
	Verify that there are no short-circuits between terminals and	d
	from terminals to ground or mains power.	
	■ Check for loose terminals, connectors or screws.	
	Make sure that the front cover is well installed before applying	ing
	power.	
$\overline{}$	■ Please do NOT touch output terminals U, V, W when power	r is
/!	still applied to L1/R, L2/S, L3/T even when the AC motor dr	ive
WARNING	has stopped. The DC-link capacitors may still be charged to	0
	hazardous voltage levels, even if the power has been turne	ed .
	off.	

3.1 Operation Method

The factory setting for operation method is set to control terminal. But it is just one of the operation methods. The operation method can be via communication, control terminals settings or optional digital keypad KPVL-CC01. Please choose a suitable method depending on application and operation rule. The operation is usually used as shown in the following table.



Operation Method	Frequency Source	Operation Command Source
Operate from communication	Please refer to the communication address 2000H a in the communication address definition.	and 2119H settings
Control Terminals- Operate from external signal	Factory setting Factor	FWD REV MI1 MI2 MI3 MI4 MI5 MI6 MI7 MI8(*1) COM E
KPVL-CC01 keypad (Optional)	UP/DOWN key	RUN, STOP/RESET
	UP/DOWN key	STOP/RESET key

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3.2 Trial Run

The factory setting of operation source is from external terminals.

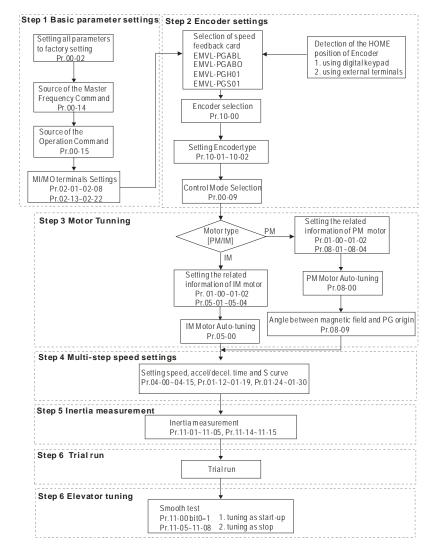
- 1. Please connect a switch for both external terminals FWD-COM and REV-COM. When Pr02-08=40 (default) enable the drive by activating MI8
- 2. Please connect a potentiometer among AUI1/AUI2, +10V, -10V and ACM or apply power -10 ~+10Vdc to AUI1/AUI2-ACM.
- 3. Setting the potentiometer or -10~+10Vdc power to less than 1V.
- 4. Make sure that all external terminal wirings are finished before applying power. After applying power, verify that LED "READY" is ON.
- 5. Setting FWD-COM=ON for forward running. And if you want to change to reverse running direction, you should set REV-COM=ON. And if you want to decelerate to stop, please set FWD/REV-COM=OFF.
- Check following items: 6.
 - Check if the motor direction of rotation is correct.
 - Check if the motor runs steadily without abnormal noise and vibration.
 - Check if acceleration and deceleration are smooth.

If the results of trial run are normal, please start the formal run.

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3.3 Auto-tuning Operations

3.3.1 Flow Chart



3-4 VLE3.1, SW V1.07



3.3.2 Explanations for the Auto-tuning Steps

3.3.2.1 Step 1

Basic parameters settings

Make sure that Pr.00-00 (identity code of the AC motor drive) corresponds with the nameplate indicated on the AC motor drive.

Make sure that all parameters are reset to factory setting (Pr.00-02 is set to 9 or 10).

Pr.00-02	0: No function
Parameter Reset	1: Read only
	8: Keypad lock
	9: All parameters are reset to factory settings (50Hz, 220V/380V)
	10: All parameters are reset to factory settings (60Hz, 220V/440V)

Source of the Master Frequency Command: users can set by themselves (Pr.00-14)

Pr.00-14 Source of the	RS-485 serial communication or digital keypad (KPVL-CC01)
Master Frequency	2: External analog input (Pr. 03-00)
Command	3: Digital terminals input

Source of the Operation Command: users can set by themselves (Pr.00-15)

Pr.00-15	1: External terminals
Source of the Operation Command	2: RS-485 serial communication or digital keypad (KPVL-CC01)

MI/MO external terminals settings:

Refer to Pr.02-01~02-08 for setting the external input terminals MI1~MI8.

NOTE: The factory setting of Pr.02-08 is 40 (Enable drive function). Please disable this function if you don't need to use this function.

Settings of Pr.02-	0: no function
01~02-08	
0. 02 00	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: Reset
	6: JOG command
	7: acceleration/deceleration speed inhibit
	8: the 1st, 2nd acceleration/deceleration time selection
	9: the 3rd, 4th acceleration/deceleration time selection
	10: EF input (07-28)
	11: Reserved
	12: Stop output
	13: Reserved

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ocidadin una otari op		
Settings of Pr.02-	14: Reserved	
01~02-08	15: operation speed command form AUI1	
	16: operation speed command form ACI	
	17: operation speed command form AUI2	
	18: Emergency Stop (07-28)	
	19-23: Reserved	
	24: FWD JOG command	
	25: REV JOG command	
	26: Reserved	
	27: ASR1/ASR2 selection	
	28: Emergency stop (EF1) (Motor coasts to stop)	
	29-30: Reserved	
	31: High torque bias (by Pr.07-21)	
	32: Middle torque bias (by Pr.07-22)	
	33: Low torque bias (by Pr.07-23)	
	34-37: Reserved	
	38: Disable write EEPROM function	
	39: Torque command direction	
	40: Enable drive function	
	41: Detection for magnetic contactor	
	42: Mechanical brake	
	43: EPS function	
C I. D. 00 40 00 00 C.	and the section of the telephone MO4 MO40	

Refer to Pr.02-13~02-22 for setting external output terminals MO1~MO10.

eter to Pr.02-13~02-22 for setting external output terminals MO1~MO10.		
Settings of Pr.02-	0: No function	
13~02-22	1: Operation indication	
	2: Operation speed attained	
	3: Desired frequency attained 1 (Pr.02-25)	
	4: Desired frequency attained 2 (Pr.02-27)	
	5: Zero speed (frequency command)	
	6: Zero speed with stop (frequency command)	
	7: Over torque (OT1) (Pr.06-05~06-07)	
	8: Over torque (OT2) (Pr.06-08~06-10)	
	9: Drive ready	
	10: User-defined Low-voltage Detection (LV)	
	11: Malfunction indication	
	12: Mechanical brake release (Pr.02-29, Pr.02-30)	
	13: Overheat (Pr.06-14)	
	14: Brake chopper signal	
	15: Motor-controlled magnetic contactor output	
	16: Slip error (oSL)	
	17: Malfunction indication 1	

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Cattiana of Da 00	18: Reserved
Settings of Pr.02- 13~02-22	10.110001100
10 02-22	19: Brake chopper output error
	20: Warning output
	21: Over voltage warning
	22: Over-current stall prevention warning
	23: Over-voltage stall prevention warning
	24: Operation mode indication (Pr.00-15≠0)
	25: Forward command
	26: Reverse command
	27: Output when current >= Pr.02-33
	28: Output when current < Pr.02-33
	29: Output when frequency >= Pr.02-34
	30: Output when frequency < Pr.02-34
	31-32: Reserved
	33: Zero speed (actual output frequency)
	34: Zero speed with Stop (actual output frequency)
	35: Error output selection 1 (Pr.06-22)
	36: Error output selection 2 (Pr.06-23)
	37: Error output selection 3 (Pr.06-24)
	38: Error output selection 4 (Pr.06-25)
	39: Reserved
	40: Speed attained (including zero speed)
	41: Reserved

3.3.2.2 Step 2

Encoder settings

Selection of speed feedback cards

Please refer to appendix B.8 for details. Delta provides 4 PG cards for user to select by their application, including EMVL-PGABL, EMVL-PGABO, EMVL-PGH01 and EMVL-PGS01.

Pr.10-00	0: No function
PG signal type	1: ABZ
1 O signal type	2: ABZ+Hall
	3: SIN/COS+Sinusoidal
	4: SIN/COS+Endat
	5: SIN/COS
	6: SIN/COS + Hiperface

Encoder settings: Pr.10-01~Pr.10-02

Detection for the magnetic pole position of motor

The detection method will be different by the setting of Pr.10-00 PG Signal Type.

The detection methods: (refer to Pr.10-00)

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Chapter 3 Operation and Start Up | V/=>-VL

- Setting 1 or 5: 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.
- Setting 2: The AC motor drive will detect the position of the magnetic pole by the UVW signal of PG.
- Setting 3: The AC motor drive will detect the position of the magnetic pole by the sine signal of PG.
- 4. Setting 4: The AC motor drive will detect the position of the magnetic pole by the communication signal of PG.

Reference table for tuning

Setting of PG signal type	PG signal type	Applicable PG card	Pr.08-00=1	Pr.08-00=3
10-00=1	A, B, Z	EMVL-PGABO/ABL	Motor will run	Motor will run
10-00=2	A, B, Z+U, V, W	EMVL-PGABL	Motor will run	Motor will run
10-00=3	SIN/COS+ Sinusoidal	EMVL-PGH01/02	Motor will run	Motor will run
10-00=4	SIN/COS+Endat	EMVL-PGS01	Motor will run	Motor won't run
10-00=5	SIN/COS	EMVL-PGH01/02	Motor will run	Motor will run
10-00=6	SIN/COS + Hiperface	EMVL-PGS01	Motor will run	Motor won't run

Pr.10-01 Encoder Pulse	1~25000
---------------------------	---------

Pr.10-02 Encoder Input Type Setting	O: 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
----------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

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3.3.2.3 Step 3

Motor tunina

- Setting the parameters according to the motor type (PM or IM)
- Motor Auto-tuning: When the Source of the Operation Command is set to digital keypad (Pr.00-15=2, refer to step 1)
- Control method: Please set Pr 00-09 to 8

Pr.00-09	0: V/f Control
Control Method	1: V/f Control + Encoder (VFPG)
	2: Sensorless vector control (SVC)
	3: FOC vector control + Encoder (FOCPG)
	4: Torque control + Encoder (TQCPG)
	8: FOC PM control (FOCPM)

NOTE: Setting parameter by the motor type (PM or IM).

Inputting the nameplate information on the motor into Pr.01-00~01-02

Pr.01-00	10.00~120.00Hz
Maximum Output Frequency	

Pr.01-01 1st Output Frequency Setting 1 (base frequency/motor rated frequency)	0.00~120.00Hz
-----------------------------------------------------------------------------------------	---------------

Pr.01-02	230V: 0.1V~255.0V
1st Output Voltage Setting 1 (base voltage/motor rated voltage)	460V: 0.1V~510.0V

IM

Motor Auto-tuning: When the Source of the Operation Command is set to digital keypad (Pr.00-15=2, refer to step 1) and setting Pr.05-00=2

Pr.05-00 Motor Auto tuning	0: No function 1: Rolling test (Rs, Rr, Lm, Lx, no-load current)
	2: Static Test

NOTE 1: It doesn't need to release the brake in this auto tuning operation. Please make sure that the electromagnetic valve is ON when it is used between the AC motor drive and motor. When Pr.05-00 is set to 2, no-load current of motor must be entered into Pr.05-05. The warning message "Auto tuning" will be displayed on the digital keypad during tuning until it is finished. Then, the measure result will be saved into Pr.05-06~Pr.05-09.

NOTE 2: It needs to finish motor auto tuning before measuring the angle between magnetic pole and PG origin.

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Pr.05-01 Full-load Current of Motor	(40~120%)*00-01 Amps
Pr.05-02 Rated power of Motor	0.00~655.35kW
Pr.05-03 Rated speed of Motor (rpm)	0~65535
Pr.05-04 Number of Motor Poles	2~48

PΜ

Motor Auto-tuning: When the Source of the Operation Command is set to digital keypad (Pr.00-15=2, refer to step 1) and setting Pr.08-00=2

Pr.08-00 Motor Auto tuning	No function Only for the unloaded motor, auto measure the Angle between magnetic pole and PG origin (08-09)
	2: For PM parameters
	3: Auto measure the Angle between magnetic pole and PG origin (08-09)

NOTE 1: It doesn't need to release the brake in this auto tuning operation. Please make sure that the electromagnetic valve is ON when it is used between the AC motor drive and motor. The warning message "Auto tuning" will be displayed on the digital keypad during tuning until it is finished. Then, the measure result will be saved into Pr.08-05 and Pr.08-07. (Pr.08-05 is Rs of Motor and Pr.08-07 is Lq of Motor)

NOTE 2: It is recommended to set Pr.08-00 to 1 (unloaded motor) for the most accurate calculation. If it needs to execute this function with loaded motor, please balance the carriage before execution.

When Pr.08-00=1, please note:

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- When executing the function of auto measure the Angle between magnetic pole and PG origin, it is recommended to stop the carriage car at the middle level.
- Make sure that the electromagnetic valve and mechanical brake are OFF before executing this function.
- When Pr.08-00=1, please execute this function with unloaded motor to get the most accurate result. If it needs to execute this function with loaded motor, please balance the carriage before execution. Make sure the balance by releasing the brake manually before running. This balance will affect the accuracy and the accuracy will influence the power efficiency in driving the motor.

NOTE 3: If it doesn't allow balancing carriage in the measured environment, it can set Pr.08-00 to 3 for executing this function. It will have a difference of 15~30° by the different encoder type.

- When Pr.08-00 is set to 3, the driver will execute the function by the setting of Pr.10-00. The difference between Pr.08-00=3 and Pr.08-00=1 is it doesn't need to put the balanced carriage when Pr.08-00=3. Besides, the operation status of the motor will be as shown in the above table (Pr.10-00=1, 2, 3 and 5, the motor will run. Pr.10-00=4 and 6, the motor won't run)
- When Pr.08-00=3, please make sure if the setting of Pr.10-02 is correct. The incorrect setting will result in the wrong position of the magnetic pole and make the wrong angle between magnetic pole and PG origin.

NOTE 4: The warning message "Auto tuning" will be displayed on the digital keypad during tuning until it is finished. Then, the measure result will be saved into Pr.08-09.

NOTE 5: If the warning message "Auto Tuning Err" displayed on the digital keypad during tuning due to abnormal drive or human factor, please check if the wiring is correct. When the warning message "PG Fbk Error" displayed on the digital keypad, please change the setting of Pr.10-02 (for example: if it was set to 1, please change it to 2). When the warning message "PG Fbk Loss" is displayed on the digital keypad, please check the feedback of Z-phase pulse.

Pr.08-01 Full-load Current of Motor	(40~120%)*00-01 Amps
Pr.08-02 Rated power of Motor	0.00~655.35 kW
Pr.08-03 Rated speed of Motor (rpm)	0~65535

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Pr.08-04 Number of Motor Poles	2~96
ramber er meter i elec	

■ Measure the angle between magnetic pole and PG origin

It can execute "RUN" by keypad or digital terminals:

- 1. Using digital keypad: setting Pr.08-00 to 1 and press "RUN" to execute "auto measure the angle between magnetic pole and PG origin". Please note that if the electromagnetic valve and brake are not controlled by the AC motor drive, please release it by manual.
- 2. Using external terminals: setting Pr.00-14=3 (frequency source) and Pr.00-15=1 (operation source). Please use "inspection" function to execute "auto measure the angle between magnetic pole and PG origin".

For the IM, it doesn't need to detect the position of the magnetic pole, this function (auto measure the Angle between magnetic pole and PG origin) doesn't have to be executed.

Measure the angle between magnetic pole and PG origin: Pr.08-00=1 or 3

Pr.08-00 Motor Auto tuning	0: No function
	1: Only for the unloaded motor, auto measure the Angle between magnetic pole and PG origin (08-09)
	2: For PM parameters
	3: Auto measure the Angle between magnetic pole and PG origin (08-09)

NOTE: The function of "auto measure the angle between magnetic pole and Pg origin" only can be enabled after finishing motor auto-tuning.

3.3.2.4 Step 4

Multi-step speed settings

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- Please confirm the total speed steps (high speed, middle speed, low speed, creep, inspection and level auto-learning)
- Please make sure that the setting of step speeds and the action of the corresponding terminals of multi-function input commands are correct.
- Setting multi-step speeds in Pr.04-00 to Pr.04-15

	Zero Step Speed Frequency	0.00~400.00Hz
	1st Step Speed Frequency	0.00~400.00Hz
	2nd Step Speed Frequency	0.00~400.00Hz
	, , , , , ,	
	3rd Step Speed Frequency	0.00~400.00Hz
	4th Step Speed Frequency	0.00~400.00Hz
	5th Step Speed Frequency	0.00~400.00Hz
	6th Step Speed Frequency	0.00~400.00Hz
Catting of Da 04 00 to Da 04 45	7th Step Speed Frequency	0.00~400.00Hz
Settings of Pr.04-00 to Pr.04-15	8th Step Speed Frequency	0.00~400.00Hz
	9th Step Speed Frequency	0.00~400.00Hz
	10th Step Speed Frequency	0.00~400.00Hz
	11th Step Speed Frequency	0.00~400.00Hz
	12th Step Speed Frequency	0.00~400.00Hz
	13th Step Speed Frequency	0.00~400.00Hz
	14th Step Speed Frequency	0.00~400.00Hz
	15th Step Speed Frequency	0.00~400.00Hz

NOTE: It is recommended to set the max. operating frequency to the half of max. operating frequency before confirming the setting of each step speed and the action of the corresponding terminals of multi-function input commands.

- Setting the acceleration/deceleration with Pr.01-23 and the setting 08 (the 1st, 2nd acceleration/deceleration time selection) and 09 (the 3rd, 4th acceleration/deceleration time selection) of multi-function input command Pr.02-01~02-08.
- Settings of acceleration/deceleration time: Pr.01-12~Pr.01-19

Settings of Pr.01-12 to Pr.01-19	Accel Time 1	0.00~600.00 sec
	Decel Time 1	0.00~600.00 sec
	Accel Time 2	0.00~600.00 sec
	Decel Time 2	0.00~600.00 sec
	Accel Time 3	0.00~600.00 sec
	Decel Time 3	0.00~600.00 sec
	Accel Time 4	0.00~600.00 sec
	Decel Time 4	0.00~600.00 sec

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NOTE: it is recommended to set the Pr.01-31 (deceleration time) to the small value in the trial run and execute smooth test after all the actions are correct.

■ Settings of S curve: Pr.01-24~Pr.01-30

Settings of Pr.01-24 to Pr.01-30	S-curve for Acceleration Departure Time S1	0.00~25.00 sec
	S-curve for Acceleration Arrival Time S2	0.00~25.00 sec
	S-curve for Deceleration Departure Time S3	0.00~25.00 sec
	S-curve for Deceleration Arrival Time S4	0.00~25.00 sec
	Mode Selection when Frequency < Fmin	O: Output waiting 1: Zero-speed operation 2: Fmin (4th output frequency setting)
	Switch Frequency for S3/S4 Changes to S5	0.00~400.00Hz
	S-curve for Deceleration Arrival Time S5	0.00~25.00 sec

NOTE: it is recommended to set the S curve time to 0 in trial run and execute smooth test after all the actions are correct.

3.3.2.5 Step 5

Inertia

Elevator speed

evator speed		
Pr.11-01 Elevator Speed	0.10~4.00 m/s	
Pr.11-02 Sheave Diameter	100~2000 mm	
Pr.11-03 Mechanical Gear Ratio	1~100	
Pr.11-04 Suspension Ratio	0: 1:1 1: 2:1	

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Pr.11-05 Inertial Ratio	1~300%
Pr.11-14 Motor Current at Accel.	50~200%
Pr.11-15 Elevator Acceleration	0.20~2.00m/s ²

3.3.2.6 Step 6

Trial run

This step is used to trial run after finishing the settings of Step 1 to Step 5 to check if it runs normally after executing the inspection with the loaded motor. At the same time, please also check if the operations of multi-function output terminals is normal, such as the action of the brake release and electromagnetic valve correspond to the host controller.

It needs to check the switch between each step speed, current value, the noise in the carriage and noise source during operation.

3.3.2.7 Step 7

Elevator tuning

Setting Pr. 11-00 to bit 0=1

Pr.11-00	Bit 0=0: disable
System control	Bit 0=1: ASR Auto tuning, PDFF enable
	Bit 7=1: When position control is enabled, it doesn't need to set Pr.07-02 (DC Brake Current Level)
	Bit 15=0: when power is applied, it will detect the position of magnetic pole again
	Bit 15=1: when power is applied, it will start from the magnetic pole position of previous power failure

NOTE: bit 15=0, it will detect the position of magnetic pole when the power is applied. (it will detect every time when the power is applied.)

Bit 15=1: when power is applied, it will start from the magnetic pole position of previous power failure. Please make sure that the motor is not manually rotated during power off. If the motor has been rotated during power off, please set Pr.08-10=1 for magnetic pole re-orientation.

2. Smooth test for general operation

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Adjust the setting of Pr.11-05

Pr.11-05	1~300%
Inertial Ratio	

■ Adjust the settings of Pr.11-06 to Pr.11-08

Settings of Pr.11-	Zero-speed Bandwidth	0~40Hz
06 to Pr.11-08	Low-speed Bandwidth	0~40Hz
	High-speed Bandwidth	0~40Hz

3. Start-up adjustment (only for PM)

Control by the zero-speed position

Setting Pr.11-00, 10-19, 10-22, 10-23, 02-29 and 10-24

Pr.11-00	Bit 0=0: disable
System control	Bit 0=1: ASR Auto tuning, PDFF enable
	Bit 7=1: When position control is enabled, it doesn't need to set Pr.07-02 (DC Brake Current Level)
	Bit 15=0: when power is applied, it will detect the position of magnetic pole again
	Bit 15=1: when power is applied, it will start from the magnetic pole position of previous power failure
Pr.10-19	0~655.00%
Zero Speed Gain (P)	

NOTE: refer to the explanations in Pr.02-32

F-	
Pr.10-22	0.000~65.535sec
Operation Time of	
Zero Speed	
Pr.10-23	0.000~65.535sec
Filter Time of Zero	
Speed	
Pr.10-24	0: after the brake release set in Pr.02-29
Time for Zero Speed	1: after the brake signal input (Pr.02-01~02-08 is set to
Execution	42)
Pr.02-29	0.000~65.000 Sec
Brake Release Delay	
Time when Elevator	
Starts	

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NOTE: When Pr.10-24=0, the zero speed control needs to be used with Pr.02-29. (refer to the explanations in Pr.02-32)

Function of the preload input

Please connect the signal of the preload signal to the external terminal of the AC motor drive (AUI1) and setting Pr.03-00=11, 07-19=1, 03-03, 03-06 and 03-09.

······································	-00=11, 07-19=1, 03-03, 03-06 and 03-09.
Pr.03-00	0: No function
Analog Input 1 (AUI1)	Frequency command (torque limit under TQR control mode)
	2: Torque command (torque limit under speed mode)
	3: Torque compensation command
	4-5: Reserved
	6: P.T.C. thermistor input value
	7: Positive torque limit
	8: Negative torque limit
	9: Regenerative torque limit
	10: Positive/negative torque limit
Pr.07-19	0: Disable
Source of Torque	1: Analog input (Pr.03-00)
Offset	2: Torque offset setting (Pr.07-20)
	3: Control by external terminal (by Pr.07-21 to Pr.07-23)
Pr.03-03	-100.0~100.0%
Analog Input Bias 1	
(AUI1)	
Pr.03-06	0: Zero bias
Positive/negative Bias	1: Lower than bias=bias
Mode (AUI1)	2: Greater than bias=bias
	3: The absolute value of the bias voltage while serving as the center
1	4: Serve bias as the center

Pr.03-09	-500.0~500.0%
Analog Input Gain 1 (AUI1)	

NOTE: Pr.03-03, 03-06 and 03-09 are used to adjust the analog input signal.

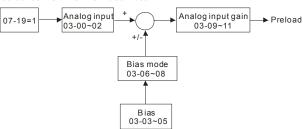
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Chapter 3 Operation and Start Up | 07-19: Source of torque offset

03-00~02: Analog input selections (AUI1/ACI/AUI2)

03-03~05: Analog input bias (AUI1/ACI/AUI2)

03-06~08: AUI1/ACI/AUI2 bias mode



4. Setting of drive stop

Adjusting Pr.01-29, Pr.01-30, Pr.01-31 and Pr.11-06

Pr.01-29	0.00~400.00Hz
Switch Frequency for	
S3/S4 Changes to S5	
Pr.01-30	0.00~25.00 sec
S-curve for Deceleration Arrival	
Time S5	
Pr.11-06	0~40Hz
Zero-speed Bandwidth	
Pr.01-31	0.00~600.00 sec
Deceleration Time	

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Chapter 4 Parameters

The VFD-VL parameters are divided into 14 groups by property for easy setting. In most applications, the user can finish all parameter settings before start-up without the need for readjustment during operation.

The 14 groups are as follows:

Group 0: System Parameters

Group 1: Basic Parameters

Group 2: Digital Input/Output Parameters

Group 3: Analog Input/Output Parameters

Group 4: Multi-Step Speed Parameters

Group 5: IM Parameters

Group 6: Protection Parameters

Group 7: Special Parameters

Group 8: PM Parameters

Group 9: Communication Parameters

Group 10: Speed Feedback Control Parameters

Group 11: Advanced Parameters

Group 12: User-defined Parameters

Group 13: View User-defined Parameters

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4.1 Summary of Parameter Settings

★: The parameter can be set during operation.

4.1.1 Group 0 System Parameters

Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
00-00	Identity Code of the AC motor drive	Read-only	#	0	0	0	0	0	0
00-01	Rated Current Display of the AC motor drive	Read-only	#	0	0	0	0	0	0
00-02	Parameter Reset	No function Tis Read only Reypard lock All parameters are reset to factory settings (50Hz, 220V/380V) In Japarameters are reset to factory settings (60Hz, 220V/480V)	0	0	0	0	0	0	0
№ 00-03	Start-up Display Selection	Display the frequency command value (LED F) Display the actual output frequency (LED H) Display the cutous of the display of the cutous of th	0	0	0	0	0	0	0
₩ 00-04	Content of Multi Function Display	O: Display output current (A) 1: Reserved 2: Display output frequency (H) 3: Display output frequency (H) 3: Display DC-BUS voltage (U) 4: Display output voltage (E) 5: Output power factor angle (n) 6: Display output power kW(P) 7: Display actual motor speed in rpm(r) 8: Display actual motor speed in rpm(r) 8: Display estimate output torque % 9: Display PG position (G) 10: Display the electrical angle of drive output 11: Display AUI 1% (1.) 12: Display AUI 1% (1.) 13: Display AUI 2% (3.) 13: Display AUI 2% (3.) 14: Display the temperature of heat sink (C) 15: Display the temperature of IGBT "C (T.) 16: The status of digital input ON/OFF (i) 17: The status of digital input ON/OFF (i) 19: The corresponding CPU pin status of digital input (i.) 20: The corresponding CPU pin status of digital output (O.) 21-23: Reserved 24: Output AC voltage when malfunction (8) 25: Output DC voltage when malfunction (A) 26: Motor frequency when malfunction (A) 27: Output current when malfunction (A) 28: Output frequency when malfunction 31: Output torque when malfunction 31: Output torque when malfunction 32: Input terminal status when malfunction 33: Output terminal status when malfunction 34: Drive status when malfunction 34: Drive status when malfunction 34: Ortput status when malfunction 34: Ortput status when malfunction	0	0	0	0		0	0
≠ 00-05	User-Defined Coefficient K	Digit 4: decimal point number (0 to 3) Digit 0-3: 40 to 9999	0	0	0	0	0	0	0
00-06	Software Version	Read-only	#.#	0	0	0	0	0	0
≠ 00-07	Password Input	1 to 9998 and 10000 to 65535 0 to 2: times of wrong password	0	0	0	0	0	0	0
⊮ 00-08	Password Set	1 to 9998 and 10000 to 65535 0: No password set or successful input in Pr.00-07 1: Password has been set	0	0	0	0	0	0	0
00-09	Control Method	0: Vif Control 1: Vif Control + Encoder (VFPG) 2: Sensorless vector control (SVC) 3: FOC vector control + Encoder (FOCPG)	0	O	0	0	0	0	0

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Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
		4: Torque control + Encoder (TQCPG) 8: FOC PM control (FOCPM)							_
≠ 00-10	Speed Unit	0: Hz 1: m/s 2: ft/s	0	0	0	0	0	0	0
00-11	Output Direction Selection	0: FWD: counterclockwise, REV: clockwise 1: FWD: clockwise, REV: counterclockwise	0	0	0	0	0	0	0
₩ 00-12	Carrier Frequency	2~15KHz	12	0	0	0	0	0	0
⊮ 00-13	Auto Voltage Regulation (AVR) Function	0: Enable AVR 1: Disable AVR 2: Disable AVR when deceleration stop	0	0	0	0	0	0	0
№ 00-14	Source of the Master Frequency Command	1: RS-485 serial communication or digital keypad (KPVL-CC01) 2: External analog input (Pr. 03-00) 3: Digital terminals input (Pr. 04-00~04-15)	1	0	0	0	0		0
≠ 00-15	Source of the Operation Command	External terminals RS-485 serial communication or digital keypad (KPVL-CC01)	1	0	0	0	0	0	0

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4.1.2 Group 1 Basic Parameters

Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
01-00	Maximum Output Frequency	10.00~400.00Hz	60.00/ 50.00	0	0	0	0	0	0
01-01	1st Output Frequency Setting 1	0.00~400.00Hz	60.00/ 50.00	0	0	0	0	0	0
01-02	1st Output Voltage Setting 1	230V: 0.1V~255.0V 460V: 0.1V~510.0V	220.0 440.0	0	0	0	0	0	0
01-03	2nd Output Frequency Setting 1	0.00~400.00Hz	0.50	0	0				
₩ 01-04	2nd Output Voltage Setting	230V: 0.1V~255.0V 460V: 0.1V~510.0V	5.0 10.0	0	0				F
01-05	3rd Output Frequency Setting 1	0.00~400.00Hz	0.50	0	0				_
 ≠ 01-06	3rd Output Voltage Setting 1	230V: 0.1V~255.0V 460V: 0.1V~510.0V	5.0 10.0	0	0				_
01-07	4th Output Frequency	0.00~400.00Hz	0.00	0	0	0	0	0	H
 ≠ 01-08	Setting 1 4th Output Voltage Setting 1	230V: 0.1V~255.0V 460V: 0.1V~510.0V	0.0	0	0				\vdash
01-09	Start Frequency	0.00~400.00Hz	0.50	0	0	0	0		m
≠ 01-10	Output Frequency Upper Limit	0.00~400.00Hz	120.00	Ō	Ō	Ō	Ō		0
⊮ 01-11	Output Frequency Lower Limit	0.00~400.00Hz	0.00	0	0	0	0		0
⊮ 01-12	Accel Time 1	0.00~600.00 sec	3.00	0	0	0	0		0
№ 01-13	Decel Time 1	0.00~600.00 sec	2.00	0	0	0	0		0
 # 01-13	Accel Time 2	0.00~600.00 sec	3.00	0	0	0	0		0
 # 01-14	Decel Time 2	0.00~600.00 sec	2.00	0	0	0	0		0
 # 01-16	Accel Time 3	0.00~600.00 sec	3.00	0	0	0	0		0
★ 01-17	Decel Time 3	0.00~600.00 sec	2.00	0	0	0	0		0
№ 01-18	Accel Time 4	0.00~600.00 sec	3.00	0	0	0	0		0
≠ 01-19	Decel Time 4	0.00~600.00 sec	2.00	0	0	0	0		0
№ 01-20	JOG Acceleration Time	0.00~600.00 sec	1.00	0	0	0	0		0
 ₩01-21	JOG Deceleration Time	0.00~600.00 sec	1.00	0	0	0	0		0
 ₩01-22	JOG Frequency	0.00~400.00Hz	6.00	0	0	0	0	0	0
 # 01-23	Switch Frequency between 1st/4th Accel/decel	0.00~400.00Hz	0.00	0	0	0	0		0
⊮ 01-24	S-curve for Acceleration Departure Time S1	0.00~25.00 sec	1.00	0	0	0	0		0
≠ 01-25	S-curve for Acceleration Arrival Time S2	0.00~25.00 sec	1.00	0	0	0	0		0
 ≠ 01-26	S-curve for Deceleration Departure Time S3	0.00~25.00 sec	1.00	0	0	0	0		0
≠ 01-27	S-curve for Deceleration Arrival Time S4	0.00~25.00 sec	1.00	0	0	0	0		0
01-28	Mode Selection when Frequency < Fmin	O: Output waiting 1: Zero-speed operation 2: Fmin (4th output frequency setting)	0	0	0	0			
★ 01-29	Switch Frequency for S3/S4 Changes to S5	0.00~400.00Hz	0.00	0	0	0	0		0
⊮ 01-30	S-curve for Deceleration Arrival Time S5	0.00~25.00 sec	1.00	0	0	0	0		0
⊮ 01-31	Deceleration Time when Operating without RUN Command	0.00~60.00 sec	2.00	0	0	0	0		0

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4.1.3 Group 2 Digital Input/Output Parameters

Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
02-00	2-wire/3-wire Operation Control	0: FWD/STOP, REV/STOP 1: FWD/STOP, REV/STOP (Line Start Lockout) 2: RUN/STOP, REV/FWD 3: RUN/STOP, REV/FWD (Line Start Lockout) 4: 3-wire 5: 3-wire (Line Start Lockout)	0	0	0	0	0	0	0
02-01	Multi-Function Input	0: no function	1	0	0	0	0	0	0
	Command 1 (MI1) (it is Stop terminal for 3-wire	1: multi-step speed command 1		0	0	0	0		0
	operation)	2: multi-step speed command 2		0	0	0	0		0
02-02	Multi-Function Input	3: multi-step speed command 3	2	0	0	0	0		0
	Command 2 (MI2)	4: multi-step speed command 4		0	0	0	0		0
02-03	Multi-Function Input	5: Reset	3	0	0	0	0	0	0
	Command 3 (MI3)	6: JOG command		0	0	0	\circ		0
02-04	Multi-Function Input	7: acceleration/deceleration speed inhibit	4	0	0	0	0		0
	Command 4 (MI4)	8: the 1st, 2nd acceleration/deceleration time selection		0	0	0	0		0
02-05	Multi-Function Input	9: the 3rd, 4th acceleration/deceleration time selection	0	0		0	\circ		0
	Command 5 (MI5)	10: EF input (07-28)	0 0 1 1 2 2	0	0	0	0	0	0
		11: Reserved							
02-06		12: Stop output	0	0	0	0		0	0
	Multi-Function Input	13: Reserved							Щ.
	Command 6 (MI6)	14: Reserved	_	_		_			Ļ
	.,	15: operation speed command form AUI1	_	0	0	0	0		0
		16: operation speed command form ACI		0)	0	0		0
02-07	Multi-Function Input Command 7 (MI7)	17: operation speed command form AUI2		_	0	0	0		0
02-08	Multi-Function Input	18: Emergency Stop (07-28)	40	0	0	0	0	0	0
	Command 8 (MI8)	19-23: Reserved	_	_					Ļ
		24: FWD JOG command		0	0	0	0		0
	(When JP1 on the control	25: REV JOG command		0	0	0	0		0
	board is inserted, MI8	26: Reserved	4						_
	functions acc. to Pr02-08.)	27: ASR1/ASR2 selection	4	0)	0	0		0
	(When JP1 on the control	28: Emergency stop (EF1) (Motor coasts to stop)	_	0	0	0	0	0	0
	board is removed, MI8 is	29-30: Reserved	4						_
	always "enable",	31: High torque bias (by Pr.07-21)	4	0	_	0	0	0	0
	independent of Pr02-08.)	32: Middle torque bias (by Pr.07-22)		0			\circ	0	0
		33: Low torque bias (by Pr.07-23)	_	0	0	0	0	0	0
		34-37: Reserved	4						_
		38: Disable write EEPROM function	4	0	0	0	U	0	0
		39: Torque command direction						0	_
		40: Enable drive function	4	0	0	0	0	0	0
		41: Detection of magnetic contactor		0)	0	0	0	0
		42: Mechanical brake	4	0	_)	0	0	0
		43: EPS function		_)	0	0	0	0
№ 02-09	Digital Input Response Time	0.001~ 30.000 sec				0	\circ	0	0
⊮ 02-10	Digital Input Operation Direction	0 ~ 65535	0	0	0	0	0	0	0
	Multi-function Output 1 RA,	0: No function	11	0	0	0	\circ	0	0
₩ 02-11	RB, RC(Relay1)	1: Operation indication			0	0	\circ	0	0
	Multi-function Output 2	2: Operation speed attained	1	0	0	0	\circ	0	0
₩ 02-12	MRA, MRC (Relay2)	3: Desired frequency attained 1 (Pr.02-25)		0	0	0	0		0
(00.40	Multi-function Output 3	4: Desired frequency attained 2 (Pr.02-27)	0	0	0	0	0		0
≠ 02-13	(MO1)	5: Zero speed (frequency command)	_	0	0	0	\circ		0
		6: Zero speed with stop (frequency command)]	0	0	0	0		0
	1	7: Over torque (OT1) (Pr.06-05~06-07)	1	0	0	0	0	0	0
	1	8: Over torque (OT2) (Pr.06-08~06-10)	1	0	0	0	0	0	0
№ 02-14	Multi-function Output 4	9: Drive ready	0	0	0	0	0	Ō	0
# UZ-14	(MO2)	10: User-defined Low-voltage Detection (LV)	1	0	0	0	0	0	0
	1	11: Malfunction indication	1	Ō	Ō	Ċ	Ō	0	Ō

