

Series

User Manual

Brushless DC Motor Drive



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Preface

Thank you for choosing DELTA's multi-function BLD-E1 Series. The BLD-E1 Series is manufactured with high-quality components and materials and incorporate the latest microprocessor technology available.

This manual is to be used for the installation, parameter setting, troubleshooting, and daily maintenance of the brushless DC motor drive. To guarantee safe operation of the equipment, read the following safety guidelines before connecting power to the brushless DC 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 brushless DC motor drive are to do installation, trial run and parameter setting. Always read this manual thoroughly before using BLD-E1 series, 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.



- DC input power must be disconnected before any wiring to the brushless DC motor drive is made.
- 2. 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. Never reassemble internal components or wiring.
- 4. Ground the BLD-E1 using the ground terminal. The grounding method must comply with the laws of the country where the brushless DC motor drive is to be installed. Refer to the Basic Wiring Diagram.
- 5. BLD-E1 series is used only to control variable speed of 3-phase induction motors, NOT for 1-phase motors or other purpose.
- 6. BLD-E1 series shall NOT be used for life support equipment or any life safety situation.
- 7. To prevent personal injury, please keep children and unqualified people away from the equipment.



- Never connect the output terminals U/T1, V/T2, and W/T3 of brushless DC motor drive directly to the AC mains circuit power supply.
- DO NOT use Hi-pot test for internal components. The semiconductor used in brushless DC motor drive easily damage by high-voltage.
- 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 brushless DC motor drive and wait for the capacitors to discharge to safe voltage levels.
- Only qualified persons are allowed to install, wire and maintain brushless DC motor drives.
- Some parameters settings can cause the motor to run immediately after applying power.



DO NOT install the brushless DC motor drive in a place subjected to high temperature, direct sunlight, high humidity or liquids.

Only use brushless DC motor drives within specification. Failure to comply may result in fire, explosion or electric shock.

When the motor cable between brushless DC motor drive and motor is too long, the layer insulation of the motor may be damaged. Please use a specific brushless DC motor for the brushless DC motor drive or add a reactor to prevent damage to the motor. Refer to appendix B Reactor for details.

The rated voltage for brushless DC motor drive must be \leq 240V (\leq 120V for 115V models and \leq 480V for 460V models).

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Chapter 1 Introduction

The brushless DC motor drive should be kept in the shipping carton or crate before installation. In order to retain the warranty coverage, the brushless DC 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. 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.
- 5. DO NOT store in an area with rapid changes in temperature. It may cause condensation and frost.
- 6. If the brushless DC 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.
- 7. When the brushless DC 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 brushless DC motor drive to an environment as stated above.

1.1 Receiving and Inspection

This BLD-E1 brushless DC motor drive has gone through rigorous quality control tests at the factory before shipment. After receiving the brushless DC motor drive, please check for the following:

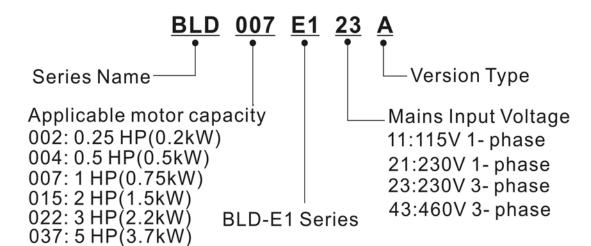
- Inspect the unit to assure it was not damaged during shipment.
- Make sure that the part number indicated on the nameplate corresponds with the part number of your order.

1.1.1 Nameplate Information

Example for 1HP/0.75kW 3-phase 230V brushless DC motor drive



1.1.2 Model Explanation



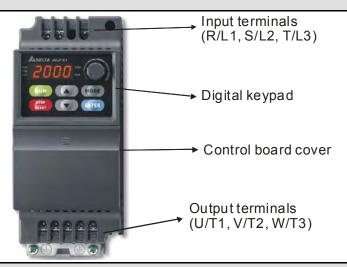
1.1.3 Series Number Explanation 007E123A 0T 9 14 0001 Production number

Production week
Production year 2009
Production factory
T: Taoyuan, W: Wujiang
Model

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

0.25-2HP/0.2-1.5kW (Frame A)



1-5HP/0.75-3.7kW (Frame B)



Internal Structure



- A Digital keypad
- NPN/PNP
- ACI/AVI
- External terminals
- **B** RS485 port (RJ-45)

RFI Jumper Location





The RFI jumper of frame A and frame B is beside the input terminals (R/L1, S/L2, T/L3) as circled in above picture and can be removed by loosening the screws.

Frame	Power range	Models
Α	0.25-2hp (0.2-1.5kW)	BLD002E111A/121A/123A, BLD004E111A/121A/123A/ 143 A, BLD007E121A/123A/143A, BLD015E123A/143A
В	1-5hp (0.75-3.7kW)	BLD007E111A , BLD015E121A, BLD022E121A /123A/ 143A, BLD037E123A/143A

RFI Jumper

RFI Jumper: The brushless DC motor drive may emit the electrical noise. The EMI(electromagnetic interference with standard Y capacity) is used to suppress the interference (Radio Frequency Interference) on the power line. As the leakage current will be increased after using with EMI, user can cut off the RFI when reducing the leakage current is required.

Main power isolated from earth:

If the brushless DC motor drive is supplied from an isolated power (IT power), the RFI jumper must be cut off. Then the RFI capacities (filter capacitors) will be disconnected from ground to prevent circuit damage (according to IEC 61800-3) and reduce earth leakage current.



- 1. After applying power to the brushless DC motor drive, do not cut off the RFI jumper. Therefore, please make sure that main power has been switched off before cutting the RFI jumper.
- The gap discharge may occur when the transient voltage is higher than 1,000V. Besides, electro-magnetic compatibility of the brushless DC motor drives will be lower after cutting the RFI jumper.
- 3. Do NOT cut the RFI jumper when main power is connected to earth.
- 4. The RFI jumper cannot be cut when Hi-pot tests are performed. The mains power and motor must be separated if high voltage test is performed and the leakage currents are too high.
- 5. To prevent drive damage, the RFI jumper connected to ground shall be cut off if the brushless DC motor drive is installed on an ungrounded power system or a high impedance grounding (over 30 ohms) power system or a corner grounded TN system.

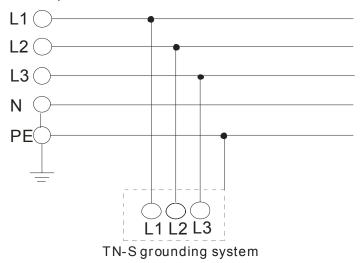
About Grounding System

According to international standard IEC60364, the grounding system can be divided as follows:

- The first letter: the connection between grounded point and power equipment (generator or transformer)
 - T: connect to the same grounded point directly, I: NOT connect to the grounded point (insulation) or grounded via high-resistance equipment.
- 2. The second letter: connection method between grounded point and the electrical device being supplied
 - T: connect to grounded point, independent of other power supplied grounded point, N: grounded via the power supply system
- The third and forth letter: position of grounded conductor
 s: neutral and grounded point are disconnection, C: neutral is connected to grounded point in parallel

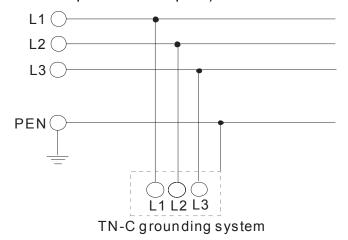
TN-S grounding system:

TN-S is a grounding system with 3-phase, 4-line and PE line. The feature of TN-S system is the neutral line and protective earth(PE) line have an only common grounding at the neutral point of transformer. The neutral line (N) is live part and PE line is NOT live part. This grounding system equips safe and reliable basic potential.



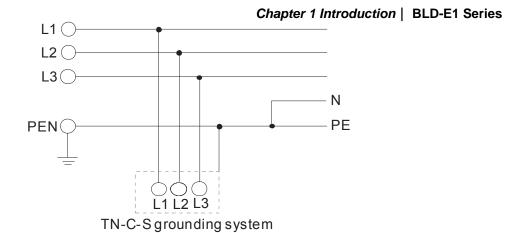
TN-C grounding system:

TN-C grounding system is called 3-phase and 4-line system. This system combines the neutral line with protective earthing(PE) and is called PEN line. This grounding system is sensitive to the grounding malfunction with simple wiring but it is only suitable for the occasions with balanced 3-phase overload. If the high harmonic current caused by the unbalanced current of PEN line and other power electronic equipment superposes on the neutral line in the normal situation and makes the neutral line to be live part with unstable current, it will cause unstable neutral grounding potential. Moreover, it will also make the equipment case connected with PEN line be live part to result in personal injury and incorrect accurate electronic equipment operation (can't get a suitable potential base point).



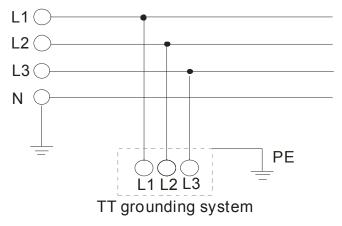
TN-C-S grounding system:

TN-C-S grounding system is made up of two grounding systems, including TN-C system and TN-S system. The connection point of these two systems is at the connection point of N line and PE line.



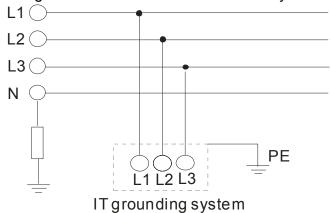
TT grounding system:

TT grounding system is usually called 3-phase 4-line grounding system. The feature of TT grounding system is no electrical connection between the neutral line and protective earthing, i.e. the grounding of the neutral and PE line is separated. No matter 3-phase load is balanced or not, the PE line won't be live part as the neutral line is live part when this system is in normal operation. When only 1-phase grounding is fault, the fault can't be stopped immediately due to the low sensitive of protective earthing and only equipment case may be live part.



IT grounding system:

IT grounding system is a 3-phase 3-line grounding system. The neutral of the system transformer is not grounded or grounded by the impedance, no neutral line N and protective earthing is grounded separately. The advantage of this system is that when only one phase is grounded, it won't cause greater current in the case and the system will operate normally.



1.1.5 Remove Instructions



Remove Fan

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For Frame A and Frame B, press and hold in the tabs on each side of the fan and pull the fan up to release.