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Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
		13: Overheat (Pr.06-14)		С	С	0	0	0	0
		14: Brake chopper signal	0	С	С	Ō	Ō	Ō	Ō
(00.40	Multi-function Output 6	15: Motor-controlled magnetic contactor output	0	С	С		$\overline{\bigcirc}$	0	0
₩ 02-16	(MO4)	16: Slip error (oSL)		С	С	Ö	\circ	Ŭ	0
		17: Malfunction indication 1		С	С	Ŏ	Ö	0	Ŏ
		18: Reserved			Ė	Ė	Ħ		Ħ
		19: Brake chopper output error		0	0	0	0	0	0
₩ 02-17	Multi-function Output 7	20: Warning output	0	0	0	0	0	0	0
# 02-17	(MO5)	21: Over voltage warning		0	0	0	0	0	0
№ 02-18	Multi-function Output 8	22: Over-current stall prevention warning	0	С	С	0			Т
# U2-10	(MO6)	23: Over-voltage stall prevention warning	_	-		_	$\overline{}$		
	Multi-function Output 9	24: Operation mode indication (Pr.00-15≠0 and PU LED on	0	0	0	Ö	Ö	0	0
⊮ 02-19	(MO7)	KPVL-CC01 is off)	U	0	0	0			
	(MO7)	25: Forward command		С	С	0	0	0	0
	Multi-function Output 10	26: Reverse command	0	C	C	Ŏ	Ö	Õ	Ŏ
≠ 02-20	(MO8)	27: Output when current >= Pr.02-33	⊣ ັ		С	Ö		0	ŏ
	Multi-function Output 11	28: Output when current < Pr.02-33	0	0	0	Ö		0	ŏ
⊮ 02-21	(MO9)	29: Output when frequency >= Pr.02-34	- °	0	0	Ö	0	0	$\frac{\circ}{\circ}$
	Multi-function Output 12	30: Output when frequency < Pr.02-34	0	0	0				$\frac{\circ}{\circ}$
≠ 02-22	(MO10)	31-32: Reserved	- 0)	0	0	\circ	0	\cup
	(33: Zero speed (actual output frequency)				0	$\overline{}$		$\overline{}$
		34: Zero speed with Stop (actual output frequency)		0	0			-	0
				0	0	0	\circ		×
		35: Fault output option 1 (Pr.06-22)	_	0	0	0	0	0	0
		36: Fault output option 2 (Pr.06-23)		0	0	0	0	0	0
		37: Fault output option 3 (Pr.06-24)		0	0	0	\circ	0	0
		38: Fault output option 4 (Pr.06-25)		0	0	0	\circ	0	0
		39: Reserved					\perp	—	_
		40: Speed attained (including zero speed) 41: Reserved	_	0	0	0	\circ		0
№ 02-23	Multi-output Direction	0 ~ 65535	0	0	0	0	0	0	0
	Serial Start Signal Selection	0: by FWD/REV	0	0	С	0	0		0
02-24	Serial Start Signal Selection	1: by Enable	U))	0			
≠ 02-25	Desired Frequency Attained 1	0.00 ~ 400.00Hz	60.00/ 50.00	0	0	0	0		0
≠ 02-26	The Width of the Desired Frequency Attained 1	0.00 ~ 400.00Hz	2.00	0	0	0	0		0
₩ 02-27	Desired Frequency Attained	0.00 ~ 400.00Hz	60.00/	0	0	0	0		0
	The Width of the Desired		50.00 2.00					-	_
≠ 02-28	Frequency Attained 2	0.00 ~ 400.00Hz		0	0	0	0	L	0
02-29	Brake Release Delay Time when Elevator Starts	0.000~65.000 Sec	0.250	0	0	0	0	0	0
02-30	Brake Engage Delay Time when Elevator Stops	0.000~65.000 Sec	0.250	0	0	0	0	0	0
⊮ 02-31	Turn On Delay of Magnetic Contactor between Drive and Motor	0.000~65.000 Sec	0.200	0	0	0	0	0	0
≠ 02-32	Turn Off Delay of Magnetic Contactor between Drive and Motor	0.000~65.000 Sec	0.200	0	0	0	0	0	0
№ 02-33	Output Current Level Setting for External Terminals	0~100%	0	0	0	0	0	0	0
№ 02-34	Output Boundary for External Terminals	0.00~+-400.00Hz (it is motor speed when using with PG)	0.00	0	0	0	0	0	0
№ 02-35	Detection Time of Mechanical Brake	0.00~10.00 Sec	0.00	0	0	0	0	0	0
≠ 02-36	Detection Time of Contactor	0.00~10.00 Sec	0.00	0	0	0	0	0	0
02-37	Check Torque Output	0: Disable	0	0	0	0	0	0	0
02-3/	Function	1: Enable	1	ĺ	l	l	1	ı	1

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4.1.4 Group 3 Analog Input/Output Parameters

Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
№ 03-00	Analog Input 1 (AUI1)	0: No function	1	0	0	0	0	0	0
№ 03-01	Analog Input 2 (ACI)	1: Frequency command (torque limit under TQR control mode)	0	0	0	0	0	0	0
№ 03-02	Analog Input 3 (AUI2)	2: Torque command (torque limit under speed mode)	0					0	
/		3: Preload Input	1	0	0	0	0	0	0
		4-5: Reserved	l						_
		6: P.T.C. thermistor input value	ł	0	0	0	0	С	0
		7: Positive torque limit	ł	_	_	_	0	_	0
		8: Negative torque limit	ł				0		
		• '					0		_
		9: Regenerative torque limit	ļ				0		0
		10: Positive/negative torque limit					0		0
₩ 03-03	Analog Input Bias 1 (AUI1)	-100.0~100.0%	0.0	0	0	0	0	0	0
№ 03-04	Analog Input Bias 2 (ACI)	-100.0~100.0%	0.0	0	0	0	0	0	0
№ 03-05	Analog Input Bias 3 (AUI2)	-100.0~100.0%	0.0	0	0	0	0	0	0
№ 03-06	Positive/negative Bias Mode	0: Zero bias	0	0	0	0	0	0	0
×03-07	(AUI1) Positive/negative Bias Mode	Serve bias as the center, lower than bias=bias Serve bias as the center, greater than bias=bias	0	0	0	0	0	0	0
	(ACI) (can be set to 0 or 1 only)	3: The absolute value of the bias voltage while serving as the							
≠ 03-08	Positive/negative Bias Mode (AUI2)	center (single polar) 4: Serve bias as the center (single polar)	0	0	0	0	0	0	0
№ 03-09	Analog Input Gain 1 (AUI1)	-500.0~500.0%	100.0	0	0	0	0	0	0
№ 03-10	Analog Input Gain 2 (ACI)	-500.0~500.0%	100.0	0	0	0	0	0	0
 ∕ 03-10	Analog Input Gain 3 (AUI2)	-500.0~500.0%	100.0	0	0	0	0	0	0
★ 03-11	Analog Input Delay Time (AUI1)	0.00~2.00 sec	0.01	0	0	0	0	0	0
≠ 03-13	Analog Input Delay Time (ACI)	0.00~2.00 sec	0.01	0	0	0	0	0	0
≠ 03-14	Analog Input Delay Time (AUI2)	0.00~2.00 sec	0.01	0	0	0	0	0	0
⊮ 03-15	Loss of the ACI Signal	Disable Continue operation at the last frequency Decelerate to 0Hz Stop immediately and display E.F.	0	0	0	0	0	0	0
03-16	Reserved								
№ 03-17	Analog Output Selection 1	0: Output frequency (Hz)	0	0	0	0	0	0	0
		1: Frequency command (Hz)		0	0	0	0	0	0
		2: Motor speed (RPM)	ļ	0	0	0	0	0	0
		3: Output current (rms) 4: Output voltage	ł		0	0	0	0	8
		5: DC Bus Voltage	ł	0	0	Ö	0	C	0
		6: Power factor	i	Ŏ	Ö	Ŏ	Ŏ	Ö	Ō
		7: Power	1	0	0	0	0	0	0
		8: Output torque		0	0	0	0	0	0
		9: AUI1		0	0	0	0	0	0
		10: ACI	l	0	0	0	0	0	0
		11: AUI2	ł	0	0	0	0	0	0
		12: q-axis current 13: q-axis feedback value	1	0		0	2		
		14: d-axis current	ĺ	0	0	0	0	0	0
		15: d-axis feedback value	1	Ö	Ö	Ö	Ö	0	Ö
		16: q-axis voltage	1	0	0	Ō	0	0	0
		17: d-axis voltage]	0	0	0	0	0	0
		18: Torque command	ļ	0	0	0	0	0	0
	Analog Output Gain 1	19-20: Reserved 0~200.0%	100.0						
⊮ 03-18	Analog Gulpul Galli I	0 200.07/	100.0	\cup	U	\cup	\cup)	\cup

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Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
⊮ 03-19	Analog Output Value in REV Direction 1	Absolute value in REV direction Output 0V in REV direction Enable output voltage in REV direction	0	0	0	0	0	0	0
₩ 03-20	Analog Output Selection 2	0: Output frequency (Hz) 1: Frequency command (Hz) 2: Motor speed (RPM) 3: Output current (rms) 4: Output voltage 5: DC Bus Voltage 6: Power factor 7: Power 8: Output torque 9: AVI 10: ACI 11: AUI 12: q-axis current 13: q-axis feedback value 14: d-axis current 15: d-axis voltage 17: d-axis voltage 18: Torque command 19-20: Reserved	0	0 000000000000000000	0 0000000000000000000	000000000000000000000000000000000000000	000000000000000000000000000000000000000	000000000000000000000000000000000000000	0 00000000000000000
≠ 03-21	Analog Output Gain 2	0~200.0%	100.0	0	0	0	0	0	0
⊮ 03-22	Analog Output Value in REV Direction 2	Absolute value in REV direction Output 0V in REV direction Enable output voltage in REV direction	0	0	0	0	0	0	0
03-23	Analog Input Type (AUI1)	0: Bipolar (±10V) 1: Unipolar (0-10V)	0	0	0	0	0	0	0
03-24	Analog Input Type (AUI2)	0: Bipolar (±10V) 1: Unipolar (0-10V)	0	0	0	0	0	0	0

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4.1.5 Group 4 Multi-Step Speed Parameters

Pr.	Explanation		Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
№ 04-00	Zero Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-01	1st Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-02	2nd Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-03	3rd Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-04	4th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-05	5th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-06	6th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-07	7th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-08	8th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-09	9th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-10	10th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-11	11th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
№ 04-12	12th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
×04-13	13th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
×04-14	14th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0
 ∕ 04-15	15th Step Speed Frequency	0.00~400.00Hz	0.00	0	0	0	0		0

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4.1.6 Group 5 IM Parameters

Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
05-00	Motor Auto Tuning	0: No function 1: Rolling test (Rs, Rr, Lm, Lx, no-load current) 2: Static Test	0	0					
05-01	Full-load Current of Motor	(40-120%)* Pr.00-01 Amps	#.##	0	0	0	0	0	
05-02	Rated power of Motor	0.00~655.35kW	#.##			0	0	0	
05-03	Rated speed of Motor (rpm)	0~65535	1710		0	0	0	0	
05-04	Number of Motor Poles	2~48	4	0	0	0	0	0	
05-05	No-load Current of Motor	0-100%	#.##		0	0	0	0	
05-06	Rs of Motor	0.000~65.535Ω	0.000			0	0	0	
05-07	Rr of Motor	0.000~65.535Ω	0.000			0	0	0	
05-08	Lm of Motor	0.0~6553.5mH	0.0			0	0	0	
05-09	Lx of Motor	0.0~6553.5mH	0.0			0	0	0	
№ 05-10	Torque Compensation Time Constant	0.001~10.000sec	0.020			0			
⊮ 05-11	Slip Compensation Time Constant	0.001~10.000sec	0.100			0			
⊮ 05-12	Torque Compensation Gain	0~10	0	0	0				
≠ 05-13	Slip Compensation Gain	0.00~10.00	0.00	0	0	0			
№ 05-14	Slip Deviation Level	0~1000% (0: disable)	0		0	0	0		
№ 05-15	Detection Time of Slip Deviation	0.0~10.0 sec	1.0		0	0	0		
≠ 05-16	Over Slip Treatment	0: Warn and keep operation 1: Warn and ramp to stop 2: Warn and coast to stop	0		0	0	0		
₩ 05-17	Hunting Gain	0~10000 (0: disable)	2000	0	0	0			
05-18	Accumulative Motor Operation Time (Min.)	00~1439	00	0	0	0	0	0	0
05-19	Accumulative Motor Operation Time (day)	00~65535	00	0	0	0	0	0	0
 € 05-20	Core Loss Compensation	0~250%	10			0			1
05-21	Accumulative Drive Power- on Time (Min.)	00~1439	00	0	0	0	0	0	0
05-22	Accumulative Drive Power- on Time (day)	00~65535	00	0	0	0	0	0	0

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4.1.7 Group 6 Protection Parameters

Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
№ 06-00	Low Voltage Level	160.0~220.0Vdc	180.0	0	0	0	0	0	0
<i>y</i> 00-00		320.0~440.0Vdc	360.0	0	0	0	0	0	0
№ 06-01	Phase-loss Protection	0: Warn and keep operation 1: Warn and ramp to stop 2: Warn and coast to stop	2	0	0	0	0	0	0
№ 06-02	Over-current Stall Prevention during Acceleration	00: disable 00~250%	00	0	0	0			
≠ 06-03	Over-current Stall Prevention during Operation	00: disable 00~250%	00	0	0	0			
№ 06-04	Accel./Decel. Time Selection of Stall Prevention at constant speed	0: by current accel/decel time 1: by the 1st accel/decel time 2: by the 2nd accel/decel time 3: by the 3rd accel/decel time 4: by the 4th accel/decel time 5: by auto accel/decel time 5: by auto accel/decel time	0	0	0	0			
₩06-05	Over-torque Detection Selection (OT1)	O: 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	0	0	0	0	0	0
₩ 06-06	Over-torque Detection Level (OT1)	10~250%	150	0	0	0	0	0	0
≠ 06-07	Over-torque Detection Time (OT1)	0.0~60.0 sec	0.1	0	0	0	0	0	0
⊮ 06-08	Over-torque Detection Selection (OT2)	O: 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 4: over-torque detection during operation, stop operation after detection	0	0	0	0	0	0	0
≠ 06-09	Over-torque Detection Level (OT2)	10~250%	150	0	0	0	0	0	0
≠ 06-10	Over-torque Detection Time (OT2)	0.0~60.0 sec	0.1	0	0	0	0	0	0
 ∕ 06-11	Current Limit	0~250%	200				0	0	0
06-12	Electronic Thermal Relay Selection	0: Inverter motor 1: Standard motor 2: Disable	2	0	0	0	0	0	0
≠ 06-13	Electronic Thermal Characteristic	30.0~600.0 sec	60.0	0	0	0	0	0	0
⊮ 06-14	Heat Sink Over-heat (OH) Warning	0.0~110.0℃	85.0	0	0	0	0	0	0
 ∕ 06-15	Stall Prevention Limit Level	0~100% (refer to Pr.06-02, Pr.06-03)	50	0	0	0			
06-16	Present Fault Record	0: No fault	0	0	0	0	\circ	0	0
06-17	Second Most Recent Fault Record	Over-current during acceleration (ocA) Over-current during deceleration (ocd)	0	0	0	0	0	0	0
06-18	Third Most Recent Fault Record	3: Over-current during constant speed (ocn) 4: Ground fault (GFF)	0	0	0	0	0	0	0
06-19	Fourth Most Recent Fault Record	5: IGBT short-circuit (occ) 6: Over-current at stop (ocS)	0	0	0	0	0	0	0
06-20	Fifth Most Recent Fault Record	7: Over-voltage during acceleration (ovA) 8: Over-voltage during deceleration (ovd) 9: Over-voltage during constant speed (ovn)	0	0	0	0	0	0	0
06-21	Sixth Most Recent Fault Record	10: Over-voltage during constant speed (ovii)	0	0	0	0	0	0	0

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Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
		22: Motor over-load (EoL1) 23: Reserved 24: Motor PTC overheat (oH3) 25: Reserved 26: over-lorque 1 (ot1) 27: over-lorque 1 (ot2) 28: Reserved 29: Reserved 29: Reserved 29: Reserved 30: Memory write-in error (cF1) 31: Memory vrite-in 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 (rd1) 36: Over-current detection error (rd2) 37: Over-current detection error (Hd0) 38: Over-voltage detection error (Hd1) 38: Over-voltage detection error (Hd3) 40: Auto tuning error (AuE) 41: PID feedback loss (AFE) 42: PG feedback loss (GF2) 43: PG feedback loss (GF2) 44: PG feedback loss (GF2) 45: PG slip error (PGF4) 46: PG ref input error (PGr1) 47: PG ref loss (PG/2) 48: Analog current input error (ACE) 49: External fault input (EF) 50: Emergency stop (EF1) 51: Reserved 52: Password error (CE3) 53: Reserved 54: Communication error (cE3) 55: Communication error (cE4) 56: Communication error (cE4) 57: Communication error (CF4) 66: PG ref hardware error (MBF) 66: PGF5 hardware error 66: Magnetic contactor error 67: Phase loss of drive output (MPHL)							
⊮ 06-22	Fault Output Option 1	0~65535 (refer to bit table for fault code)	0	0	0	0	0	0	0
≠ 06-23	Fault Output Option 2	0~65535 (refer to bit table for fault code)	0	0	0 (C	0	0	
№ 06-24	Fault Output Option 3	0~65535 (refer to bit table for fault code)	0	0	0	C	0	0	0
₩06-25 ₩06-26	Fault Output Option 4 PTC (Positive Temperature Coefficient) Detection Selection	0~65535 (refer to bit table for fault code) 0: Warn and keep operation 1: Warn and ramp to stop	0	0	0	0	0	0	0
⊮ 06-27	PTC Level	0.0~100.0%	50.0	0	0	0	0	0	0
⊮ 06-28	Filter Time for PTC Detection	0.00~10.00sec	0.20	0	0	0	0	0	0
06-29	UPS or Battery Voltage	48.0~375.0Vdc 96.0~750.0Vdc	48.0 96.0	0	0	0	0	0	0
≠ 06-30	Setting Method of Fault Output	0: By settings of Pr.06-22~06-25 1: By the binary setting	0	0	0	0	0	0	0

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		Chapte	r 4 Par	ame	V_{i}	7	-VL		
Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
06-31	Phase Loss of Drive Output (MPHL)	0: Disable 1: Enable	0	0	0	0	0	0	0
06-32	Accumulative Drive Power- on Time at the First Fault (min.)	00~1439	00	0	0	0	0	0	0
06-33	Accumulative Drive Power- on Time at the First Fault (day)	00~65535	00	0	0	0	0	0	0
06-34	Accumulative Drive Power- on Time at the Second Fault (min.)	00~1439	00	0	0	0	0	0	0
06-35	Accumulative Drive Power- on Time at the Second Fault (day)	00~65535	00	0	0	0	0	0	0
06-36	Accumulative Drive Power- on Time at the Third Fault (min.)	00~1439	00	0	0	0	0	0	0
06-37	Accumulative Drive Power- on Time at the Third Fault (day)	00~65535	00	0	0	0	0	0	0
06-38	Accumulative Drive Power- on Time at the Fourth Fault (min.)	00~1439	00	0	0	0	0	0	0
06-39	Accumulative Drive Power- on Time at the Fourth Fault (day)	00~65535	00	0	0	0	0	0	0
06-40	Accumulative Drive Power- on Time at the Fifth Fault (min.)	00~1439	00	0	0	0	0	0	0
06-41	Accumulative Drive Power- on Time at the Fifth Fault (day)	00~65535	00	0	0	0	0	0	0
06-42	Accumulative Drive Power- on Time at the Sixth Fault (min.)	00~1439	00	0	0	0	0	0	0
06-43	Accumulative Drive Power- on Time at the Sixth Fault (day)	00~65535	00	0	0	0	0	0	0
№ 06-44	Operation Speed of Emergency Power Mode	0.00~400.00Hz	0.00	0	0	0	0	0	0
≠ 06-45	Low-voltage Protection	0: Fault and coast to stop 1: Warn and coast to stop	0	0	0	0	0	0	0

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Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
№ 07-00	Brake Chopper Level	230V: 350.0~450.0Vdc 460V: 700.0~900.0Vdc	380.0 760.0	0	0	0	0	0	0
07-01	Reserved								
₩ 07-02	DC Brake Current Level	0~100%	0	0	0	0			
≠ 07-03	DC Brake Time during Start- up	0.0~60.0 sec	0.0	0	0	0	0		0
≠ 07-04	DC Brake Time during Stopping	0.0~60.0 sec	0.0	0	0	0	0		0
≠ 07-05	Ctart-point for DO Brake	0.00~400.00Hz	0.00	0	0	0	0		
≠ 07-06	DC Brake Proportional Gain	1~500Hz	50	0	0	0			
≠ 07-07	Dwell Time at Accel.	0.00~600.00sec	0.00	0	0	0	0		0
№ 07-08	Dwell Frequency at Accel.	0.00~400.00Hz	0.00	0	0	0	0		0
№ 07-09	Dwell Time at Decel.	0.00~600.00sec	0.00	0	0	0	0		0
⊮ 07-10	Dwell Frequency at Decel.	0.00~400.00Hz	0.00	0	0	0	0		0
⊮ 07-11	Fan Control	Fan always ON Initute after AC motor drive stops, fan will be OFF AC motor drive runs and fan ON, AC motor drive stops and fan OFF S - Fan ON to run when preliminary heat sink temperature attained I - Fan always OFF	2	0	0	0	0	0	0
⊮ 07-12	Torque Command	-100.0~100.0% (Pr. 07-14 setting=100%)	0.0					0	
№ 07-13	Torque Command Source	0: Digital keypad (KPVL-CC01) 1: RS485 serial communication (RJ-11) 2: Analog signal (Pr.03-00)	2					0	
★ 07-14	Maximum Torque Command	0~300%	100	0	0	0	0	0	0
≠ 07-15	Filter Time of Torque Command	0.000~1.000 sec	0.000					0	Г
07-16	Speed Limit Selection	0: By Pr.07-17 and Pr.07-18 1: Frequency command source (Pr.00-14)	0					0	
₩ 07-17	Torque Mode +Speed Limit	0~120%	10					0	
№ 07-18	Torque Mode-Speed Limit	0~120%	10					0	
⊮ 07-19	Source of Torque Offset	0: Disable 1: Analog input (Pr.03-00) 2: Torque offset setting (Pr.07-20) 3: Control by external terminal (by Pr.07-21 to Pr.07-23)	0			0	0	0	0
№ 07-20	Torque Offset Setting	0.0~100.0%	0.0			0	0	0	0
≠ 07-21	High Torque Offset	0.0~100.0%	30.0			0	0	0	0
×07-22	Middle Torque Offset	0.0~100.0%	20.0			0	0	0	0
⊮ 07-23	Low Torque Offset	0.0~100.0%	10.0			0	0	0	0
 ₩ 07-24	Forward Motor Torque Limit	0~300%	200				0	0	0
№ 07-25	Forward Regenerative Torque Limit	0~300%	200				0	0	0
₩ 07-26	Reverse Motor Torque Limit	0~300%	200				0	0	0
≠ 07-27	Reverse Regenerative Torque Limit	0~300%	200				0	0 0	0
⊮ 07-28	Emergency Stop (EF) & Forced Stop Selection	0: Coast to stop 1: By deceleration Time 1 2: By deceleration Time 2 3: By deceleration Time 3 4: By deceleration Time 3 5: By Pr.01-31	0	0	0	0	0	0	0

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		Chapt	er 4 Par	ame	ter	s	\mathbb{Z}	7	-VL
Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
⊮ 07-29	Time for Decreasing Torque at Stop	0.000~1.000 sec	0.000				0	0	0

4.1.9 Group 8 PM Parameters

Pr.	Explanation	Settings	Factory Setting	VFPG	SVC	FOCPG	TOCPG	FOCPM
08-00	Motor Auto Tuning	No function Tonly for the unloaded motor, auto measure the angle between magnetic pole and PG origin (08-09) For PM parameters Auto measure the angle between magnetic pole and PG origin (08-09)	0					0
08-01	Full-load Current of Motor	(40-120%)*00-01 Amps	#.##					0
08-02	Rated power of Motor	0.00~655.35 kW	#.##					0
08-03	Rated speed of Motor (rpm)	0~65535	1710					0
08-04	Number of Motor Poles	2~96	4					0
08-05	Rs of Motor	0.000~65.535Ω	0.000					0
08-06	Ld of Motor	0.0~6553.5mH	0.0					0
08-07	Lq of Motor	0.0~6553.5mH	0.0					0
08-08	Back Electromotive Force	0.0~6553.5Vrms	0.0					0
08-09	Angle between Magnetic Pole and PG Origin	0.0-360.0°	360					0
08-10	Magnetic Pole Re- orientation	0: Disable 1: Enable	0					0

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4.1.10 Group 9 Communication Parameters

Pr.	Explanation		Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
№ 09-00	Communication Address	1~254	1	0	0	0	0	0	0
№ 09-01	Transmission Speed	4.8~115.2Kbps	9.6	0	0	0	0	0	0
≠ 09-02	Transmission Fault Treatment	0: Warn and keep operation 1: Warn and ramp to stop 2: Reserved 3: No action and no display	3	0	0	0	0	0	0
№ 09-03	Time-out Detection	0.0~100.0 sec	0.0	0	0	0	0	0	0
№ 09-04	Communication Protocol	0. 7N1 (ASCII) 1. 7N2 (ASCII) 2. 7E1 (ASCII) 2. 7E1 (ASCII) 3. 7O1 (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) 15. 8O1 (RTU) 15. 8O1 (RTU) 17. 8O2 (RTU	13	0	0	0	0	0	0
≠ 09-05	Response Delay Time	0.0~200.0ms	2.0	0	0	0	0	0	0

4.1.11 Group 10 Speed Feedback Control Parameters

Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
10-00	PG Signal Type	0: No function	0		0		0	0	0
		1: ABZ 2: ABZ+Hall							
		3: SIN/COS+Sinusoidal							
		4: SIN/COS+Endat							
		5: SIN/COS 6: SIN/COS + Hiperface							
10-01	Encoder Pulse	1~20000	600		0			0	
10-02	Encoder Input Type Setting	0: Disable	0		0		0	0	0
		1: Phase A leads in a forward run command and phase B leads			_			_	ľ
		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							
№ 10-03	Encoder Feedback Fault	0: Warn and keep operation	2		0		0	0	
× 10-00	Treatment (PGF1, PGF2)	Warn and ramp to stop Warn and stop operation							
	Detection Time for Encoder	0.00~10.0 sec	1.0		0		0	0	0
№ 10-04	Feedback Fault)	
⊮ 10-05	Encoder Stall Level (PGF3)	0~120% (0: disable)	115		0	0	0		0
⊮ 10-06	Encoder Stall Detection Time	0.0~2.0 sec	0.1		0	0	0		0
⊮ 10-07	Encoder Slip Range (PGF4)	0~50% (0: disable)	50		0	0	0		0
⊮ 10-08	Encoder Slip Detection Time	0.0~10.0 sec	0.5		0	0	0		0
	Encoder Stall and Slip Error	0: Warn and keep operation	2		0	0	0		0
⊮ 10-09	Treatment	1: Warn and ramp to stop 2: Warn and coast to stop	_						
10-10	Mode Selection for UVW	Z signal is at the falling edge of U-phase Z signal is at the rising edge of U-phase	0		0		0	0	0
	Input ASR (Auto Speed	0.0~500.0%	100.0		0	0	0		0
⊮ 10-11	Regulation) Control (P) of Zero Speed)		
⊮ 10-12	ASR (Auto Speed	0.000~10.000 sec	0.100	0	0	0	0		0
	Regulation) Control (I) of Zero Speed								
⊮ 10-13	ASR (Auto Speed Regulation) Control (P) 1	0.0~500.0%	100.0	0	0	0	0		0
№ 10-14	ASR (Auto Speed Regulation) Control (I) 1	0.000~10.000 sec	0.100	0	0	0	0		0
⊮ 10-15	ASR (Auto Speed Regulation) Control (P) 2	0.0~500.0%	100.0	0	0	0	0		0
⊮ 10-16	ASR (Auto Speed Regulation) Control (I) 2	0.000~10.000 sec	0.100	0	0	0	0		0
⊮ 10-17	ASR 1/ASR2 Switch Frequency	0.00~400.00Hz (0: disable)	7.00	0	0	0	0		0
⊮ 10-18	ASR Primary Low Pass Filter Gain	0.000~0.350 sec	0.008	0	0	0	0		0
⊮ 10-19	Zero Speed Gain (P)	0~655.00%e	80.00	L	L	L	L		0
⊮ 10-20	Zero Speed/ASR1 Width Adjustment	0.0~400.00Hz	5.00		0		0		0
⊮ 10-21	ASR1/ASR2 Width Adjustment	0.0~400.00Hz	5.00		0		0		0
⊮ 10-22	Operation Time of Zero Speed	0.000~65.535 sec	0.250						0
⊮ 10-23	Filter Time of Zero Speed Time for Executing Zero	0.000~65.535 sec 0: after the brake release set in Pr.02-29	0.004						0
⊮ 10-24	Speed Speed	1: after the brake signal input (Pr.02-01~02-08 is set to 42)	U						0

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4.1.12 Group 11 Advanced Parameters

Pr.	Explanation	Settings	Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
⊮ 11-00	System Control	Bit 0=0: no function Bit 0=1: ASR Auto tuning, PDFF enable Bit 7=0: no function Bit 7=1: When position control is enabled, it doesn't need to set Pr.07-02 (DC Brake Current Level) Bit 15=0: when power is applied, it will detect the position of magnetic pole again Bit 15=1: when power is applied, it will start from the magnetic pole position of previous power failure	0				0		0
⊮ 11-01	Elevator Speed	0.10~4.00 m/s	1.00				0		0
⊮ 11-02	Sheave Diameter	100~2000 mm	400				0		0
⊮ 11-03	Mechanical Gear Ratio	1~100	1				0		0
⊮ 11-04	Suspension Ratio	0: 1:1 1: 2:1	1				0		0
⊮ 11-05	Inertial Ratio	1~300%	40				0		0
⊮ 11-06	Zero-speed Bandwidth	0~40Hz	10				0		0
⊮ 11-07	Low-speed Bandwidth	0~40Hz	10				0		0
⊮ 11-08	High-speed Bandwidth	0~40Hz	10				0		0
⊮ 11-09	PDFF Gain Value	0~200%	30				0		0
⊮ 11-10	Gain for Speed Feed Forward	0~500	0				0		0
⊮ 11-11	Notch Filter Depth	0~20db	0				0		0
⊮ 11-12	Notch Filter Frequency	0.00~200.00Hz	0.00				0		0
⊮ 11-13	Low-pass Filter Time of Keypad Display	0.001~65.535s	0.500	0	0	0	0	0	0
⊮ 11-14	Motor Current at Accel.	50~200%	150						0
⊮ 11-15	Elevator Acceleration	0.20~2.00m/s ²	0.75						0
11-16	Reserved								
11-17	Reserved								
11-18	Reserved								_

4.1.13 Group 12 User-defined Parameters

User-defined Parameters with range from group 00 to 11

★: The parameter can be set during operation.

Pr.	Explanation (Default Function)	Settings	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
№ 12-00	Present Fault Record	0610	0	0	0	0	0	0
№ 12-01	Present Fault Time of Motor Operation (min.)	0620	0	0	0	0	0	0
№ 12-02	Present Fault Time of Motor Operation (day)	0621	0	0	0	0	0	0
⊮ 12-03	Frequency Command at Present Fault	2120	0	0	0	0	0	0
⊮ 12-04	Output Frequency at Preset Fault	2121	0	0	0	0	0	0
⊮ 12-05	Output Current at Present Fault	2122	0	0	0	0	0	0
№ 12-06	Motor Frequency at Present Fault	2123	0	0	0	0	0	0
№ 12-07	Output Voltage at Present Fault	2124	0	0	0	0	0	0
№ 12-08	DC-Bus Voltage at Present Fault	2125	0	0	0	0	0	0
⊮ 12-09	Output Power at Present Fault	2126	0	0	0	0	0	0
⊮ 12-10	Output Torque at Present Fault	2127	0	0	0	0	0	0
⊮ 12-11	IGBT Temperature of Power Module at Present Fault	2128	0	0	0	0	0	0
⊮ 12-12	Multi-function Terminal Input Status at Present Fault	2129	0	0	0	0	0	0
⊮ 12-13	Multi-function Terminal Output Status at Present Fault	212A	0	0	0	0	0	0
⊮ 12-14	Drive Status at Present Fault	212B	0	0	0	0	0	0
№ 12-15	Second Most Recent Fault Record	0611	0	0	0	0	0	0
⊮ 12-16	Second Most Recent Fault Time of Motor Operation (min.)	0622	0	0	0	0	0	0
⊮ 12-17	Second Most Recent Fault Time of Motor Operation (day)	0623	0	0	0	0	0	0
⊮ 12-18	Third Most Recent Fault Record	0612	0	0	0	0	0	0
⊮ 12-19	Third Most Recent Fault Time of Motor Operation (min.)	0624	0	0	0	0	0	0
⊮ 12-20	Third Most Recent Fault Time of Motor Operation (day)	0625	0	0	0	0	0	0
⊮ 12-21	Fourth Most Recent Fault Record	0613	0	0	0	0	0	0
⊮ 12-22	Fourth Most Recent Fault Time of Motor Operation (min.)	0626	0	0	0	0	0	0
⊮ 12-23	Fourth Most Recent Fault Time of Motor Operation (day)	0627	0	0	0	0	0	0
⊮ 12-24	Fifth Most Recent Fault Record	0614	0	0	0	0	0	0
⊮ 12-25	Fifth Most Recent Fault Time of Motor Operation (min.)	0628	0	0	0	0	0	0
⊮ 12-26	Fifth Most Recent Fault Time of Motor Operation (day)	0629	0	0	0	0	0	0
⊮ 12-27	Sixth Most Recent Fault Record	0615	0	0	0	0	0	0
⊮ 12-28	Sixth Most Recent Fault Time of Motor Operation (min.)	062A	0	0	0	0	0	0
⊮ 12-29	Sixth Most Recent Fault Time of Motor Operation (day)	062B	0	0	0	0	0	0
⊮ 12-30	No Factory Setting							
⊮ 12-31	No Factory Setting							

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4.1.14 Group 13 View User-defined Parameters

Pr.	Explanation		Factory Setting	VF	VFPG	SVC	FOCPG	TOCPG	FOCPM
13-00 13-31	View User-defined Parameters	Pr.00-00 to Pr.11-18	-	0	0	0	0	0	0

4.2 Description of Parameter Settings

4.2.1 Group 0 User Parameters

★: This parameter can be set during operation.