1.2 Preparation for Installation and Wiring

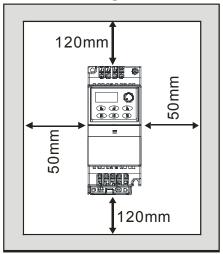
1.2.1 Ambient Conditions

Install the brushless DC motor drive in an environment with the following conditions:

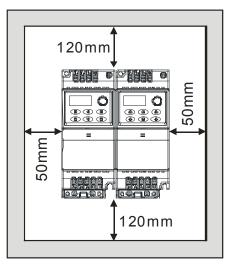
	Air Temperature	-10 ~ +40°C (14~104°F) for UL & cUL -10 ~ +30 °C (14~86°F)for side-by-side mounting	
	Relative Humidity	<90%, no condensation allowed	
Operation	Atmosphere pressure	86 ~ 106 kPa	
	Installation Site Altitude	<1000m	
	Vibration	<20Hz: 9.80 m/s² (1G) max 20 ~ 50Hz: 5.88 m/s² (0.6G) max	
	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

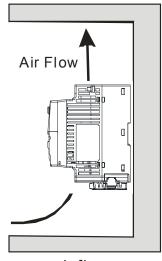
Frame A Mounting Clearances



single drive

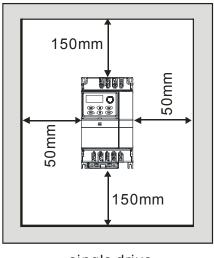


side-by-side installation

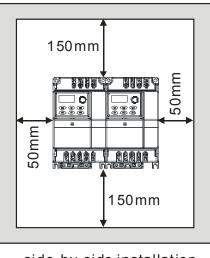


air flow

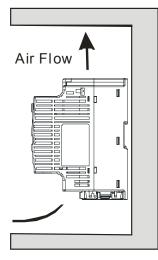
Frame B Mounting Clearances



single drive



side-by-side installation

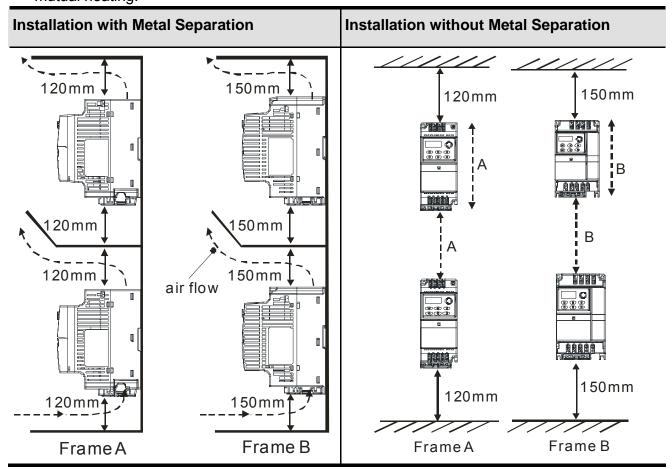


airflow



- Operating, storing or transporting the brushless DC motor drive outside these conditions may cause damage to the brushless DC motor drive.
- 2. Failure to observe these precautions may void the warranty!
- 3. Mount the brushless DC motor drive vertically on a flat vertical surface object by screws. Other directions are not allowed.
- 4. The brushless DC 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 brushless DC motor drive is mounted must be noncombustible and be able to withstand this high temperature.
- 6. When brushless DC 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 brushless DC motor drive in a space with bad ventilation.
- 7. When installing multiple brushless DC motor drives in the same cabinet, they should be adjacent in a row with enough space in-between. When installing one brushless DC motor drive below another one, use a metal separation between the brushless DC motor drives to prevent mutual heating.

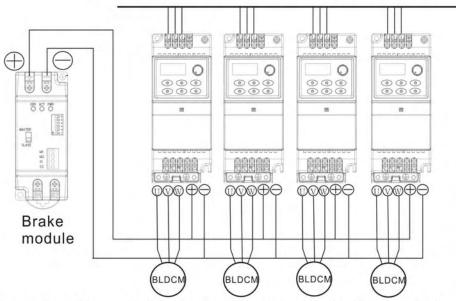


1.2.2 DC-bus Sharing: Connecting the DC-bus of the Brushless DC motor drive in Parallel

- 1. The brushless DC motor drives can absorb mutual voltage that generated to DC bus when deceleration.
- 2. Enhance brake function and stabilize the voltage of the DC bus.
- 3. Only the same capacity and same power system can be connected in parallel.
- 4. The 5 drives should be in same power system, e.g. if the input voltage is 220V, the 5 brushless DC motor drives connected in parallel must also be 220V.

The power should be applied at the same time (only the same capacity and same power system can be connected in parallel).

Power 208/220/230/380/440/480 (depend on models)



For frame A and frame B, terminal + (-) is connected to the terminal + (-) of the brake module.



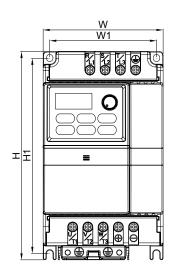
Prevent fiber particles, scraps of paper, dust, metal particles from adhering to the heatsink.

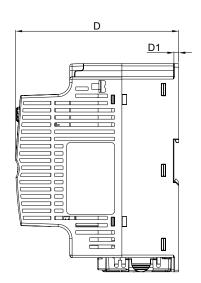
The material on which the brushless DC motor is mounted must be noncombustible and be able to withstand the high temperature to prevent fire accidents.

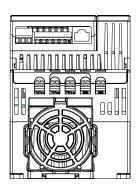
The parallel connection of multiple drives is NOT for 115V models.

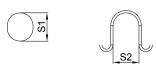
1.3 Dimensions

(Dimensions are in millimeter and [inch]) Frame A









Frame	W	W1	Н	H1	D	D1	S1	S2
Α	72.0	59.0	174.0	151.6	136.1	4.0	5.4	5.4
	[2.83]	[2.32]	[6.86]	[5.97]	[5.36]	[0.16]	[0.21]	[0.21]
В	100.0	89.0	174.0	162.9	136.0	4.0	5.9	5.4
	[3.94]	[3.50]	[6.85]	[6.42]	[5.36]	[0.16]	[0.23]	[0.21]



Frame A: BLD002E111A/121A/123A, BLD004E111A/121A/123A/143A, BLD007E121A/123A/143A, BLD015E123A/143A

Frame B: BLD007E111A, BLD015E121A, BLD022E121A/123A/143A, BLD037E123A/143A

Chapter 2 Installation and Wiring

After removing the cover of input/output terminals and control terminals, check if terminals are clear. Be sure to observe the following precautions when wiring.



- 1. 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. All the units must be grounded directly to a common ground terminal to prevent lightning strike or electric shock and also for decreasing the noise interference.
- 3. 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.



- 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
 brushless DC motor drive.
- 2. Only qualified personnel familiar with brushless DC motor drives is allowed to perform installation, wiring and commissioning.
- 3. Make sure that the power is off before doing any wiring to prevent electric shock.

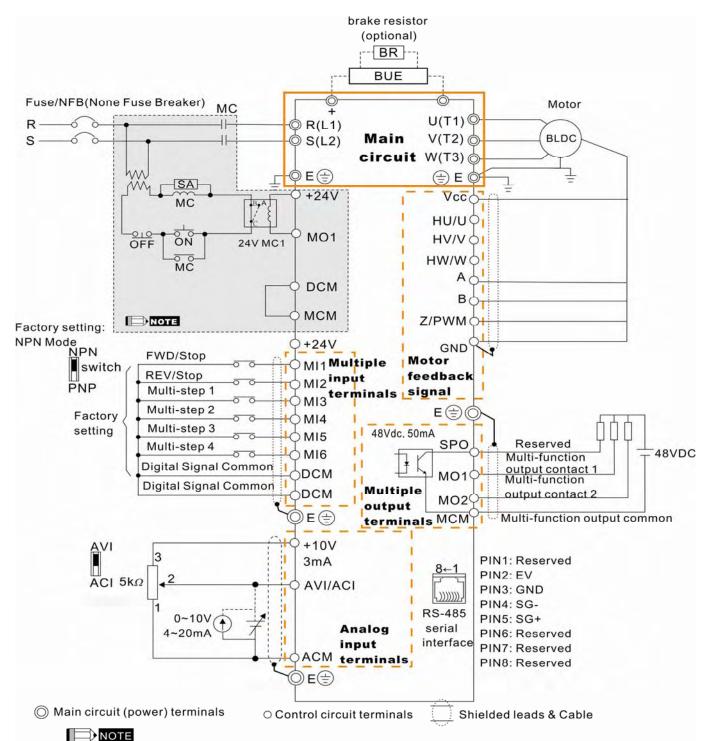


- 1. Use wire gauges that comply with the local regulations during wiring.
- 2. Check following items after finishing the wiring:
 - A. Are all connections correct?
 - B. No loose wires?
 - C. No short-circuits between terminals or to ground?

2.1 Wiring

There are main circuit and control circuit for the wiring of the brushless DC motor. Users must connect wires according to the circuit diagrams on the following pages.

Figure 1 for models of BLD-E1 Series BLD002E111A/121A, BLD004E111A/121A, BLD007E111A/121A, BLD015E121A, BLD022E121A

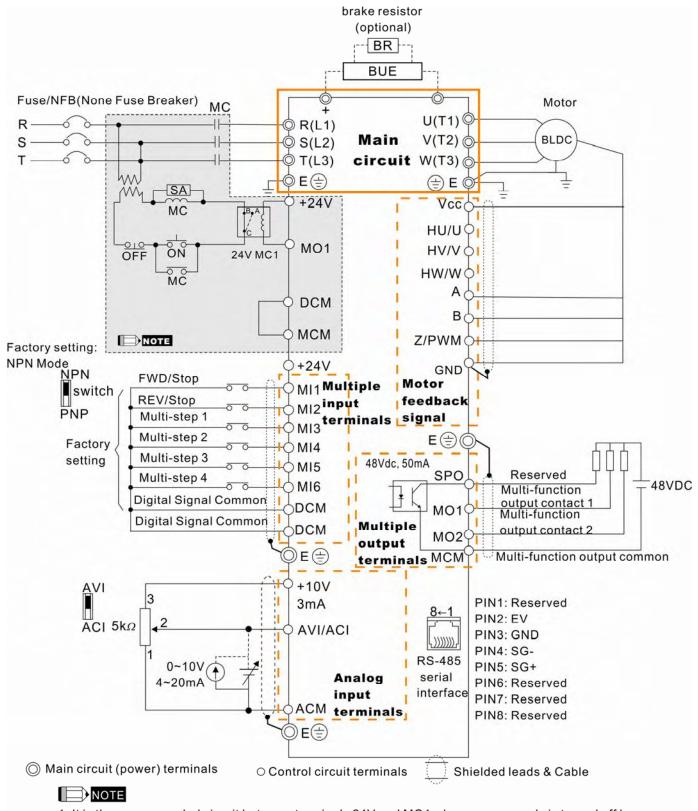


^{1.} It is the recommended circuit between terminals 24V and MO1 when power supply is turned off by a fault output. This protection circuit will turn on the contact of multi-function output terminals to turn off the power and protect the power system.

Revision May 2009, 00DE, V0.50

^{2.} Please connects phase U/V/W individually to terminal U(T1)/V(T2)/W(T3) in order to prevent overheat and overspeed of motor and to prevent drive damage. Note: The wire color of phase U/V/W for Delta ECMD-E9 Series motor are red/white/black.

Figure 2 for models of BLD-E1 Series BLD002E123A, BLD004E123A/143A, BLD007E123A/143A, BLD0015E123A/143A, BLD022E123A/143A, BLD037E123A/143A

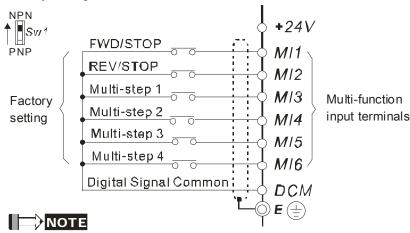


- 1. It is the recommended circuit between terminals 24V and MO1 when power supply is turned off by a fault output. This protection circuit will turn on the contact of multi-function output terminals to turn off the power and protect the power system.
- 2. Please connects phase U/V/W individually to terminal U(T1)/V(T2)/W(T3) in order to prevent overheat and overspeed of motor and to prevent drive damage. Note: The wire color of phase U/V/W for Delta ECMD-E9 Series motor are red/white/black.