00-00				Motor Drive	
Control mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	Factory setting: ##
	Settings	Read	Only		
00-01	Rated C	urrent Di	splay o	f the AC Motor Drive	
Control mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	Factory setting: ##
	Settings	Pear	Only		

- 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 correspond 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.

				230V S	Series			
kW	5.5	7.5	11	15	18.5	22	30	37
HP	7.5	10	15	20	25	30	40	50
Pr.00-00	12	14	16	18	20	22	24	26
Rated Output Current for General Purposes (A)	21.9	27.1	41	53	70	79	120	146
Rated Output Current for Elevators (A)	25	31	47	60	80	90	150	183
Max. Carrier Frequency			15k	Hz			9kl	-lz

					460	V Ser	ies				
kW	5.5	7.5	11	15	18.5	22	30	37	45	55	75
HP	7.5	10	15	20	25	30	40	50	60	75	100
Pr.00-00	13	15	17	19	21	23	25	27	29	31	33
Rated Output Current for General Purposes (A)	12.3	15.8	21	27	34	41	60	73	91	110	150
Rated Output Current for Elevators (A)	14	18	24	31	39	47	75	91	113	138	188
Max. Carrier Frequency			15k	:Hz				9kHz		6kl	Hz

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mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	Factory setting: 0
	Settings	0	No Fun	ction	
		1	Read O	nly	
		8	Keypad	Lock	
		9	All para	meters are reset to factory settings (50	Hz, 220V/380V)
		10	All para	meters are reset to factory settings (60	Hz, 220V/440V)
ш	When it is	set to 1	I, all para	ameters are read only except Pr.00-00~	-00-07 and it can be used
	with passw	ord se	tting for p	password protection.	
Ω	This param	eter al	llows the	user to reset all parameters to the fact	ory settings except the fault
	records (Pr	.06-16	~ Pr.06-	-21).	
	50Hz: Pr.01	1-01 is	set to 50	0Hz and Pr.01-02 is set to 230V or 400\	V.
(60Hz: Pr.0	1-01 is	set to 60	OHz and Pr.01-02 is set to 230Vor 460V	′ .
	When Pr.00	0-02=0	8, the Ki	PVL-CC01 keypad is locked and only P	r.00-02 can be set. To unlo
	the keypad	, set P	r.00-02=	00.	
	When Pr.00	0-02 is	set to 1,	Pr.00-02 setting should be set to 0 bef	fore setting to other setting.
□ 00-03			set to 1, play Sele		fore setting to other setting.
	✓ Start-				
00-03	✓ Start-	up Dis VFPG	play Sele	ection	Factory setting: (
00-03	✓ Start-	up Dis VFPG	play Sele svc Display	ection FOCPG TQCPG FOCPM	Factory setting: (
00-03	✓ Start-	vFPG	svc Display Display	ection FOCPG TQCPG FOCPM the frequency command value. (LED F	Factory setting: (
00-03	✓ Start-	vFPG 0 1	svc Display Display DC BUS	FOCPG TQCPG FOCPM the frequency command value. (LED F the actual output frequency (LED H)	Factory setting: (
00-03	✓ Start-	vFPG 0 1 2	svc Display Display DC BUS	FOCPG TQCPG FOCPM the frequency command value. (LED F the actual output frequency (LED H) S voltage the output current (A)	Factory setting: (
00-03	✓ Start-	vFPG 0 1 2 3	play Seles svc Display Display DC BUS Display Output v	FOCPG TQCPG FOCPM the frequency command value. (LED F the actual output frequency (LED H) S voltage the output current (A)	Factory setting:
00-03 Contro mode	*/Start- VF Settings	vFPG 0 1 2 3 4 5	svc Display Display DC BUS Display Output v Multifun	FOCPG TQCPG FOCPM the frequency command value. (LED F the actual output frequency (LED H) S voltage the output current (A) voltage	Factory setting: (
Contro mode	VF Settings	vFPG 0 1 2 3 4 5	svc Display Display DC BUS Display Output v Multifun etermine:	rection FOCPG TQCPG FOCPM the frequency command value. (LED F the actual output frequency (LED H) S voltage the output current (A) voltage ction display, see Pr.00-04	Factory setting: (
Contro mode	Settings This param Conte	vFPG 0 1 2 3 4 5	svc Display Display DC BUS Display Output v Multifun etermine:	FOCPG TQCPG FOCPM the frequency command value. (LED F the actual output frequency (LED H) soltage the output current (A) voltage ction display, see Pr.00-04 s the start-up display page after power	Factory setting: (

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1 Reserved

00-04 ✓ Content of Multi-Function Display

Display actual output frequency (H)

U: Actual Freq. So 0.00Hz

3 Display the actual DC BUS voltage in VDC of the AC motor drive

U: DC BUS So 255. 3Vol t

Display the output voltage in VAC of terminals U, V, W to the motor.

U: Out put Voltage So 0. 0 Volt

5 Display the power factor angle in ° of terminals U, V, W to the motor.

U: Power Angle So 0. Odeg

6 Display the output power in kW of terminals U, V and W to the motor.

U: Out put Power Se 0.000KW

7 Display the actual motor speed in rpm (enabled when using with PG card).

U: Motor Speed So ORPM

B Display the estimated value of torque in % as it relates to current.

U: Torque S**o** 0.0%

9 Display PG position

U: PG Feedback So 1567

10 Display the electrical angle of drive output

U: Electric Angle So XXX. Xdeg

Display the signal of AUI1 analog input terminal in 11 %.

U: AUI 1 Se 0. 3%

Range 0~10V corresponds to 0~100%. (1.)

U: ACI So 0.0%

Display the signal of ACI analog input terminal in %.
Range 4~20mA/0~10V corresponds to 0~100%. (2.)
Display the signal of AUI2 analog input terminal in

U: AUI 2 So 0.3%

13 %. Range -10V~10V corresponds to 0~100%. (3.)

U: Heat Sink So 0.0 C

14 Display the temperature of heat sink (°C)

U: I GBT Temp So 41.3 C

15 Display the temperature of IGBT in °C.

U: DI ON/OFF Stat

16 Display digital input status ON/OFF (i)

U: DO ON/ OFF Stat So 0000Hex

17 Display digital output status ON/OFF (o)

U: Multi-Speed Se 0

18 Display multi-step speed

U: Error Drive So 0000Hex

	,	mapter 4 Farameters 172 241
00-04	tion Display	
19 The corre	sponding CPU pin status of digital in	put (i.) U: DI Pin Status
20 The corre-	sponding CPU pin status of digital οι	U: DO Pin Status
21 Reserved 23		
24 Output AC	C voltage when malfunction (8)	U: Error Vout So 0. 0Vac
25 Output DO	C voltage when malfunction (8.)	U: Error Vbus Sa 256. 4Vdc
26 Motor free	juency when malfunction (h)	U: Error Ff bk Sa 0.00Hz
27 Output cu	rrent when malfunction (4)	U: Error Current Sa 0.00Amps
28 Output fre	quency when malfunction (h.)	U: Error Fout Sa 0.00Hz
29 Frequency	y command when malfunction	U: Error Fcmd Sa 0.00Amps
30 Output po	wer when malfunction	U: Error Power Sa 0.00KW
31 Output tor	que when malfunction	U: Error Torque Sa 0.00%
32 Input term	inal status when malfunction	U: Error DI State Sa 0000Hex
33 Output ter	minal status when malfunction	U: Error DO State So 0000Hex

It is used to display the content when LED U is ON. It is helpful for getting the AC motor drive's status by this parameter.

34 Drive status when malfunction

ON/ OFF Stat 0086 Hex U: DI Sa

Chapter 4 Parameters | V/572-VL

apto a.											
Terminal	MI8	MI7	MI6	MI5	MI4	MI3	MI2	MI1	REV	FWD	
Status	0	0	1	0	0	0	0	1	1	0	

0: OFF, 1: ON

MI1: Pr.02-01 is set to 1 (multi-step speed command 1)

MI6: Pr.02-06 is set to 8 (the 1st, 2nd acceleration/deceleration time selection)

If REV, MI1 and MI6 are ON, the value is 0000 0000 1000 0110₂ in binary and 0086H in HEX. At the meanwhile, if Pr.00-04 is set to "16" or "19", it will display "0086" with LED U is ON on the keypad KPVL-CC01. The setting 16 is the status of digital input and the setting 19 is the corresponding CPU pin status of digital input. User can set to 16 to monitor digital input status and then set to 19 to check if the wire is normal.

U: DO ON/OFF Stat So 0001 Hex

Terminal	MO10	МО9	MO8	MO7	MO6	MO5	MO4	МОЗ	MO2	MO1	MRA	RA	MO10
Status	0	0	0	0	0	0	0	0	0	0	0	1	1

RA: Pr.02-11 is set to 9 (Drive ready).

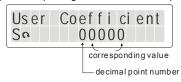
After applying the power to the AC motor drive, if there is no other abnormal status, the contact will be ON. At the meanwhile, if Pr.00-04 is set to 17 or 20, it will display 0001 with U on the keypad. The setting 17 is the status of digital output and the setting 20 is the corresponding CPU pin status of digital output. User can set 17 to monitor the digital output status and then set to 20 to check if the wire if normal.

00-05	⊮ User	Define	d Coeff	icient K		
Control mode	VF VFPG SVC FOCPG TQCPG FOCPM					Factory setting: 0
	Settings		Digit 4: decimal point number (0 to 3)		point number (0 to 3)	
			Digit 0	-3: 40 to 9	9999	

It is used digital setting method

Digital 4: decimal point number (0: no decimal point, 1: 1 decimal point and so on.)

Digit 0-3: 40 to 9999 (the corresponding value for the max. frequency).



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- Ш For example, if use uses rpm to display the motor speed and the corresponding value to the 4pole motor 60Hz is 1800. This parameter can be set to 01800 to indicate that the corresponding value for 60Hz is 1800rpm. If the unit is rps, it can be set 10300 to indicate the corresponding value for 60Hz is 30.0 (a decimal point).
- Ш Only frequency setting can be displayed by the corresponding value.
- Ш After setting Pr.00-05, it won't display the unit of frequency "Hz" after returning to the main menu

00-06	Software Version											
Control mode	VF	VFPG	svc	FOCPG	TQCPG F	ОСРМ	Factory setting: Read Only					
	Settings	s F	Read Or	ıly								
	Display		.##									

00-07	∦ Passv	vord Inp	ut			Unit: 1
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCPN	Factory setting: 0
	Settings	: 1	to 9998	and 100	000 to 65535	
	Display	0-	~2 (time	s of wror	ng password)	

- \square The function of this parameter is to input the password that is set in Pr.00-08. Input the correct password here to enable changing parameters. You are limited to a maximum of 3 attempts. After 3 consecutive failed attempts, a fault code "Password Error" will show up to force the user to restart the AC motor drive in order to try again to input the correct password.
- When forgetting password, you can decode by setting 9999 and press button wice. Ш Please note that all the settings will be set to factory setting.

80-00	⊮ Passv	vord Set		Unit: 1			
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCPM		Factory setting: 0
	Settings	1	to 9998	and 100	000 to 65535		
	Display	0		No pas	sword set or suc	cessful input in Pr. 00-0	7
		1		Passwo	ord has been set		

Ш To set a password to protect your parameter settings.

> If the display shows 0, no password is set or password has been correctly entered in Pr.00-07. All parameters can then be changed, including Pr.00-08.

Chapter 4 Parameters | V/=72-VL

The first time you can set a password directly. After successful setting of password the display will show 1

Be sure to record the password for later use.

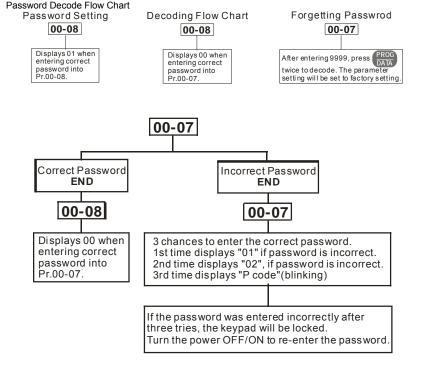
To cancel the parameter lock, set the parameter to 0 after inputting correct password into Pr. 00-07

The password consists of min. 2 digits and max. 5 digits.

How to make the password valid again after decoding by Pr.00-07:

Method 1: Re-input original password into Pr.00-08 (Or you can enter a new password if you want to use a changed or new one).

Method 2: After rebooting, password function will be recovered.



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00-09	Control	Method							
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCE	PM			
								Factory	Setting: 0
	Settings	0	V/f	control					
		1	V/f	+ Encode	er (VFPG)				
		2	Sen	nsorless v	ector control (SVC)			
		3	FO	C vector of	control + Enco	der (FOCP	3)		
		4	Tor	que contr	ol + Encoder (TQCPG)			
		8	FO	C PM cor	ntrol (FOCPM)				

Ш This parameter determines the control method of the AC motor drive:

Setting 0: user can design V/f ratio by requirement and control multiple motors simultaneously.

Setting 1: User can use PG card with Encoder to do close-loop speed control.

Setting 2: To have optimal control characteristic by auto-tuning.

Setting 3: To increase torque and control speed precisely. (1:1000)

Setting 4: To increase accuracy for torque control.

Setting 8: To increase torque and control speed precisely. (1:1000). This setting is only for using with permanent magnet motor and others are for induction motor.

00-10	✓ Speed	d Unit			
Control mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	
					Factory Setting: 0
	Settings	0	Hz		
		1	m/s		
		2	ft/s		
00-11	Output [Direction	Select	ion	
Control mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	
					Factory Setting: 0
	Settings	0	FWD	counterclockwise, REV: clockwise	
		1	FWD	clockwise, REV: counterclockwise	

Omapio			$\overline{}$			
00-12	✓ Carrie	er Frequ	ency			Unit: 1
Control mode	VF	VFPG	svc	FOCPG TQCPG	FOCPM	Factory setting: 12
	Settings	2~1	5KHz			

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

		230V/460V Series								
Models		7.5-15HP 5.5-11kW		20-30HP 15-22kW	40-60 30-45		40-100HP 30-75kW			
Setting Range		2~15kHz		2~15kHz	02-09	kHz	02~15kHz			
Factory Se	Factory Setting		12kHz	9kHz	6kHz		6kHz			
		rrier uency	Acoustic Noise	Electromagnetic Noise or Leakage Current	Heat Dissipation	Current Wave				
	2kHz 8kHz		Significant	Minimal	Minimal	~^^^	•			
			1 1	1	1					
15kHz		ίΗz	Minimal	Significant	Significant		ļ			

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.

00-13	 ∕ Auto										
Control mode	VF	VFPG	SVC FOCPG TQCPG FOCPM	Factory setting: 0							
	Settings	0	Enable AVR								
		1	Disable AVR								
		2	Disable AVR when deceleration stop								
m u			as AVD made AVD is used to manufact the custom	4							

- It is used to select the AVR mode. AVR is used to regulate the output voltage to the motor. For example, if V/f curve is set to AC200V/50Hz and the input voltage is from 200 to 264VAC, the output voltage won't excess AC200V/50Hz. If the input voltage is from 180 to 200V, the output voltage to the motor and the input voltage will be in direct proportion.
- When setting Pr.00-13 to 1 during ramp to stop and used with auto accel./decel. function, the acceleration will be smoother and faster.

00-14	∦ Source	e of the	Master	Frequer	ncy Command		
Control mode	VF	VFPG	svc	FOCPG	FOCPM		Factory setting: 1
	Settings	1	RS-4	85 seria	l communication or digi	tal keypad (KPV	L-CC01)
		2	Exter	nal anal	og input (Pr. 03-00)		
		3	Digita	al termina	als input (Pr.04-00~04-	15)	

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This parameter determines the drive's master frequency source.

00-1	5 / Source	ce of the	Opera	tion Com	mand		
Contr	VI	VFPG	svc	FOCPG	TQCPG FOCI	PM	Factory setting: 1
	Settings	1	Exte	rnal term	inals		_
		2	RS-4	185 serial	communicati	on or digital keypad	(KPVL-CC01)
Ш	VFD-VL ser	ries is sh	ipped v	without di	gital keypad a	nd users can use e	xternal terminals or RS-
	485 to cont	rol the or	eratio	n comma	nd.		

When the LED PU is light, the operation command can be controlled by the optional digital keypad (KPVL-CC01). Refer to appendix B for details.

4.2.2 Group 1 Basic Parameters

01-00	Maxim	ium Outp	out Freq	uency		Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG TQCPG	FOCPM	Factory setting: 60.00/50.00
	Setting	s	10.00	to 400.00Hz		
т т	hia naran	notor dot	orminos	the AC motor dri	vo'o Movimu	m Output Fraguency All the AC

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 and -10V to +10V) are scaled to correspond to the output frequency range.

01-01	1st Out	put Freq	uency S	Setting	Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	Factory setting: 60.00/50.00
	Setting	S	0.00)~400.00Hz	

- lt is for the base frequency and motor rated frequency.
- 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.

01-02	1st Outp	ut Volta	age Set	ting	Unit: 0.1
Control mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	
	Settings	230V	series	0.1 to 255.0V	Factory Setting: 220.0
		460V	series	0.1 to 510.0V	Factory Setting: 440.0

- It is for the base frequency and motor rated frequency.
- 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.

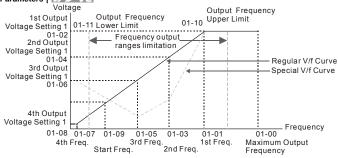
01-03	2nd Output F	requency Setting	Unit: 0.01
Control mode	VF VFP	G	Factory setting: 0.50
	Settings	0.00~400.00Hz	

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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.

For the V/f curve setting, it should be Pr.01-01≥ Pr.01-03≥ Pr.01-05≥ Pr.01-07. There is no limit for the voltage setting, but a high voltage at the low frequency may cause motor damage, overheat, stall prevention or over-current protection. Therefore, please use the low voltage at the low frequency to prevent motor damage.





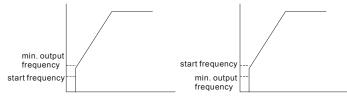
V/f Curve

01-09	Start Fre	quency			Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG	Factory setting: 0.50
	Settings	0.0	00~400	.00Hz	

To distinguish which frequency should be start frequency, it needs to compare the value of min.

output frequency and start frequency. The larger value will be start frequency.

When min. output frequency > start frequency When start frequency > min. output frequency

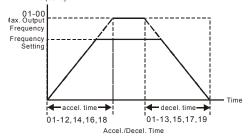


01-10	⊮ Outp	ut Freque	ency Up	oper Limit	Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG FOCPM	Factory setting: 120.00
	Setting	s 0.0	00~400	.00Hz	
01-11	⊮ Outp	ut Freque	ency Lo	wer Limit	Unit: 0.01
01-11 Control mode	V F Outp	ut Freque	svc	FOCPG FOCPM	Unit: 0.01 Factory setting: 0.00

The upper/lower output frequency setting is used to limit the actual output frequency. If the frequency setting is lower than the start-up frequency, it will run with zero speed. If the frequency setting is higher than the upper limit, it will runs with the upper limit frequency. If output frequency lower limit > output frequency upper limit, this function is invalid.

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						Ch	apter 4 Parameters V/-72-VL
01-1	Acce ✓ Acce	I. Time 1					Unit: 0.01
01-1	4 ✓ Acce	I. Time 2					Unit: 0.01
01-1	Acce	I. Time 3					Unit: 0.01
01-1	8 ⊮Acce	l. Time 4					Unit: 0.01
Contr	. VI	VFPG	svc	FOCPG	FOCPM		Factory setting: 3.00
	Setting	s 0.0	00~600	.00 sec			
01-1	∦ Dece	el. Time 1					Unit: 0.01
01-1	√ Dece	el. Time 2					Unit: 0.01
01-1	✓ Dece	el. Time 3					Unit: 0.01
01-1	9 ∦ Dece	el. Time 4					Unit: 0.01
Contr		VFPG	svc	FOCPG	FOCPM		Factory setting: 2.00
	Setting	s 0.0	00~600	.00 sec			
01-2	⊮ JOG	Accelera	tion Tir	ne			Unit: 0.01
01-2	1 ⊮JOG	Decelera	ation Tir	ne			Unit: 0.01
Contr		VFPG	svc	FOCPG	FOCPM		Factory setting: 1.00
	Setting	s 0.0	00~600	.00 sec			
	The Accele	eration Ti	me is u	sed to de	etermine	the time required for	the AC motor drive to ramp
	from 0Hz to	o Maximu	ım Out	out Frequ	uency (P	r.01-00).	
Ω.	The Decel	eration Ti	me is u	sed to de	etermine	the time require for t	he AC motor drive to
	decelerate	from the	Maxim	um Outp	ut Fregu	ency (Pr.01-00) dowr	to 0Hz.
ш	The Accele	eration/De	ecelera	tion Time	e 1. 2. 3.	4 are selected accord	ding to the Multi-function Input
							nd deceleration time 1.
Ω.		J		,	J		ccel./decel. time setting is
	•	•	•		•		· ·
			•			·	prevention function. When it
	happens, a	actual acc	el./dec	el. time v	vill be lor	nger than the action a	bove.

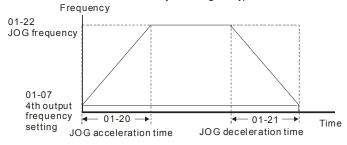


01-22	 ∕JOG F	requen	СУ				Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory setting: 6.00
	Settings	0.00	~400.0	0Hz			

- Both external terminal JOG and key "JOG" on the keypad can be used. When the jog command is ON, the AC motor drive will accelerate from 0Hz to jog frequency (Pr.01-22).

 When the jog command is OFF, the AC motor drive will decelerate from Jog Frequency to zero.

 The used Accel./Decel. time is set by the Jog Accel./Decel. time (Pr.01-20, Pr.01-21).
- The JOG command can't be executed when the AC motor drive is running. In the same way, when the JOG command is executing, other operation commands are invalid except forward/reverse commands and STOP key on the digital keypad.



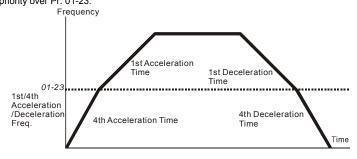
JOG accel./decel. time

01-23	✓ Switch	h Frequ	ency b	etween 1st/4th Accel/decel	Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG FOCPM	Factory setting: 0.00
	Settings	0.00)~400.C	00Hz	

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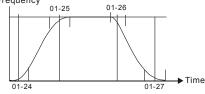
- Ш This parameter selects the frequency point for transition from acceleration/deceleration time 1 to acceleration/deceleration time 4
- Ш The transition from acceleration/deceleration time 1 to acceleration/deceleration time 4, may also be enabled by the external terminals (Pr. 02-01 to 02-08). The external terminal has priority over Pr. 01-23.



1st/4th Acceleration/Deceleration Switching

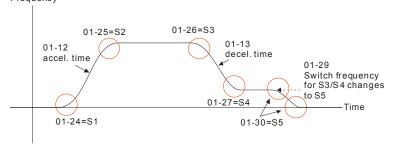
S-curve for Deceleration Arrival Time S5 VF VFPG SVC FOCPG FOCPM	Unit: 0.01 Factory setting: 1.00
3 daile for Bedereration 7 time of	Onit. 0.01
S-curve for Deceleration Arrival Time S4	Unit: 0.01
S-curve for Deceleration Departure Time S3	Unit: 0.01
S-curve for Acceleration Arrival Time S2	Unit: 0.01
S-curve for Acceleration Departure Time S1	Unit: 0.01
(S-curve for Acceleration Departure Time S1 S-curve for Acceleration Arrival Time S2 S-curve for Deceleration Departure Time S3

- \square It is used to give the smoothest transition between speed changes. The accel./decel. curve can adjust the S-curve of the accel./decel. When it is enabled, the drive will have different accel./decel. curve by the accel./decel. time.
- Ω The Actual Accel. Time = selected accel. Time + (Pr.01-24 + Pr.01-25)/2 The Actual Decel. Time = selected decel. Time + (Pr.01-26 + Pr.01-27 + Pr.01-30*2)/2 Frequency



		✓ Switch Frequency for S3/S4 Changes to S5			Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG FOCPM	Factory setting: 0.00
	Settings	0.00	~400.C	0Hz	

- It is used to set the switch frequency between S4 and S5 for smooth stop.
- It is recommended to set this parameter to the leveling speed of elevator.
 Frequency



01-28	Mode S	Mode Selection when Frequency< Fmin					
Control mode	VF	VFPG	svc	Factory setting: 0			
	Settings	0	Output Waiting				
		1	Zero-speed operation				
		2	Fmin (4th output frequency setting)				
		-	<u> </u>				

- When the AC motor drive is at 0Hz, it will operate by this parameter.
- When it is set to 1 or 2, voltage will be output by Fmin corresponding output voltage(Pr.01-08).

01-31	01-31 ✓ Deceleration Time when Operating without RUN Command				Unit: 0.01	
Control mode	VF	VFPG	svc	FOCPG	FOCPM	Factory setting: 2.00
	Settings	0.00	~ 600.0	0 Sec		

The AC motor drive will stop by the setting of this parameter when canceling RUN command.

Refer to the figure in Pr.01-29 for details.

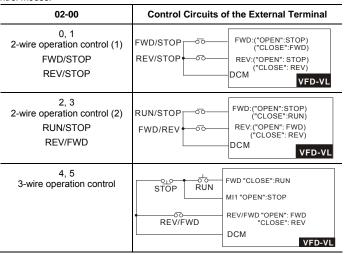
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4.2.3 Group 2 Digital Input/Output Parameters

02-00	2-wire/3-	wire Op	eration	Control		
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCPM	Factory setting: 0
	Settings	0	F	WD/STO	P, REV/STOP	
		1	F	WD/STO	P, REV/STOP (Line Start Lo	ockout)
		2	R	UN/STO	P, REV/FWD	
		3	R	UN/STO	P, REV/FWD (Line Start Loc	ckout)
		4	3-	-wire		
		5	3-	-wire (Lin	e Start Lockout)	

- \square Three of the six methods include a "Line Start Lockout" feature. 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.
- Ш This parameter is used to control operation from external terminals. There are three different control modes.



02-01

Multi-Function Input Command 1 (MI1) (it is Stop terminal for 3-wire operation)

Factory Setting: 1

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02-02 Multi-Function Input Command 2 (MI2)	
	Factory Setting: 2
02-03 Multi-Function Input Command 3 (MI3)	_
	Factory Setting: 3
02-04 Multi-Function Input Command 4 (MI4)	
	Factory Setting: 4
02-05 Multi-Function Input Command 5 (MI5)	_
	Factory Setting: 0
02-06 Multi-Function Input Command 6 (MI6)	_
	Factory Setting: 0
02-07 Multi-Function Input Command 7 (MI7)	_
	Factory Setting: 0
Multi-Function Input Command 8 (MI8)	
02-08 When JP1 on the control board is inserted, MI8 functions acc. to Pr02-08.	
When JP1 on the control board is removed, MI8 is always "enable", independent of Pr02-08.	
	Factory Setting: 40
Settings 0-43	

Outton	Control Mode						
Settings	VF	VFPG	SVC	FOCPG	TQCPG	FOCPM	
0: no function	0	0	0	0	0	0	
1: multi-step speed command 1	0	0	0	0		0	
2: multi-step speed command 2	0	0	0	0		0	
3: multi-step speed command 3	0	0	0	0		0	
4: multi-step speed command 4	0	0	0	0		0	
5: Reset	0	0	0	0	0	0	
6: JOG command	0	0	0	0		0	
7: acceleration/deceleration speed inhibit	0	0	0	0		0	
8: the 1st, 2nd acceleration/deceleration time selection	0	0	0	0		0	
9: the 3rd, 4th acceleration/deceleration time selection	0	0	0	0		0	
10: EF input (07-28)	0	0	0	0	0	0	
11: Reserved							
12: Stop output	0	0	0	0	0	0	
13: Reserved							
14: Reserved							
15: operation speed command form AUI1	0	0	0	0		0	
16: operation speed command form ACI	0	0	0	0		0	
17: operation speed command form AUI2	0	0	0	0		0	
18: Emergency Stop (07-28)	0	0	0	0	0	0	
19-23: Reserved							
24: FWD JOG command	0	0	0	0		0	
25: REV JOG command	0	0	0	0		0	
26: Reserved							
27: ASR1/ASR2 selection	0	0	0	0		0	
28: Emergency stop (EF1) (Motor coasts to stop)	0	0	0	0	0	0	
29-30: Reserved							

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		Onapt	ci + i aiai	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	/// // // // // // // // // // // // //	
Control Mode						
VF	VFPG	SVC	FOCPG	TQCPG	FOCPM	
0	0	0	0	0	0	
0	0	0	0	0	0	
0	0	0	0	0	0	
0	0	0	0	0	0	
				0		
0	0	0	0	0	0	
0	0	0	0	0	0	
0	0	0	0	0	0	
0	0	0	0	0	0	
	VF	VF VFPG	Contro	Control Mode		

- $\ \square$ This parameter selects the functions for each multi-function terminal.
- If Pr.02-00 is set to 3-wire operation control. Terminal MI1 is for STOP terminal. Therefore, MI1 is not allowed for any other operation.

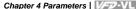
Settings	Functions	Descriptions				
0	No Function					
1	Multi-step speed command 1					
2	Multi-step speed command 2	15 step speeds could be conducted through the digital statuses of the 4 terminals, and 17 in total if the master speed and JOG are included. (Refer to Pr. 04-00~04-14				
3	Multi-step speed command 3	When using communication to control the multi-step speed, setting 1 to 4 will be invalid.				
4	Multi-step speed command 4					
5	Reset	After the error of the drive is eliminated, use this terminal to reset the drive.				
6	JOG Command	JOG operation				
7	Acceleration/deceleration Speed Inhibit	When this function is enabled, acceleration and deceleration is stopped and the AC motor drive starts to accel./decel. from the inhibit point.				
8	The 1 st , 2 nd acceleration or deceleration time	The acceleration/deceleration time of the drive could be selected from this function or the digital statuses of the terminals; there are 4 acceleration/deceleration speeds in total for selection. Bit 0 Bit 1 Descriptions 0 0 First acceleration/deceleration				
Ü	selection	time When output frequency is less than Pr.01-23 (Switch Frequency between 1st/4th Accel/decel), it will output 4th accel/decel time. 0 1 2nd accel./decel. time				

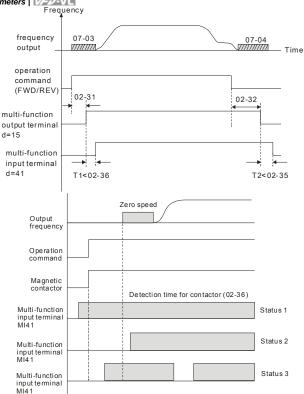
Chapter 4 Parameters | V/372-VL

Settings	Functions	Descriptions
9	The 3 rd , 4 th acceleration or deceleration time selection	
10	EF Input	External fault input terminal and decelerates by Pr.07-28. (EF fault will be recorded)
11	Reserved	
12	Stop output	When this function is enabled, the drive output will stop immediately and the motor is free run. When this function is disabled, the drive will accelerate to the frequency setting.
13-14	Reserved	
15	Operation speed command form AUI1	When the source of operation speed command is set to AUI1, ACI and AUI2 at the same time and two or above terminals are ON, the priority is AUI1>ACI>AUI2.
		When this function is enabled, the source of the frequency will force to be AUI1.
16	Operation speed command form ACI	When this function is enabled, the source of the frequency will force to be ACI.
17	Operation speed command form AUI2	When this function is enabled, the source of the frequency will force to be AUI2.
18	Emergency Stop	When this function is enabled, the drive will ramp to stop by Pr.07-28 setting.
19-23	Reserved	
24	FWD JOG command	When this function is enabled, the drive will execute forward Jog command.
25	REV JOG command	When this function is enabled, the drive will execute reverse Jog command.
26	Reserved	
27	ASR1/ASR2 selection	ON: speed will be adjusted by ASR 2 setting. OFF: speed will be adjusted by ASR 1 setting.
28	Emergency stop (EF1) (Motor coasts to stop)	When it is ON, the drive will execute emergency stop. (it will have fault code record)
29-30	Reserved	
31	High torque bias	When Pr.07-19 is set to 3:
32	Middle torque bias	The high torque bias is according to the Pr.07-21 setting.
33	Low torque bias	The middle torque bias is according to the Pr.07-22 setting.

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		Chapter 4 Parameters
Settings	Functions	Descriptions
34-37	Reserved	
38	Disable write EEPROM function	When this function is enabled, you can't write into EEPROM.
39	Torque command direction	When Pr.07-13=2 and analog input is ACI or unipolar AUI, torque command direction is decided by this terminal.
40	Enable drive function	When this function is enabled, the drive function can be executed. This function can be used with multi-function output (setting Pr.02-11~Pr.02-14 to 15) and (Pr.02-31 and Pr.02-32).
41	Detection of magnetic contactor	This terminal is used for the feedback signal of magnetic contactor ON/OFF. When drive receives RUN command, the corresponding output terminal (setting 15) will be enabled after Pr.02-31 time. It will check if this function is enabled within the detection time (Pr.02-36). If NOT, the fault of mechanical brake occurs and fault code "MCF" will be displayed.
42	Mechanical brake	When drive receives RUN command, the corresponding output terminal (setting 12) will be enabled after Pr.02-29 time. It will check if this function is enabled within the detection time (Pr.02-35). If NOT, the fault of mechanical brake occurs and fault code "MBF" will be displayed.
43	EPS function	If power is cut during running, the drive will stop when DC bus voltage is less than low voltage level. After power is cut, drive will run by the frequency depend on EPS when EPS is applied and this function is ON.





02-09	✓ Digit	tal Input	Respon	Unit: 0.001	
Control mode	VF	VFPG	svc	FOCPG TQCPG FOC	M Factory setting: 0.005
	Settings 0.001~ 30.000 sec				

This parameter is used for digital input terminal signal delay and confirmation. The delay time is confirmation time to prevent some uncertain interferences that would result in error (except for the counter input) in the input of the digital terminals (FWD, REV and MI1~8). Under this condition, confirmation for this parameter could be improved effectively, but the response time will be somewhat delayed.