Chapter 2 Installation and Wiring | BLD-E1 Series Figure 3 Wiring for NPN mode and PNP mode

NPN Mode

Factory setting is NPN



Don't apply mains voltage into above terminals.

Applicable Output Signal

Open collector output



VCC

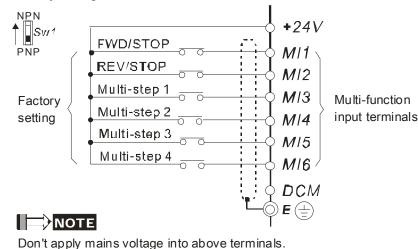
0V



It needs to connect O/P to multi-function input terminals for normal operation.

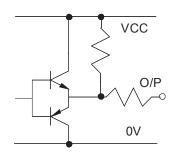
PNP Mode

Factory setting is PNP



Applicable Output Signal

Complementary output



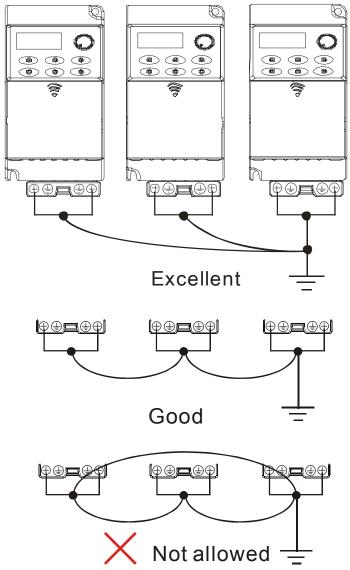


It needs to connect O/P to multi-function input terminals for normal operation.



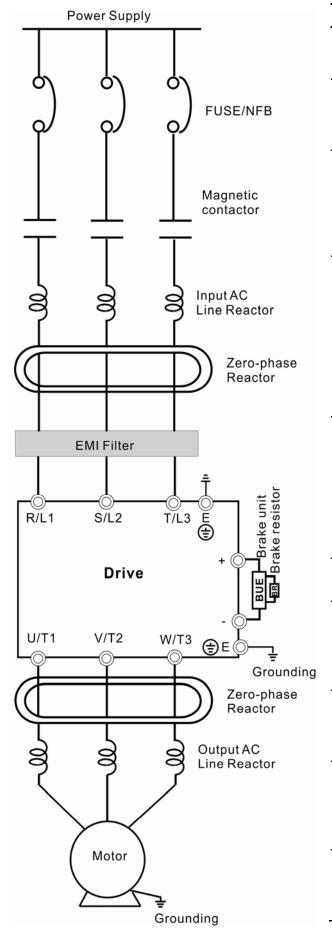
- 1. The wiring of main circuit and control circuit should be separated to prevent erroneous actions.
- 2. Please use shield wire for the control wiring and not to expose the peeled-off net in front of the terminal.
- 3. Please use the shield wire or tube for the power wiring and ground the two ends of the shield wire or tube.
- 4. Damaged insulation of wiring may cause personal injury or damage to circuits/equipment if it comes in contact with high voltage.
- 5. The brushless DC 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.

- 6. With long motor cables between the brushless DC motor drive and motor, high capacitive switching current peaks can cause over-current, high leakage current or lower current readout accuracy. To prevent this, the motor cable should be less than 20m for 3.7kW models and below. And the cable should be less than 50m for 5.5kW models and above. For longer motor cables use an AC output reactor.
- 7. The brushless DC motor drive, electric welding machine and the greater horsepower motor should be grounded separately.
- 8. Use ground leads that comply with local regulations.
- 9. No brake resistor is built in the BLD-E1 series, it can install brake resistor for those occasions that use higher load inertia or frequent start/stop. Refer to Appendix B for details.
- 10. To prevent the lightening strike and electric shock, the metal grounding wire of electric equipment should be thick, short and connect to the specific ground terminal of the variable frequency system.
- 11. Multiple BLD-E1 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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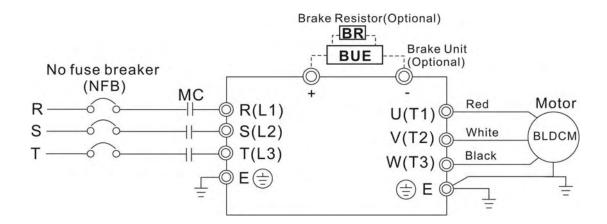
2.2 External Wiring



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)	Do NOT run/stop brushless DC motor drives by turning the magnetic contactor ON/OFF, as it will reduce the usage life of drive. If you still need to run/stop drives by turning the magnetic contactor ON/OFF, it is recommended to do so only ONCE per hour.
Input AC Line Reactor (Optional)	Used to improve the input power factor, to reduce harmonics and provide protection from AC line disturbances (surges, switching spikes and short interruptions). AC line reactor should be installed when the power supply capacity is 500kVA or more or advanced capacity is activated .The wiring distance should be ≤ 10m. Refer to appendix B for details.
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 brushless DC motor drive. 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	To reduce electromagnetic interference. It is built in 230V 1-phase and 460V models.
Driver	The surrounding temperature should be within the specification (refer to chapter 1) to prevent from reducing the drive's usage life. Please wire according to chapter 2 wiring, wrong wire may cause damage.
Brake resistor and Brake unit	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	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 drive output side. Please refer to the chart in appendix B.
Grounding	To prevent electric shock due to leakage current of the drive, the drive and motor should be grounded. Please refer to specification of main circuit terminal.

2.3 Main Circuit

2.3.1 Main Circuit Connection



Terminal Symbol	Explanation of Terminal Function
R/L1, S/L2, T/L3	Input terminals of commercial power (1-phase/3-phase)
U/T1, V/T2, W/T3	Output terminals of brushless DC motor drive for connecting brushless DC motor. Wire: U/T1 (Red); V/T2 (White); W/T3 (Black)
+, -	Connections for External Brake unit (BUE series)
E E	Earth connection, please comply with local regulations.



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

- DO NOT apply 1-phase power to 3-phase models. It is unnecessary to consider phase-sequence of these mains power terminals (R/L1, S/L2, T/L3).
- To connect a no fuse switch between 3-phase AC input power and main circuit terminals (R/L1, S/L2, T/L3) is necessary. 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 brushless DC 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 time to avoid nuisance tripping. For the specific GFCI of the brushless DC motor drive, please select a current sensor with sensitivity of 30mA or above.

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

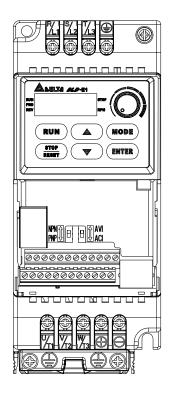
- The factory setting of the operation direction is forward running.
- When it needs to install the filter at the output side of terminals U/T1, V/T2, W/T3 on the brushless DC motor drive. Please use inductance filter. Do not use advanced capacitors or L-C (Inductance-Capacitance) or R-C (Resistance-Capacitance), unless approved by Delta.
- DO NOT connect advanced capacitors or surge absorbers at the output terminals of brushless DC motor drives.
- Use well-insulated motor, suitable for drive operation.
- 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 time to avoid nuisance tripping. For the specific GFCI of the brushless DC motor drive, please select a current sensor with sensitivity of 30mA or above.

Terminals [+, -] for connecting brake resistor

- Connect a brake resistor or brake unit in applications with frequent decelerations, short deceleration time, insufficient brake torque or requiring increased brake torque.
- When using external brake unit, please connect it to the terminals [+, -]. Please do NOT connect brake resistors to terminals [+, -] directly, as it may cause damage.
- All BLD-E1 series don't have a built-in brake chopper. Please connect an external optional brake unit (BUE-series) and brake resistor.
- When not used, please leave the terminals [+, -] open.

2.3.2 Main Circuit Terminals

Frame A

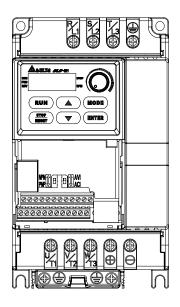


Main circuit terminals:

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

Models	Wire	Torque	Wire type
BLD002E111A			
BLD002E121A			
BLD002E123A			
BLD004E111A		44.40	Ctronded
BLD004E121A	12-18	14-16	Stranded
BLD004E123A	AWG (3.3-	kgf-cm	copper
BLD004E143A	0.8mm²)	(12-14	Only, 75°C
BLD007E121A	,	in-lbf)	750
BLD007E123A			
BLD007E143A			
BLD015E123A			
BLD015E143A			

Frame B

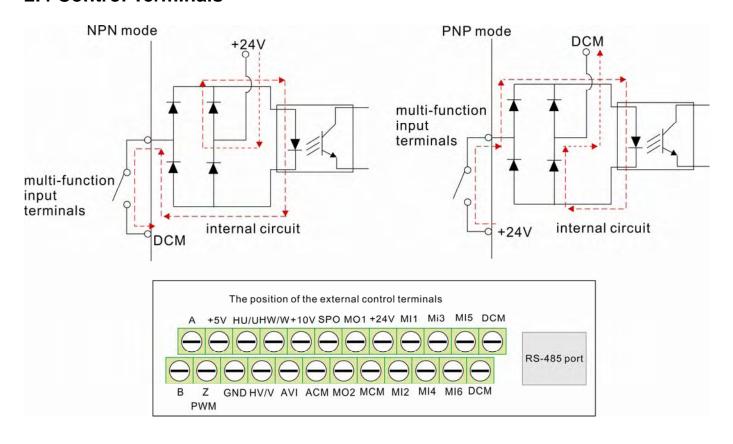


Main circuit terminals:

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

Models	Wire	Torque	Wire type
BLD007E111A			
BLD015E121A			
BLD022E121A	8-18	16-19	Stranded
BLD022E123A	AWG.	kgf-cm	copper
BLD022E143A	(8.3- 0.8mm ²)	(14-17 in-lbf)	Only, 75°C
BLD037E123A BLD037E143A	,	,	

2.4 Control Terminals



Specification	Specification Torque Wire	
Terminal A, B	2 kgf-cm (2 in-lbf)	16-24 AWG (1.3-0.2mm ²)

Terminal symbols and functions

Terminal	Terminal Function	Factory Settings (NPN mode)		
Symbol		ON: Connect to DCM		
MI1	Forward-Stop command	ON: forward running		
	r orward-otop command	OFF: Ramp to stop		
MIO	Dovorgo Ston command	ON: reverse running		
MI2 Reverse-Stop command	Reverse-Stop command	OFF: Ramp to stop		
MI3	Multi-function Input 3	Refer to Pr.04-05 to Pr.04-08 for programming the		
MI4	Multi-function Input 4	Multi-function Inputs.		
MI5	Multi-function Input 5	ON: the activation current is 16mA.		
MI6	Multi-function Input 6	OFF: leakage current tolerance is 10μA.		

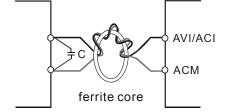
		Chapter 2 Installation and Wiring BLD-E1 Seri
Terminal Symbol	Terminal Function	Factory Settings (NPN mode) ON: Connect to DCM
+24V	DC Voltage Source	+24VDC, 20mA
DCM	Digital Signal Common	Common for digital inputs
HU/U	Reserved	
HV/V	Reserved	
HW/W	Reserved	
А	PG feedback signal contact 1	Sending PG signals to the drive, e.g. activation, operation, speed control etc.
В	PG feedback signal contact 2	Sending PG signals to the drive, e.g. activation, operation, speed control etc.
Z/PWM	PG feedback signal contact PWM	Sending PMW signals to the drive to activate at the origin position.
SPO	Reserved	
+5V	Encoder Power Supply	
GND	Feedback Signal Common	
MO1	Multi-function Output 1 (Photocoupler)	The brushless DC motor monitors all kinds of signal, such as during operation, speed attained and overload indication, by the open collector output. Please refer to Pr.02-13, Pr.02-14 for more details. Max: 48VDC/50mA
MO2	Multi-function Output 2 (Photocoupler)	MCM internal circuit
MCM	Multi-function output common (Photocoupler)	Max 48Vdc 50mA
+10V	Potentiometer power supply	Power supply for analog frequency setting +10VDC 3mA (variable resistor $3\sim5k\Omega$)

Terminal Symbol	Terminal Function	Factory Settings (NPN mode) ON: Connect to DCM	
AVI	Analog voltage Input +10V AVI ACM internal circuit	Impedance: $20k\Omega$ Resolution: 10 bits Range: $0 \sim 10 \text{VDC} = 0 \sim \text{Max. Output Speed (Pr.01-00)}$	
ACI	Analog current Input ACI ACI ACM internal circuit	Impedance: $250\Omega/100k\Omega$ Resolution: 10 bits Range: $4 \sim 20\text{mA} = 0 \sim \text{Max. Output Speed(Pr.01-00)}$	
ACM	Analog control signal (common)	Common for AVI and ACI	

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

Analog inputs (AVI, ACI, 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.
- If the analog input signals are affected by noise from the brushless DC 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 (MI1~MI6, DCM)

■ When using contacts 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.

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Chapter 3 Keypad and Start Up

- 3.1 Keypad
- 3.2 Operation Method
- 3.3 Trial Run



- Make sure that the wiring is correct. In particular, check that the output terminals U/T1, V/T2, W/T3 are NOT connected to power and that the drive is well grounded.
- Verify that no other equipment is connected to the motor.
- Do NOT operate the brushless DC motor drive with humid hands.
- Check if it displays 2000.0 on the digital keypad after power is applied.



■ It should be stopped when fault occurs during running and refer to "Fault Code Information and Maintenance" for solution. Please do NOT touch output terminals U, V, W when power is still applied to L1/R, L2/S, L3/T even when the brushless DC motor drive has stopped. It may cause electric shock if touching the output terminals U, V, W.

Chapter 3 Keypad and Start Up | BLD-E1 Series

3.1 Keypad



- Status Display
 Display the driver's operation status.
- LED Display Indicate speed, voltage, current and user defined units.
- 3 Potentiometer For master speed setting.
- 4 RUN Key Start operation

UP and DOWN Key Set the parameter number and change the numerical data, such as master speed.

- **6** MODE Change between different display mode.
- STOP/RESET
 Stop operation and reset the drive after fault occurred.

There are five indications on the keypad:

STOP Stop indicator: it will light up when the motor is stop

RUN RUN indicator: it will light up when the motor is running

FWD Forward indicator: it will light up when the motor runs in forward direction

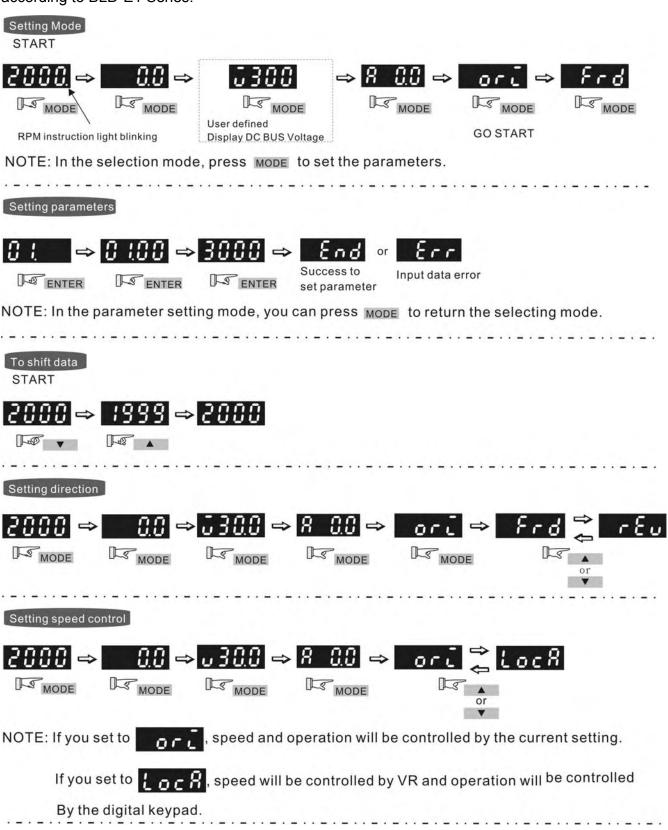
REV Reverse indicator: it will light up when the motor runs in reverse direction

RPM Speed indicator: it will light up when the speed is setting or outputting

	Chapter 3 Keypad and Start Up BLD-E1 Series
Display Message	Descriptions
RUN• FWD• REV• STOP • RPM	Displays the master speed of the drive and RPM signal blinking.
RUN• FWD• REV• STOP	Displays the actual output speed at terminals U/T1, V/T2, and W/T3.
RUN• FWD• REV• RPM	User defined unit
RUN STOP FWD REV RPM	Displays the output current at terminals U/T1, V/T2, and W/T3.
RUN• FWD• REV•	Displays the brushless DC motor drive forward run status.
RUN• FWD• REV•	Displays the brushless DC motor drive reverse run status.
RUN• FWD• REV• STOP	The counter value (C).
RUN• FWD• REV• STOP	Speed is controlled by current setting.
RUN• FWD• REV• STOP	Speed is controlled by potentiometer and operation is controlled by the digital keypad.
RUN• FWD• REV• STOP	Displays the selected parameter.
RUN• FWD• REV• STOP	Displays the actual stored value of the selected parameter.
RUN• FWD• REV•	External Fault.
RUN• FWD• REV• RPM	Display "End" for approximately 1 second if input has been accepted and automatically stored in memory.
RUN • STOP FWD • RPM	Display "Err", if the input is invalid.

3.1.1 How to Operate the Digital Keypad

The setting values in the following diagram are only example. Please regards the setting value according to BLD-E1 Series.



Reference Table for the 7-segment LED Display of the Digital Keypad

Digit	0	1	2	3	4	5	6	7	8	9
LED Display	8	8	8	3	8	5	8	8	8	8
ASCII	0x30	0x31	0x32	0x33	0x34	0x35	0x36	0x37	0x38	0x39
Digit	Α	b	Сс	d	E	F	G	Hh	i	Jj
LED Display	R	6		ď	E	F	5	X X	-,	ر ن
ASCII	0x41	0x62	0x43,0x63	0x64	0x45	0x46	0x47	0x48,0x68	0x69	0x4a,0x6a
Digit	K	L	n	0	Р	q	r	S	t	Uu
LED Display	4	L	n	o	P	9	-	5	E	Uu
ASCII	0x4b	0x4c	0x6e	0x6f	0x50	0x71	0x72	0x53	0x74	0x55,0x75
Digit	V	Υ	Z							
LED Display	Ū	5	-							
ASCII	0x76	0x59	0x5a							
Digit	A.	b.	C.c.	d.	E.	F.	G.	H.h.	j.	J.j.
LED Display	R	6	C . c.	ď	E.	F.	G.	H A	- 1.	d.
ASCII	0xb0	0xb1	0xb2,0xb3	0xb4	0xb5	0xb6	0xb7	0xb8,0xb9	0xba	0xbb,0xbc
Digit	K.	L.	n.	Ο.	P.	q.	r.	S.	t.	U.u.
LED Display	H .	L.	n,	O.	P.	9	r .	5	L .	
ASCII	0xbd	0xbe	0xbf	0xc0	0xc1	0xc2	0xc3	0xc4	0xc5	0xc6,0xc7
Digit	V.	Y.	Z.							
LED Display	<u>Li</u>	3	-							
ASCII	0xc8	0xc9	0xca							

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3.2 Operation Method

The operation method can be set via communication and control terminals.



Operation Method	Frequency Source	Operation Command Source
Operate from the communication	When setting communication by the PC, it needs to IFD8500 converter to connect to the PC. Refer to the communication address 2000H and 2	
Operate from the digital keypad	RUN STOP RESET Figure 3-1	MODE
	Potentiometer	RUN, STOP/RESET

Operation Method	Frequency Source	Operation Command Source
Operate from external signal	* Don't apply the mains voltage directory setting: ACI Mode AVI ACI ACI/AVI switch Factory setting is ACI	MI4 input terminals MI5 MI6 MI6 MI6 DCM E = +10V Power supply +10V 20mA AVI Master Frequency 0 to 10V 47K0 ACI/AVI 4-20mA/0-10V ACM mal Common E = =
	MI3-DCM (Set Pr.04-05=d10) MI4-DCM (Set Pr.04-06=d11)	MI1-DCM (FWD/STOP) MI2-DCM(REV/STOP)

3.3 Trial Run

The factory setting of trial run is by the potentiometer, please operate by the following steps.

- 1. After applying the power, setting the parameter according to the motor type in parameter group 08. (For Delta's ECMD-E9 Series of motor, the drive will atuo set the motor parameter to the default value)
- Please execute angle detection for the first time operation of Delta ECMD-E9 Motor and drive. First set 08-00=1 and press RUN, the keypad will show "tun" during the angle detection. The keypad will return to the main menu after the auto-detection is finished.
- 3. Verify that LED display shows 0~3000RPM (depends on the potentiometer position) with RPM signal blinking and FWD indicator lighted on.
- 4. Please set potentiometer to a low running speed around 100RPM.
- 5. Press RUN key for forward running. For ramp to stop, please press STOP/RESET key.
- 6. To switch to reverse running, press the MODE key and look for FWD page, then press UP/DOWN key to REV page to finish setting.
- 7. Check following items:
 - Check if the direction of motor 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.

Chapter 4 Parameters

The BLD-E1 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 re-adjustment during operation.