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02-10	✓ Digit	al Input (Operatio	Unit: 1		
Control mode	VF	VFPG	<u> </u>	FOCPG TQCPG	FOCPM	Factory setting: 0
	Settings	s 0	~ 6553	5		
☐ Tr	nis param	neter is u	sed to s	set the input sign	al level and i	it won't be affected by the

- SINK/SOURCE status.
- Ш Bit0 is for FWD terminal, bit1 is for REV terminal and bit2 to bit9 is for MI1 to MI8.
- User can change terminal status 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.02-10=9 by communication and it can forward with 2nd step speed. It doesn't need to wire any multi-function terminal.

bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
MI8	MI7	MI6	MI5	MI4	MI3	MI2	MI1	REV	FWD

02-11	Multi-function Output 1 RA, RB, RC (Relay1)	
		Factory Setting: 11
02-12	Multi-function Output 2 MRA, MRC (Relay2)	
	_	Factory Setting: 1
02-13	Multi-function Output 3 (MO1)	_
02-14	Multi-function Output 4 (MO2)	_
02-15	Multi-function Output 5 (MO3) (need to use with EMVL-IODA01)	_
02-16	Multi-function Output 6 (MO4) (need to use with EMVL-IODA01)	_
02-17	Multi-function Output 7 (MO5) (need to use with EMVL-IODA01)	_
02-18	Multi-function Output 8 (MO6) (need to use with EMVL-IODA01)	_
02-19	Multi-function Output 9 (MO7) (need to use with EMVL-IODA01)	_
02-20	Multi-function Output 10 (MO8) (need to use with EMVL-IODA01)	
02-21	Multi-function Output 11 (MO9) (need to use with EMVL-IODA01)	
02-22	Multi-function Output 12 (MO10) (need to use with EMVL-IODA01)	
		Factory Setting: 0
	Settings 0-41	

Chapter 4 Parameters | V=D-VL

Chapter 4 Parameters			Contro	ol Mode		
Settings	VF	VFPG	SVC	FOCPG	TQCPG	FOCPM
0: No function	0	0	0	0	0	0
1: Operation indication	0	0	0	0	0	0
2: Operation speed attained	0	0	0	0	0	0
3: Desired frequency attained 1 (Pr.02-25, 02-26)	0	0	0	0		0
4: Desired frequency attained 2 (Pr.02-27, 02-28)	0	0	0	0		0
5: Zero speed (frequency command)	0	0	0	0		0
6: Zero speed with stop (frequency command)	0	0	0	0		0
7: Over torque (OT1) (Pr.06-05~06-07)	0	0	0	0	0	0
8: Over torque (OT2) (Pr.06-08~06-10)	0	0	0	0	0	0
9: Drive ready	0	0	0	0	0	0
10: User-defined Low-voltage Detection (LV)	0	0	0	0	0	0
11: Malfunction indication	0	Ō	Ō	Ō	Ō	Ō
12: Mechanical brake release (Pr.02-29, Pr.02-30)	0	Ō	Ō	Ō	Ō	Ō
13: Overheat (Pr.06-14)	Ō	Ō	Ō	Ō	Ō	Ō
14: Brake chopper signal	Ō	Ō	Ō	Ō	Ō	Ō
15: Motor-controlled magnetic contactor output	0	0	Ō	0	Ō	Ō
16: Slip error (oSL)	0	0	0	0		Õ
17: Malfunction indication 1	Õ	0	Ö	0	0	Ö
18: Reserved						
19: Brake chopper output error	0	0	0	0	0	0
20: Warning output	0	0	0	0	0	0
21: Over voltage warning	0	0	0	0	0	0
22: Over-current stall prevention warning	0	0	0			
23: Over-voltage stall prevention warning	0	0	0	0	0	0
24: Operation mode indication (Pr.00-15≠0)	Ō	Ō	Ō	Ō	Ō	Ō
25: Forward command	0	Ō	Ō	0	Ō	Ō
26: Reverse command	Ō	Ö	Ö	Ö	Ö	Õ
27: Output when current >= Pr.02-33	Õ	Ö	Ö	Ö	Ö	Õ
28: Output when current < Pr.02-33	Ō	Ö	Ö	Õ	Õ	Õ
29: Output when frequency >= Pr.02-34	Õ	Õ	Ö	Õ	Õ	Õ
30: Output when frequency < Pr.02-34	Õ	Ö	Ö	Ö	Õ	Õ
31-32: Reserved						
33: Zero speed (actual output frequency)	0	0	0	0		0
34: Zero speed with Stop (actual output frequency)	Ō	Ō	Ō	Ō		Ō
35: Fault output option 1 (Pr.06-22)	Ō	Ō	Ō	Ō	0	Ō
36: Fault output option 2 (Pr.06-23)	Ō	Ō	Ō	Ō	Ō	Ō
37: Fault output option 3 (Pr.06-24)	Ö	Ö	Ö	Ö	Ö	Ö
38: Fault output option 4 (Pr.06-25)	Õ	Ö	Ö	Õ	Õ	Õ
39: Reserved		Ü				
40: Speed attained (including zero speed)	0	0	0	0		0
41: Reserved						

Settings	Functions	Descriptions
0	No Function	
1		Active when there is an output from the drive or RUN command is ON.
2	Operation speed attained	Active when the AC motor drive reaches the output frequency setting.

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Settings	Functions	Descriptions
3	Desired Frequency Attained 1 (Pr.02-25, 02- 26)	Active when the desired frequency (Pr.02-25, 02-26) is attained.
4	Desired Frequency Attained 2 (Pr.02-27, 02- 28)	Active when the desired frequency (Pr.02-27, 02-28) is attained.
5	Zero Speed (frequency command)	Active when frequency command =0. (the drive should be at RUN mode)
6	Zero Speed with Stop (frequency command)	Active when frequency command =0 or stop.
7	Over Torque (OT1) (Pr.06-05~06-07)	Active when detecting over-torque. Refer to Pr.06-05 (over-torque detection selection-OT1), Pr.06-06 (over-torque detection level-OT1) and Pr.06-07 (over-torque detection time-OT1).
8	Over Torque (OT2) (Pr.06-08~06-10)	Active when detecting over-torque. Refer to Pr.06-08 (over-torque detection selection-OT2), Pr.06-09 (over-torque detection level-OT2) and Pr.06-10 (over-torque detection time-OT2).
9	Drive Ready	Active when the drive is ON and no abnormality detected.
10	User-defined Low- voltage Detection	Active when the DC Bus voltage is too low. (refer to Pr.06-00 low voltage level)
11	Malfunction Indication	Active when fault occurs (except Lv stop).
12	Mechanical Brake Release (Pr.02-29, Pr.02-30)	When drive runs after Pr.02-29, it will be ON. This function should be used with DC brake and it is recommended to use contact "b"(N.C).
13	Overheat (Pr.06-14)	Active when IGBT or heat sink overheats to prevent OH turn off the drive. (refer to Pr.06-14)
14	Brake Chopper Signal	The output will be activated when the drive needs help braking the load. A smooth deceleration is achieved by using this function. (refer to Pr.07-00)
15	Motor-controlled Magnetic Contactor Output	Active when the setting is set to 15.
16	Slip Error (oSL)	Active when the slip error is detected (by Pr.05-14).
17	Malfunction indication 1	Activate after 10ms when fault occurs (except Lv stop).
18	Reserved	

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Settings	Functions	Descriptions					
19	Brake Chopper Output Error	Active when the brake chopper error is detected.					
20	Warning Output	Active when the warning is detected.					
21	Over-voltage Warning	Active when the over-voltage is detected.					
22	Over-current Stall Prevention Warning	Active when the over-current stall prevention is detected.					
23	Over-voltage Stall prevention Warning	Active when the over-voltage stall prevention is detected.					
24	Operation Mode Indication	Active when the operation command is controlled by external terminal. (Pr.00-15=1) and PU LED on keypad KPVL-CC01 is OFF.					
25	Forward Command	Active when the operation direction is forward.					
26	Reverse Command	Active when the operation direction is reverse.					
27	Output when Current >= Pr.02-33	Active when current is >= Pr.02-33.					
28	Output when Current < Pr.02-33	Active when current is < Pr.02-33.					
29	Output when frequency >= Pr.02-34	Active when frequency is >= Pr.02-34.					
30	Output when Frequency < Pr.02-34	Active when frequency is < Pr.02-34.					
31-32	Reserved						
33	Zero Speed (actual output frequency)	Active when the actual output frequency is 0. (the drive should be at RUN mode)					
34	Zero Speed with Stop (actual output frequency)	Active when the actual output frequency is 0 or Stop. (the drive should be at RUN mode)					
35	Fault output option 1	Active when Pr.06-22 is ON.					
36	Fault output option 2	Active when Pr.06-23 is ON.					
37	Fault output option 3	Active when Pr.06-24 is ON.					
38	Fault output option 4	Active when Pr.06-25 is ON.					

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Settings	Functions	Descriptions Descriptions
39	Reserved	
	Speed Attained (including zero speed)	Active when the output frequency reaches frequency setting.
41	Reserved	

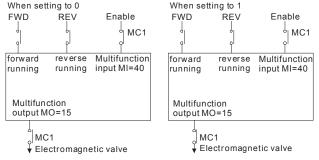
02-23	✓ Multi-	-output	Directio	n		Unit:1	
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory setting: 0
	Settings	s 0	~ 6553	5			

- ω This parameter is bit setting. If the bit is 1, the multi-function output terminal will be act with opposite direction. For example, if Pr.02-11 is set to 1 and forward bit is 0, Relay 1 will be ON when the drive is running and OFF when the drive is stop.
- Ш The multi-function output terminals MO3~MO10 need to use with EMVL-IODA01.

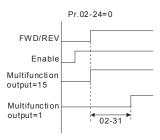
Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MO10	МО9	MO8	MO7	MO6	MO5	MO4	моз	MO2	MO1	MRA	RA

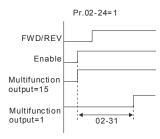
02-24 ✓ Serial Start Signal Selection Control VF Factory setting: 0 VFPG SVC FOCPG FOCPM mode Settings 0 by FWD/REV 1 by Enable

 \Box This parameter is used to select serial start method of electromagnetic valve.



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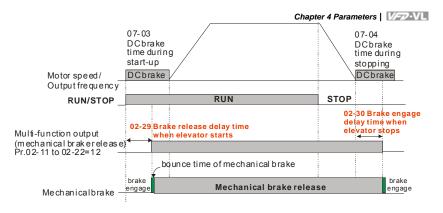
02-25	⊮ Desi	red Frequ	uency A	Attained 1	Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG FOCPM	Factory setting: 60.00/50.00
02-26	✓ The	Width of	the De	sired Frequency Attained 1	Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG FOCPM	Factory setting: 2.00
02-27	∦ Desi	red Frequ	uency A	Attained 2	Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG FOCPM	Factory setting: 60.00/50.00
02-28	✓ The	Width of	the De	sired Frequency Attained 2	Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG FOCPM	Factory setting: 2.00
	Setting	js 0.	00 ~ 40	00.00Hz	

Once output frequency reaches desired frequency and the corresponding multi-function output terminal is set to 3 or 4 (Pr.02-11~Pr.02-22), this multi-function output terminal will be ON.

02-29	Brake F	Release D	Delay Ti	ime wher	Unit:0.001		
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory setting: 0.250
02-30	Brake B	Engage D	elay Ti	me when	Elevato	r Stops	Unit:0.001
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory setting: 0.250
	Setting	s 0.	000~65	5.000 Sed	2		

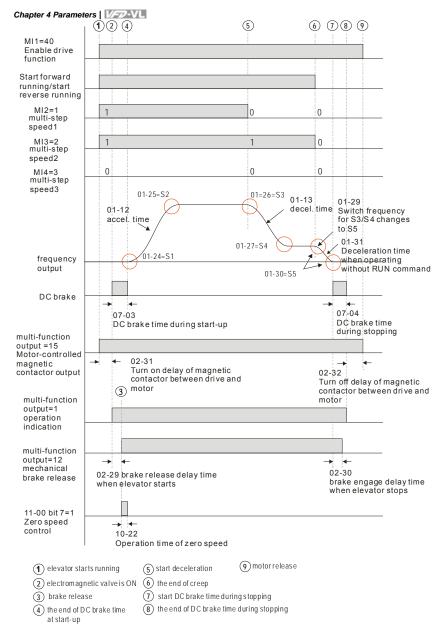
- When the AC motor drive runs after Pr.02-29 delay time, the corresponding multi-function output terminal (12: mechanical brake release) will be ON. This function should be used with DC brake.
- When the AC motor drive stops 12 after Pr.02-30 delay time, the corresponding multi-function output terminal (12: mechanical brake release) will be OFF.

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02-31		or Unit:0.001						
02-32	✓ Turn Off Delay of Magnetic Contact between Drive and Motor	✓ Turn Off Delay of Magnetic Contact between Drive and Motor Unit:0.001						
Control mode	VF VFPG SVC FOCPG TQCPG FOCPM	Factory setting: 0.200						
	Settings 0.000~65.000 Sec							

After running, it is used with setting 40 of multifunction input terminal and settings 15 of multifunction output terminals. When multifunction output terminals is ON, the drive starts output after Pr.02-31 delay time. When drive stops output, multifunction output terminals will release after Pr.02-32 delay time.



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02-	33	✓ Outp	ut Currer	nt Leve	I Setting	for Exter	nal Terminals	Unit:1
Con		VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory setting: 0
	(Setting	s 0-	~100%				
	Whe	en outp	out curren	t is >=	Pr.02-33	, it will ac	ctivate multi-func	tion output terminal (Pr.02-11 to
	Pr.0	2-22 is	set to 27	7).				
ш	Whe	en outp	ut curren	t is < P	r.02-33,	it will acti	ivate multi-function	on output terminal (Pr.02-11 to
	Pr.0	12-22 is	set to 28	3).				
02-	3/1	≁ Out	put Boun	dany fo	r Evterna	I Termin	ale	Unit:0.01
Con		VF	VFPG	SVC		TQCPG		Factory setting: 0.00
mo		VF	VFPG	SVC	FUCPG	TQCPG	FOCPINI	Tactory setting. 0.00
		Setting	s 0.	00~±40	00.00Hz			
Ω						it will ac	tivate the multi-fu	unction terminal (Pr.02-11 to
Ω	Whe	en outp		ncy is		it will ac	tivate the multi-fu	unction terminal (Pr.02-11 to
	Whe	en outp	out freque	ency is	>=02-34,			`
	Whe	en outp	out freque s set to 29 out freque	ency is	>=02-34,			`
	Whe Pr.0 Whe 22 is	en outp 2-22 is en outp s set to	out freque s set to 29 out freque o 30).	ency is a	>=02-34, <02-34, i	t will activ		nction terminal (Pr.02-11 to Pr.02
① 02-	Whe Pr.0 Whe 22 is	en outp 12-22 is en outp s set to	s set to 29 out freque o 30).	ency is an ency in ency in ency is an ency in	>=02-34, <02-34, i	t will activ	vate the multi-fur	nction terminal (Pr.02-11 to Pr.02 Unit: 0.01
1	When Pr.00 When 22 is	en outp 2-22 is en outp s set to	out freque s set to 29 out freque o 30).	ency is a	>=02-34, <02-34, i	t will activ	vate the multi-fur	nction terminal (Pr.02-11 to Pr.02 Unit: 0.01
02-	When Pr.0 When 22 is	en outp 12-22 is en outp s set to	out freque s set to 29 out freque o 30). ection Tim	ency is and an analysis of M	>=02-34, <02-34, i	t will activ	vate the multi-fur	nction terminal (Pr.02-11 to Pr.02 Unit: 0.01
02-Continuo	When Pr.0 When 22 is	en outp 2-22 is en outp s set to VF Setting	out freque s set to 29 out freque o 30). ection Tim VFPG s 0.	ency is an ency in	>=02-34, i <02-34, i echanica FOCPG	t will activ	vate the multi-fur	nction terminal (Pr.02-11 to Pr.02 Unit: 0.01
02-Continuo	When Pr.0 When 22 is strol de	en outp 2-22 is en outp s set to VF Setting en med	out freque s set to 29 out freque o 30). ection Tim VFPG s 0.	ency is an	>=02-34, i <02-34, i echanica FOCPG 0.00 sec	I Brake TQCPG etting 42	vate the multi-fur	Unit: 0.01 Factory setting: 0.00
02-Continuo	Whee Pr.C Whee 22 is 335 Whee Setti	en outp 2-22 is en outp s set to VF Setting en med ing tim	out freque s set to 29 out freque o 30). ection Tim VFPG s 0.	ency is and an ency is	>=02-34, if <02-34, if echanica FOCPG 0.00 sec anction (signature)	I Brake TQCPG etting 42	FOCPM of Pr.02-01~02-F) mechanical br	Unit: 0.01 Factory setting: 0.00 08) is not enabled within this ake error.
Continuo	Whee Pr.C Whee 22 is when 335 Whee setti	en outp 2-22 is en outp s set to VF Setting en med ing tim	out freque s set to 29 out freque o 30). ection Tim VFPG s 0. chanical b	ency is and an ency is	>=02-34, if colors agnetic C	I Brake TQCPG etting 42	FOCPM of Pr.02-01~02- F) mechanical br	Unit: 0.01 Factory setting: 0.00 08) is not enabled within this

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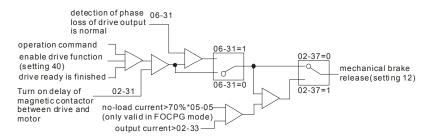
When mechanical brake function (setting 41 of Pr.02-01~02-08) is not enabled within this

setting time, it will display fault code 66 (MCF) mechanical brake error.

02-37	Check ⁻	Check Torque Output Function							
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCPM	Factory setting: 0			
	Settings	s 0	Disal	ole					
		1	Enab	le					

When the drive receives the operation signal, the drive will check if there is torque output.

When this function is enabled, it will release mechanical brake after confirming that there is torque output.



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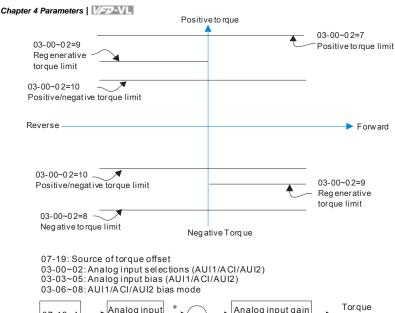
4.2.4 Group 3 Analog Input/Output Parameters

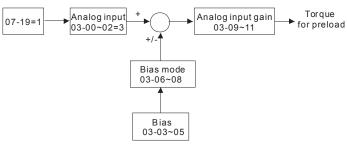
03-00										
					Fa	ctory Se	etting: 1			
03-01										
					Fa	ctory Se	etting: 0			
03-02	✓ Analog Input 3 (AUI2)									
					Fa	ctory Se	etting: 0			
ш										
	Settings			Contro	l Mode					
	Settings	VF	VFPG	SVC	FOCPG	TQCPG	FOCPM			

0: No function 0 1: Frequency command (torque limit under TQR control mode) 2: Torque command (torque limit under speed mode) 3: Preload input 4-5: Reserved 6: P.T.C. thermistor input value 7: Positive torque limit 8: Negative torque limit 9: Regenerative torque limit 10: Positive/negative torque limit 11: Preload Input

Ш	When it is frequency command or TQR speed limit, the corresponding value for 0~ $\!\pm$
	10V/4~20mA is 0 – max. output frequency(Pr.01-00)

- When it is torque command or torque limit, the corresponding value for $0\sim\pm10\text{V}/4\sim20\text{mA}$ is 0-max. output torque (Pr.07-14).
- Ш When it is torque compensation, the corresponding value for $0\sim\pm10\text{V}/4\sim20\text{mA}$ is 0-ratedtorque.





03-03	∦ Analo	g Input	Bias 1 ((AUI1)	Unit: 0.1		
Control mode	VF	VFPG	svc	Factory setting: 0.0			
	Settings	: -1	00.0~1	00.0%			

It is used to set the corresponding AUI1 voltage of the external analog input 0.

03-04	∦ Analo	og Input	Bias 1 ((ACI)	Unit: 0.1	
Control mode	VF	VFPG	svc	FOCPG	Factory setting: 0.0	
	Settings	s -1	00.0~1	00.0%		

It is used to set the corresponding ACI voltage of the external analog input 0.

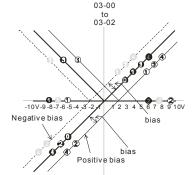
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Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory setting: 0.0
	Settings	s -1	00.0~1	00.0%			
□ It	is used to	set the	corresp	onding A	AUI2 volt	age of the exte	rnal analog input 0.
□ Th	ne relation	n betwee	n exter	nal input	voltage/	current and se	tting frequency is equal to -10~+10\
(4	-20mA) c	orrespor	ds to 0	-60Hz.			
03-06		tive/nega	ative Bi	as Mode	(AUI1)		
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory setting: 0
03-07		tive/nega	ative Bi	as Mode	(ACI) (c	an be set to 0 o	or 1 only)
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory setting: 0
03-08	✓ Posi	tive/nega	ative Bi	as Mode	(AUI2)		
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory setting: 0
	Settings	0	Zei	o bias		•	
		1	Sei	rve bias a	as the ce	nter, lower tha	n bias=bias

In a noisy environment, it is advantageous to use negative bias to provide a noise margin. It is recommended NOT to use less than 1V to set the operating frequency.

Serve bias as the center (unipolar)



2

3

4

(unipolar)

03-05

✓ Analog Input Bias 1 (AUI2)

03-09~03-11 gain is positive

The absolute value of the bias voltage while serving as the center

0 Zero bias

Serve bias as the center, greater than bias=bias

- 1 Serve bias as the center, lower than bias = bias
- 2 Serve bias as the center, greater than bias=bias
- The absolute value of the bias voltage while serving as the center (unipolar)
- 4 Serve bias as the center (unipolar)

03-09	✓ Ana	log Input	Gain 1	(AUI1)		Unit: 0.1
Control mode	VF	VFPG	svc	FOCPG TQ	CPG FOCPM	Factory setting: 100.0
03-10	✓ Ana	log Input	Gain 1	(ACI)		Unit: 0.1
Control mode	VF	VFPG	svc	FOCPG TQ	CPG FOCPM	Factory setting: 100.0
03-11	✓ Ana	log Input	Gain 1	(AUI2)		Unit: 0.1
Control mode	VF	VFPG	svc	FOCPG TQ	CPG FOCPM	Factory setting: 100.0
	Setting	s 0.	0~500.	0%		

Parameters 03-03 to 03-11 are used when the source of frequency command is the analog voltage/current signal.

03-12	∦ Ana	log Input	Delay	Time (AUI1)	Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG TQCPG FOC	Factory setting: 0.01
03-13	∦ Ana	alog Input	Delay	Time (ACI)	Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG TQCPG FOC	PM Factory setting: 0.01

03-14	✓ Anal	log Input	Delay	Time (AL	II2)		Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory setting: 0.01
	Settings	s 0	.00 to 2	.00 sec			

- ☐ Interferences commonly exist with analog signals, such as those entering AUI, ACI and AUI2.

 These interferences constantly affect the stability of analog control and using the Input Noise Filter will create a more stable system.
- If Pr. 03-14 is large, the control will be stable, yet the response to the input will be slow. If Pr. 03-14 is small, the control may be unstable, yet the response to the input will fast.

03-15										
Control mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	Factory setting: 0					
	Settings	0	Dis	able						
		1	Co	ntinue operation at the last frequency						
		2	Decelerate to stop							
		3	Sto	p immediately and display E.F.						

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Ш This parameter determines the behavior when ACI (4-20mA) is lost.

03-16	Reserved							
03-17								
03-20								
	Factory Setting: 0							
	Settings 0-20							

Ш

Cattings		Control Mode						
Settings	VF	VFPG	SVC	FOCPG	TQCPG	FOCPM		
0: Output frequency (Hz)	0	0	0	0	0	0		
1: Frequency command (Hz)	0	0	0	0	0	0		
2: Motor speed (RPM)	0	0	0	0	0	0		
3: Output current (rms)	0	0	0	0	0	0		
4: Output voltage	0	0	0	0	0	0		
5: DC Bus Voltage	0	0	0	0	0	0		
6: Power factor	0	0	0	0	0	0		
7: Power	0	0	0	0	0	0		
8: Output torque	0	0	0	0	0	0		
9: AUI1	0	0	0	0	0	0		
10: ACI	0	0	0	0	0	0		
11: AUI2	0	0	0	0	0	0		
12: q-axis current	0	0	0	0	0	0		
13: q-axis feedback value	0	0	0	0	0	0		
14: d-axis current	0	0	0	0	0	0		
15: d-axis feedback value	0	0	0	0	0	0		
16: q-axis voltage	0	0	0	0	0	0		
17: d-axis voltage	0	0	0	0	0	0		
18: Torque command	0	0	0	0	0	0		
19-20: Reserved								

03-18 / Analog Output Gain 1	Unit: 0.1
03-21 / Analog Output Gain 2	Unit: 0.1
Control VF VFPG SVC FOCPG TQCPG FOCPM mode	Factory setting: 100.0
Settings 0 to 200.0%	

This parameter is set the corresponding voltage of the analog output 0.

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03-19	✓ Anal	✓ Analog Output Value in REV Direction 1							
03-22	✓ Anal	og Outpu	ıt Value	in REV	Directio	n 2			
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Fa	actory setting: 0	
	Settings 0 Absolute value in REV direction								
	1 Output 0V in REV direction								
	2 Enable output voltage in REV direction								
		<u> </u>	10V	quency		10V frequency	10V frequer	ncy	

Selection for the analog output direction

03-19=1

03-19=2

0V

03-23	Analog I	Analog Input Type (AUI1)								
03-24	Analog I	Analog Input Type (AUI2)								
Control mode	VF	VFPG	SVC FOCPG TQCPG FOCPM	Factory setting: 0						
	Settings	0	Bipolar (±10V)							
		1	Unipolar (0-10V)							

When setting to 0 and Pr.03-00=1 or 2, AUI can decide the operation direction. Ш

03-19=0

- When setting to 1 and Pr.03-00=1, the operation direction can be set by FWD/REV terminal.
- When setting to 1 and Pr.03-00=2, the operation direction can be set by setting 39 of Pr.02-01 to Pr.02-08.



4.2.5 Group 4 Multi-Step Speed Parameters

04-00		Unit: 0.01				
04-01		Unit: 0.01				
04-02		Unit: 0.01				
04-03		Unit: 0.01				
04-04		Unit: 0.01				
04-05		Unit: 0.01				
04-06		Unit: 0.01				
04-07		Unit: 0.01				
04-08		Unit: 0.01				
04-09	✓ 9th Step Speed Frequency	Unit: 0.01				
04-10		Unit: 0.01				
04-11						
04-12		Unit: 0.01				
04-13	₩13th Step Speed Frequency					
04-14		Unit: 0.01				
04-15		Unit: 0.01				
Control mode	VF VFPG SVC FOCPG FOCPM	Factory setting: 0.00				
	Settings 0.00 to 400.00 Hz					

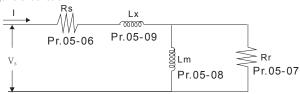
Ш The Multi-Function Input Terminals (refer to Pr.02-01 to 02-08) are used to select one of the AC motor drive Multi-step speeds. The speeds (frequencies) are determined by Pr.04-00 to 04-15 as shown above.

Ш

4.2.6 Group 5 IM Parameters

05-00	Motor Auto	Tuning		
Control mode	VF			Factory setting: 0
	Settings	0	No function	_
		1	Rolling test (Rs, Rr, Lm, Lx, no-load current)	
		2	Static Test	

- Starting auto tuning by pressing RUN key and it will write the measure value into Pr.05-05 to Pr.05-09 (Rs, Rr, Lm, Lx, no-load current).
- ☐ The steps to AUTO-Tuning are: (when setting to 1)
 - Make sure that all the parameters are set to factory settings and the motor wiring is correct.
 - 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 set to 2 if the motor can't separate from the load.
 - 3. Fill in Pr.01-02, Pr.01-01, Pr.05-01, Pr.05-02, Pr.05-03 and Pr.05-04 with correct values. Refer to motor capacity to set accel./decel. time.
 - 4. When Pr.05-00 is set to 1, the AC motor drive will execute auto-tuning immediately after receiving a "RUN" command. (NOTE: the motor will run!)
 - 5. After executing, please check if all values are filled in Pr.05-05 to Pr.05-09.
 - 6. Equivalent circuit



Equivalent circuit for VFD-VL series

If Pr.05-00 is set to 2, it needs to input Pr.05-05.



- 1. 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.
- 3. The no-load current is usually 20~50% X rated current.

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 The rated speed can't be larger or equal to 120f/p. (f: output frequency Pr.01-01, p: Number of Motor Poles Pr.05-04)

05-01	Full-loa	d Curren	t of Mo	tor		
Control mode	VF	VFPG	svc	FOCPG	TQCPG	Factory setting: #.##
	Settings	s (4	0 to 12	0%)*Pr.0	0-01 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 the rated current for 7.5hp (5.5kW) models is 25A and the factory setting is 22.5A. In this way, the current range will be from 10A (25*40%) to 30A (25*120%).

05-02 Rated Power of Motor	Unit: 0.01
Control SVC FOCPG TQCPG mode	Factory setting: #.##
Settings 0.00 to 655.35 kW	Factory Setting: #.##

It is used to set rated power of the motor. The factory setting is the power of the drive.

05-03 Rated Speed of Motor (rpm)	Unit: 1
Control VFPG SVC FOCPG TQCPG mode	Factory setting: 1710
Settings 0 to 65535 rpm	

It is used to set the rated speed of the motor and need to set according to the value indicated on the motor nameplate.

05-04	Number	of Motor	Poles			
Control mode	VF	VFPG	svc	FOCPG	TQCPG	Factory setting: 4
	Settings	2 t	to 48			

It is used to set the number of motor poles (must be an even number).

05-05 No-load	Current of Motor	Unit: Amp
Control VFPG mode	SVC FOCPG TQCPG	Factory setting: #.##
Settings	0 to 100%	

The factory setting is 40% X rated current.

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0.00 to 10.00

Settings

- When the asynchronous motor is driven by the drive, the load and slip will be increased. This parameter can be used to correct frequency and lower the slip to make the motor can run near the synchronous speed under rated current. When the output current is larger than the motor no-load current, the drive will compensate the frequency by Pr.05-13 setting. If the actual speed is slower than expectation, please increase the setting and vice versa.
- It is only valid in SVC mode.

05-14	✓ Slip D	eviati	on Le	vel		Unit: 1
Control mode	VFPG	svc	FO	CPG		Factory setting: 0
	Settings		0 to 1	000% (0: disable))	
05-15	✓ Detect	tion ti	me o	Slip Deviation		Unit: 0.1
Control mode	VFPG	svc	FO	CPG		Factory setting: 1.0
	Settings		0.0 to	10.0 sec		
05-16	✓ Over S	Slip Tr	eatm	ent		
Control mode	VFPG	svc	FO	CPG		Factory setting: 0
	Settings		0	Warn and keep o	peration	
			1	Warn and ramp to	o stop	
			2	Warn and coast t	o stop	

Pr.05-14 to Pr.05-16 are used to set allowable slip level/time and over slip treatment when the drive is running.

05-17		ng Gain		Unit: 1
Control mode	VF	VFPG	svc	Factory setting: 2000
	Settings	0 1	to 10000 (0: disable)	

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, Pr.05-17 can be set to 0. when the current wave motion happens in the low frequency, please increase Pr.05-17.)

05-18	Accur	mulative N	Notor O	peration Time (Min.)	Unit: 1
Contro mode	l VF	VFPG	svc	FOCPG TQCPG FOCPM	Factory setting: 00
	Setting	gs 00	0 to143	9	

Settings

00 to 65535

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05-19	Accui	mulative I	Motor C	peration T	ime (Day)	Unit: 1
Control mode	VF	VFPG	svc	FOCPG 1	TQCPG FOCPM	Factory setting: 00
	Setting	s 00) to 655	535		
□ Pr	. 05-18 a	and Pr.05	-19 are	used to re	ecord the motor ope	ration time. They can be cleared by
se	tting to (00 and tin	ne whic	h is less th	nan 60 seconds will	not be recorded.
05-20	✓ Core	e Loss Co	mpens	ation		Unit: 1
Control mode	svc					Factory setting: 10
	Setting	s 0	to 250%	%		
05-21	Accui	mulative [Orive Po	ower-on Ti	ime (Min.)	Unit: 1
Control mode	VF	VFPG	svc	FOCPG 1	TQCPG FOCPM	Factory setting: 00
	Setting	s 00) to 143	39		
05-22	Accui	mulative [Orive Po	ower-on Ti	ime (day)	Unit: 1
Control mode	VF	VFPG	svc	FOCPG 1	TQCPG FOCPM	Factory setting: 00

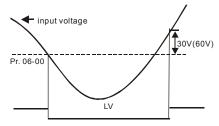
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4.2.7 Group 6 Protection Parameters

06-00	Low Vol	tage Lev	vel	Unit: 0.1	
Control mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	
	Settings	230V	series	160.0~220.0Vdc	Factory Setting: 180.0
		460V	series	320.0~440.0Vdc	Factory Setting: 360.0

Ш It is used to set the Ly level.



06-01	✓ Phase	Phase-loss Protection						
Control mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	Factory setting: 2			
	Settings	0	Wa	rn and keep operation				
		1	Wa	rn and ramp to stop				
		2	Wa	rn and coast to stop				

It is used to set the phase-loss treatment. The phase-loss will effect driver's control characteristic and life.

06-02	✓ Over-	Current	Stall Prevention during Acceleration	Unit: 1
Control mode	VF	VFPG	svc	Factory setting: 00
	Settings	00	0~250% (00: disable)	

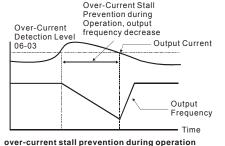
Ш During acceleration, the AC drive output current may increase abruptly and exceed the value specified by Pr.06-02 due to rapid acceleration or excessive load on the motor. When this function is enabled, the AC drive will stop accelerating and keep the output frequency constant until the current drops below the maximum value.

actual acceleration time when over-current stall prevention is enabled

- time

06-03	✓ Over-	-current	Stall Prevention during Operation	Unit: 1
Control mode	VF	VFPG	svc	Factory setting: 00
	Settings	0	0 to 250% (00: disable)	

 \Box If the output current exceeds the setting specified in Pr.06-03 when the drive is operating, the drive will decrease its output frequency by Pr.06-04 setting to prevent the motor stall. If the output current is lower than the setting specified in Pr.06-03, the drive will accelerate (by Pr.06-04) again to catch up with the set frequency command value.



Accel /Decel Time Selection of Stall Prevention at constant speed

	A Accel			
Control mode	VF	VFPG	svc	Factory setting: 0
	Settings	0	by current accel/decel time	
		1	by the 1st accel/decel time	
		2	by the 2nd accel/decel time	
		3	by the 3rd accel/decel time	
		4	by the 4th accel/decel time	
		5	by auto accel/decel time	

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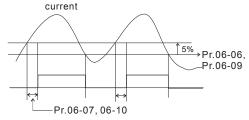


It is used to set the accel./decel. time selection when stall prevention occurs at constant speed.

	# Over-	torque L	retectio	n Selection (OT1)			
Control mode	VF	VFPG	svc	FOCPG TQCPG	FOCPM	Factory setting: (
	Settings	0	0	ver-Torque detec	ction disabled.			
		1		ver-torque detect perate after detec		speed operation, continue to		
		2		ver-torque detect peration after dete		speed operation, stop		
		3		ver-torque detect etection	ion during operation	n, continue to operate after		
		4		Over-torque detection during operation, stop operation after detection				
06-06	✓ Over-t	orque D	etection	n Level (OT1)		Unit: 1		
Control mode	VF	VFPG	svc	FOCPG TQCPG	FOCPM	Factory setting: 150		
	Settings	10	to 250	1%				
06-07	✓ Over-t	orque D	etectior	n Time (OT1)		Unit: 0.1		
Control mode	VF	VFPG	svc	FOCPG TQCPG	FOCPM	Factory setting: 0.1		
	Settings	0.	0 to 60.	.0 sec				
06-08	✓ Over-t	orque D	etection	n Selection (OT2))			
Control mode	VF	VFPG	svc	FOCPG TQCPG	FOCPM	Factory setting: (
	Settings	0	0	ver-Torque detec	ction disabled.			
		1		ver-torque detect perate after detec		speed operation, continue to		
		2		ver-torque detect peration after dete		speed operation, stop		
		3		ver-torque detect etection	ion during operatio	n, continue to operate after		
		4		ver-torque detect etection	ion during operation	n, stop operation after		
06-09	✓ Over-t	orque D	etection	n Level (OT2)		Unit: 1		
Control	VF	VFPG	svc	FOCPG TQCPG	FOCPM	Factory setting: 150		
mode								

06-10		•		Time (OT2)		Unit: 0.1
Control mode	VF	VFPG	svc	FOCPG TQCPG F	ОСРМ	Factory setting: 0.1
	Settings	0.	0 to 60.	0 sec		

Pr.06-05 and Pr.06-08 determine the operation mode of the drive after the over-torque is detected via the following method: if the output current exceeds the over-torque detection level (Pr.06-06) and also exceeds the Pr.06-07 Over-Torque Detection Time, the fault code "OT1/OT2" is displayed. If a Multi-Functional Output Terminal is to over-torque detection, the output is on. Please refer to Pr.02-11~02-22 for details.