4.1 Summary of Parameter Setting	4.2 Description of Parameter Setting
----------------------------------	--------------------------------------

00 : System Parameter 00 : System Parameter

01 : Basic Parameters 01 : Basic Parameters

02 : Digital Input/Output Parameters 02 : Digital Input/Output Parameters

03 : Analog Input/Output Parameter 03 : Analog Input/Output Parameter

04 : Multi-Step Speed Parameters 04 : Multi-Step Speed Parameters

05 : IM Parameters 05 : IM Parameters

06 : Protection Parameters 06 : Protection Parameters

07 : Special Parameters 07 : Special Parameters

08 : PM Parameters 08 : PM Parameters

09 : Communication Parameters 09 : Communication Parameters

10 : Speed Feedback Control Parameters 10 : Speed Feedback Control Parameters

12 : User-defined Parameters 12 : User-defined Parameters

4.1 Summary of Parameter Settings

Group 00 System Parameters

** The parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
00.00	Identity Code of	0: 115V,1PH,0.2KW,1/4HP	Read-	\circ	0	0
	the Brushless DC	2: 115V,1PH,0.4KW,1/2HP	only			
	Motor Drive	4: 115V,1PH,0.7KW,1HP				
		0:230V,1PH,0.2KW,1/4HP				
		2 : 230V,1PH,0.4KW,1/2HP				
		4:230V,1PH,0.7KW,1HP				
		6: 230V,1PH,1.5KW,2HP				
		8 : 230V,1PH,2.2KW,3HP				
		0:230V,3PH,0.2KW,1/4HP				
		2:230V,3PH,0.4KW,1/2HP				
		4:230V,3PH,0.7KW,1HP				
		6: 230V,3PH,1.5KW,2HP				
		8 : 230V,3PH,2.2KW,3HP				
		10:230V,3PH,3.7KW,5HP				
		3:460V,3PH,0.4KW,1/2HP				
		5 : 460V,3PH,0.7KW,1HP				
		7:460V,3PH,1.5KW,2HP				
		9 : 460V,3PH,2.2KW,3HP				
		11:460V,3PH,3.7KW,5HP				
00.01	Rated Current	Display according to the model	Read-	\circ	\circ	\bigcirc
	Display of the	series	only			
	Brushless DC					
	Motor Drive					
00.02	Parameter Reset	0 : No function	0	\circ	\circ	\circ
		10 : All parameters are reset to				
		factory settings				
⊮ 00.03	Start-up Display	0 : Frequency command	0	\circ	\circ	\circ
	Selection	1 : Out put frequency				
		2 : DC BUS voltage				
		3 : Output current				
		4 : output voltage				

Chapter 4 Parameters | BLD-E1 Series

		<u> </u>	rs BLD	SLD-E1 Series		
Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
		5 : defined by user (Pr.00-04)				
№ 00.04	Content of Multi-	0 : Display the output current from	0	\circ	0	0
	function Display	drive to motor				
		1 : Reserved				
		2 : Display actual output frequency				
		3 : Display DC-Bus voltage (U)				
		4:Display output voltage of U, V,				
		W (E)				
		5 : Display output power factor				
		angle (n.)				
		6 : Display output power (kW)				
		7 : Display actual motor speed in				
		rpm (HU)				
		8 : Display estimate output torque				
		(%)				
		9 : Display PG feedback				
		10 : Display the electrical angle of				
		drive output 11:Display the signal				
		value % of VR analog input				
		terminal				
		12 : Display the signal value % of				
		ACI analog input terminal				
		13 : Display the signal value % of				
		AVI analog input terminal				
		14 : Reserved				
		15 : Display IGBT temperature °C				
		16 : Digital input status ON/OFF				
		17 : Digital output status ON/OFF				
		18 : Multi-step speed (S)				
		19 : The corresponding CPU pin				
		status of digital input				
		20 : The corresponding CPU pin				
		status of digital output				
		21~23 : Reserved				
		24 : Output AC voltage when				

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
		malfunction				
		25 : Output DC voltage when				
		malfunction				
		26 : Motor frequency when				
		malfunction				
		27: Output current when				
		malfunction				
		28 : Output frequency when				
		malfunction				
		29 : Frequency command when				
		malfunction				
		30 : Output power when				
		malfunction				
		31 : Output torque when				
		malfunction				
		32 : Input terminal status when				
		malfunction				
		33 : Output terminal status when				
		malfunction				
		34 : Drive status when malfunction				
⊮ 00.05		Reserved				
00.06	Software Version	Read-only	#.#	0	\circ	0
00.07	Selection of motor	0 : decelerate braking to stop	0	\circ	\bigcirc	\circ
	stop method	1 : coast to stop				
⊮ 00.08	Setting of Motor	0 : reverse running allowed	0	\bigcirc	\circ	\circ
	Running Direction	1 : reverse running not allowed				
		2 : forward running not allowed				
₩ 00.09	Control Method	0 : V/Fcontrol	8	\circ	\bigcirc	\circ
		1 : V/Fcontrol + Encoder (VFPG)				
		8 : FOC PM Control (FOCPM)				
 ∕ 00.10	Speed Unit	0 : Hz	3	0	0	0
		3 : RPM				
00.11		Reserved				
⊮ 00.12	Carrier Frequency	2~15KHz	8	\circ	0	0
⊮ 00.13	Auto voltage	0 : Enable AVR	0	\circ	\circ	0

		Ch	apter 4 Para	mete	rs BLD	-E1 Series
Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
	Regulation (AVR)	Disable AVR Disable AVR when deceleration stop				
₩ 00.14	Source of Frequency Command	0 : Digital keypad input 1 : RS-485 serial communication input 2 : External analog input (Pr.03-00~03-02) 3 : Digital terminals input (Pr.04-00~04-15)	2	0	0	0
⊮ 00.15	Source of Operation Command	0 : Digital keypad input1 : External terminal operation2 : RS-485 serial communication input	0	0	0	0

Group 01 Basic Parameters

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
01.00	Maximum Operation	120~4000RPM (10~400Hz)	3000	\circ	\circ	0
	Frequency		(250)			
01.01	1st Output	0~400.00Hz	60.00	\circ	0	0
	Frequency Setting 1					
	(Base Frequency/					
	Rated Motor					
	Frequency)					
01.02	1st Output Voltage	230V Series : 0.0V~255.0V	220.0	\circ	\circ	\circ
	Setting 1	460V Series : 0.0V~510.0V	440.0			
	(Base Voltage/ Rated					
	Motor Voltage)					
01.03	2nd Output	0~400.00Hz	0.50	\bigcirc	\circ	
	Frequency Setting 1					
⊮ 01.04	2nd Output Voltage	230V Series : 0.0V~255.0V	5.0	\bigcirc	\circ	
	Setting 1	460V Series : 0.0V~510.0V	10.0			
01.05	3rd Output	0~400.00Hz	0.50	\bigcirc	\circ	
	Frequency Setting 1					
⊮ 01.06	3rd Output Voltage	230V Series : 0.0V~255.0V	5.0	\bigcirc	\circ	
	Setting 1	460V Series : 0.0V~510.0V	10.0			
01.07	4th Output	0~400.00Hz	0.00	\bigcirc	\circ	
	Frequency Setting 1					
⊮ 01.08	4th Output Voltage	230V Series : 0.0V~255.0V	0.0	\bigcirc	\circ	
	Setting 1	460V Series : 0.0V~510.0V	0.0			
01.09	Start Frequency	0~4000rpm (0~400.00Hz)	6 (0.5)	\circ	\circ	
⊮ 01.10	Output Frequency	0~4000rpm (0~400.00Hz)	3000	\circ	\circ	\circ
	Upper Limit		(250)			
⊮ 01.11	Output Frequency	0~4000rpm (0~400.00Hz)	0 (0.00)	\bigcirc	\circ	\circ
	Lower Limit					
⊮ 01.12	Accel Time 1	0.00~600.00 sec	3.00	\circ	\circ	0
⊮ 01.13	Decel Time 1	0.00~600.00 sec	2.00	\circ	0	0
⊮ 01.14	Accel Time 2	0.00~600.00 sec	3.00	\circ	0	0
⊮ 01.15	Decel Time 2	0.00~600.00 sec	2.00	\circ	0	0
⊮ 01.16	Accel Time 3	0.00~600.00 sec	3.00	\circ	0	0
⊮ 01.17	Decel Time 3	0.00~600.00 sec	2.00	\circ	\circ	0

-		Chap				E1 Series
Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
⊮ 01.18	Accel Time 4	0.00~600.00 sec	3.00	\circ	0	0
 ∕ 01.19	Decel Time 4	0.00~600.00 sec	2.00	\circ	\circ	0
⊮ 01.20	Reserved					
 ∕ 01.21	Reserved					
⊮ 01.22	Reserved					
⊮ 01.23	Switch Frequency between 1st/4th Accel/decel	0~4000rpm (0~400.00Hz)	0 (0.00)	0	0	0
№ 01.24	S-curve for Acceleration Departure Time S1	0.0~25.0 sec	0.0	0	0	0
⊮ 01.25	S-curve for Acceleration Arrival Time S2	0.0~25.0 sec	0.0	0	0	0
⊮ 01.26	S-curve for Deceleration Departure Time S3	0.0~25.0 sec	0.0	0	0	0
⊮ 01.27	S-curve for Deceleration Arrival Time S4	0.0~25.0 sec	0.0	0	0	0
01.28	Mode Selection when Frequency < Fmin	O : Output waiting I : Zero-speed operation E : Fmin (4 th output frequency setting)	0	0	0	
⊮ 01.29	Switch Frequency form S to S5	0~4000rpm (0~400.00Hz)	0 (0.00)	0	0	0
№ 01.30	S-curve for Deceleration Arrival Time S5	0.0~25.0 sec	0.0	0	0	0
⊮ 01.31	Time required for deceleration to stop	0.00~600.00 sec	2.00	0	0	0

NOTE: With Delta ECMD-E9 Series motor, rated frequency is 2000rpm and maximum frequency is 3000rmp.

Group 02 Digital

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
02.00	2-wire/3-wire Operation Control	0 : 2-wire operation mode1, FWD/STOP, REV/STOP 1 : 2 –wire mode1, FWD/STOP, REV/STOP (Line Start Lockout)	0	0	0	0
		2 : 2-wire mode2, RUN/STOP, REV/FWD 3 : 2-wire mode2, RUN/STOP,				
		REV/FWD (Line Start Lockout) 4: 3-wire, 5: 3-wire (Line Start Lockout).				
02.01	Multi-Function Command Input (MI3)	0 : no function	1	0	0	0
02.02	Multi-Function Input (MI4)	1 : Multi-step command 1	2	0	0	0
02.03	Multi-Function Command Input (MI5)	2 : Multi-step command 2	3	0	Ο	0
02.04	Multi-Function	3 : Multi-step command 3	4	0	0	0
	Command Input	4 : Multi-step command 4		0	0	0
	(MI6)	5 : Reset		0	0	0
		6 : Reserved		0	0	0
		7 : acceleration/deceleration speed inhibit		0	0	0
		8 : the 1st, 2nd acceleration/deceleration time selection		0	0	0
		9 : the 3rd, 4th acceleration/deceleration time selection		0	0	0
		10: EF input (Pr.07-28)		0	0	0
		11: Reserved		0	0	0
		12: Stop output		0	0	0

	T	T	Chapter 4 Parameters BLD-E1 Sc				
Parameter	Explanation	Settings	Factory	VF	VFPG	FOCPM	
			Setting				
		13~14: Reserved		0	0	0	
		15 : Running speed		0	0	0	
		command from VR					
		16 : Running speed		0	0	0	
		command from ACI					
		17 : Running speed		0	0	0	
		command from AVI					
		18 : Emergency Stop		0	0	0	
		(Pr.07-28)					
		19~26 : Reserved		0	0	0	
		27 : ASR1/ASR2 Selection		0	0	0	
		28 : Emergency stop (EF1)		0	0	0	
		(Motor coasts to stop)					
		29~30 : Reserved		0	0	0	
		31: High torque bias (by		0	0	0	
		Pr.07-21)					
		32: Middle torque bias (by		0	0	0	
		Pr.07-22)					
		33: Low torque bias (by		0	0	0	
		Pr.07-23)					
		34-37: Reserved		0	0	0	
		38: Disable EEPROM write		0	0	0	
		function					
		39 : Reserved		0	0	0	
		40 : Enable drive to		0	0	0	
		function					
02.05 ~	Reserved						
02.08							
№ 02.09	Digital Input	0.001~ 30.000 Sec	0.005	0	0	0	
	Response Time						
⊮ 02.10	Digital Input	0 ~ 65535	0	0	0	0	
	Operation						
	Direction						
02.11	Reserved						

Parameter	Explanation	Settings	Factory	VF	VFPG	FOCPM
			Setting			
02.12	Reserved					
⊮ 02.13	Multi-function	0 : No function	41	0	0	0
	Output (MO1)					
№ 02.14	Multi-function	1: Operation indication	41	0	0	0
	Output (MO2)	2: Operation speed attained		0	0	0
		3 : Desired frequency		0	0	0
		attained 1 (Pr. 02-25, 02-				
		26)				
		4 : Desired frequency		0	0	0
		attained 2 (Pr. 02-27, 02-				
		28)				
		5: Zero speed (frequency		0	0	0
		command)				
		6: Zero speed with stop		0	0	0
		(frequency command)				
		7: Over torque (OT1) (Pr.		0	0	0
		06-05~06-07)				
		8: Over torque (OT2) (Pr.		0	0	0
		06-08~06-10)				
		9: Drive ready		0	0	0
		10 : Low-voltage Detection		0	0	0
		(LV)				
		11 : Malfunction indication		0	0	0
		12 : Reserved		0	0	0
		13 : Overheat warning (Pr.		0	0	0
		06-14)				
		21 : Ove voltage warning		0	0	0
		22 : Over-current stall		0	0	0
		prevention warning				
		23 : Over-voltage stall		0	0	0
		prevention warning				
		24 : Drive operation mode		0	0	0
		(Parameter: 00.21=0)				

Parameter	Evalenation	Sattings	Chapter 4 F				
Parameter	Explanation	Settings	Factory	VF	VFPG	FOCPM	
			Setting				
		25: Forward running		0	0	0	
		command]				
		26: Reverse running		0	0	0	
		command					
		27~30 : Reserved		0	0	0	
		31 : Forward running input		0	0	0	
		32 : Reverse running input		0	0	0	
		33 : Zero-speed (Actual output frequency)		0	0	0	
		34: Zero speed with Stop		0	0	0	
		(actual output frequency)					
		35~39 : Reserved		0	0	0	
		40 : Speed attained		0	0	0	
		(including zero speed)					
₩ 02.23	Multi-output Direction	0 ~ 65535	0	0	0	0	
02.24	Reserved		•				
№ 02.25	Desired	0~4000RPM	0 (0.00)	0	0	0	
	Frequency	(0.00~400.0Hz)					
	Attained 1	,					
№ 02.26	Width of Desired	0~4000RPM	24 (2.00)	0	0	0	
	Frequency	(0.00~400.0Hz)					
	Attained 1						
 √ 02.27	Desired	0~4000RPM	0 (0.00)	0	0	0	
	Frequency	(0.00~400.0Hz)					
	Attained 2	•					
№ 02.28	Width of Desired	0~4000RPM	24 (2.00)	0	0	0	
	Frequency	(0.00~400.0Hz)					
	Attained 2	,					

Group 03: Time Parameters

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
⊮ 03.00	Analog Input (VR)	0 : No function	1	\circ	\circ	0
⊮ 03.01	Analog Input (ACI)	1 : Frequency command (torque limit under TQR control mode)	0	\circ	0	0
№ 03.02	Analog Input 3	2 : Reserved	0			
	(AVI)	3 : Preload input		\circ	0	0
		4~6 : Reserved				
		7: Positive torque limit				0
		8: Negative torque limit				0
		9: Regenerative torque limit				0
		10: Positive/negative torque limit				0
№ 03.03	Analog Input Bias VR	-100.0~100.0%	0.0	\circ	0	0
№ 03.04	Analog Input Bias ACI	-100.0~100.0%	0.0	\bigcirc	0	0
№ 03.05	Analog Input Bias AVI	-100.0~100.0%	0.0	\bigcirc	\circ	0
№ 03.06	Positive/negative	0: Zero bias	0	\circ	\bigcirc	\circ
	Bias Mode VR	1: Serve bias as the center, lower				
⊮ 03.07	Positive/negative	than bias=bias	0	0	0	0
	Bias Mode ACI	2: Serve bias as the center, greater				
	(can be set to 0 or	than bias=bias				
	1 only)	3: The absolute value of the bias				
№ 03.08	Positive/negative	voltage while serving as the center	0	\circ	\circ	0
	Bias Mode AVI	(single polar)				
		4: Serve bias as the center (single				
		polar)				
№ 03.09	Analog Input Gain VR	0.0~500.0%	100.0	0	0	0
⊮ 03.10	Analog Input Gain ACI	0.0~500.0%	100.0	0	0	0
 ∕ ⁄ 03.11	Analog Input Gain AVI	0.0~500.0%	100.0	\bigcirc	0	0
⊮ 03.12	Analog Input Delay Time VR	0.00 ~ 2.00 sec	0.05	0	0	0

		Chapte	er 4 Parame	eters	BLD-	E1 Series
Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
₩ 03.13	Analog Input Delay Time ACI	0.00 ~ 2.00 sec	0.05	0	\circ	0
₩ 03.14	Analog Input Delay Time AVI	0.00 ~ 2.00 sec	0.05	0	\circ	0
 ∕ ⁄ 03.15	Loss of the ACI Signal	0: Disable1: Continue operation at the last frequency2: Decelerate to 0Hz3: Stop immediately and display E.F.	0	0	0	0

Chapter 4 Parameters AT | Troubleshooting | BLD-E1 Series Group 04: Multi-Step Speed Parameters

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
№ 04.00	Zero Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.01	1st Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.02	2nd Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.03	3rd Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.04	4th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.05	5th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.06	6th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.07	7th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.08	8th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.09	9th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
₩ 04.10	10th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
₩ 04.11	11th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.12	12th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.13	13th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.14	14th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0
№ 04.15	15th Step Speed Frequency	0~4000RPM (0.00~400.0Hz)	0.00	0	0	0

Chapter 4 Parameters | BLD-E1 Series

Group 05: IM Parameters
** The parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
05.18	Accumulative	00~1439	0	\circ	0	\circ
	Motor Operation					
	Time (min.)					
05.19	Accumulative	00~65535	0	\circ	0	\circ
	Motor Operation					
	Time (day)					
05.21	Accumulative	00~1439	0	\circ	0	\circ
	Drive Power-on					
	Time (min.)					
05.22	Accumulative	00~65535	0	0	0	0
	Drive Power-on					
	Time (day)					

Group 6: Protection Parameters

* The parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting			FOCPM
№ 06.00	Low Voltage Level	160.0~220.0Vdc	180.0	\circ	0	\circ
		320.0~440.0Vdc	360.0			
 ∕ 06.01	Phase-loss	0: Warn and keep operation	2	\circ	\circ	\circ
	Protection	1: Warn and ramp to stop				
		2: Warn and coast to stop				
№ 06.02	Over-current Stall	00: disable	00	\circ	\circ	
	Prevention during	00~250%				
	Acceleration					
 ∕ 06.03	Over-current Stall	00: disable	00	\circ	0	
	Prevention during	00~250%				
	Operation					
 ∕ 06.04	Accel./Decel. Time	0: by current accel/decel time	0	0	\circ	
	Selection of Stall	1: by the 1st accel/decel time				
	Prevention at	2: by the 2nd accel/decel time				
	constant speed	3: by the 3rd accel/decel time				
		4: by the 4th accel/decel time				
		5: by auto accel/decel time				
№ 06.05	Over-torque	0: disable	0	\circ	0	\circ
	Detection Selection	1: over-torque detection during				
	(OT1)	constant speed operation, continue				
		to operate after detection				
		2: over-torque detection during				
		constant speed operation, stop				
		operation after detection				
		3: over-torque detection during				
		operation, continue to operate after				
		detection				
		4: over-torque detection during				
		operation, stop operation after				
		detection				
 ∕ 06.06	Over-torque	10~250%	150	\circ	\circ	\circ
	Detection Level					
	(OT1)					
⊮ 06.07	Over-torque	0.0~60.0 sec	0.1	\bigcirc	0	\circ

Chapter 4 Parameters | BLD-E1 Series **Factory Parameter Explanation Settings** VF VFPG FOCPM **Setting Detection Time** (OT1) 0 **№**06.08 Over-torque 0: disable \bigcirc \bigcirc \bigcirc Detection Selection 1: over-torque detection during (OT2) 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 \bigcirc **№**06.09 Over-torque 10~250% 150 \bigcirc \bigcirc **Detection Level** (OT2) **№**06.10 Over-torque 0.0~60.0 sec 0.1 \bigcirc \bigcirc \bigcirc **Detection Time** (OT2) **№**06.11 **Current Limit** 0~250% 200 \bigcirc \bigcirc \bigcirc 06.12 2 \bigcirc **Electronic Thermal** 0: Inverter motor \bigcirc Relay Selection 1: Standard motor 2: Disable **№**06.13 **Electronic Thermal** 30.0~600.0 sec 60.0 \bigcirc \bigcirc Characteristic **№**06.14 0.0~110.0℃ 85.0 \bigcirc \bigcirc \bigcirc Heat Sink Overheat (OH) Warning 0 ~ 100% (refers to Pr. 06-02, 06-03) **№**06.15 Stall Prevention 50 \bigcirc \bigcirc \bigcirc Limit Level 06.16 Present Fault 0: No fault 0 \bigcirc \bigcirc \bigcirc Record 0 \bigcirc 06.17 Second Most 1: Over-current during acceleration

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Parameter		Settings	Factory Setting	VF	VFPG	FOCPM
	Recent Fault Record	(ocA)				
06.18	Third Most Recent Fault Record	2: Over-current during deceleration (ocd)	0	0	0	0
06.19	Fourth Most Recent Fault Record	3: Over-current during constant speed (ocn)	0	0	\circ	0
06.20	Fifth Most Recent Fault Record	4: Ground fault (GFF)	0	0	\bigcirc	0
06.21	Sixth Most Recent Fault Record	5 : Reserved 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 during constant speed (Lvn) 14: Low-voltage at stop (LvS) 15: Phase loss protection (PHL) 16: IGBT heat sink over-heat (oH1) 17: Reserved 18: 18: TH1 open loop error (tH1o) 19~20: Reserved 21: over-load (oL) (150% 1Min) 22: Motor over-load (EoL1) 23~25: Reserved 26: over-torque 1 (ot1) 27: over-torque 1 (ot2) 28: Reserved	0			

		Chapte	er 4 Parameters		BLD-	E1 Series
Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
		29: Reserved				
		30: Memory write-in error (cF1)				
		31: Memory read-out error (cF2)				
		32: Isum current detection error (cd0)				
		33: U-phase current detection error				
		(cd1)				
		34: V-phase current detection error				
		(cd2)				
		35: W-phase current detection error				
		(cd3)				
		36 : current detection error (Hd0)				
		37 : current detection error (Hd1)				
		38 : Over-voltage detection error				
		(Hd2)				
		39: Ground current detection error				
		(Hd3)				
		40: Auto tuning error (AuE)				
		41 : Reserved				
		42: PG feedback error (PGF1)				
		43: PG feedback loss (PGF2)				
		44: PG feedback stall (PGF3)				
		45: PG slip error (PGF4)				
		46~47 : Reserved				
		48: Analog current input error (ACE)				
		49: External fault input (EF)				
		50: Emergency stop (EF1)				
		51 : B.B. (Base Block)				
		52~53 : 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)				
		1 33 3 41110 341 (31 10)		l		