06-11	✓ Current I	Limit	Unit: 1
Control mode	FOCPG TQ	CPG FOCPM	Factory setting: 200
(Settings	0 to 250%	

It is used to set the current limit.

06-12	Electron	lectronic Thermal Relay Selection						
Control mode	VF	VFPG	svc	FOCPG TQCPG	FOCPM	Factory setting: 2		
,	Settings	0	Ir	verter motor				
		1	Standard motor					
		2	D	isabled				

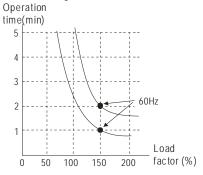
It is used to prevent self-cooled motor overheats under low speed. User can use electrical thermal relay to limit driver's output power.

06-13 ✓ Electronic Thermal Characteristic	Unit: 0.1
Control VF VFPG SVC FOCPG TQCPG FOCPM mode	Factory setting: 60.0
Settings 30.0 to 600.0 sec	_

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The parameter is set by the output frequency, current and operation time of the drive for activating the I²t electronic thermal protection function. The function will be activated for the 150% * setting current for the setting of Pr.06-13.



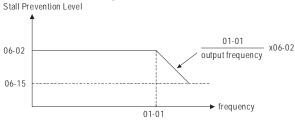
06-14	✓ Hear	t Sink Ov	er-hea	t (OH) Warn	ning	Un	it: 0.1
Control mode	VF	VFPG	svc	FOCPG TO	QCPG FOCPM	Factory setting:	85.0
	Settings	s 0.	0 to 11	0.0 °C			

06-15	✓ Stall I	Preventi	on Limit Level	Unit: 1
Control mode	VF	VFPG	svc	Factory setting: 50
	Settings	0 t	o 100% (refer to Pr.06-02, Pr.06-03)	

 \square When the operating frequency is larger than Pr.01-01, Pr06-02=150%, Pr. 06-03=100% and Pr. 06-15=80%:

Stall Prevention Level during acceleration = 06-02x06-15=150x80%=120%.

Stall Prevention Level at constant speed= 06-03x06-15=100x80%=80%.



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Chapter 4	Parameters	VFD	-VL				
06-16	Present Fa	ault Re	cord				
06-17	Second M	ost Red	cent Fault Record				
06-18	Third Mos	t Recer	nt Fault Record				
06-19	Fourth Re	Fourth Recent Fault Record					
06-20	Fifth Most	Recen	Fault Record				
06-21	Sixth Mos	t Recer	t Fault Record				
Control mode	VF V	FPG	SVC FOCPG TQCPG FOCPM	Factory setting: 0			
	Readings	0	No fault				
		1	Over-current during acceleration (ocA)				
		2	Over-current during deceleration (ocd)				
		3	Over-current during constant speed (ocn)				
		4	Ground fault (GFF)				
		5	IGBT short-circuit (occ)				
		6	Over-current at stop (ocS)				
		7	Over-voltage during acceleration (ovA)				
		8	Over-voltage during deceleration (ovd)				
		9	Over-voltage during constant speed (ovn)				
		10	Over-voltage at stop (ovS)				
		11	Low-voltage during acceleration (LvA)				
		12	Low-voltage during deceleration (Lvd)				
		13	Low-voltage during constant speed (Lvn)				
		14	Low-voltage at stop (LvS)				
		15	Phase loss (PHL)				
		16	IGBT heat sink over-heat (oH1)				
		17	Heat sink over-heat (oH2)(for 40HP above)				
		18	TH1 open loop error (tH1o)				
		19	TH2 open loop error (tH2o)				
		20	Fan error signal output				
		21	Over-load (oL) (150% 1Min)				
		22	Motor over-load (EoL1)				
		23	Reserved				
		24	Motor PTC overheat (oH3)				
		25	Reserved				
		26	Over-torque 1 (ot1)				
		27	Over-torque 1 (ot2)				
		28	Reserved				

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_	20	
4	29	Reserved
3	30	Memory write-in error (cF1)
3	31	Memory read-out error (cF2)
3	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)
	36 37	Clamp current detection error (Hd0) Over-current detection error (Hd1)
	38	Over-voltage detection error (Hd2)
3	39	Ground current detection error (Hd3)
4	10	Auto tuning error (AuE)
4	11	PID feedback loss (AFE)
4	12	PG feedback error (PGF1)
4	13	PG feedback loss (PGF2)
4	14	PG feedback stall (PGF3)
4	1 5	PG slip error (PGF4)
4	16	PG ref input error (PGr1)
4	17	PG ref loss (PGr2)
4	1 8	Analog current input error (ACE)
4	19	External fault input (EF)
Ę	50	Emergency stop (EF1)
ţ	51	Reserved
Ę	52	Password error (PcodE)
Ę	53	Reserved
Ę	54	Communication error (cE1)
ţ	55	Communication error (cE2)
ţ	56	Communication error (cE3)
ţ	57	Communication error (cE4)
ţ	58	Communication Time-out (cE10)

It will record when the fault occurs and force stopping. For the Lv, it will record when it is operation, or it will warn without record.

Magnetic contactor error (MCF)

Phase loss of drive output (MPHL)

PGF5 hardware error

65

66

67

06-30	✓ Settir	✓ Setting Method of Fault Output					
Control mode	VF	VFPG	SVC FOCPG TQCPG FOCPM	Factory setting: 0			
	Settings	0	By settings of Pr.06-22~06-25				
		1	By the binary setting				

- It is used with the settings 35~38 of Pr.02-11~02-22 (Multi-function Output). The fault output selection 1~4 corresponds to Bit 0~3.
- This parameter provides two setting methods for the fault output: setting 0: it is set by the settings of Pr.06-22~Pr.06-25; setting 1: it is set by the binary setting and please refer to the following example for details.

Example:

Assume that

Pr.02-15 (Multi-function Output 5 (MO3)) is set to 35 Fault output option 1 (Pr.06-22).

Pr.02-17 (Multi-function Output 7 (MO5)) is set to 36 Fault output option 2 (Pr.06-23).

Pr.02-19 (Multi-function Output 9 (MO7)) is set to 37 Fault output option 3 (Pr.06-24).

Pr.02-21 (Multi-function Output 11 (MO9)) is set to 38 Fault output option 4 (Pr.06-25).

Assume that external faults output with the following signal: MO3=1, MO5=1, MO7=0 and MO9=1. The corresponding Bit 3~0 is 1011.

Bit 3	Bit 2	Bit 1	Bit 0	Fault code
-	-	•		0: No fault
0	0	0	1	1: Over-current during acceleration (ocA)
				2: Over-current during deceleration (ocd)
				3: Over-current during constant speed (ocn)
				4: Ground fault (GFF)
				5: IGBT short-circuit (occ)

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	_	W. V.	7 900
1.7		Δ^{\dagger}	
1.2	M .	ma .	_

Cnapter 4 Parameters 12				
Bit 3	Bit 2	Bit 1	Bit 0	Fault code
				6: Over-curent at stop (ocS)
				7: Over-voltage during acceleration (ovA)
0	0	1	0	8: Over-voltage during deceleration (ovd)
U	U	'		9: Over-voltage during constant speed (ovn)
				10: Over-voltage at stop (ovS)
				11: Low-voltage during acceleration (LvA)
				12: Low-voltage during deceleration (Lvd)
0	0	1	1	13: Low-voltage during constant speed (Lvn)
				14: Low-voltage at stop (LvS)
				15: Phase loss (PHL)
				16: IGBT heat sink over-heat (oH1)
•		_		17: Heat sink over-heat (oH2)(for 40HP above)
0	1	0	0	18: TH1 open loop error (tH1o)
				19: TH2 open loop error (tH2o)
1	0	0	0	20: Fan error signal output
0	1	0	1	21: over-load (oL) (150% 1Min)
				22: Motor 1 over-load (EoL1)
0	1	1	0	24: Motor PTC overheat (oH3)
				26: over-torque 1 (ot1)
0	1	1	1	27: over-torque 1 (ot2)
				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)
1	1 0 0	0	0	35: W-phase current detection error (cd2)
				36: Clamp current detection error (Hd0)
				37: Over-current detection error (Hd1)
				38: Over-voltage detection error (Hd2)
				39: Ground current detection error (Hd3)
1	0	0	1	40: Auto tuning error (AuE)
	U	U	- 1	
1	0	1	0	41: PID feedback loss (AFE)
ı	U	'	U	42: PG feedback error (PGF1)
0	1	1	1	43: PG feedback loss (PGF2)
U	- 1	- 1	1	44: PG feedback stall (PGF3)
				45: PG slip error (PGF4)
1	0	1	0	46: PG ref input error (PGr1)
				47: PG ref loss (PGr2)
				48: Analog current input error (ACE)
1	0	1	1	49: External fault input (EF)
				50: Emergency stop (EF1)
1	0	0	1	52: Password error (PcodE)
				54: Communication error (cE1)
				55: Communication error (cE2)
1	1	0	0	56: Communication error (cE3)
•		-	-	57: Communication error (cE4)
				58: Communication Time-out (cE10)
				59: PU time-out (cP10)
1	0	0	0	60: Brake chopper error (bF)
1	0	1	1	63: Safety loop error (Sry)

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Bit 3	Bit 2	Bit 1	Bit 0	Fault code
				64: Mechanical brake error (MBF)
1	0	0	0	65: PGF5 hardware error
1	0	1	1	66: Magnetic contactor error (MCF)
1	0	1	1	67: Phase loss of drive output (MPHL)

06-22		Unit: 1
06-23		Unit: 1
06-24		Unit: 1
06-25		Unit: 1
Control mode	VF VFPG SVC FOCPG TQCPG FOCPM	Factory setting: 0
	Settings 0 to 65535 sec (refer to bit table for fault code)	

These parameters can be used with multi-function output (set Pr.02-11 to Pr.02-22 to 35-38) for the specific requirement. When the fault occurs, the corresponding terminals will be activated (It needs to convert binary value to decimal value to fill in Pr.06-22 to Pr.06-25).

Fault and	Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6
Fault code	current	Volt.	OL	SYS	FBK	EXI	CE
0: No fault							
1: Over-current during acceleration (ocA)	•						
2: Over-current during deceleration (ocd)	•						
3: Over-current during constant speed (ocn)	•						
4: Ground fault (GFF)						•	
5: IGBT short-circuit (occ)	•						
6: Over-curent at stop (ocS)	•						
7: Over-voltage during acceleration (ovA)		•					
8: Over-voltage during deceleration (ovd)		•					
9: Over-voltage during constant speed (ovn)		•					
10: Over-voltage at stop (ovS)		•					

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	Bit0	Bit1	Bit2	Bit3	ter 4 Parai	Bit5	Bit6
Fault code	current	Volt.	OL	SYS	FBK	EXI	CE
11: Low-voltage during acceleration (LvA)		•					
12: Low-voltage during deceleration (Lvd)		•					
13: Low-voltage during constant speed (Lvn)		•					
14: Low-voltage at stop (LvS)		•					
15: Phase loss (PHL)						•	
16: IGBT heat sink over-heat (oH1)			•				
17: Heat sink over-heat (oH2)(for 40HP above)			•				
18: TH1 open loop error (tH1o)			•				
19: TH2 open loop error (tH2o)			•				
20: Fan error signal output						•	
21: over-load (oL) (150% 1Min)			•				
22: Motor 1 over-load (EoL1)			•				
23: Reserved							
24: Motor PTC overheat (oH3)			•				
25: Reserved							
26: over-torque 1 (ot1)			•				
27: over-torque 1 (ot2)			•				
28: Reserved							
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				•			

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(cd2)

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Fault code	Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6
rault code	current	Volt.	OL	SYS	FBK	EXI	CE
35: W-phase current detection error (cd3)				•			
36: 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: PID feedback loss (AFE)					•		
42: PG feedback error (PGF1)					•		
43: PG feedback loss (PGF2)					•		
44: PG feedback stall (PGF3)					•		
45: PG slip error (PGF4)					•		
46: PG ref input error (PGr1)					•		
47: PG ref loss (PGr2)						•	
48: Analog current input error (ACE)						•	
49: External fault input (EF)						•	
50: Emergency stop (EF1)						•	
51: Reserved							
52: Password error (PcodE)				•			
53: Reserved							
54: Communication error (cE1)							•
55: Communication error (cE2)							•
56: Communication error (cE3)				_			•
57: Communication error (cE4)						_	•
58: Communication Time-out (cE10)							•
59: PU time-out (cP10)							•

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				Chap	ter 4 Para	meters	/FD-VL
Fault code	Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6
rault code	current	Volt.	OL	SYS	FBK	EXI	CE
60: Brake chopper error (bF)						•	
61-62: Reserved							
63: Safety loop error (Sry)				•			
64: Mechanical brake error (MBF)						•	
65: PGF5 hardware error				•			
66: Magnetic contactor error (MCF)						•	
67: Phase loss of drive output (MPHL)						•	

06-26	✓ PTC (Positive	Temperature Coefficient) Detection Selection	
Control mode	VF	VFPG	SVC FOCPG TQCPG FOCPM	Factory setting: 0
	Settings	0	Warn and keep operating	
		1	Warn and ramp to stop	

It is used to set the treatment after detecting PTC.

06-27	⊮ PTC	Level			Unit: 0.1
Control mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	Factory setting: 50.0
	Setting	s 0.	0 to 10	0.0%	

It is used to set the PTC level, and the corresponding value for 100% is max. analog input value.

06-28		Time for	r PTC D	etection			Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory setting: 0.20
	Settings	0.	00 to 10	0.00 sec			
06-29	UPS or I	Battery \	/oltage				Unit: 0.1
06-29 Control mode	UPS or E	Battery \	/oltage svc	FOCPG	TQCPG	FOCPM	Unit: 0.1
Control		VFPG			TQCPG	FOCPM	Unit: 0.1 Factory setting: 48.0

Chapter 4 Parameters | V/372-VL

☐ It is used with the setting 43 (EPS function) of Pr.02-01~02-08 (Multi-Function Input Command).

		,-					
06-31	Phase	Loss of D	rive Ou	ıtput (MF	PHL)		_
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCPM		Factory setting: 0
	Setting	s 0	D	isable			_
		1	E	nable			
□ W	hen it is	set to 1, i	t will a	uto detec	t if the connection betwe	en the drive	and motor is normal
wł	nenever	the drive	runs.				
	_						
06-32	Accum	ulative D	rive Po	wer-on T	ime at the First Fault (m	in.)	
06-34	Accum	ulative D	rive Po	wer-on T	ime at the Second Faul	t (min.)	
06-36	Accum	ulative D	rive Po	wer-on T	ime at the Third Fault (r	nin.)	
06-38	Accum	ulative D	rive Po	wer-on T	ime at the Fourth Fault	(min.)	
06-40	Accum	ulative D	rive Po	wer-on T	ime at the Fifth Fault (m	in.)	
06-42	Accum	ulative D	rive Po	wer-on T	ime at the Sixth Fault (r	nin.)	
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCPM		Factory setting: 0
	Setting	s 00) to 143	19			-
06-33	Accum	ulative D	rive Po	wer-on T	ime at the First Fault (d	ay)	
06-35	Accum	ulative D	rive Po	wer-on T	ime at the Second Faul	t (day)	
06-37	Accum	ulative D	rive Po	wer-on T	ime at the Third Fault (o	lay)	
06-39	Accum	ulative D	rive Po	wer-on T	ime at the Fourth Fault	(day)	
06-41	Accum	ulative D	rive Po	wer-on T	ime at the Fifth Fault (d	ay)	
06-43	Accum	ulative D	rive Po	wer-on T	ime at the Sixth Fault (c	lay)	
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCPM		Factory setting: 0
	Setting	s 00	to 655	35			
06-44	✓ Oper	ration Spe	eed of I	Emergen	cy Power Mode		Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCPM		Factory setting: 0.00
	Settings	s 0.	00 to 4	00.00Hz			

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Ш Max. operation speed F_{EPS} in emergency power mode:

$$\mathsf{F}_{\mathsf{EPS}} \texttt{=} 06\text{-}29/01\text{-}02^*(1/\sqrt{2}\)^*01\text{-}01^*(1/2)$$

When Pr.06-44 > F_{EPS} , the speed in emergency power mode will be operated by F_{EPS} .

When Pr.06-44 ≤ F_{EPS}, the speed in emergency power mode will be operated by Pr.06-44.

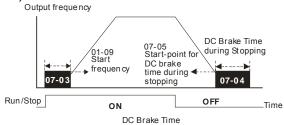
06-45	⊮ Low-	voltage F	Protection	
Control mode	VF	VFPG	SVC FOCPG TQCPG FOCPM	Factory setting: 0
	Settings	0	Fault and coast to stop	
		1	Warn and coast to stop	

07-00	⊮ Brak	e Chopp	er I eve	اد	Unit: 0.1
Contro	I '	VFPG	SVC	FOCPG TQCPG FOCPM	Offic. 0.1
mode	0 - 111			050.0.450.0)///-	F. d. O. W
	Setting			350.0~450.0Vdc	Factory Setting: 380.0
		46UV	series	700.0~900.0Vdc	Factory Setting: 760.0
I I	his paran	neter sets	the Do	C-bus voltage at which the brake	chopper is activated.
07-01	Reserv	ed			
07-02	₩ DC	Brake Cu	rrent Le	evel	Unit: 1
Contro mode	l VF	VFPG	svc		Factory Setting: 0
	Setting	s 0	to 1009	%	
ı T	his paran	neter sets	the lev	vel of DC Brake Current output to	the motor during start-up and
s	topping. \	When set	ting DC	Brake Current, the Rated Curre	ent (Pr.00-01) is regarded as 100%.
	•		•		, ,
li li	t is recom	mended t	o start	with a low DC Brake Current Lev	vel and then increase until proper
					vel and then increase until proper
h	olding tor	que has l	been at	ttained.	
h III V	olding tor Vhen it is	que has l	been at	ttained.	
h D V	olding tor	que has l	been at	ttained.	
h III V	olding tor Vhen it is ralue.	que has l	been at	ttained.	
h V	volding tor When it is value.	que has l	been at	ttained. PG/FOCPM mode, it can enable	DC brake function by setting to an Unit: 0.1
07-03	volding tor When it is value.	que has l in FOCP Brake Tin VFPG	been at G/TQC ne durir	ttained. PG/FOCPM mode, it can enable ng Start-up FOCPG FOCPM	DC brake function by setting to an
V V 07-03 Control mode	when it is ralue. When DC VF Setting	que has l in FOCP Brake Tin VFPG s 0.	oeen at G/TQC ne durin svc	ttained. PG/FOCPM mode, it can enable ng Start-up FOCPG FOCPM	DC brake function by setting to an Unit: 0.1
V 07-03 Contro	When it is alue. When DC VF Setting	que has l in FOCP Brake Tin VFPG s 0. neter dete	ne durir svc 0 to 60	ttained. PG/FOCPM mode, it can enable ng Start-up FOCPG FOCPM .0 sec	DC brake function by setting to an Unit: 0.1 Factory Setting: 0.0
07-03 Control mode	Vhen it is alue. When to be alue. When the beautiful of	que has l in FOCP Brake Tin VFPG s 0. neter dete	ne durir svc 0 to 60	ttained. PG/FOCPM mode, it can enable ng Start-up FOCPG FOCPM 1.0 sec s the duration of the DC Brake cu	DC brake function by setting to an Unit: 0.1 Factory Setting: 0.0 urrent after a RUN command. Unit: 0.1
07-04 Control	Vhen it is alue. VF Setting This param	que has l in FOCPe Brake Tin VFPG s 0. neter dete Brake Tin VFPG	ne during svc 0 to 60 ermines during e	ttained. PG/FOCPM mode, it can enable ng Start-up FOCPG FOCPM 1.0 sec 1.0 the duration of the DC Brake cut ng Stopping FOCPG FOCPM	DC brake function by setting to an Unit: 0.1 Factory Setting: 0.0 urrent after a RUN command. Unit: 0.1
07-03 Contro mode	When it is value. We DC VF Setting We DC VF Setting VF Setting	gue has lin FOCPe Brake Tin VFPG s 0. Brake Tin VFPG Srake Tin VFPG s 0.	ne during svc 0 to 60 ermines during svc 0 to 60 0 to	ttained. PG/FOCPM mode, it can enable ng Start-up FOCPG FOCPM 1.0 sec 1.0 the duration of the DC Brake cut ng Stopping FOCPG FOCPM	Unit: 0.1 Factory Setting: 0.0 urrent after a RUN command. Unit: 0.1 Factory Setting: 0.0
07-03 Contro mode	w DC VF Setting A DC VF Setting This param	gue has lin FOCPe Brake Tin VFPG s 0. Brake Tin VFPG Srake Tin VFPG s 0.	ne during svc 0 to 60 ermines 0 to 60 ermines	ttained. PG/FOCPM mode, it can enable ng Start-up FOCPG FOCPM 1.0 sec s the duration of the DC Brake cu ng Stopping FOCPG FOCPM 1.0 sec s the duration of the DC Brake cu	Unit: 0.1 Factory Setting: 0.0 urrent after a RUN command. Unit: 0.1 Factory Setting: 0.0
O7-03 Control mode TO7-04 Control mode	When it is ralue. Vere Setting This param When it is ralue.	gue has lin FOCPo	ne during svc 0 to 60 ermines 0 to 60 ermines	ttained. PG/FOCPM mode, it can enable ng Start-up FOCPG FOCPM 1.0 sec s the duration of the DC Brake cu ng Stopping FOCPG FOCPM 1.0 sec s the duration of the DC Brake cu	Unit: 0.1 Factory Setting: 0.0 urrent after a RUN command. Unit: 0.1 Factory Setting: 0.0

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This parameter determines the frequency when DC Brake will begin during deceleration. When the setting is less than start frequency (Pr.01-09), start-point for DC brake will begin from the min. frequency.



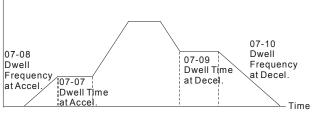
07-06 DC Brake Proportional Gain	Unit: 1
Control VF VFPG SVC mode	Factory Setting: 50
Settings 1 to 500Hz	

It is used to set the output voltage gain when DC brake.

07-07	✓ Dwe	II Time at	Accel.		Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG FOCPM	Factory Setting: 0.00
	Settings	s 0.	00 to 6	00.00 sec	
07-08	✓ Dwe	II Freque	ncy at A	Accel.	Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG FOCPM	Factory Setting: 0.00
	Settings	s 0.	00 to 4	00.00 Hz	
07-09	✓ Dwe	II Time at	Decel.		Unit: 0.01
Control mode	VF	VFPG	svc	FOCPG FOCPM	Factory Setting: 0.00
	Settings	s 0.	00 to 6	00.00 sec	
07-10	✓ Dwe	II Freque	ncy at [Unit: 0.01	
Control mode	VF	VFPG	svc	FOCPG FOCPM	Factory Setting: 0.00
	Settings	s 0.	00 to 4	00.00 Hz	

- In the heavy load situation, Dwell can make stable output frequency temporarily.
- Pr.07-07 to Pr.07-10 are for heavy load to prevent OV or OC occurs.





Dwell at accel./decel.

07-11	1 ✓ Fan Control								
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCPM	Factory Setting: 2			
	Settings	0	Fa	an always	s ON				
		1	1	1 minute after AC motor drive stops, fan will be OFF					
		2	A	AC motor drive runs and fan ON, AC motor drive stops and fan OFF					
		3	Fa	an ON to	run when preliminar	y heat sink temperature attained			
		4	Fa	an always	s OFF				

- This parameter is used for the fan control.
- When setting to 3, fan will start to run until temperature is less than 40°C if temperature exceeds 40°C.

07-12	✓ Torque (Command	Unit: 0.1
Control mode	TQCPG		Factory Setting: 0.0
	Settings	-100.0 to 100.0% (Pr. 07-14 setting=100%)	_

This parameter is torque command. When Pr.07-14 is 250% and Pr.07-12 is 100%, the actual torque command = 250X100% X motor rated torque.

07-13	✓ Torque Command Source						
Control mode	TQCPG			Factory Setting: 2			
	Settings	0	Digital keypad	_			
		1	RS485 serial communication (RJ-11)				
		2	Analog signal (Pr.03-00)				

This parameter is torque command source and the torque command is in Pr.07-12.

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07-14	07-14 ✓ Maximum Torque Command						Unit: 1
Control mode	VF	VFPG	svc	FOCPG T	TQCPG	FOCPM	Factory Setting: 100
	Settings	s 0	to 300%	6			

This parameter is for the max. torque command (motor rated torque is 100%).

07-15		ne of Torque Command	Unit: 0.001
Control mode	TQCPG		Factory Setting: 0.000
	Settings	0.000 to 1.000 sec	

When the setting is too long, the control will be stable but the control response will be delay. When the setting is too short, the response will be quickly but the control maybe unstable. User can adjust the setting by the control and response situation.

07-16 Speed Limit Selection Control **TQCPG** Factory Setting: 0 mode Settings 0 By Pr.07-17 and Pr.07-18 1 Frequency command source (Pr.00-14) torque torque toraue frequency frequency frequency 07-18 07-17 07-18 00-14 07-17 00-14 07-16=1 07-16=1 Pr.07-16=0 When it is reverse running, When it is forward running, Running/opposite running running direction is limited running direction is limited direction are

07-17	✓ Torque	Mode+Speed Limit	Unit: 1
07-18	✓ Torque	Mode-Speed Limit	Unit: 1
Control mode	TQCPG		Factory Setting: 10
	Settings	0 to 120%	

opposite running direction

is limited by Pr.07-18.

by Pr.00-14

limited by Pr.07-17

and Pr.07-18.

by Pr.07-17

opposite running direction

is limited by Pr.00-14.

 \square These parameters are used in the torque mode to limit the running direction and opposite direction. (Pr.01-00 max. output frequency=100%)

	Chapter 4 Parameters V						
07-19	07-19 ✓ Source of Torque Offset						
Control mode	SVC FOCE	PG TO	QCPG FOCPM		Factory Setting: 0		
	Settings	0	Disable				
		1	Analog input (Pr.03-	-00)			
		2	Torque offset setting	(Pr.07-20)			
		3	Control by external t	erminal (by Pr.07-21 to Pr	:.07-23)		
ш т	his parameter i	s the	source of torque offse	t.			
□ W	/hen it is set to	3, the	e source of torque offs	et will decide to Pr.07-21,	Pr.07-22 and Pr.07-23		
b	y the multi-fund	tion ir	nput terminals setting	(31, 32 or 33).			
02-01~0	2-08 is set to 3	1 02-	-01~02-08 is set to 32	02-01~02-08 is set to 33	Torque offset		
	OFF		OFF	OFF	None		
	OFF		OFF	ON	07-23		
	OFF		ON	OFF	07-22		
	OFF		ON	ON	07-23+07-22		
	ON		OFF	OFF	07-21		
	ON		OFF	ON	07-21+07-23		
-	ON		ON	OFF	07-21+07-22		
	ON		ON	ON	07-21+07-22+07-23		

07-20	✓ Torque Of	fset Setting	Unit: 0.1
Control mode	SVC FOCE	PG TQCPG FOCPM	Factory Setting: 0.0
	Settings	0.0 to 100.0%	

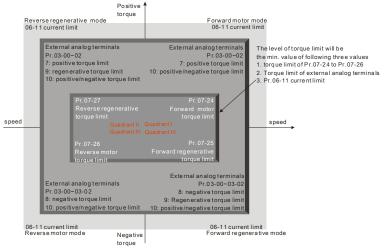
Ш This parameter is torque offset. The motor rated torque is 100%.

07-21	Unit: 0.1
Control SVC FOCPG TQCPG FOCPM mode	Factory Setting: 30.0
Settings 0.0 to 100.0%	
07-22	Unit: 0.1
Control SVC FOCPG TQCPG FOCPM mode	Factory Setting: 20.0
Settings 0.0 to 100.0%	_

When it is set to 3, the source of torque offset will decide to Pr.07-21, Pr.07-22 and Pr.07-23 by the multi-function input terminals setting (19, 20 or 21). The motor rated torque is 100%.

07-24		Unit: 1					
07-25	✓ Forward Regenerative Torque Limit	Unit: 1					
07-26	✓ Reverse Motor Torque Limit	Unit: 1					
07-27							
Control mode	FOCPG TQCPG FOCPM	Factory Setting: 200					
	Settings 0 to 300%	_					

The motor rated torque is 100%. The settings for Pr.07-24 to Pr.07-27 will compare with Pr.03-00=5, 6, 7, 8. The minimum of the comparison result will be torque limit.

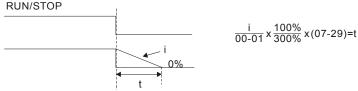


Chapter 4	Chapter 4 Parameters V/=v/-VL									
07-28	07-28 ★ Emergency Stop (EF) & Forced Stop Selection									
Control mode	VF	VFPG	S	VC FOCPG TQCPG FOCPM	Factory Setting: 0					
	Settings		0	Coast to stop						
			1	By deceleration Time 1						
			2	By deceleration Time 2						
			4	By deceleration Time 4						
			5	By Pr.01-31						

 \Box When the multi-function input terminal is set to 10 or 14 and it is ON, the AC motor drive will be operated by Pr.07-28.

07-29								
Control mode	FOCPG TQC	PG FOCPM	Factory Setting: 0.000					
	Settings	0.000 to 1.000 sec						

- \Box When the elevator is stop and the mechanical brake is engaged, the drive will stop output. At the same time, it will produce the noise from the reacting force between the motor and the mechanical brake. This parameter can be used to decrease this reacting force and lower the noise.
- \square It is used to set the time for decreasing torque to 0%.





4.2.9 Group 8 PM Parameters

08-00	Motor Au	Motor Auto Tuning							
Control mode	FOCPM		Factory setting: 0						
	Settings	0	No function						
		1	Only for the unloaded motor, auto measure the angle between magnetic pole and PG origin (08-09)						
		2	For PM parameters						
		3	Auto measure the angle between magnetic pole and PG origin (08-09)						

- ш For setting 1: It can auto measure the angle between magnetic pole and PG origin. Please notice the following items when measuring:
 - Please unload before tuning.
 - 2. If brake is controlled by drive, the drive will act by the normal operation to finish tuning after wiring and setting brake control parameters.
 - 3. If brake is controlled by the host controller, it needs to make sure that brake is in release state before tuning.
 - 4. Make sure the setting of Pr.10-02 is correct. Because the wrong setting of Pr.10-02 will cause wrong position of magnetic pole and also the wrong angle between magnetic pole and PG origin.
- Ш For setting 2: Starting auto tuning by pressing RUN key and it will write the measure value into Pr.08-05, Pr.08-07 (Rs, Lg) and Pr.08-08 (back EMF).

The steps to AUTO-Tuning are: (Dynamic measure)

- 1. Make sure that all the parameters are set to factory settings and the motor wiring is correct.
- 2. Motor: Fill in Pr.08-01, Pr.08-02, Pr.08-03 and Pr.08-04 with correct values. Refer to motor capacity to set accel./decel. time.
- 3. When Pr.08-00 is set to 2, the AC motor drive will execute auto-tuning immediately after receiving a "RUN" command. (NOTE: the motor will run! The shaft needs to be locked with external force.)
- 4. After executing, please check if all values are filled in Pr.08-05 and Pr.08-07.
- For setting 3: It can auto measure the angle between magnetic pole and PG origin. Please notice the following items when measuring:
 - 1. It can be loaded motor or unloaded motor before tuning.

- 2. If brake is controlled by drive, the drive will act by the normal operation to finish tuning after wiring and setting brake control parameters.
- If brake is controlled by the host controller, it needs to make sure that brake is in release state before tuning.



- The rated speed can't be larger or equal to 120f/p.
- Please notice that if the electromagnetic valve and brake is not controlled by the AC motor drive, please release it by manual.
- It is recommended to set Pr.08-00 to 1 (unloaded motor) for the accurate calculation.
 If it needs to execute this function with loaded motor, please balance the carriage before execution
- if it doesn't allow balancing the carriage in the measured environment, it can set Pr.08-00=3 for executing this function. It can execute this function with loaded motor by setting Pr.08-00=3. It will have a difference of 15~30° by the different encoder type.
- It will display the warning message "Auto tuning" on the digital keypad during measuring until the measure is finished. Then, the result will be saved into Pr.08-09.
- It will display "Auto Tuning Err" on the keypad when stopping by the fault of the AC motor drive or human factor to show the failed detection. At this moment, please check the connections of the wirings of the AC motor drives. If it displays "PG Fbk Error" on the digital keypad, please change the setting of Pr.10-02 (if it is set to 1, please change it to 2). If it displays "PG Fbk Loss" on the digital keypad, please check the feedback of Z-phase pulse.

08-01	Full-load Current of Motor							
Control mode	FOCPM		Factory setting: #.##					
	Settings	(40 to 120%)*Pr.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 the rated current for 7.5hp (5.5kW) models is 25A and the factory setting is 22.5A. In this way, the current range will be from 10A (25*40%) to 30A (25*120%).

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08-02		ower of Motor	Unit: 0.01
Control mode	FOCPM		Factory setting: #.##
	Settings	0.00 to 655.35 kW	
□ Iti	is used to se	et rated power of the motor. The factory se	etting is the power of the drive.
08-03	✓ Rated S	Speed of Motor (rpm)	Unit: 1
Control mode	FOCPM		Factory setting: 1710
	Settings	0 to 65535	
🕮 It i	is used to se	et the rated speed of the motor and need to	o set according to the value indicated
or	the motor n	nameplate.	
08-04	Number of	Motor Poles	
Control mode	FOCPM		Factory setting: 4
	Settings	2 to 96	
Ш It∶i	is used to se	et the number of motor poles (must be an	even number).
08-05		et the number of motor poles (must be an	Unit: 0.00
	is used to se	et the number of motor poles (must be an	Unit: 0.00
08-05 Control	Rs of Moto	et the number of motor poles (must be an	Unit: 0.00
08-05 Control mode	Rs of Moto FOCPM Settings	et the number of motor poles (must be an or $0.000{\sim}65.535\Omega$	Unit: 0.00° Factory setting: 0.000
08-05 Control mode	Rs of Motor FOCPM Settings	et the number of motor poles (must be an or $0.000{\sim}65.535\Omega$	Unit: 0.001 Factory setting: 0.000 Unit: 0.1
08-05 Control mode	Rs of Moto FOCPM Settings	et the number of motor poles (must be an or $0.000{\sim}65.535\Omega$	Unit: 0.001 Factory setting: 0.000 Unit: 0.1
08-05 Control mode 08-06 Control mode 08-07	Rs of Motor FOCPM Settings	et the number of motor poles (must be an or $0.000{\sim}65.535\Omega$	Unit: 0.001 Factory setting: 0.000 Unit: 0.1 Factory setting: 0.0 Unit: 0.1
08-05 Control mode 08-06 Control mode	Rs of Motor FOCPM Settings Ld of Motor FOCPM	et the number of motor poles (must be an or $0.000{\sim}65.535\Omega$	Unit: 0.00° Factory setting: 0.00° Unit: 0.° Factory setting: 0.0 Unit: 0.°
08-05 Control mode 08-06 Control mode 08-07 Control	Rs of Motor FOCPM Settings Ld of Motor FOCPM Lq of Motor	et the number of motor poles (must be an or $0.000{\sim}65.535\Omega$	Unit: 0.00° Factory setting: 0.00° Unit: 0.° Factory setting: 0.0 Unit: 0.°
08-05 Control mode 08-06 Control mode 08-07 Control	Rs of Motor FOCPM Settings Ld of Motor FOCPM Lq of Motor FOCPM Settings	et the number of motor poles (must be an or or 0.000~65.535Ω	Unit: 0.000 Factory setting: 0.000 Unit: 0.000 Unit: 0.000 Factory setting: 0.000 Factory setting: 0.000
08-05 Control mode 08-06 Control mode 08-07 Control mode	Rs of Motor FOCPM Settings Ld of Motor FOCPM Lq of Motor FOCPM Settings	et the number of motor poles (must be an or $0.000\sim65.535\Omega$	Unit: 0.001 Factory setting: 0.000 Unit: 0.1 Factory setting: 0.0 Unit: 0.1 Factory setting: 0.0 Unit: 0.1 Factory setting: 0.0

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motor is operated in the rated speed.