Group 07 Protection Parameters \varkappa : The parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
07.00	Reserved					
07.01	Reserved					
⊮ 07.02	DC Brake	0~100%	0	\circ	\circ	
	Current Level					
№ 07.03	DC Brake Time	0.0~60.0 sec	0.0	\circ	\circ	\circ
	during Start-up					
№ 07.04	DC Brake Time	0.0~60.0 sec	0.0	\circ	\circ	\circ
	during Stopping					
№ 07.05	DC Brake	0~4000rpm (0.00~400.0Hz)	0.00	\circ	\circ	
	Starting					
	Frequency					
№ 07.06	DC Brake	1~500	50	\circ	\circ	
	Proportional Gain					
07.07 ~	Reserved					
07.10				T		
⊮ 07.11	Fan Control	0: Fan always ON	1	0	\circ	\bigcirc
		1: 1 minute after brushless DC motor				
		drive stops, fan will be OFF				
		2: Brushless DC motor drive runs				
		and fan ON, brushless DC motor				
		drive stops and fan OFF				
		3: Fan ON to run when preliminary				
		heat sink temperature attained				
		4: Fan OFF				
⊮ 07.12	Reserved					
⊮ 07.13	Reserved			1	•	
₩ 07.14	Maximum Torque	0~300%	100			\bigcirc
	Command					
07.15 ~	Reserved					
07.18						

	T		Chapte	r 4 Parar	neters BL	D-E1 Series
Parameter	Explanation	Settings	Factory	VF	VFPG	FOCPM
			Setting			
⊮ 07.19	Source of	0: Disable	0			\circ
	Torque Offset	1: Analog input (Pr.03-				
		00)				
		2: Torque offset setting				
		(Pr.07-20)				
		3: Control by external				
		terminal (Pr.07-21 to 07-				
		23)				
 ∕ 07.20	Torque Offset	0.0~100.0%	0.0			0
	Setting					
 ∕ 07.21	High Torque	0.0~100.0%	30.0			0
	Offset					
 ∕ 07.22	Mid Torque	0.0~100.0%	20.0			0
	Offset					
 ∕ 07.23	Low Torque	0.0~100.0%	10.0			0
	Offset					
 ∕ 07.24	Forward Motor	0~300%	200			0
	Torque Limit					
 ∕ 07.25	Forward	0~300%	200			0
	Regenerative					
	Torque Limit					
 ∕ 07.26	Reverse Motor	0~300%	200			0
	Torque Limit					
 ∕ 07.27	Reverse	0~300%	200			0
	Regenerative					
	Torque Limit					
⊮ 07.28	Emergency	0: Coast to stop	0	0	0	0
	Stop (EF) &	1: By deceleration Time 1				
	Forced Stop	2: By deceleration Time 2				
	Selection	3: By deceleration Time 3				
		4: By deceleration Time 4				
		5: By Pr.01-31				
 ∕ 07.29	Time Required	0.000~1.000 sec	0.000			0
	for Decreasing					
	Torque at Stop					

Group 08 PM Parameters

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
08.00	Motor Auto	0: No function	0			0
	Tuning	1: Only for the unloaded motor, auto				
		measure the angle between				
		magnetic pole and PG origin (Pr.				
		08.09)				
		2: For PM parameters				
		3: Auto measure the angle between				
		magnetic pole and PG origin				
		(Pr.08-09)				
08.01	Full-load Current	40~120%) *00.01 Amps	#.##			\circ
	of Motor					
08.02	Rated power of	0.00~655.35kW	#.##			\circ
	Motor					
08.03	Rated speed of	0~65535	200			\circ
	Motor (rpm)					
08.04	Number of Motor	2~96	10			\circ
	Poles					
08.05	Rs of Motor	0.000~65.535Ω	#			0
08.06	Reserved					
08.07	Lq of Motor	0.0~6553.5mH	#			\circ
08.08	Back	0.0~6553.5Vrms	#			\circ
	Electromotive					
	Force					
08.09	Angle between	0.0~360.0°	360.0			0
	Magnetic Pole					
	and PG Origin					
08.10	Magnetic Pole	0: Disable	0			0
	Re-orientation	1: Enable				

Chapter 4 Parameters | BLD-E1 Series

Group 09 Communication Parameters
** The parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	∣ VF	VFPG	FOCPM
№ 09.00	Communication Address	1~254	1	0	0	0
№ 09.01	Transmission Speed (Keypad)	4.8~38.4Kbps	9.6	0	0	0
№ 09.02	Transmission Fault Treatment (Keypad)	0: Warn and keep operation1: Warn and ramp to stop2: Reserved3: No action and no display	3	0	0	0
№ 09.03	Time-out Detection (Keypad)	0.0 ~ 100.0 sec	0.0	0	0	0
№ 09.04	Communication Protocol (Keypad)	0: 7N1 (ASCII) 1: 7N2 (ASCII) 2: 7E1 (ASCII) 3: 7O1 (ASCII) 4: 7E2 (ASCII) 5: 7O2 (ASCII) 6: 8N1 (ASCII) 7: 8N2 (ASCII) 8: 8E1 (ASCII) 9: 8O1 (ASCII) 10: 8E2 (ASCII) 11: 8O2 (ASCII) 12: 8N1 (RTU) 13: 8N2 (RTU) 14: 8E1 (RTU) 15: 8O1 (RTU) 16: 8E2 (RTU) 17: 8O2 (RTU)	1			
№ 09.05	Response Delay Time	0.0~200.0ms	2.0	0	0	0

Group 10: Speed Feedback Control Parameters

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
10.00	Encoder Type	0 : No function	3		0	0
		1 : ABZ				
		2 : ABZ+UVW				
		3 : AB+PWM				
10.01	Encoder Pulse	1~25000	256		\circ	\circ
10.02	Encoder Input Type	0 : Disable	1		\bigcirc	0
	Setting	0: Disable				
		1: Phase A leads in a forward run				
		command and phase B leads in				
		a reverse run command				
		2: Phase B leads in a forward				
		run command and phase A leads				
		in a reverse run command				
		3 : Phase A is a pulse input and				
		phase B is a direction input.				
		(L=reverse direction, H=forward				
		direction)				
⊮ 10.03	Encoder Feedback	0: Warn and keep operation	2		0	
	Fault Treatment	1: Warn and decelerate to stop				
	(PGF1, PGF2)	2: Warn and stop operation				
№ 10.04	Detection Time for	0.0~10.0 sec	3.0		\circ	0
	Encoder Feedback					
	Fault					
№ 10.05	Encoder Stall Level	0~120% (0 : disable)	115		0	0
	(PGF3)					
⊮ 10.06	Encoder Stall	0.0 ~ 2.0 sec	0.1		0	0
	Detection Time					
№ 10.07	Encoder Slip Range	0~50% (0 : disable)	50		0	0
	(PGF4)					
№ 10.08	Encoder Slip	0.0 ~ 10.0 sec	0.5		0	0
	Detection Time					

Chapter 4 Parameters | BLD-E1 Series

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
№ 10.09	Encoder Stall and Slip	0: Warn and keep operation	2		0	
	Error Treatment	1: Warn and decelerate to stop				
		2: Warn and stop operation				
10.10	Mode Selection for	0: Z signal is at the falling edge	0		\circ	\circ
	UVW Input	of U-phase				
		1: Z signal is at the rising edge of				
		U-phase				
⊮ 10.11	ASR (Auto Speed	0.0~500.0%	100.0	\bigcirc	\circ	\circ
	Regulation) Control					
	(P) of Zero Speed					
⊮ 10.12	ASR (Auto Speed	0.000~10.000 sec	0.200	\bigcirc	\circ	\circ
	Regulation) Control (I)					
	of Zero Speed					
⊮ 10.13	ASR (Auto Speed	0.0~500.0%	100.0	\bigcirc	\circ	\circ
	Regulation) Control					
	(P) 1					
⊮ 10.14	ASR (Auto Speed	0.000~10.000 sec	0.200	\bigcirc	\circ	\circ
	Regulation) Control (I)					
	1					
№ 10.15	ASR (Auto Speed	0.0~500.0%	100.0	\bigcirc	\circ	\circ
	Regulation) Control					
	(P) 2					
⊮ 10.16	ASR (Auto Speed	0.000~10.000 sec	0.200	\bigcirc	\circ	\circ
	Regulation) Control (I)					
	2					
⊮ 10.17	ASR 1/ASR2 Switch	0~4000RPM (0.00~400.0Hz)	7.00	\bigcirc	\circ	\circ
	Frequency					
⊮ 10.18	ASR Primary Low	0.000~0.350 sec	800.0	\bigcirc	0	0
	Pass Filter Gain					
⊮ 10.19	Zero Speed Gain (P)	0~655.00%	80.00			0
⊮ 10.20	Zero Speed/ASR1	0~4000RPM (0.00~400.0Hz)	5.00		0	0

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
	Width Adjustment					
⊮ 10.21	ASR1/ASR2 Width Adjustment	0~4000RPM (0.00~400.0Hz)	5.00		0	0
⊮ 10.22	Operation Time of Zero Speed	0.000~65.535 sec	0.250			0
⊮ 10.23	Filter Time of Zero Speed	0.000~65.535 sec	0.004			0

Chapter 4 Parameters | BLD-E1 Series

Group 11: Advanced Parameters

✓: The parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
11.00	System Control	bit 7=1 : Enable position control	0	\circ	0	\circ
		bit 15=0 : when power is applied , it				
		will re-detect the magnetic pole				
		position				
11.01 ~	Decembed					
11.05	Reserved					
№ 11.06	Zero-speed	0~40Hz	10			\circ
	Bandwidth					
№ 11.07	Low-speed	0~40Hz	10			\circ
	Bandwidth					
№ 11.08	High-speed	0~40Hz	10			\circ
	Bandwidth					
11.09 ~	Reserved					
11.15						
11.16	Memory Address	0X0000~0XFFFF	0	\bigcirc	0	0

Chapter 4 Parameters AT | Troubleshooting | BLD-E1 Series Group 12: User-defined Parameters

(User-defined Parameters: from group 00 to 11)

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
⊮ 12.00	Present Fault Record	0616	Read-only	0	0	0
₩12.01	Present Fault Time of Motor Operation (min.)	0632	Read-only	0	0	0
⊮ 12.02	Present Fault Time of Motor Operation (day)	0633	Read-only	0	0	0
№ 12.03	Frequency Command at Present Fault	2132	Read-only	0	0	0
⊮ 12.04	Output Frequency at Preset Fault	2133	Read-only	\circ	0	0
⊮ 12.05	Output Current at Present Fault	2134	Read-only	0	0	0
⊮ 12.06	Motor Frequency at Present Fault	2135	Read-only	0	0	0
№ 12.07	Output Voltage at Present Fault	2136	Read-only	0	0	0
⊮ 12.08	DC-Bus Voltage at Present Fault	2137	Read-only	0	0	0
⊮ 12.09	Output Power at Present Fault	2138	Read-only	0	0	0
⊮ 12.10	Output Torque at Present Fault	2139	Read-only	0	0	0
№ 12.11	IGBT Temperature of Power Module at Present Fault	2140	Read-only	0	0	0
⊮ 12.12	Multi-function Terminal Input Status at Present Fault	2141	Read-only	0	0	0