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☐ It can get RMS value by Pr.08-00=2 (Motor Auto Tuning).

08-09	Angle bet	ween Magnetic Pole and PG Origin	Unit: 0.1
Control mode	FOCPM		Factory setting: 360.0
	Settings	0.0~360.0°	

This function is used to measure the angle between magnetic pole and PG origin.

08-10	Magnetic	Magnetic Pole Re-orientation									
Control mode	FOCPM		Factory setting: 0								
	Settings	0	Disable								
		1	Enable								

- Please use with Pr.11-00 bit15=1.
- This function is used for searching magnetic pole position and only for permanent magnet motor.
- When it doesn't have origin-adjustment for encoder (Pr.08-09 is 360.0), it can only ensure that the motor operation efficiency can be up to 86% of the best efficiency. In this situation, when the operation efficiency needs to be improved, user can re-power on or set Pr.08-10 to 1 to get the magnetic pole orientation.

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4.2.10 Group 9: Communication Parameters

When the AC motor drive is controlled by RS-485 serial communication, a converter, VFD-USB01 or IFD8500, should be connected between the AC motor drive and PC.



09-00	⊮ Comm									
Control mode	VF	VFPG	svc	FOCPG TQCPG FOCPM	Factory Setting: 1					
	Settings	1	to 254							

Ш 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	✓ Trans	smission	Speed				Unit: 0.1
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory Setting: 9.6
	Settings	s 4.	8 to 11	5.2kbps			

 Ω This parameter is used to set the transmission speed between the RS485 master (PLC, PC, etc.) and AC motor drive.

09-02	✓ Transmission Fault Treatment						
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCPM	Factory Setting: 3	
	Settings	0	V	arn and	keep operating		
		1	W	arn and I	RAMP to stop		
		2	R	eserved			
		3	N	o action a	and no display		

 \Box This parameter is set to how to react if transmission errors occur.

09-03	✓ Time-	out De	tection			Unit: 0.1
Control mode	VF	VFPG	svc	FOCPG	TQCPG FOCPM	Factory Setting: 0.0
-	Settings		0.0 ~ 10	00.0 sec	(0.0: disable)	

It is used to set the communication time-out time.

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09-04	✓ Comr	nunicatio	n Protocol	
Control mode	VF	VFPG	SVC FOCPG TQCPG FOCPM	Factory Setting: 13
	Settings	0	Modbus ASCII mode, protocol <7,N,	1>
		1	Modbus ASCII mode, protocol <7,N,2	2>
		2	Modbus ASCII mode, protocol <7,E,	1>
		3	Modbus ASCII mode, protocol <7,0,	1>
		4	Modbus ASCII mode, protocol <7,E,2	2>
		5	Modbus ASCII mode, protocol <7,0,3	2>
		6	Modbus ASCII mode, protocol <8,N,	1>
		7	Modbus ASCII mode, protocol <8,N,2	2>
		8	Modbus ASCII mode, protocol <8,E,	1>
		9	Modbus ASCII mode, protocol <8,0,	1>
		10	Modbus ASCII mode, protocol <8,E,2	2>
		11	Modbus ASCII mode, protocol <8,0,3	2>
		12	Modbus RTU mode, protocol <8,N,1	>
		13	Modbus RTU mode, protocol <8,N,2	>
		14	Modbus RTU mode, protocol <8,E,1>	>
		15	Modbus RTU mode, protocol <8,O,1	>
		16	Modbus RTU mode, protocol <8,E,2	>
		17	Modbus RTU mode, protocol <8,O,2	>

Ш 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

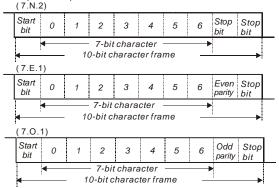
RTU mode:

Each 8-bit data is the combination of two 4-bit hexadecimal characters. For example, 64 Hex.

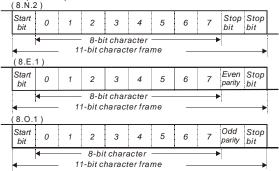
2 Data Format

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10-bit character frame (For ASCII):



11-bit character frame (For RTU):



3. Communication Protocol

3.1 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:
to	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) to DATA 0	Contents of data: n×8-bit data, n<=16
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, communication 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 08H: loop detection 10H: write multiple registers

The available function codes and examples for VFD-VL are described as follows:

(1) 03H: multi read, read data from registers.

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

ASCII mode:

Command message:

Command message.				
STX	٠.,			
Address	'0'			
Address	'1'			
E	'0'			
Function	'3'			
	'2'			
Starting data	'1'			
address	'0'			
	'2'			
Number of data	'0'			
(count by word)	'0'			

Response message:

Response message.					
STX	٠.,				
Address	'0'				
Address	'1'				
F	'0'				
Function	'3'				
Number of data	'0'				
(Count by byte)	'4'				
Content of starting	'1'				
address	'7'				
2102H	'7'				
210211	'0'				

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Command message:	
	'0'
	'2'
LRC Check	,D,
LIVO OTIECK	'7'
END	CR
LIND	LF

Response message:

	'0'
Content of address	'0'
2103H	'0'
	'0'
LRC Check	'7'
LKC CHECK	'1'
FND	CR
END	LF

RTU mode:

Command message:

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

Response message:

response message.		
Address	01H	
Function	03H	
Number of data	04H	
(count by byte)	0711	
Content of address	17H	
2102H	70H	
Content of address	00H	
2103H	00H	
CRC CHK Low	FEH	
CRC CHK High	5CH	

(2) 06H: single write, write single data to register.

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

ASCII mode:

Command message:

Communa moccago.	
STX	٠.,
Address	'0'
	'1'
Function	'0'
i unction	'6'
	'0'
Data address	'1'
Data address	'0'
	'0'
Data content	'1'
	'7'
	'7'
	'0'
LRC Check	'7'
	'1'
END	CR
	LF

Response message:	
STX	
Address	'0'
Address	'1'
Function	΄Ο'
1 unction	·6
	΄Ο'
Data address	'1'
Data address	'0'
	'0'
Data content	'1'
	'7'
	'7'
	΄Ο΄
LRC Check	'7'
	'1'
END	CR
	LF
	'1' CR

RTU mode:

Command message:

Address	01H
Function	06H
Data address	01H
	00H
Data content	17H
	70H

Response message:

Address	01H
Function	06H
Data address	01H
	00H
Data content	17H
	70H

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CRC CHK Low 86H CRC CHK High 22H

CRC CHK Low	86H
CRC CHK High	22H

Response message:

(3) 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:		
STX	·.·	
Address 1	'0'	
Address 0	'1'	
Function 1	'1'	
Function 0	'0'	
	'0'	
Starting data	' 5'	
address	'0'	
	'0'	
	'0'	
Number of data	'0'	
(count by word)	'0'	
i	'2'	
Number of data	'0'	
(count by byte)	'4'	
The first data content	'1'	
	'3'	
	'8'	
	'8'	
	'0'	
The second data content	'F'	
	'A'	
	'0'	
LRC Check	'9'	
	'A'	
END	CR	
LIND	LF	

·:'
'0'
'1'
'1'
'0'
'0'
' 5'
ΰ,
'0'
'0'
'0'
·0'

LRC Check

END

Έ'

'8' CR

LF

RTU mode:

Command message:

Command message.	
01H	
10H	
05H	
00H	
00H'	
02H	
04	
13H	
88H	
0FH	
A0H	
·9'	
'A'	

Response message:

Response message:		
Address	01H	
Function	10H	
Starting data address	05H	
	00H	
Number of data	00H	
(count by word)	02H	
CRC Check Low	41H	
CRC Check High	04H	

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3.4 Check sum

ASCII mode:

LRC (Longitudinal Redundancy Check) is calculated by summing up, module 256, 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, reading 1 word from address 0401H of the AC drive with address 01H.

STX	·.·
Address 1	'0'
Address 0	'1'
Function 1	,0,
Function 0	'3'
	'0'
Starting data address	'4'
Starting data address	'0'
	'1'
Number of data	'0'
	'0'
	'0'
	'1'
LRC Check 1	'F'
LRC Check 0	'6'
END 1	CR
END 0	LF

01H+03H+04H+01H+00H+01H=0AH, the 2's-complement negation of 0AH is F6H.

RTU mode:

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

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 register.

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.

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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;
}
```

3.5 Address list

The contents of available addresses are shown as below:

Content	Address	Function			
AC drive Parameters	GGnn H	GG means parameter group, nn means parameter number, for example, the address of Pr 4-01 is 0401H. Referencing to chapter 5 for the function of each parameter. When reading parameter by command code 03H, only one parameter can be read at one time. O: No function			
Command Write only	2000H				
		Bit 4-5	00B: No function 01B: FWD 10B: REV 11B: Change direction		
		Bit 6-7	00B: 1st accel/decel 01B: 2nd accel/decel 10B: 3rd accel/decel 11B: 4th accel/decel		
		Bit 8-11	Represented 16 step speeds.		

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			Chapter 4 Parameters V/=>>-VL
Content	Address		Function
		Bit 12	1: disable bit 06-11
		Bit 13~14	00B: No function
			01B: operated by digital keypad
			02B: operated by Pr.00-15 setting
			03B: change operation source
		Bit 15	Reserved
	2001H	Frequency	
		Bit 0	1: EF (external fault) on
	2002H	Bit 1 Bit 2	1: Reset 1: B.B. ON
		Bit 3-15	Reserved
	2100H		refer to Pr.06-16 to Pr.06-21
	210011	Bit 0-Bit 1	
		DIL O-DIL 1	01: deceleration
			10: Ready for operation
			11: operation
		Bit 2	1:JOG command
		Dit 2	00: FWD command, FWD output
Status			01: FWD command, REV output
monitor Read		Bit 3-Bit 4	10: REV command, FWD output
only			11: Reserved
,		Bit 5	Reserved
	2119H	Bit 6	Reserved
		Bit 7	Reserved
		Bit 8	Master frequency Controlled by communication interface
		Bit 9	Master frequency controlled by analog/external terminals signal
		Bit 10	Operation command controlled by communication interface
		Bit 11	1: Parameters have been locked
		Bit 12	1: enable to copy parameter from keypad
		Bit 13-15	Reserved
	2102H		command (F)
	2103H	Output free	
	2104H	Output curi	rent (AXXX.X)
	2105H	DC-BUS V	oltage (UXXX.X)
	2106H		age (EXXX.X)
	2107H	Current ste	ep number of Multi-Step Speed Operation
	2116H		on display (Pr.00-04)
	2120H		command when malfunction
	2121H		quency when malfunction
	2122H		rent when malfunction
	2123H	Motor frequ	uency when malfunction
	2124H	Output volt	age when malfunction
	2125H		Itage when malfunction
	2126H		ver when malfunction
	2127H		ue when malfunction
	2128H	IGRI IEM	perature of Power Module at Present Fault

Content	Address	Function
	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.00-05 user-defined setting
	2203H	AUI1 analog input (XXX.XX %)
	2204H	ACI analog input (XXX.XX %)
	2205H	AUI2 analog input (XXX.XX %)
	2206H	Display temperature of IGBT (°C)
	2207H	Display temperature of heatsink (°C) (only for model 40HP
		and above)
	2208H	Digital input state
	2209H	Digital output state

3.6 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 of an exception response of command code 06H and exception code 02H:

ACCII mada.

ASCII mode:							
STX	.,						
Address Low	'0'						
Address High	'1'						
Function Low	'8'						
Function High	'6'						
Exception code	'0'						
Exception code	'2'						
LRC CHK Low	'7'						
LRC CHK High	'7'						
END 1	CR						
END 0	LF						

RTII mode:

K I U IIIUU	ic.
Address	01H
Function	86H
Exception code	02H
CRC CHK Low	C3H
CRC CHK High	A1H

The explanation of exception codes:

Exception code	Explanation
01	Illegal function code: The function code received in the command message is not available for the AC motor drive.
02	Illegal data address: The data address received in the command message is not available for the AC motor drive.

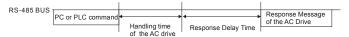
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	Chapter 4 Farameters 17/2
Exception code	Explanation
03	Illegal data value: The data value received in the command message is not available for the AC drive.
04	Slave device failure: The AC motor drive is unable to perform the requested action.
10	Communication time-out: If Pr.09-03 is not equal to 0.0, Pr.09-02=0~1, and there is no communication on the bus during the Time Out detection period (set by Pr.09-03) "FE.10" will be shown on the keynad

Ш

09-05 ✓ Response Delay Time								
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM		Factory Setting: 2.0
	Settings	0.0	0 ~ 200	0.0 ms				_

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



4.2.11 Group 10 Speed Feedback Control Parameters

10-00	PG Sigr	al Type			
Control mode	VFPG	FOCPG	TQ	PG FOCPM	Factory Setting: 0
	Settings	i	0	No function	
			1	ABZ	
			2	ABZ+ Hall	
			3	SIN/COS+Sinusoidal	
			4	SIN/COS+Endat	
			5	SIN/COS	
			6	SIN/COS + Hiperface	

- When Pr.10-00 is set to 3, encoder will have one sine and one cosine signal for each revolution. The signal must be: 0.75 to 1.2Vpp for the amplitude with phase angle 90°±5 elec. (EX: ERN 1185 ERN 1387)
- When setting is 4 or 6, it needs to wait for 2 seconds after applying the power to execute RUN command.
- Detection of the magnetic pole:

Setting 1 or 5: 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.

Setting 2: The AC motor drive will detect the position of the magnetic pole by the UVW signal of encoder

Setting 3: The AC motor drive will detect the position of the magnetic pole by the sine signal of encoder.

Setting 4 or 6: The AC motor drive will detect the position of the magnetic pole by the communication signal of encoder.

Reference table for tuning

1 1010101100 10	abio ioi taimig				
Setting of PG signal type	PG signal type	Applicable PG card	Pr.08-00=1	Pr.08-00=3	
10-00=1	A, B, Z	EMVL-PGABO/ABL	Motor will run	Motor will run	
10-00=2	A, B, Z+U, V, W	EMVL-PGABL	Motor will run	Motor will run	
10-00=3	SIN/COS+ Sinusoidal	EMVL-PGH01/02	Motor will run	Motor will run	

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			O.Lupto.	Ti didilicters
Setting of PG signal type	PG signal type	Applicable PG card	Pr.08-00=1	Pr.08-00=3
10-00=4	SIN/COS+Endat	EMVL-PGS01	Motor will run	Motor won't run
10-00=5	SIN/COS	EMVL-PGH01/02	Motor will run	Motor will run
10-00=6	SIN/COS + Hiperface	EMVL-PGS01	Motor will run	Motor won't run

10-01 Encoder Pulse	Unit: 1
Control VFPG FOCPG TQCPG FOCPM mode	Factory Setting: 600
Settings 1 to 20000	

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.

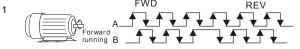
10-02 Encoder Input Type Setting Control mode VFPG FOCPG TQCPG FOCPM Factory Setting: 0

Settings 0 Disable

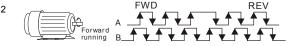
3

4

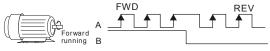
Phase A leads in a forward run command and phase B leads in a reverse run command



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



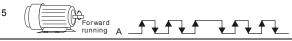
Phase A is a pulse input and phase B is a direction input. (low input=reverse direction, high input=forward direction)



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

Forward running B

Single-phase input



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

10-03		edba	ck Fault Treatment (PGF1, PGF2)	
Control mode	VFPG FOCPO	3 TQC	CPG	Factory Setting: 2
	Settings	0	Warn and keep operation	
		1	Warn and RAMP to stop	
		2	Warn and stop operation	
10-04	✓ Detection T	ime fo	or Encoder Feedback Fault	Unit: 0.1
Control mode	VFPG FOCPO	G TQ	CPG FOCPM	Factory Setting: 1.0
	Settings	0.0 to	10.0 sec	
□ w	hen PG loss, er	ncode	r signal error, pulse signal setting error or sig	nal error, if time exceeds

When PG loss, encoder signal error, pulse signal setting error or signal error, if time exceeds the detection time for encoder feedback fault (Pr.10-04), the PG signal error will occur. Refer to the Pr.10-03 for encoder feedback fault treatment.

10-05	✓ Encod	er Stall Level (PGF5)	Unit: 1
Control mode	VFPG	SVC FOCPG FOCPM	Factory Setting: 115
	Settings	0 to 120% (0: disable)	
	Settings	0 to 120% (0. disable)	

This parameter determines the maximum encoder feedback signal allowed before a fault occurs. (max. output frequency Pr.01-00 =100%)

10-06	Detection Time	Unit: 0.1
Control VFPG SVC F	OCPG FOCPM	Factory Setting: 0.1
Settings 0.0	to 2.0 sec	
10-07 ✓ Encoder Slip R	ange (PGF7)	Unit: 1
Control VFPG SVC F	OCPG FOCPM	Factory Setting: 50
Settings 0 to	50% (0: disable)	

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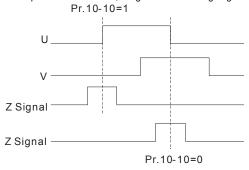
	_				Chapter 41 drameters	
10-08	✓ Encode	der Slip	Detection	on Time	Unit: 0.1	
Control mode	VFPG	svc	FOCPG	FOCPM	Factory Setting: 0.5	
	Settings	C).0 to 10.	0 sec	_	
10-09						
Control mode	VFPG	svc	FOCPG	FOCPM	Factory Setting: 2	
'	Settings	C) W	arn and keep operating	_	
		1	l W	arn and RAMP to stop		
		2	2 W	arn and COAST to stop		

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

10-10	Mode Sele	Mode Selection for UVW Input						
Control mode	VFPG FO	VFPG FOCPG TQCPG FOCPM Factory Setting: 0						
	Settings	0	Z signal is at the falling edge of U-phase					
		1	Z signal is at the rising edge of U-phase					

Setting 0: when the operation is U->V->W, Z signal is at the falling edge of U-phase.

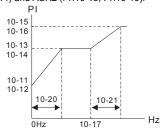
Setting 1: when the operation is U->V->W, Z signal is at the rising edge of U-phase.



10-11	✓ ASR ((Auto Sp	eed Re	gulation)	Control (P) of Z	ero Speed	Unit: 0.1
Control mode	VF	VFPG	svc	FOCPG	FOCPM		Factory Setting: 100.0
	Settings	0.	0 to 500	0.0%			

Unit: 0.001	n) Control (I) of Zero Speed	eed Re	(Auto Sp	✓ ASR	10-12
Factory Setting: 0.100	G FOCPM	svc	VFPG	VF	Control mode
	sec	000 to	0.0	Settings	
Unit: 0.1	n) control (P) 1	ed Re	(Auto Spe	. ∕ ASR	10-13
Factory Setting: 100.0	FOCPM	svc	VFPG	VF	Control mode
) to 50	s 0.0	Settings	
Unit: 0.001	n) control (I) 1	eed Re	(Auto Sp	✓ ASR	10-14
Factory Setting: 0.100	G FOCPM	svc	VFPG	VF	Control mode
	sec	000 to	0.0	Settings	
Unit: 0.1	n) control (P) 2	eed Re	(Auto Sp	✓ ASR	10-15
Factory Setting: 100.0	G FOCPM	svc	VFPG	VF	Control mode
) to 500	s 0.0	Settings	
Unit: 0.001	n) control (I) 2	eed Re	(Auto Sp	✓ ASR	10-16
Factory Setting: 0.100	G FOCPM	svc	VFPG	VF	Control mode
	sec	000 to	6 0.0	Settings	
Unit: 0.01	ncy	Switch	1/ASR2	✓ ASR	10-17
Factory Setting: 7.00	G FOCPM	svc	VFPG	VF	Control mode
		00 o 40	s 0.0	Settings	
		00: disa	0.0		

- ASR P determines Proportional control and associated gain (P). ASR I determines integral control and associated gain (I).
- When integral time is set to 0, it is disabled. Pr.10-17 defines the switch frequency for the ASR1 (Pr.10-13, Pr.10-14) and ASR2 (Pr.10-15, Pr.10-16).



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When using multi-function input terminals to switch ASR1/ASR2, the diagram will be shown as follows.

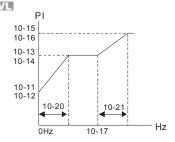


0.1 sec

10-18		Unit: 0.001
Control mode	VF VFPG SVC FOCPG FOCPM	Factory Setting: 0.008
	Settings 0.000 to 0.350 sec	
□ It	defines the filter time of the ASR command.	
□ W	hen setting to 1, this function is disabled.	
10-19	✓ Zero Speed Gain (P)	Unit: 0.01
Control mode	FOCPM	Factory Setting: 80.00
	Settings 0.00 to 655.00%	
□ W	hen Pr.11-00 is set to Bit 7=1, Pr.10-19 is valid.	
10-20	✓ Zero Speed/ASR1 Width Adjustment	Unit: 0.01
Control mode	VFPG FOCPG FOCPM	Factory Setting: 5.00
	Settings 0.0 to 400.00Hz	
10-21	✓ ASR1/ASR2 Width Adjustment	Unit: 0.01
Control mode	VFPG FOCPG FOCPM	Factory Setting: 5.00
	Settings 0.0 to 400.00Hz	

Ш These two parameters are used to decide width of slope of ASR command during zero speed to low speed or Pr.10-17 to high speed.

Chapter 4 Parameters | VFD-VL



10-22	✓ Operation	✓ Operation Time of Zero Speed Unit: 0.001							
Control mode	FOCPM	FOCPM Factory Setting: 0.250							
	Settings	0.001	to 65.535sec						
10-23									
Control mode	FoCPM Factory Setting: 0.00								
	Settings	0.001	to 65.535sec						
10-24		xecutin	g Zero Speed						
Control mode	FOCPM		Factory Setting:						
	Settings	0	After the brake release set in Pr.02-29						
		1	After the brake signal input (Pr.02-01~02-08 is set to 42)						

When Pr.10-24=0, the zero speed control needs to be used with Pr.02-29. (refer to the explanations in Pr.02-32)

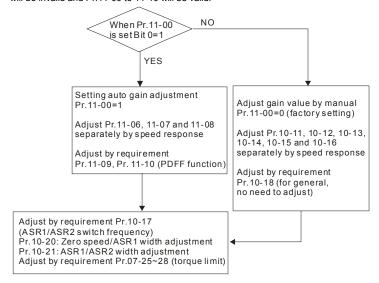
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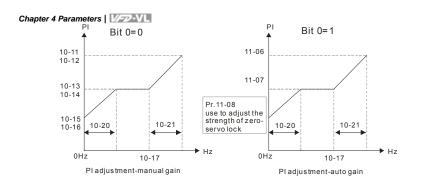


4.2.12 Group 11 Advanced Parameters

11-00	System Cor	ntrol	
Control mode	FOCPG FO	СРМ	Factory Setting: 0
	Settings	Bit 0=0	No function
		Bit 0=1	ASR Auto tuning, PDFF enable
		Bit 7=0	No function
		Bit 7=1	When position control is enabled, it doesn't need to set Pr.07-02 (DC Brake Current Level)
		Bit 15=0	when power is applied, it will detect the position of magnetic pole again
		Bit 15=1	when power is applied, it will start from the magnetic pole position of previous power failure

 \square Bit 0=1: PDFF function is enabled and system will generate an ASR setting, Pr. 10-11~10-16 will be invalid and Pr.11-09 to 11-10 will be valid.

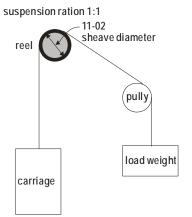


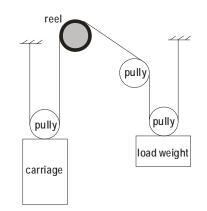


11-01	✓ Elevator	Snee	d	Unit: 0.01
Control	FOCPG FO	•	<u> </u>	Factory Setting: 1.00
mode				
	Settings	0.1	0 to 4.00 m/s	
11-02	✓ Sheave I	Diame	ter	Unit: 1
Control mode	FOCPG FOO	CPM		Factory Setting: 400
	Settings	10	0 to 2000 mm	_
11-03	✓ Mechanic	cal Ge	ear Ratio	Unit: 1
Control mode	FOCPG FOO	CPM		Factory Setting: 1
	Settings	1 t	o 100	
11-04	✓ Suspensi	ion Ra	atio	Unit: 1
Control mode	FOCPG FO			Factory Setting: 1
	Settings	0	1:1	
		1	2:1	

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suspension ration 2:1





11-05	✓ Inertial Ra	tio	Unit: 1
Control mode	FOCPG FOCE	PM	Factory Setting: 40
	Settings	1 to 300%	

ш The load inertia can be calculated by the settings of motor parameter, Pr.11-02 Sheave Diameter, Pr.11-14 Motor Current at Accel. and Pr.11-15 Elevator Acceleration. This parameter can be used to adjust inertia ratio of load.

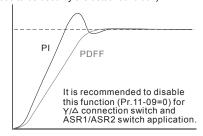
11-06	✓ Zero-speed Bandwidth Ur Ur Ur Ur Ur Ur Ur Ur Ur U						
11-07	✓ Low-speed Bandwidth Ur						
11-08		Unit: 1					
Control mode	FOCPG FOCPM	Factory Setting: 10					
	Settings 0 to 40Hz	_					

After estimating inertia and set Pr.11-00=1 (auto tuning), user can adjust parameters Pr.11-06, 11-07 and 11-08 separately by speed response. The larger number you set, the faster response you will get. Pr.10-08 is the switch frequency for low-speed/high-speed bandwidth.

11-09	✓ PDFF Gair	n Value		Unit: 1
Control mode	FOCPG FOCP	M		Factory Setting: 30
	Settings	0 to 200%		

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- After finishing estimating and set Pr.11-00=1 (auto tuning), using Pr.11-09/11-10 to reduce overshoot. 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. Set Pr.11-00 to 1
 - Adjust Pr.11-09/11-10 (the larger number is set and the suppressed overshoot function will be better. But it needs to be used by the actual condition)



11-10	✓ Gain for	Speed Feed Forward	Unit: 1
Control mode	FOCPG FO	СРМ	Factory Setting: 0
	Settings	0 to 500	

Pr.11-09 and Pr.11-10 will be enabled when Pr.11-00 is set to Bit0=1.

11-11	✓ Notch Filter Depth	Unit: 1
Control mode	FOCPG FOCPM	Factory Setting: 0
	Settings 0 to 20 db	
11-12	✓ Notch Filter Frequency	Unit: 0.01
Control mode	FOCPG FOCPM	Factory Setting: 0.00
	Settings 0.00 to 200.00Hz	

- This parameter is used to set resonance frequency of mechanical system. It can be used to suppress the resonance of mechanical system.
- The larger number you set Pr.11-11, the better suppression resonance function you will get.
- $\hfill\square$ The notch filter frequency is the resonance of mechanical frequency.

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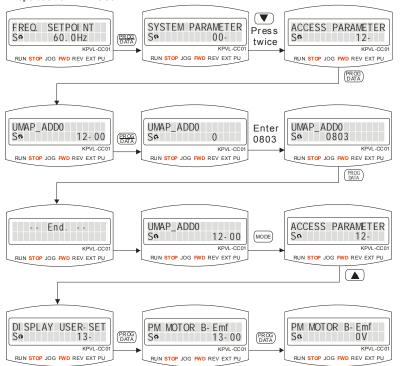


11-13	✓ Low-pass Filter Time of Keypad Display ✓ Unit: 0.001								
Control mode	VF VFI	PG SVC	FOCPG TQCPG FOCPM	Factory Setting: 0.500					
	Settings	0.001 to	65.535 s						
□ Iti	is used to low	er the blink	ing frequency of LCD display.						
11-14	✓ Motor Cu	rrent at Acc	pel.	Unit: 1					
Control mode	FOCPM Factory Setting: 15								
	Settings	50 to 200	0%						
11-15	✓ Elevator A	Acceleration	n	Unit: 0.1					
Control mode	FOCPM			Factory Setting: 0.75					
	Settings	0.20 to 2	.00m/s ²						

4.2.13 Group 12 User-defined Parameters

12-00 12-31	✓ User-	defined	Parame	eters			
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM	Factory Setting: -
	Settings		-				

- Users can enter the parameters from group 0 to group 11 into group 12 (it can save 32 parameters). The saved value can also be the parameter addresses (but the hexadecimal value needs to be converted to decimal value).
- Example 1: If you want to enter Pr.08-03 into Pr.12-00, you only need to enter 0803 into Pr.12-00. Then it will display the setting of Pr.08-03 in Pr.13-00. Refer to the following figure for the operation of KPVL-CC01.

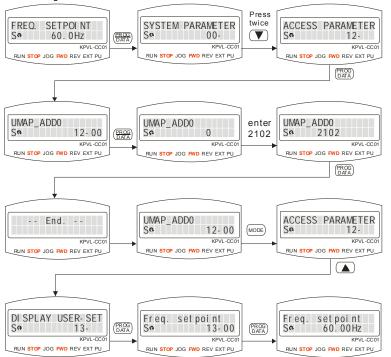


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 \square Example 2: If it needs to enter parameter address 2102H and 211BH by the digital keypad, 211BH needs to be converted to binary value before entering.

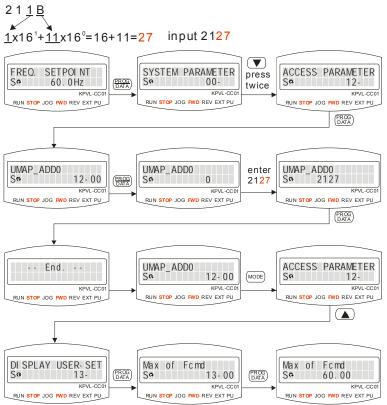
The setting method of 2102H



Chapter 4 Parameters | V=V=V-VL

The setting method of 211BH

Convert 211BH (hexadecimal) to decimal value:



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Chapter 4 Parameters | VIIII In the following, it shows the factory setting of Pr.12-00 to Pr.12-29. You can change the setting as required.

setting as required.									
12-00	✓ Prese	nt Fault	Record	i					
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM			
	Settings	0610							
-									
12-01	✓ Prese	nt Fault	Time o	f Motor (Operation	n (min.)			
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM			
	Settings	0620							
12-02	✓ Prese	nt Fault	Time o	f Motor C	Operation	n (day)			
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM			
	Settings	0621							
12-03	✓ Frequ	ency Co	mmano	d at Pres	ent Faul	t			
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM			
	Settings	2120							
12-04	✓ Outpu	ıt Freque	ency at	Preset F	ault				
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM			
	Settings	2121							
12-05	✓ Outpu	ıt Curren	t at Pre	esent Fa	ult				
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM			
	Settings	2122							
-	<u></u>								
12-06	✓ Motor	Frequer	ncy at F	Present F	ault				
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM			
	Settings	2123							

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	_					Chapter 4 Parameters V 77-V
12-14	✓ Drive	Status a	t Prese	ent Fault		
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM
	Settings	212B				
12-15	✓ Seco	nd Most	Recent	Fault Re	ecord	
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM
	Settings	0611				
12-16	✓ Seco	nd Most	Recent	Fault Ti	me of Mo	otor Operation (min.)
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM
	Settings	0622				
12-17		nd Most	Recent	Fault Ti	me of Mo	otor Operation (day)
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM
	Settings	0623				
12-18	★ Third	Most Re	cent Fa	ault Reco	ord	
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM
	Settings	0612				
12-19	✓ Third	Most Re	cent Fa	ault Time	of Moto	r Operation (min.)
Control mode	VF	VFPG	svc		TQCPG	
mode	Settings	0624				
						• " " "
12-20	✓ Third	Most Re	cent Fa	ault Time	of Moto	r Operation (day)
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM

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Settings

0625

	Settings	0629				
12-27	✓ Sixth	Most Red	cent Fa	ult Reco	rd	
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM
	Settings	0615				

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Settings

062B

4.2.14 Group 13 View User-defined Parameters

13-00 13-31	View User-defined Parameters								
Control mode	VF	VFPG	svc	FOCPG	TQCPG	FOCPM		Factory Setti	ng: -
	Settings	1	-						

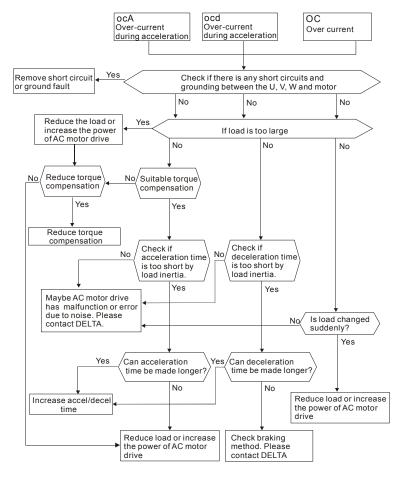
Refer to group 12 for details.

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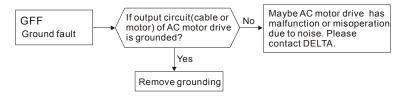
Chapter 5 Troubleshooting

5.1 Over Current (OC)

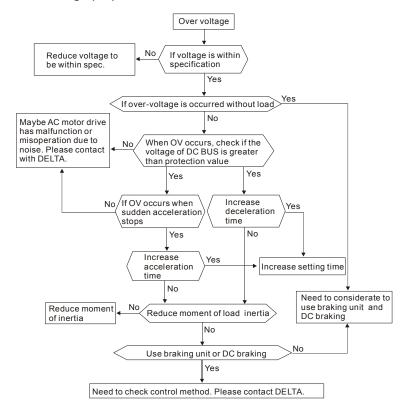




5.2 Ground Fault



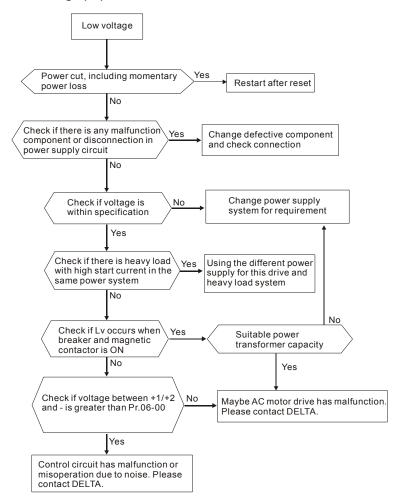
5.3 Over Voltage (OV)



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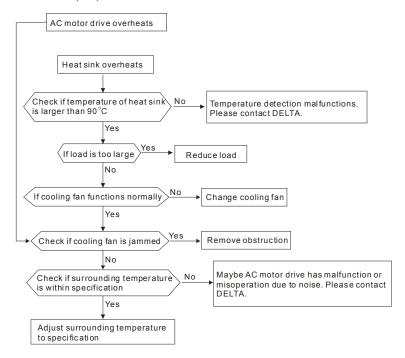


5.4 Low Voltage (Lv)

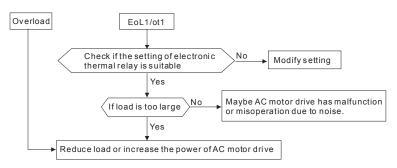




5.5 Over Heat (OH)



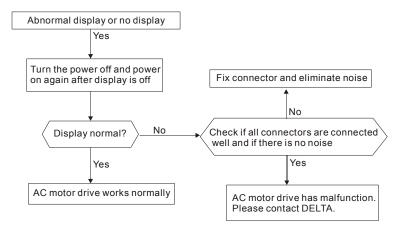
5.6 Overload



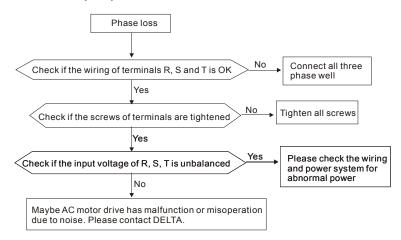
5-4 VLE3.1, SW V1.07



5.7 Display of KPVL-CC01 is Abnormal

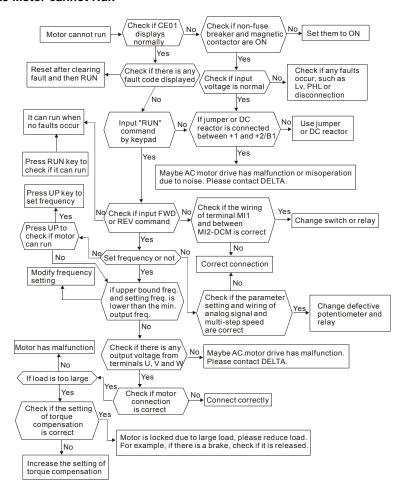


5.8 Phase Loss (PHL)





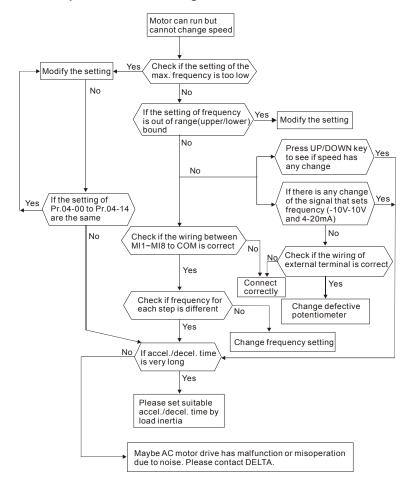
5.9 Motor cannot Run



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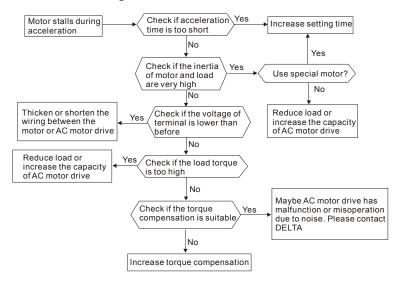


5.10 Motor Speed cannot be Changed

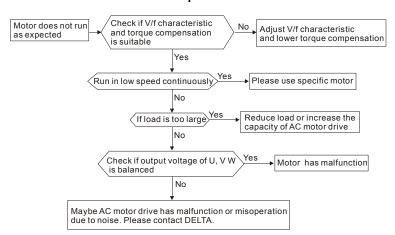




5.11 Motor Stalls during Acceleration



5.12 The Motor does not Run as Expected



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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.

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Chapter 5 Troubleshooting | V=Z-VL

In additional, the microcomputer may not work in extreme low temperature and needs to have heater

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.

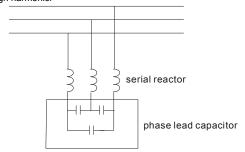
5.15 Affecting Other Machines

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.
- Use reactor at the power input terminal of AC motor drive or decrease high harmonic by multiple circuit.
- 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

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Chapter 6 Fault Code Information and Maintenance

6.1 Fault Code Information

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:

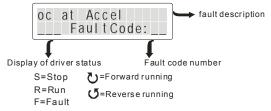


- Wait 5 seconds after a fault has been cleared before performing reset via keypad of input terminal.
- When the power is off after 5 minutes for ≤ 22kW models and 10 minutes for ≥ 30kW models, please confirm that the capacitors have fully discharged by measuring the voltage between DC+ and DC-. The voltage between DC+ and DC- should be less than 25VDC.
- Only qualified personnel can install, wire and maintain AC motor drives. Please take off any metal objects, such as watches and rings, before operation. And only insulated tools are allowed.
- Never reassemble internal components or wiring.
- Make sure that installation environment comply with regulations without abnormal noise, vibration and smell.



6.1.1 Common Problems and Solutions

Following fault name will only be displayed when using with optional digital keypad KPVL-CC01.



	2
Display	Description
	Over-current during acceleration (Output current exceeds triple rated current during acceleration.)
oc at Accel Fo FaultCode: 01	Corrective Actions: Short-circuit at motor output: Check for possible poor insulation at the output lines. Acceleration Time too short: Increase the Acceleration Time. AC motor drive output power is too small: Replace the AC motor drive with the next higher power model.
oc at Decel Fo FaultCode: 02	Over-current during deceleration (Output current exceeds triple rated current during deceleration.) Corrective Actions: 1. Short-circuit at motor output: Check for possible poor insulation at the output line. 2. Deceleration Time too short: Increase the Deceleration Time. 3. AC motor drive output power is too small: Replace the AC motor drive with the next higher power model.
oc at Normal SPD Fo FaultCode: 03	Over-current during steady state operation (Output current exceeds triple rated current during constant speed.) Corrective Actions: 1. Short-circuit at motor output: Check for possible poor insulation at the output line. 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 the next higher power model.

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optional brake resistor.

1.

2.

3

Fo Fault Code: 09

Check if the input voltage falls within the rated AC

If DC BUS over-voltage due to regenerative voltage, please increase the Deceleration Time or add an

motor drive input voltage range.

Check for possible voltage transients.

pter 6 Fault Code Information and Maintenance V/=>>-VL						
Display	Description					
	DC BUS over-voltage at stop					
ov at Stop Fo FaultCode:10	Corrective Actions: Check if the input voltage falls within the rated AC motor drive input voltage range. Check for possible voltage transients.					
Lv at Accel Fo FaultCode: 11	DC BUS voltage is less than Pr.06-00 during acceleration. Corrective Actions: 1. Check if the input voltage is normal 2. Check for possible sudden load					
Lv at Decel Fo FaultCode: 12	DC BUS voltage is less than Pr.06-00 during deceleration. Corrective Actions: 1. Check if the input voltage is normal 2. Check for possible sudden load					
Lv at Normal SPD Fo FaultCode:13	DC BUS voltage is less than Pr.06-00 during constant speed. Corrective Actions: 1. Check if the input voltage is normal 2. Check for possible sudden load					
Lv at Stop Fo FaultCode:14	Low voltage at stop Corrective Actions: 1. Check if the input voltage is normal 2. Check for possible sudden load					
Phase Loss Fo FaultCode:15	Phase loss Corrective Actions: Check Power Source Input if all 3 input phases are connected without loose contacts.					
I GBT Over Heat Fo Fault Code: 16	IGBT overheating IGBT temperature exceeds protection level 1 to 15HP: 90 °C 20 to 100HP: 100 °C Corrective Actions: 1. Ensure that the ambient temperature falls within the specified temperature range. 2. Make sure that the ventilation holes are not obstructed. 3. Remove any foreign objects from the heatsinks and check for possible dirty heat sink fins. 4. Check the fan and clean it. 5. Provide enough spacing for adequate ventilation.					

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Make sure that the motor is not obstructed.

specified temperature range.

Ensure that the ambient temperature falls within the

Take the next higher power AC motor drive model.

Corrective Actions:

1.

2.

Motor Over Heat

Fo Fault Code: 24

	Maintenance V
Display	•
	Electronic Thermal Relay 1 Protection
	Corrective Actions:
Over_Torque_1	Check whether the motor is overloaded.
Fo Fault Code: 26	Check whether motor rated current setting (Pr.05-01) is suitable
	Check electronic thermal relay function
	4. Take the next higher power AC motor drive model.
	Electronic Thermal Relay 2 Protection
	Corrective Actions:
Over Torque 2	Check whether the motor is overloaded.
F∘ Fault Code: 27	2. Check whether motor rated current setting (Pr.05-01)
	is suitable 3. Check electronic thermal relay function
	Take the next higher power AC motor drive model.
	Internal EEPROM can not be programmed.
EEPROM Write Err	Corrective Actions:
Fo Fault Code: 30	Press "RESET" key to the factory setting.
	Return to the factory.
	Internal EEPROM can not be read.
EEPROM Read Err	Corrective Actions:
Fo Fault Code: 31	Press "RESET" key to the factory setting.
	Return to the factory. Hardware failure in current detection.
L	hardware failure in current detection
Isum Sensor Err	Corrective Actions:
Tault Couc. 32	Re-power on to try it. If fault code is still displayed on the
	keypad, please return to the factory. U-phase error
las Sensor Err	•
Fo Fault Code: 33	Corrective Actions:
	Re-power on to try it. If fault code is still displayed on the keypad, please return to the factory.
	V-phase error
Ibs Sensor Err	Commention Antioner
Fo Fault Code: 34	Corrective Actions: Re-power on to try it. If fault code is still displayed on the
	keypad, please return to the factory.
	W-phase error
Ics Sensor Err	Corrective Actions:
Fo Fault Code: 35	Re-power on to try it. If fault code is still displayed on the
	keypad, please return to the factory.
	CC (current clamp)
cc HW Error	Corrective Actions:
Fo Fault Code: 36	Re-power on to try it. If fault code is still displayed on the
	keypad, please return to the factory.

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	Chapter 6 Fault Code Information and Maintenance
Display	Description
oc HW Error Fo FaultCode: 37	OC hardware error Corrective Actions: Re-power on to try it. If fault code is still displayed on the keypad, please return to the factory.
ov HW Error Fo Fault Code: 38	OV hardware error Corrective Actions: Re-power on to try it. If fault code is still displayed on the keypad, please return to the factory.
GFF HW Error Fa FaultCode: 39	GFF hardware error Corrective Actions: Re-power on to try it. If fault code is still displayed on the keypad, please return to the factory.
Auto Tuning Err Fo FaultCode: 40	Auto tuning error Corrective Actions: 1. Check cabling between drive and motor 2. Check the motor capacity and parameters settings 3. Retry again
PID Fbk Error Fo FaultCode: 41	PID loss (ACI) Corrective Actions: 1. Check the wiring of the PID feedback 2. Check the PID parameters settings
PG Fbk Error Fo FaultCode: 42	PG feedback error Corrective Actions: Check if Pr.10-01 is not set to 0 when it is PG feedback control
PG Fbk Loss Fa FaultCode: 43	PG feedback loss Corrective Actions: Check the wiring of the PG feedback
PG Fbk Over SPD Fo FaultCode: 44	PG feedback stall Corrective Actions: 1. Check the wiring of the PG feedback 2. Check if the setting of PI gain and deceleration is suitable 3. Return to the factory
PG Fbk Deviate Fo FaultCode: 45	PG slip error Corrective Actions: 1. Check the wiring of the PG feedback 2. Check if the setting of PI gain and deceleration is

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Return to the factory

suitable

3.

oter 6 Fault Code Information and Maintenance						
Display	Description					
	Pulse input error					
PG Ref Error	Corrective Actions:					
Fo Fault Code: 46	Check the pulse wiring					
	2. Return to the factory					
	Pulse input loss					
PG Ref Loss	Corrective Actions:					
Fo Fault Code: 47	Check the pulse wiring					
	2. Return to the factory ACI loss					
	ACI loss					
ACI Loss Fo FaultCode: 48	Corrective Actions:					
Fa Fault Code: 48	Check the ACI wiring					
	Check if the ACI signal is less than 4mA External Fault					
	External rault					
External Fault	Corrective Actions:					
Fo Fault Code: 49	Input EF (N.O.) on external terminal is closed to GND. Output U, V, W will be turned off.					
	2. Give RESET command after fault has been cleared.					
	Emergency stop					
	Occupation Authoris					
Emergency Stop	Corrective Actions: 1. When the multi-function input terminals MI1 to MI8 are					
Fo Fault Code: 50	set to emergency stop and the AC motor drive stops					
	output.					
	Press RESET after fault has been cleared. Base Block					
	Dase Block					
Base_Block	Corrective Actions:					
Fo Fault Code: 51	When the multi-function input terminals MI1 to MI8 are set to base block and the AC motor drive stops output.					
	Press RESET after fault has been cleared.					
	Password is locked					
Password Error	Corrective Actions:					
Fo Fault Code: 52	Keypad will be locked. Turn the power ON after power OFF					
	to re-enter the correct password. See Pr.00-07 and 00-08.					
	Illegal function code					
PC Err Command	Corrective Actions:					
Fo Fault Code: 54	Check if the function code is correct (function code must be					
	03, 06, 10, 63)					
PC Err Address	Illegal data length					
Fo Fault Code: 55	Corrective Actions:					
	Check if the communication data length is correct.					
PC Err Data	Illegal data value					
Fo Fault Code: 56	Corrective Actions:					
1 44110040.50	Check if the data value exceeds max./min. value.					

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	Chapter 6 Fault Code Information and Maintenance V->>-VI
Display	Description
PC Slave Fault Fo FaultCode: 57	illegal communication address Corrective Actions: Check if the communication address is correct.
PC Time Out Fa FaultCode: 58	Corrective Actions: Check if the wiring for the communication is correct.
PU Time Out Fo FaultCode: 59	Keypad (KPVL-CC01) communication time-out Corrective Actions: 1. Check if the wiring for the communication is correct 2. Check if there is any wrong with the keypad
Brk Chopper Fail Fo FaultCode: 60	Brake chopper fail Corrective Actions: Press RESET key to correct it. If fault code is still displayed on the keypad, please return to the factory.
Safety Relay Err Fo FaultCode: 63	Corrective Actions: Check if the jumper JP18 is short circuit. Re-power on to try it. If fault code is still displayed on the keypad, please return to the factory.
Mech Brake Fail Fo FaultCode: 64	Corrective Actions: Check if the mechanical brake signal is correct. Check if the detection time setting of mechanical brake (Pr.02-35) is correct.
PG HW Error Fo FaultCode:65	PG hardware error Corrective Actions: 1. Check if the wiring of PG feedback is correct. 2. If fault code is still displayed on the keypad with correct PG feedback, please return to the factory.
Contactor Fail Fo FaultCode:66	Corrective Actions: 1. Check if the signal of electromagnetic valve is correct. 2. Check if the setting of Pr.02-36 is correct.

6.1.2 Reset

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

1. Press RESET key on KPVL-CC01.

Chapter 6 Fault Code Information and Maintenance | Variable |

- 2. Set external terminal to "RESET" and then set to be ON.
- 3. Send "RESET" command by communication.



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

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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 DCshould be less than 25VDC.

Ambient environment

	Methods and Criterion		Maintenance Period		
Check Items			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	0			
If there are any dangerous objects	Visual inspection	0			

Voltage

	Methods and Criterion		Maintenance Period		
Check Items			Half Year	One Year	
Check if the voltage of main circuit and control circuit is correct	Measure with multimeter with standard specification	0			

Keypad

Object to the	Methods and Criterion		Maintenance Period		
Check Items			Half Year	One Year	
Is the display clear for reading	Visual inspection	0			
Any missing characters	Visual inspection	0			



Mechanical parts

2		Maintenance Period				
Check Items	Methods and Criterion	Daily	Half Year	One Year		
If there is any abnormal sound or vibration	Visual and aural inspection		0			
If there are any loose screws	Tighten the screws		0			
If any part is deformed or damaged	Visual inspection		0			
If there is any color change by overheating	Visual inspection		0			
If there is any dust or dirt	Visual inspection		0			

Main circuit

Check Items		Maintenance Period				
	Methods and Criterion	Daily	Half Year	One Year		
If there are any loose or missing screws	Tighten or replace the screw	0				
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		0			
If there is any dust or dirt	Visual inspection		0			

Terminals and wiring of main circuit

Check Items	Mathada and Criterian	Maintenance Period				
	Methods and Criterion	Daily	Half Year	One Year		
If the terminal or the plate is color change or deformation due to overheat	Visual inspection		0			
If the insulator of wiring is damaged or color change	Visual inspection		0			
If there is any damage	Visual inspection	0				

DC capacity of main circuit

Check Items		Maintenance Period					
	Methods and Criterion	Daily	Half Year	One Year			
If there is any leak of liquid, color change, crack or deformation	Visual inspection	0					
If the safety valve is not removed? If valve is inflated?	Visual inspection	0					
Measure static capacity when required		0					

Resistor of main circuit

Check Items		Maintenance Period				
	Methods and Criterion	Daily	Half Year	One Year		
If there is any peculiar smell or insulator cracks due to overheat	Visual inspection, smell	0				
If there is any disconnection	Visual inspection	0				
If connection is damaged?	Measure with multimeter with standard specification	0				

Transformer and reactor of main circuit

			intenar Period	
Check Items	Methods and Criterion	Daily	Half Year	One Year
If there is any abnormal vibration or peculiar smell	Visual, aural inspection and smell	0		



Magnetic contactor and relay of main circuit

Check Items			intenar Period	
	Methods and Criterion	Daily	Half Year	One Year
If there are any loose screws	Visual and aural inspection	0		
If the contact works correctly	Visual inspection	0		

Printed circuit board and connector of main circuit

Check Items		Maintenance Period				
	Methods and Criterion	Daily	Half Year	One Year		
If there are any loose screws and connectors	Tighten the screws and press the connectors firmly in place.		0			
If there is any peculiar smell and color change	Visual and smell inspection		0			
If there is any crack, damage, deformation or corrosion	Visual inspection		0			
If there is any liquid is leaked or deformation in capacity	Visual inspection		0			

■ Cooling fan of cooling system

Check Items		Maintenance Period				
	Methods and Criterion	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		0			
If there is any loose screw	Tighten the screw		0			
If there is any color change due to overheat	Change fan		0			



■ Ventilation channel of cooling system

Check Items			intenar Period	
	Methods and Criterion	Daily	Half Year	One Year
If there is any obstruction in the heat sink, air intake or air outlet	Visual inspection		0	



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

Chapter 6 Fault Code Information and Maintenance | V/>>>VIL

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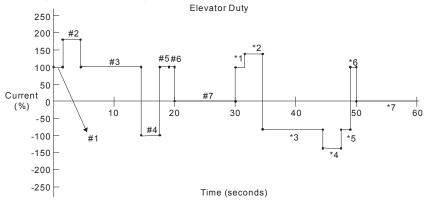
Appendix A Specifications

There are 230V and 460V models for customers to choose by their requirement.

	Voltage Class				230V	Class				
	Model Number VFD-XXXVL	055	075	110	150	185	220	300	370	
Ma	ax. Applicable Motor Output (kW)	5.5	7.5	11	15	18.5	22	30	37	
Ma	ax. Applicable Motor Output (hp)	7.5	10	15	20	25	30	40	50	
	Rated Output Capacity (kVA)	9.5	12.5	19	25	29	34	46	55	
ing	Rated Output Current for General Purposes (A)	21.9	27.1	41.1	53	70	79	120	146	
Output Rating	**Rated Output Current for Elevators (A)	25	31	47	60	80	90	150	183	
	Maximum Output Voltage (V)	3-Phase Proportional to Input Voltage								
0	Output Frequency (Hz)				0.00~12	20.00 Hz				
	Carrier Frequency (kHz)		12kHz			9kHz		6k	Hz	
g	Rated Input Current (A)	25	31	47	60	80	90	106	126	
Rating	Rated Voltage/Frequency					nase ′, 50/60Hz				
put	Voltage Tolerance				±10%(18	0~264 V)				
드	Frequency Tolerance					~63 Hz)				
_	ooling Method					cooled				
V	/eight (kg)	8	10	10	13	13	13	36	36	

	Voltage Class					46	0V Cla	ss				
	Model Number VFD-XXXVL	055	075	110	150	185	220	300	370	450	550	750
Ma	ax. Applicable Motor Output (kW)	5.5	7.5	11	15	18.5	22	30	37	45	55	75
М	ax. Applicable Motor Output (hp)	7.5	10	15	20	25	30	40	50	60	75	100
	Rated Output Capacity (kVA)	9.9	13.7	18	24	29	34	46	56	69	80	100
g	Rated Output Current for General Purposes (A)	12.3	15.8	21	27	34	41	60	73	91	110	150
t Rating	**Rated Output Current for Elevators (A)	14	18	24	31	39	47	75	91	113	138	188
Output	Maximum Output Voltage (V)	3-phase Proportional to Input Voltage										
	Output Frequency (Hz)	0.00~120.00 Hz										
	Carrier Frequency (kHz)		15kHz			9kHz				6kHz		
g	Rated Input Current (A)	14	18	24	31	39	47	56	67	87	101	122
Rating	Rated Voltage				3-ph	ase 380	to 480	V, 50/6	60Hz			
nput F	Voltage Tolerance					±10%	(342~5	28 V)				
Inp	Frequency Tolerance					±5%	(47~63	Hz)				
С	ooling Method					Fa	an Cool	ed				
W	eight (kg)	8	10	10	13	13	13	36	36	36	50	50

**Rated Output Current for Elevators (A)



Event	Description	Time(s)	Current
#1	Per torque	1.5	100%
#2	Accel up	3	175%
#3	Cruise	10	100%
#4	Decel up	3	115%
#5	Post	1.5	140%
#6	Per torque	1	100%
#7	Rest	10	0%
*1	Per torque	1.5	100%
*2	Accel up	3	140%
*3	Cruise	10	80%
*4	Decel up	3	140%
*5	Post	1.5	140%
*6	Per torque	1	100%
*7	Rest	10	0%

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		General Specifications	
	Control System	1: V/f, 2: VF+PG, 3: SVC, 4: FOC+PG, 5: TQR+PG, 6:FOC+PM	
	Start Torque	Starting torque is 150% at 0.5Hz and 0Hz with control modes FOC + PG and FOC+PM	
Control Characteristics	Speed Control Range	1:100 Sensorless vector (up to 1:1000 when using PG card)	
	Speed Control Resolution	±0.5% Sensorless vector (up to±0.02% when using PG card)	
	Speed Response Ability	5Hz (up to 30Hz for vector control)	
	Max. Output Frequency	0.00 to 120.00Hz	
ıac	Output Frequency Accuracy	Digital command ±0.005%, analog command ±0.5%	
ol Cha	Frequency Setting Resolution	Digital command $\pm 0.01 \text{Hz},$ analog command: 1/4096(12-bit) of the max. output frequency	
ont	Torque Limit	Max. is 200% torque current	
ک	Torque Accuracy	±5%	
	Accel/Decel Time	0.00 to 600.00/0.0 to 6000.0 seconds	
	V/f Curve	Adjustable V/f curve using 4 independent points and square curve	
Protection Characteristics	Frequency Setting Signal	0-+10V, ±10V, 4~20mA	
	Brake Torque	About 20%	
	Motor Protection	Electronic thermal relay protection	
	Over-current Protection	The current forces 220% of the over-current protection and 300% of the rated current	
	Ground Leakage Current Protection	Higher than 50% rated current	
	Overload Ability	Constant torque: 150% for 60 seconds, variable torque: 200% for 3 seconds	
	Over-voltage Protection	Over-voltage level: Vdc > 400/800V; low-voltage level: Vdc < 200/400V	
	Over-voltage Protection for the Input Power	Varistor (MOV)	
	Over-temperature Protection	Built-in temperature sensor	
	Compensation for the Momentory Power Loss	Up to 5 seconds for parameter setting	
Environmental Conditions	Protection Level	NEMA 1/IP20	
	Operation Temperature	-10°C to 45°C	
	Storage Temperature	-20°C to 60°C	
	Ambient Humidity	Below 90% RH (non-condensing)	
	Vibration	9.80665m/s² (1G) less than 20Hz, 5.88m/s² (0.6G) at 20 to 50Hz	
	Installation Location	Altitude 1,000 m or lower, keep from corrosive gasses, liquid and dust	
Aŗ	pprovals	C€	

Appendix A Specifications | V/->>

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A-4 VLE3.1, SW V1.07

Appendix B Accessories

General Precautions



- This VFD-VL AC motor drive has gone through rigorous quality control tests at the factory before shipment. If the package is damaged during shipping, please contact your dealer.
- The accessories produced by Delta are only for using with Delta AC motor drive. Do NOT use with other drive to prevent damage.

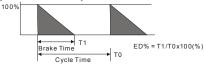
B.1 All Brake Resistors & Brake Units Used in AC Motor Drives

Voltage		cable	Full Load Torque	Resistor value spec for each AC Motor	Brake Torque	Min. Equivalent Resistor Value for each
>	hp	kW	Nm	Drive	10 /0LD	AC Motor Drive
	7.5	5.5	3.111	2400W 16Ω	125	16Ω
	10	7.5	4.148	3000W 12Ω	125	12Ω
ies	15	11	6.186	4800W 9Ω	125	9Ω
Series	20	15	8.248	4800W 6.8Ω	125	6.8Ω
2	25	18.5	10.281	6000W 6Ω	125	6Ω
230V	30	22	12.338	9600W 5Ω	125	5Ω
	40	30	16.497	6000W 5Ω	125	5Ω
	50	37	20.6	9600W 4Ω	125	4Ω
	7.5	5.5	3.111	500W 50Ω	125	50 Ω
	10	7.5	4.148	1000W 40Ω	125	40 Ω
	15	11	6.186	1000W 33 Ω	125	33 Ω
Ś	20	15	8.248	1500W 25Ω	125	25 Ω
460V Series	25	18.5	10.281	4800W 21Ω	125	21Ω
Ñ	30	22	12.338	4800W 19Ω	125	19Ω
30	40	30	16.497	6000W 20Ω	125	20 Ω
4	50	37	20.6	9600W 16Ω	125	16Ω
	60	45	24.745	9600W 13.6Ω	125	13.6 Ω
	75	55	31.11	12000W 10Ω	125	10Ω
	100	75	42.7	19200W 6.8Ω	125	6.8Ω



- 1. Please select the recommended resistance value (Watt) and the duty-cycle value (ED%).
- 2. Definition for Brake Usage ED%

Explanation: The definition of the brake usage ED(%) is for assurance of enough time for the brake unit and brake resistor to dissipate away heat generated by braking. When the brake resistor heats up, the resistance would increase with temperature, and brake torque would decrease accordingly. Recommended cycle time is one minute.



3. For safety consideration, install an overload relay between the brake unit and the brake resistor. In conjunction with the magnetic contactor (MC) prior to the drive, it can perform complete protection against abnormality. The purpose of installing the thermal overload relay is to protect the brake resistor from damage due to frequent brake, or due to brake unit keeping operating

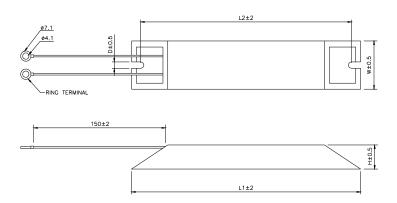
B-2 , VLE3.1, SW V1.07

- resulted from unusual high input voltage. Under such circumstance, just turn off the power to prevent damaging the brake resistor.
- If damage to the drive or other equipment are due to the fact that the brake resistors and the brake modules in use are not provided by Delta, the warranty will be void.
- 5. Take into consideration the safety of the environment when installing the brake resistors.
- If the minimum resistance value is to be utilized, consult local dealers for the calculation of the Watt figures.
- Please select thermal relay trip contact to prevent resistor over load. Use the contact to switch power off to the AC motor drive!
- 8. When using more than 2 brake units, equivalent resistor value of parallel brake unit can't be less than the value in the column "Minimum Equivalent Resistor Value for Each AC Drive" (the right-most column in the table).
- Please read the wiring information in the user manual of brake unit thoroughly prior to taking into operation.

B.1.1 Dimensions and Weights for Brake Resistors

(Dimensions are in millimeter)

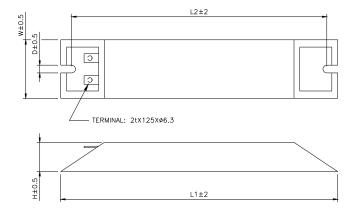
Order P/N: BR080W200, BR080W750, BR300W070, BR300W100, BR300W250, BR300W400, BR400W150, BR400W040



Model no.	L1	L2	Н	D	W	Max. Weight (g)
BR080W200	440	405	20	5 0	00	400
BR080W750	140	125	20	5.3	60	160
BR300W070						
BR300W100	045	200	20	5.0	00	750
BR300W250	215	200	30	5.3	60	750
BR300W400						
BR400W150	205	050	20	5.0	00	020
BR400W040	265	250	30	5.3	60	930

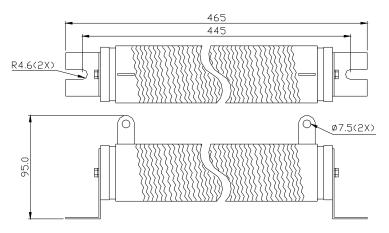
B-4 , VLE3.1, SW V1.07

Appendix B Accessories | V72-VL Order P/N: BR500W030, BR500W100, BR1K0W020, BR1K0W075



Model no.	L1	L2	Н	D	W	Max. Weight
BR500W030	225	200	20	. 0	00	4400
BR500W100	335	320	30	5.3	60	1100
BR1K0W020	400	005	50	5.0	400	0000
BR1K0W075	400	385	50	5.3	100	2800

Appendix B Accessories | 1/27-11 Order P/N: BR1K0W050, BR1K2W008, BR1K2W6P8, BR1K5W005, BR1K5W040



B.1.2 Specifications for Brake Unit

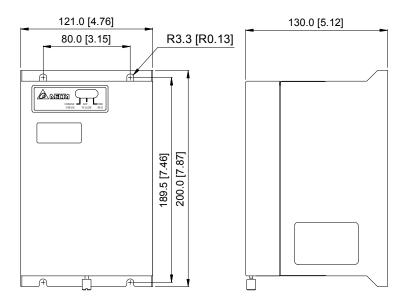
			230V Series		460V Series		
		2015	2022	4030	4045	4132	
	Max. Motor Power (kW)	15	22	30	45	132	
	Max. Peak Discharge Current (A) 10%ED	40	60	40	60	240	
Output Rating	Continuous Discharge Current (A)	15	20	15	18	75	
OE	Brake Start-up Voltage (DC)		/360/380 15±3V		720/760/ 30±6V	618/642/667/690 /725/750±6V	
Input Rating	DC Voltage	200~400VDC		400~800VDC			
on	Heat Sink Overheat	Temp	erature o	ver +95°C	(203 °F)		
Protection	Alarm Output	Relay	contact	5A 120VA	C/28VDC	(RA, RB, RC)	
Pro	Power Charge Display	Blackout until bus (+~-) voltage is below 50VDC			below 50VDC		
t	Installation Location	Indoor (no corrosive gases, metallic dust)					
Environment	Operating Temperature	-10°C ~ +50°C (14°F to 122°F)					
лu	Storage Temperature	-20°C ~ +60°C (-4°F to 140°F)					
/iro	Humidity	90% Non-condensing					
En	Vibration	9.8m/s² (1G) under 20Hz 2m/s² (0.2G) at 20~50Hz					
W	all-mounted Enclosed Type	·	IP50 IP10				

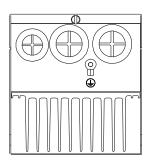


B.1.3 Dimensions for Brake Unit

(Dimensions are in millimeter[inch])

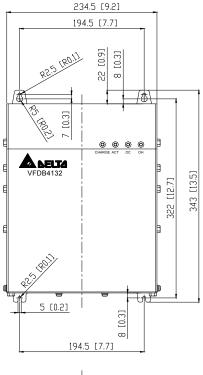
VFDB2015, VFDB2022, VFDB4030, VFDB4045

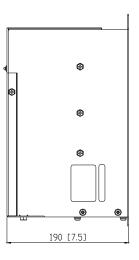


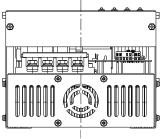


Appendix B Accessories | V-77-VL

VFDB4132









B.2 Non-fuse Circuit Breaker Chart

For 1-phase/3-phase drives, the current rating of the breaker shall be within 2-4 times maximum input current rating.

	3-phase						
Model	Recommended Input Current (A)	Model	Recommended Input Current (A)				
VFD055VL23A	50	VFD220VL23A	175				
VFD055VL43A	30	VFD220VL43A	100				
VFD075VL23A	60	VFD300VL23A	225				
VFD075VL43A	40	VFD300VL43A	125				
VFD110VL23A	100	VFD370VL23A	250				
VFD110VL43A	50	VFD370VL43A	150				
VFD150VL23A	125	VFD450VL43A	175				
VFD150VL43A	60	VFD550VL43A	250				
VFD185VL23A	150	VFD750VL43A	300				
VFD185VL43A	75						

B.3 Fuse Specification Chart

Smaller fuses than those shown in the table are permitted.

Model	I (A)	I (A)	Line Fuse		
Wodel	Input	Output	I (A)	Bussmann P/N	
VFD055VL23A	26	25	50	JJN-50	
VFD055VL43A	14	13	30	JJN-30	
VFD075VL23A	34	33	60	JJN-60	
VFD075VL43A	19	18	40	JJN-40	
VFD110VL23A	50	49	100	JJN-100	
VFD110VL43A	25	24	50	JJN-50	
VFD150VL23A	60	65	125	JJN-125	
VFD150VL43A	32	32	60	JJN-60	
VFD185VL23A	75	75	150	JJN-150	
VFD185VL43A	39	38	75	JJN-70	
VFD220VL23A	90	90	175	JJN-175	
VFD220VL43A	49	45	100	JJN-100	

Appendix B Accessories | V/-72-VL

Model	I (A)	I (A)	Line Fuse		
Model	Input	Output	I (A)	Bussmann P/N	
VFD300VL23A	110	120	225	JJN-225	
VFD300VL43A	60	60	125	JJN-125	
VFD370VL23A	142	145	250	JJN-250	
VFD370VL43A	63	73	150	JJN-150	
VFD450VL43A	90	91	175	JJN-175	
VFD550VL43A	130	110	250	JJN-250	
VFD750VL43A	160	150	300	JJN-300	

B-10 , VLE3.1, SW V1.07

B.4 AC Reactor

B.4.1 AC Input Reactor Recommended Value

460V, 50/60Hz, 3-Phase

kW	HP	_D Fundamental	Max.	Inductance (mH)		
KVV	ПР	Amps	continuous Amps	3% impedance	5% impedance	
5.5	7.5	12	18	2.5	4.2	
7.5	10	18	27	1.5	2.5	
11	15	25	37.5	1.2	2	
15	20	35	52.5	0.8	1.2	
18.5	25	35	52.5	0.8	1.2	
22	30	45	67.5	0.7	1.2	
30	40	55	82.5	0.5	0.85	
37	50	80	120	0.4	0.7	
45	60	80	120	0.4	0.7	
55	75	100	150	0.3	0.45	
75	100	130	195	0.2	0.3	

B.4.2 AC Output Reactor Recommended Value

230V, 50/60Hz, 3-Phase

kW	HP	Fundamental	Max.	Inductance (mH)		
KVV	пР	Amps	continuous Amps	3% impedance	5% impedance	
5.5	7.5	25	37.5	0.5	1.2	
7.5	10	35	52.5	0.4	0.8	
11	15	55	82.5	0.25	0.5	
15	20	80	120	0.2	0.4	
18.5	25	80	120	0.2	0.4	
22	30	100	150	0.15	0.3	
30	40	130	195	0.1	0.2	
37	50	160	240	0.075	0.15	

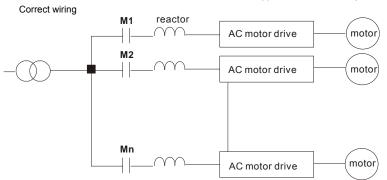
130/	ш	Fundamental	Max.	Inductance (mH)		
kW	HP	Amps	continuous Amps	3% impedance	5% impedance	
5.5	7.5	18	27	1.5	2.5	
7.5	10	18	27	1.5	2.5	
11	15	25	37.5	1.2	2	
15	20	35	52.5	0.8	1.2	
18.5	25	45	67.5	0.7	1.2	
22	30	45	67.5	0.7	1.2	
30	40	80	120	0.4	0.7	
37	50	80	120	0.4	0.7	
45	60	100	150	0.3	0.45	
55	75	130	195	0.2	0.3	
75	100	160	240	0.15	0.23	

B.4.3 Applications for AC Reactor

Connected in input circuit

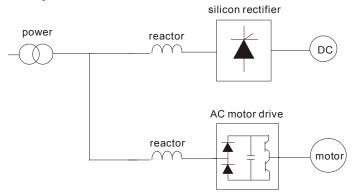
Application 1	Question
When more than one AC motor drive is connected to the same power, one of them is ON during operation.	When applying to one of the AC motor drive, the charge current of capacity may cause voltage ripple. The AC motor drive may damage when over current occurs during operation.

B-12 , VLE3.1, SW V1.07



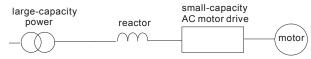
Application 2	Question
Silicon rectifier and AC motor drive is connected to the same power.	Surges will be generated at the instant of silicon rectifier switching on/off. These surges may damage the mains circuit.

Correct wiring



Application 3	Question
Used to improve the input power factor, to reduce harmonics and provide protection from AC line disturbances _₹ (surges, switching spikes, short interruptions, etc.). AC line reactor should be installed when the power supply capacity is 500kVA or more and exceeds 6 times the inverter capacity, or the mains wiring distance ≤ 10m.	When power capacity is too large, line impedance will be small and the charge current will be too large. That may damage AC motor drive due to higher rectifier temperature.

Correct wiring



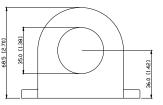
B-14 , VLE3.1, SW V1.07

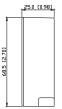


MOTOR

B.5 Zero Phase Reactor (RF220X00A)

Dimensions are in millimeter and (inch)





Power

Supply

phase reactors.



Zero Phase Reactor

Cable type	Reco	mmend Size	Qty.	Wiring		
(Note)	AWG	mm²	Nominal (mm²)	Qty.	Method	
Single-	≦10	≦5.3	≦5.5	1	Diagram A	
core	≦2	≦33.6	≦38	4	Diagram B	
Three-	≦12	≦3.3	≦3.5	1	Diagram A	
core	≦1	≦42.4	≦50	4	Diagram B	

Note: 600V Insulated unshielded Cable.

Diagram A

Please wind each wire 4 times around the core. The reactor must be put at inverter output as close as possible.

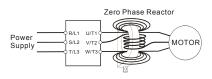
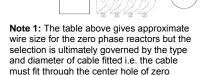


Diagram B

Please put all wires through 4 cores in series without winding.



Note 2: Only the phase conductors should pass through, not the earth core or screen.

Note 3: When long motor output cables are used an output zero phase reactor may be required to reduce radiated emissions from the cable.

B.6 DC Choke Recommended Values

230V DC Choke

Input voltage	kW	HP	DC Amps	Inductance (mh)
	5.5	7.5	32	0.85
	7.5	10	40	0.75
	11	15	62	Built-in
230Vac	15	20	92	Built-in
50/60Hz	18.5	25	110	Built-in
3-Phase	22	30	125	Built-in
	30	40	-	Built-in
	37	50	-	Built-in

460V DC Choke

Input voltage	kW	HP	DC Amps	Inductance (mh)
	5.5	7.5	18	3.75
	7.5	10	25	4.00
	11	15	32	Built-in
	15	20	50	Built-in
400) (18.5	25	62	Built-in
460Vac	22	30	80	Built-in
50/60Hz 3-Phase	30	40	92	Built-in
0 1 11000	37	50	110	Built-in
	45	60	125	Built-in
	55	75	200	Built-in
	75	100	240	Built-in



B.7 Digital Keypad KPVL-CC01

The digital keypad is the display of VFD-VL series. The following keypad appearance is only for reference and please see the product for actual appearance.

B.7.1 Description of the Digital Keypad KPVL-CC01



Display Message	Descriptions
FREQ. SETPOINT So 60.00Hz Press MODE key	Displays the AC drive Master Frequency
OUTPUT FREQ. So 0.00Hz Press MODE key	Displays the actual output frequency present at terminals U/T1, V/T2, and W/T3

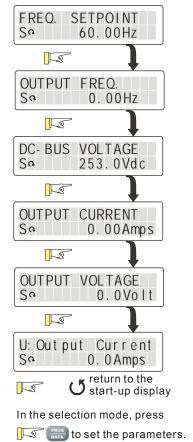
Appendix B Accessories	<i>√/</i> 7VL	
Display Message	Descriptions	
DC- BUS VOLTAGE Ro 716.0Vdc	Displays the voltage of DC BUS	
OUTPUT CURRENT So 0.00Amps	Displays the output current present at terminals U/T1, V/T2, and W/T3	
OUTPUT VOLTAGE Sa 0.0Volt	Displays the output voltage of motor	
U: Out put Current Sa 0.0 Amps Press MODE key	User defined unit (Where U= Pr.00-04)	
PARAM COPY So READ 1	Copy the first set of parameter groups from the drive to the keypad. It can save two sets of parameter groups to keypad. (one set is from group 0 to group 13)	
PARAM COPY So SAVE 1 v1.00	Save the first set of parameter groups from the keypad to other drive. The firmware version is 1.00.	
SYSTEM PARAMETER So 00-	Displays the group number	
Rated Current 27.10Amp	Displays the actual stored value of the selected parameter	
External Fault Fo FaultCode: 60	External Fault	
End	Display "End" for approximately 1 second if input has been accepted by pressing PROG/DATA key. After a parameter value has been set, the new value is automatically stored in memory.	
Err	Display "Err", if the input is invalid.	

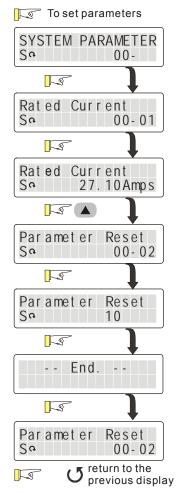
B-18 VLE3.1, SW V1.07



B.7.2 How to Operate the Digital Keypad KPVL-CC01

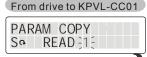
Selection Mode



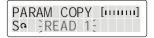


In the parameters mode, it will display parameters and parameters definitions

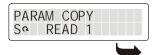
Appendix B Accessories | VIII To copy parameters



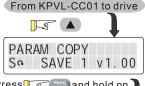
Press and hold on for about 5 seconds



When "READ 1" starts blinking, it starts to save to KPVL-CC01.



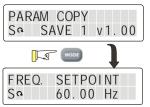
Finish to save parameters



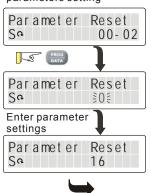
Press and hold on for about 5 seconds

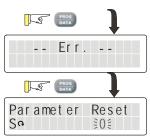


When "SAVE 1" starts blinking, it starts to save to KPVL-CC01. V1.00 is the firmware version. It fails to save to KPVL-CC01 when it displays V ----. It needs to save parameters from drive to KPVL-CC01 first.



When entering error parameters setting





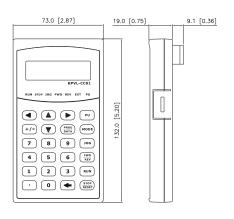
Please re-enter the correct value when the setting is blinking.

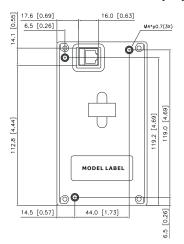
B-20 VLE3.1, SW V1.07



B.7.3 Dimension of the Digital Keypad

Unit: mm [inch]

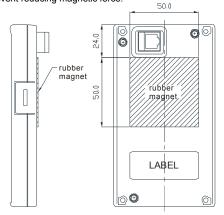




B.7.4 Recommended Position the Rubber Magnet of the Digital Keypad

This rubber magnet is shipped with the digital keypad. Users can adhere to anywhere of the back of the digital keypad to stick on the case of the AC motor drive. Please don't stick on the communication port to prevent reducing magnetic force.

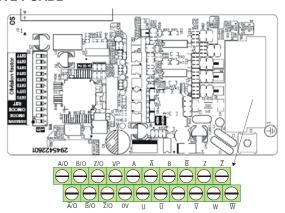






B.8 PG Card (for Encoder)

B.8.1 EMVL-PGABL



1. Terminals descriptions

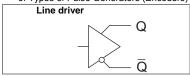
Т	erminal Symbols	Descriptions	Specifications
	I VP		Voltage: +5V±0.5V or +12V±1V Current: 200mA max.
	0V	Power source common for encoder	Reference level of the power of encoder
TB1	$A, \overline{A}, B, \overline{B}, Z, \overline{Z}$	Incremental line driver input	Line driver RS422 Max. input frequency: 100 kHz
	$U, \overline{U}, V, \overline{V}, W, \overline{W}$	Absolute line driver input (UVW 3-bit code)	Line driver RS422 Max. input frequency: 50 kHz
	A/O, A/O, B/O, B/O, Z/O, Z/O	Signal output for PG feedback card and can be used as a frequency divider.	Line driver RS422 Max. output frequency: 100 kHz
50	(1)	Grounding	Connected to the grounding of the power of the AC motor drive and used for PG shielding

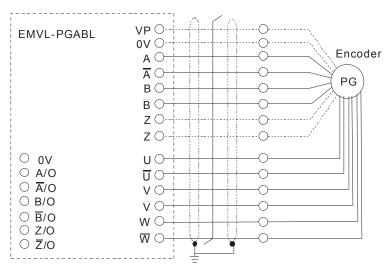
B-22 VLE3.1, SW V1.07

2. Wire length

Types of Pulse Generators	Maximum Wire Length	Wire Gauge
Line Driver	100m	1.25mm ² (AWG16) or above

3. Types of Pulse Generators (Encoders)





4. Output Signal Setting of the Frequency Divider

It generates the output signal of division factor RESERVE: reserved bit (PIN1) "n" after dealing with the input pulse. Please set by the switch SW1 on the card

	-,									
	3VE E DE			D	ivis	ion	Fac	ctor		
	RESEF I/MOD O/MOI RST	BITO	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	
0	ON C] [

I/MODE: input type setting of the division

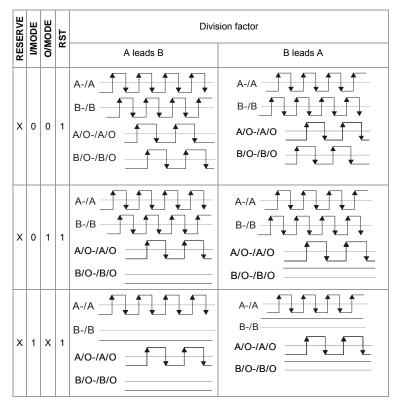
pulse (PIN 2)

O/MODE: output type setting of the division pulse (PIN 3)

RST: clock reset bit (PIN 4)

Division factor: setting for division factor n:

1~256 (PIN5~12)



NOTE

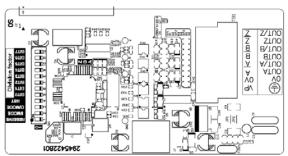
- When the switch is ON, it means logic 0.
- A-/A and B-/B are the input signals of PG card. A/O-/A/O and B/O-/B/O are the line driver outputs of the frequency divider measured by the differential probe.
- PIN1 is reserved
- PIN 5~12 are the denominator for the frequency divider. PIN 5 is the low bit (EX: the setting of XXXX10101010 is that the input signal divides by 85).

B-24 VLE3.1, SW V1.07



- When PIN 2 and PIN 3 are set to 0, the input signals (A-/A and B-/B) of PG card should be square wave and A/O-/A/O and B/O-/B/O are the outputs of frequency divider.
- When PIN 2 is set to 0 and PIN 3 is set to 1, the input signals (A-/A and B-/B) of PG card should be square wave and B/O-/B/O is the indication of phase A and B. (EX: LOW means A leads B and HIGH means B leads A). A/O-/A/O is the output of frequency divider.
- When PIN 2 is set to 1 and PIN 3 is set to X, B-/B should be the input signal of direction indication. (EX: when B-/B is LOW, it means that A leads B. When B-/B is HIGH, it means that B leads A. A-/A is a square wave input. B/O-/B/O and B-/B should be input synchronously. A/O-/A/O is the output of frequency divider.
- Z/O-/Z/O of the PG card will act by the input signal of Z-/Z and don't have the function of frequency divider.
- When changing the denominator of the frequency divider or input/output type, it needs to clear the counter value by clock reset bit (PIN4) before operation. Please set the switch to 1 after reset.

B.8.2 EMVL-PGABO



3. Terminals descriptions

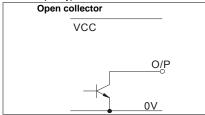
Т	erminal Symbols	Descriptions	Specifications
	VP	Power source of encoder	Voltage: +12V±1V Current: 200mA max.
TB1	ov	Power source common for encoder	Reference level of the power of encoder
	$A, \overline{A}, B, \overline{B}, Z, \overline{Z}$	Incremental line driver input	Open collector signal input. Max. bandwidth is $\frac{100 \text{kHz}}{\overline{A}, \overline{B}, \overline{Z}}$ and

т	erminal Symbols	Descriptions	Specifications
			0V should be short circuit.
<u>-</u>	A/O, A/O, B/O, B/O, Z/O, Z/O	Signal output for PG feedback card and can be used as a frequency divider.	Line driver RS422 Max. output frequency: 100 kHz
TB1	(Grounding	Connected to the grounding of the power of the AC motor drive and used for PG shielding

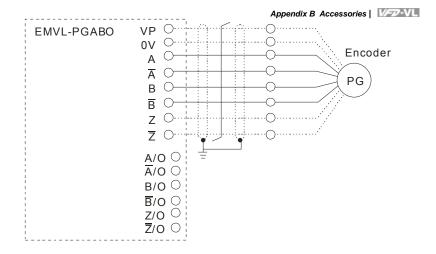
2. Wire length

Output Type of the Encoder	Maximum Wire Length	Wire Gauge
Open collector	50m	1.25mm ² (AWG16) or above

3. Output Type of Encoder



B-26 VLE3.1, SW V1.07



4. Output Signal Setting of the Frequency Divider

It generates the output signal of division factor RESERVE: reserved bit (PIN1) "n" after dealing with the input pulse. Please set by the switch SW1 on the card.

RESERVE I/MODE O/MODE RST Division Factor 3 5 6 8 9 10 11 12 7

I/MODE: input type setting of the division

pulse (PIN 2)

O/MODE: output type setting of the division

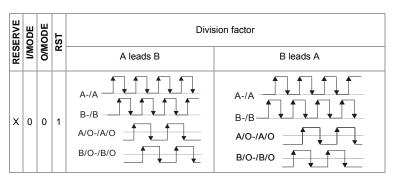
pulse (PIN 3)

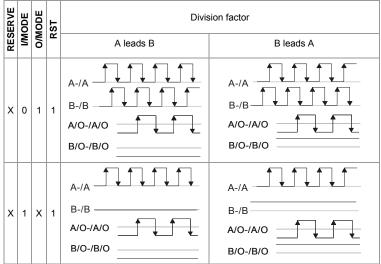
RST: clock reset bit (PIN 4)

Division factor: setting for division factor n:

1~256 (PIN5~12)

Settings and explanations







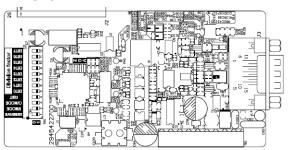
- When the switch is ON, it means logic 0.
- A-/A and B-/B are the input signals of PG card. A/O-/A/O and B/O-/B/O are the line driver outputs of the frequency divider measured by the differential probe.
- PIN1 is reserved
- PIN 5~12 are the denominator for the frequency divider. PIN 5 is the low bit (EX: the setting of XXXX10101010 is that the input signal divides by 85).
- When PIN 2 and PIN 3 are set to 0, the input signals (A-/A and B-/B) of PG card should be square wave and A/O-/A/O and B/O-/B/O are the outputs of frequency divider
- When PIN 2 is set to 0 and PIN 3 is set to 1, the input signals (A-/A and B-/B) of PG card should be square wave and B/O-/B/O is the indication of phase A and B. (EX: LOW means A leads B and HIGH means B leads A). A/O-/A/O is the output of frequency divider.
- When PIN 2 is set to 1 and PIN 3 is set to X, B-/B should be the input signal of direction indication. (EX: when B-/B is LOW, it means that A leads B. When B-/B is HIGH, it means that B leads A. A-/A is a square wave input. B/O-/B/O and B-/B should be input synchronously. A/O-/A/O is the output of frequency divider.

B-28 VLE3.1, SW V1.07



- Z/O-/Z/O of the PG card will act by the input signal of Z-/Z and don't have the function of frequency divider.
- When changing the denominator of the frequency divider or input/output type, it needs to clear the counter value by clock reset bit (PIN4) before operation. Please set the switch to 1 after reset.

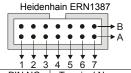
B.8.3 EMVL-PGH01



Heidenhain: ERN1085,ERN1185,ERN1387,ERN487

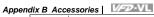
1. Sinusoidal Encoder Function

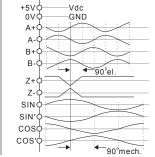




Terminal Name
B-
NC
Z+
Z-
A+
A-
0V
B+
+5V
SIN
SIN'
COS
COS'
NC
NC

PIN NO	i erminai Name
5a	B-
NC	NC
4b	R+
4a	R-
6b	A+
2a	A-
5b	0V
3b	B+
1b	UP
1a	C-
7b	C+
2b	D+
6a	D-
-	-
-	-

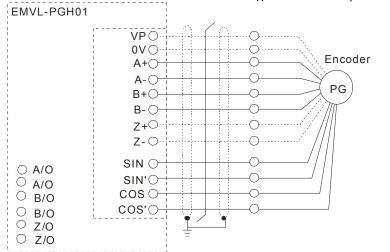




2. Terminals descriptions

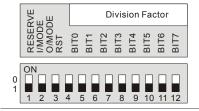
Te	rminal Symbols	Descriptions	Specifications
£L	+5V	Specific power output of encoder	Voltage: +5V±0.5V Current: 200mA max.
	0V	Power source common for encoder	Reference level of the power of encoder
	A+, A-, B+, B-, Z+, Z-	Sine line driver input (incremental signal)	0
56	SIN, SIN', COS, COS'	Sine line driver input signal (absolute signal)	360'mech. 0
	A/O, A/O, B/O, B/O, Z/O, Z/O	Signal output for PG feedback card and can be used as a frequency divider.	Line driver RS422 Max. output frequency: 100 kHz

B-30 VLE3.1, SW V1.07



4. Output Signal Setting of the Frequency Divider

It generates the output signal of division factor RESERVE: reserved bit (PIN1) "n" after dealing with the input pulse. Please set by the switch SW1 on the card.



I/MODE: input type setting of the division pulse (PIN 2)

O/MODE: output type setting of the division

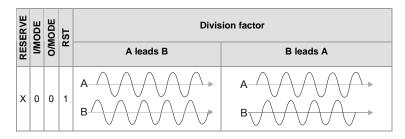
pulse (PIN 3)

RST: clock reset bit (PIN 4)

Division factor: setting for division factor n:

1~256 (PIN5~12)

Settings and explanations



RESERVE	I/MODE	O/MODE	RST	Division factor			
RES	Š			A leads B	B leads A		
				A/O-/A/O	A/O-/A/O		
				B/O-/B/O	B/O-/B/O		
				A	A		
x	0	1	1	B	$B \bigvee \bigvee \bigvee $		
				A/O-/A/O	A/O-/A/O		
				B/O-/B/O	B/O-/B/O		
Х	1	Х	1	This setting is NOT for EMVL-PGH01			



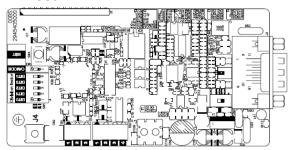
- When the switch is ON, it means logic 0.
- A-/A and B-/B are the input signals of PG card. A/O-/A/O and B/O-/B/O are the line drivers of the frequency divider measured by the differential probe.
- PIN1 is reserved.
- PIN 5~12 are the denominator for the frequency divider. PIN 5 is the low bit (EX: the setting of XXXX10101010 is that the input signal divides by 85).
- When PIN 2 and PIN 3 are set to 0, the input signals (A-/A and B-/B) of PG card should be square wave and A/O-/A/O and B/O-/B/O are the outputs of frequency divider.
- When PIN 2 is set to 0 and PIN 3 is set to 1, the input signals (A-/A and B-/B) of PG card should be square wave and B/O-/B/O is the indication of phase A and B. (EX: LOW means A leads B and HIGH means B leads A). A/O-/A/O is the output of frequency divider.
- When PIN 2 is set to 1 and PIN 3 is set to X, B-/B should be the input signal of direction indication. (EX: when B-/B is LOW, it means that A leads B. When B-/B is HIGH, it means that B leads A. A-/A is a square wave input. B/O-/B/O and B-/B should be input synchronously. A/O-/A/O is the output of frequency divider.

B-32 VLE3.1. SW V1.07



- Z/O-/Z/O of the PG card will act by the input signal of Z-/Z and don't have the function of frequency divider.
- When changing the denominator of the frequency divider or input/output type, it needs to clear the counter value by clock reset bit (PIN4) before operation. Please set the switch to 1 after reset.

B.8.4 EMVL-PGS01



Applicable encoders for EMVL-PGS01:

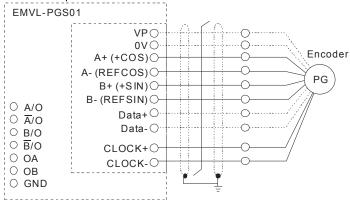
- EnDat2.1: EQN425, EQN1325, ECN113, ECN413, ECN1113, ECN1313
- HIPERFACE: SRS50/60
- 1. Pin description

VFD-VL Series



VFD-VL Series	Corresponding terminal		
Pin No.	EnDat	HIPERFACE®	
1	B-	REFSIN	
2	0V	0V	
3	0V	0V	
4	0V	0V	
5	A+	+COS	
6	A-	REFCOS	
7	0V	0V	
8	B+	+SIN	
9	VP	VP	
10	Data+	Data+	
11	Data-	Data-	
12	CLOCK+	-	
13	CLOCK-	-	
14	VP	VP	
15	0V	0V	





2. Terminals descriptions

Terminal Symbols		Descriptions	Specifications	
J3	VP	Power source of encoder (use SW2 to switch 12V/5V)	Voltage: +5VDC±5% or +8.3 VDC±6% Current: 250mA max.	
	0V	Power source common for encoder	Reference level of the power of encoder	
	A+, A-, B+, B-	Sine line drive input (incremental signal)	Input frequency: 40kHz max. 360°el. A 0.81.2Vss (≈1Vss; Z ₀ =120 Q)	
	+SIN, +COS REFSIN, REFCOS	Sine line drive input (incremental signal)	Input frequency: 20kHz max. SIN O.91.1V REFSIN/REFCOS	
	CLOCK+, CLOCK-	CLOCK line drive output	Line Driver RS422 Level output	
	Data+, Data-		RS485 communication interface	
			Terminal resistor: about 130 Ω	
TB1	A/O, $\overline{\overline{A}}$ /O, B/O, $\overline{\overline{B}}$ /O	Signal output for PG feedback card and can be used as a frequency divider.	Line Driver RS422 Level output	
TB2	OA OB	Open collector output signal and can be used as a frequency divider	Transistor open collector output Max. 24VDC, 30mA VOL≤1.5V(IOL=30mA) IOH≤200μA(VOH=24VDC)	
	GND	Open collector output common	Reference level of NPN transistor open collector output	

B-34 VLE3.1, SW V1.07

4. Output Signal Setting of the Frequency Divider

It generates the output signal of division factor O/MODE: output type setting of the division "n" after dealing with the input pulse. Please set by the switch SW1 on the card.

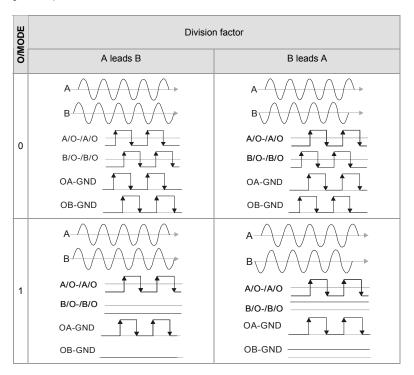
pulse

RST: clock reset bit

Division factor: setting for division factor n: 1~31



Settings and explanations





- When the switch is ON, it means logic 0.
- A-/A and B-/B are the input signals of PG card. A/O-/A/O and B/O-/B/O are the line driver outputs of the frequency divider measured by the differential probe.
- Bit 0-4 are the denominators for the frequency divider. Bit 0 is the low bit (EX: the setting of 10110 is that the input signal divides by 13).
- When the output pulse type of frequency divider is set to 0, A/O-/A/O, B/O-/B/O, OA-GND and OB-GND are the outputs of frequency divider.
- When the output pulse type of frequency divider is set to 1, B/O-/B/O and OB-GND are the indication of phase A and B. (EX: LOW means A leads B and HIGH means B leads A). A/O-/A/O and OA-GND are the output of frequency dividers.
- When changing the denominator of the frequency divider or output type, it needs to clear the counter value by clock reset bit before operation.

B-36 VLE3.1, SW V1.07



B.9 AMD-EMI Filter Cross Reference

230V 3-phase Model	Filter Model Name	230V 3-phase Model	Filter Model Name
VFD055VL23A	KMF336A	VFD055VL43A	KMF318A
VFD075VL23A	KMF336A	VFD075VL43A	KMF325A
VFD110VL23A	KMF350A	VFD110VL43A	KMF325A
VFD150VL23A	KMF370A	VFD150VL43A	KMF336A
VFD185VL23A	KMF3100A	VFD185VL43A	KMF350A
VFD220VL23A	KMF3100A	VFD220VL43A	KMF350A
VFD300VL23A	KMF3150A	VFD300VL43A	KMF370A
VFD370VL23A	KMF3150A	VFD370VL43A	KMF370A
		VFD450VL43A	KMF3100A
		VFD550VL43A	KMF3150A
		VFD750VL43A	KMF3150A

For more detail information of filter, please see http://www.dem-uk.com/ikcm/Home

Installation

All electrical equipment, including AC motor drives, will generate high-frequency/low-frequency noise and will interfere with peripheral equipment by radiation or conduction when in operation. By using an EMI filter with correct installation, much interference can be eliminated. It is recommended to use DELTA EMI filter to have the best interference elimination performance.

We assure that it can comply with following rules when AC motor drive and EMI filter are installed and wired according to user manual:

- EN61000-6-4
- EN61800-3: 1996
- EN55011 (1991) Class A Group 1

General precaution

- EMI filter and AC motor drive should be installed on the same metal plate. 1
- 2 Please install AC motor drive on footprint EMI filter or install EMI filter as close as possible to the AC motor drive
- 3. Please wire as short as possible.
- 4 Metal plate should be grounded.
- 5 The cover of EMI filter and AC motor drive or grounding should be fixed on the metal plate and the contact area should be as large as possible.

Choose suitable motor cable and precautions

Improper installation and choice of motor cable will affect the performance of EMI filter. Be sure to observe the following precautions when selecting motor cable.

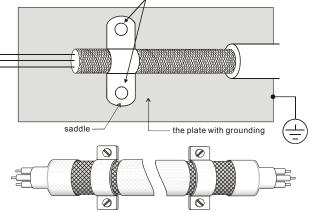
1. Use the cable with shielding (double shielding is the best).

Appendix B Accessories | V=>-VL

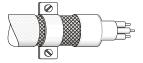
- 2 The shielding on both ends of the motor cable should be grounded with the minimum length and maximum contact area.
- 3 Remove any paint on metal saddle for good ground contact with the plate and shielding.



Remove any paint on metal saddle for good ground contact with



Saddle on both ends



Saddle on one end

The length of motor cable

When motor is driven by an AC motor drive of PWM type, the motor terminals will experience surge voltages easily due to components conversion of AC motor drive and cable capacitance. When the motor cable is very long (especially for the 460V series), surge voltages may reduce insulation quality. To prevent this situation, please follow the rules below:

B-38 VLE3.1. SW V1.07



- Use a motor with enhanced insulation.
- Connect an output reactor (optional) to the output terminals of the AC motor drive
- The length of the cable between AC motor drive and motor should be as short as possible (10 to 20 m or less)
- For models 7.5hp/5.5kW and above:

Insulation level of motor	1000V	1300V	1600V	
460VAC input voltage	66 ft (20m)	328 ft (100m)	1312 ft (400m)	
230VAC input voltage	1312 ft (400m)	1312 ft (400m)	1312 ft (400m)	



When a thermal O/L relay protected by motor is used between AC motor drive and motor, it may malfunction (especially for 460V series), even if the length of motor cable is only 165 ft (50m) or less.

To prevent it, please use AC reactor and/or lower the carrier frequency (Pr. 00-17 PWM carrier frequency).



Never connect phase lead capacitors or surge absorbers to the output terminals of the AC motor drive.

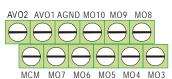
- If the length is too long, the stray capacitance between cables will increase and may cause leakage current. It will activate the protection of over current, increase leakage current or not insure the correction of current display. The worst case is that AC motor drive may damage.
- If more than one motor is connected to the AC motor drive, the total wiring length is the sum of the wiring length from AC motor drive to each motor.

VLE3.1. SW V1.07 B-39



B.10 EMVL-IOA01





Terminals	Descriptions			
AVO1-AGND	Multifunction analog voltage output terminal			
AVO2-AGND	-10.0V~10.0V			
	The analog output is defined by Pr.03-17 and Pr.03-20.			
MO3~MO10	The AC motor drive outputs every monitor signal, such as			
Multifunction output	operation indication, frequency attained and overload indication by			
terminals	the transistor (open collector). Refer to Pr.02-15~02-22			
(photocoupler)	multifunction output terminals for details.			
	Max: +24V/5mA			
	MO3~MO10			
	internal circuit MCM			

VLE3.1, SW V1.07 B-40



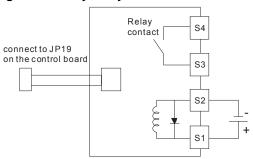
B.11 Safety Relay EMVL-SAF01



B.11.1 Functions of the Terminals

Terminals		Descriptions	Specifications		
J1	S1	+24VDC power Input	Min. activation voltage: +19Vdc		
	S2 +24VDC, reference		· Impedance: 720+10%Ω		
		level of the power	Rated power: about 800mW		
	S3	A dry contact of a relay	· Rated current: 8 A		
	S4	A dry contact of a relay	Rated voltage/max. switch voltage: 240/400 VAC		
			Contact material: AgSnO2		
			Contact impedance:		
			≤100 mOhm / 1 A / 24 VDC		
			≤20 Ohm / 10 mA / 5 VDC		
			Mechanical endurance: 10x10 ⁶ cycles		
			• Rated operation frequency: 6 min ⁻¹ / 150 min ⁻¹ (loaded/unloaded)		

B.11.2 Wiring of the Safety Relay



VLE3.1, SW V1.07 B-41

Appendix B Accessories | Descriptions

- 1. When the power +24VDC is applied to S1 and S2 (S1 is +), the relay contacts of S3 and S4 are ON. When the power +24VDC isn't applied to S1 and S2, the relay contacts of S3 and S4 are OFF. At the meanwhile, EMVL-SAF01 can stop the output of the AC motor drive by connecting to JP19 on the control board. It can also be used with MI8 to achieve two safety-loop protections via hardware.
- 2. Multifunction input MI8
 - (1) Please remove JP1 from the control board before using safety-loop function. At the meanwhile, the multifunction input MI8 can control the output of the AC motor drive.
 - (2) operation method:

MI8 is ON: the AC motor drive can output

MI8 is OFF: the AC motor drive can't output

NOTE: Please insert JP1 into the control board when this function is disabled.

- Safety-Relay EMVL-SAF01
 - (1) Please connect the power of J3 to JP19 on the control board and remove JP18 on the control board
 - (2) Operation method:

When the power is applied to S1-S2: It is ON and the AC motor drive can output When the power isn't applied to S1-S2: it is OFF and the AC motor drive can't output

(3) S3-S4 are the monitor contacts and user can check the safety-loop by this contact.



- Please notice that when J3 of relay board is connected to JP19 of control board,
 JP18 must be removed when using EMVL-SAF01.
- Please supply the power +24VDC to S1 and S2 before the AC motor drive is powered on to drive relay.

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Appendix C How to Select the Right 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	•	•	•	•
Continuous operation, Short-time operation Long-time operation at medium/low speeds			•	•	
Maximum output current (instantaneous) Constant output current (continuous)		•		•	
Maximum frequency, Base frequency		•			
Power supply transformer capacity or percentage impedance Voltage fluctuations and unbalance Number of phases, single phase protection Frequency				•	•
Mechanical friction, losses in wiring				•	•
Duty cycle modification			•		

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C.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=

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

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=

$$\frac{k \times N}{\eta \times \cos \varphi} \left[n_r + n_s (k_{s-1}) \right] = P_{Cl} \left[1 + \frac{n_s}{n_r} (k_{s-1}) \right] \le 1.5 \times the_capacity_of_AC_motor_drive(kVA)$$

Acceleration time ≥60 seconds

The starting capacity=

$$\frac{k \times N}{\eta \times \cos \varphi} \left[n_r + n_s(k_{s-1}) \right] = P_{C_1} \left[1 + \frac{n_s}{n_r} (k_{s-1}) \right] \le the_capacity_of_AC_motor_drive(kVA)$$

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

Acceleration time ≤60 seconds

$$n_T + I_M \left[1 + \frac{n_S}{n_T} (k_S - 1) \right] \le 1.5 \times the_rated_current_of_AC_motor_drive(A)$$

Acceleration time ≥60 seconds

$$n_{\tau} + I_{M} \left[1 + \frac{n_{s}}{n_{\tau}} (k_{s} - 1) \right] \le the _rated _current _of _AC _motor _drive(A)$$



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=

$$\frac{k \times P_M}{\eta \times \cos \varphi} \le the _capacity_of _AC_motor_drive(kVA)$$

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

$$k \times \sqrt{3} \times V_M \times I_M \times 10^{-3} \le the_capacity_of_AC_motor_drive(kVA)$$

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)

: Motor efficiency (normally, approx. 0.85) η

 $\cos \varphi$: Motor power factor (normally, approx. 0.75)

: Motor rated voltage(V) V_M

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

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

PWM method)

: Continuous motor capacity (kVA) P_{C1}

: Starting current/rated current of motor $k_{\rm S}$

: Number of motors in parallel n_T

: Number of simultaneously started motors n_s

: Total inertia (GD²) calculated back to motor shaft (kg m²) GD^2

 T_L : Load torque

: Motor acceleration time t_A

Ν : Motor speed

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C.2 General Precaution

Selection Note

- 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.
- 4. When an error occurs on the drive, a protective circuit will be activated and the AC Motor Drive output is turned off. Then the motor will coast to stop. For an emergency stop, an external mechanical brake is needed to quickly stop the motor.

Parameter Settings Note

- 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.
- 4. If the stall prevention function is activated, the accel./decel. time is automatically extended to a length that the AC Motor Drive can handle. If the motor needs to decelerate within a certain time with high load inertia that can't be handled by the AC Motor Drive in the

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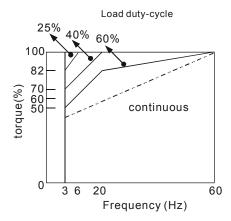
required time, either use an external brake resistor and/or brake unit, depending on the model, (to shorten deceleration time only) or increase the capacity for both the motor and the AC Motor Drive.

C.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.
- The load tolerance of a standard motor is as follows: 4.



- 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.

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- 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.
- 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:

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.

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.

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.

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

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motor drive operates more than one motor, please pay attention to starting and changing the motor

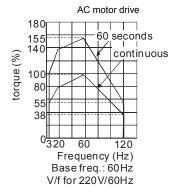
Power Transmission Mechanism

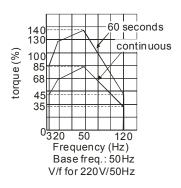
Pay attention to reduced lubrication when operating gear reduction motors, gearboxes, belts and chains, etc. over longer periods at low speeds. At high speeds of 50/60Hz and above, lifetime reducing noises and vibrations may occur.

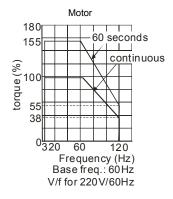
Motor torque

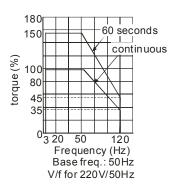
The torque characteristics of a motor operated by an AC motor drive and commercial mains power are different.

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









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