			Chapte	oter 4 Parameters BLD-E1 Series				
Parameter	Explanation	Settings	Factory	VF	VFPG	FOCPM		
- arameter	LXPIAHALIOH	Settings	Setting	٧١	VIFG	1 OCF W		
⊮ 12.13	Multi-function	2142	Read-	\circ	\circ	\circ		
	Terminal		only					
	Output Status							
	at Present							
	Fault							
⊮ 12.14	Drive Status at	2143	Read-	\circ	\circ	\circ		
	Present Fault		only					
⊮ 12.15	Second Most	0617	Read-	\circ	\circ	\circ		
	Recent Fault		only					
	Record							
⊮ 12.16	Second Most	0634	Read-	\circ	\circ	\circ		
	Recent Fault		only					
	Time of Motor							
	Operation							
	(min.)							
⊮ 12.17	Second Most	0635	Read-	\circ	\circ	\circ		
	Recent Fault		only					
	Time of Motor							
	Operation							
	(day)							
⊮ 12.18	Third Most	0618	Read-	\circ	\circ	\circ		
	Recent Fault		only					
	Record							
⊮ 12.19	Third Most	0636	Read-	\circ	\circ	\circ		
	Recent Fault		only					
	Time of Motor							
	Operation							
	(min.)							
⊮ 12.20	Third Most	0637	Read-	0	\circ	\circ		
	Recent Fault		only					
	Time of Motor							
	Operation							
	(day)							

	etersAT Troublesho		Factory		\/===	
Parameter	Explanation	Settings	Setting	VF	VFPG	FOCPM
⊮ 12.21	Fourth Most	0619	Read-	0	0	0
	Recent Fault		only			
	Record					
⊮ 12.22	Fourth Most	0638	Read-	\circ	\circ	\bigcirc
	Recent Fault		only			
	Time of Motor					
	Operation					
	(min.)					
⊮ 12.23	Fourth Most	0639	Read-	\circ	\circ	\circ
	Recent Fault		only			
	Time of Motor					
	Operation					
	(day)					
⊮ 12.24	Fifth Most	0620	Read-	0	\circ	\circ
	Recent Fault		only			
	Record					
⊮ 12.25	Fifth Most	0640	Read-	\circ	\circ	\circ
	Recent Fault		only			
	Time of Motor					
	Operation					
	(min.)					
⊮ 12.26	Fifth Most	0641	Read-	\circ	\circ	\bigcirc
	Recent Fault		only			
	Time of Motor					
	Operation					
	(day)					
⊮ 12.27	Sixth Most	0621	Read-	\circ	\circ	\bigcirc
	Recent Fault		only			
	Record					
⊮ 12.28	Sixth Most	0642	Read-	0	\circ	\circ
	Recent Fault		only			
	Time of Motor					

			Chapte	r 4 Para	meters B	LD-E1 Series
Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
	Operation (min.)					
⊮ 12.29	Sixth Most Recent Fault Time of Motor Operation (day)	0643	Read- only	0	0	0
⊮ 12.30	No Factory Setting			0	0	0
⊮ 12.31	No Factory Setting			0	0	0

Group 13: View User-defined Parameters

★: The parameter can be set during operation.

Parameter	Explanation	Settings	Factory Setting	VF	VFPG	FOCPM
13.00 ~	View User-defined	Pr. 00-00~11-16				
13.31	Parameters					

4.2 Description of Parameter Settings

Group 00 User Parameters

★: This parameter can be set during operation.

00-00	Identity	dentity Code of the Brushless DC Motor Drive							
Control mode	VF	VFPG	FOCPM	Factory setting: Read Only					
	Settings Read Only								
00-01	Rated 0	Current [Display of the Brushless DC Motor Drive						
Control mode	VF	VFPG	FCPM	Factory setting: Read Only					
		•							

Settings Read Only

Pr. 00-00 determines the drive capacity that is set by the factory. It displays the identity code of the brushless DC 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 brushless DC drive correspond to the identity code.

Pr.00-01 displays the rated current of the brushless DC motor drive. By reading this parameter the user can check if it is correct for the brushless DC motor drive.

	•	115V Series	3	460V Series					
kW	0.2	0.4	0.75	0.4	0.75	1.5	2.2	3.7	
HP	0.25	0.5	1.0	0.5	1.0	2.0	3.0	5.0	
Pr.00-00	0	2	4	3	5	7	9	11	
Rated Output Current (A)	1.6	2.5	4.2	1.5	2.5	4.2	5.5	8.2	
Max. Carrier Frequency				15Hz					

	230V Series (1-phase)						230V Series (3-phase)				
kW	0.2	0.4	0.75	1.5	2.2	0.2	0.4	0.75	1.5	2.2	3.7
HP	0.25	0.5	1.0	2.0	3.0	0.25	0.5	1.0	2.0	3.0	5.0
Pr.00-00	0	2	4	6	8	0	2	4	6	8	10
Rated Output Current (A)	4.9	6.5	9.7	15.7	24	1.9	2.7	4.9	9.0	15	17.0
Max. Carrier Frequency						15kHz					

Chapter 4	Paramete	ersAT	Troubleshooting} BLD-E1 Series					
00-02	Parameter Reset							
Control mode	VF	VFPG	FOCPM	Factory setting: 0				
	Settings	0	No Function					
		10	All parameters are reset to factory settings					
₩ V	Vhen it is	set to	10, all parameters will be reset to factory settings.					
00-03	✓ Start-	up Dis	play Selection					
Control mode	VF	VFPG	FOCPM	Factory setting: 0				
	Settings	0	Display the frequency command value. (F)					
		1	Display the actual output frequency (H)					
		2	DC BUS voltage (V)					
		3	Display the output current (A)					
		4	Output voltage (E)					
		5	Multifunction display, see Pr.00-04					
T T	his parar	neter o	determines the start-up display page after power is applie	ed to the drive. User				
d	efined op	tions a	are displayed according to Pr.00-04.					
00-04		nt of N	/lulti-Function Display					
Control mode	VF	VFPG	FOCPM	Factory setting: 0				
	Sattings	. 0	Display the output current in A supplied to the motor					

Settings

- 0 Display the output current in A supplied to the motor
 - 1 Reserved
 - 2 Display actual output frequency (H)
 - Display the actual DC BUS voltage in VDC of the brushless DC motor drive (U)
 - Display the output voltage in VAC of terminals U, V, W to the motor (E)
 - Display the power factor angle in ° of terminals U, V,
 - W to the motor (n.)
 - Display the output power in kW of terminals U, V and W to the motor (kW)
 - Display the actual motor speed in rpm (enabled when using with PG card).
 - Display the estimated value of torque in % as it relates to current.
 - 9 Display PG position

00-04	
-------	--

- 10 Display the electrical angle of drive output
- Display the signal of VR analog input terminal in %.
- Range 0~10V corresponds to 0~100%.
- Display the signal of ACI analog input terminal in %.
- 12 Range 4~20mA/0~10V corresponds to 0~100%.
- Display the signal of AVI analog input terminal in %.
- Range -10V~10V corresponds to 0~100%.
- 14 Reserved
- 15 Display the temperature of IGBT in °C.
- 16 Display digital input status ON/OFF
- 17 Display digital output status ON/OFF
- 18 Display multi-step speed
- 19 The corresponding CPU pin status of digital input
- 20 The corresponding CPU pin status of digital output

21

| Reserved

- 24 Output AC voltage when malfunction
- 25 Output DC voltage when malfunction
- 26 Motor frequency when malfunction
- 27 Output current when malfunction
- 28 Output frequency when malfunction
- 29 Frequency command when malfunction
- 30 Output power when malfunction
- 31 Output torque when malfunction
- 32 Input terminal status when malfunction
- 33 Output terminal status when malfunction
- 34 Drive status when malfunction
- It is used to display the content when LED U is ON. It is helpful for getting the brushless DC motor drive's status by this parameter.

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

MI3: Pr.02-01 is set to 1 (multi-step speed command 1)

MI6: Pr.02-04 is set to 8 (the 1st, 2nd acceleration/deceleration time selection)

If REV, MI2, MI3 and MI6 are ON, the value is 0000 0000 0010 0110B in binary and 0026H in HEX. At the meanwhile, if Pr.00-04 is set to "16" or "19", it will display "0026" 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.

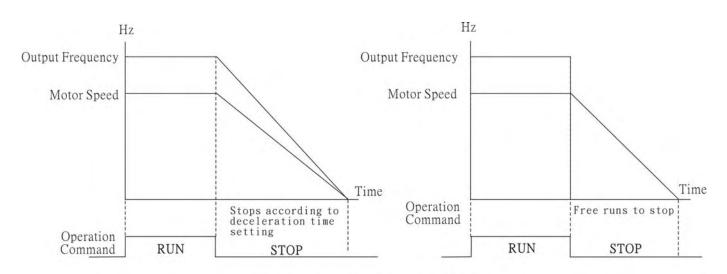
Terminal	MO2	MO1
Status	0	1

RA: Pr.02-13 is set to 9 (Drive ready).

After applying the power to the brushless DC 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 LED U is ON 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		
00-06	Software Version	
Control mode	VF VFPG FOCPM Factory setting	g: #.##
	Settings Read Only	
00-07	Selection of motor stop method	
Control mode	VF VFPG FOCPM Factory set	ting: 0
	Settings 0: ramp to stop	
	1: coast to stop	
<u> </u>	As the drive receives "stop" command, the stop method will be according to this para	neter

setting.



Ramp to Stop and Coast to Stop

- Ramp to stop: the brushless DC decelerates the motor to Minimum Output Frequency
- Pr.01-09 and stops according to the deceleration time set in Pr.01-07.
- Coast to stop: the brushless DC drive stops output instantly upon command, and motor free run until it comes to a complete stop.
- If the machinery is turned off, the motor must also be stopped to avoid waste of power and for safety concern. It is suggested to set the brake ramp to stop with ramping duration matches machinery characteristics.
- As the machinery is turned off, if it is allowed for motor to spin freely or the inertia load is large, it is suggested to set the motor to coast to stop.

00-08	✓ Setting of Motor Running Direction							
Control mode	VF	VFPG	FOCPM	Factory setting: 0				
	Settings	3	0 : reverse running allowed					
			1 : reverse running not allowed					
			2 : forward running not allowed					
Q TI	his paran	neter pr	events the machine damage which caused by fwd/rev	motor run error.				
00-09	⊮ Conti	rol Meth	od					

	00-09	⊮ Contr	✓ Control Method								
	Control mode	VF	VFPG	FOCPM	Factory Setting: 0						
•		Settings	0	V/f control							
			1	V/f + Encoder (VFPG)							
			8	FOC PM control (FOCPM)							

This parameter determines the control method of the brushless DC 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 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	∦ Spee	d Unit				
Control mode	VF	VFPG	FOCPM	Factory Setting: 0		
	Settings	0	Hz			
		3	RPM			
Q V	When parameter 00.10=3, the setting of parameter 01.00, .09~01.11, 01.23, 01.29,					
0	2.25~02.	28, 04.0	00~04.15	07.05, 10.17, 10.20 and 10.21 will adjust according to the		
d	lifferent ru	ınning s	peed (RF	PM).		
00-11	Reserve	ed				
	•					
00-12		er Freq	uency			
Control mode	VF	VFPG	FOCPM	Factory setting: 8		
	Settings	2~	15KHz			

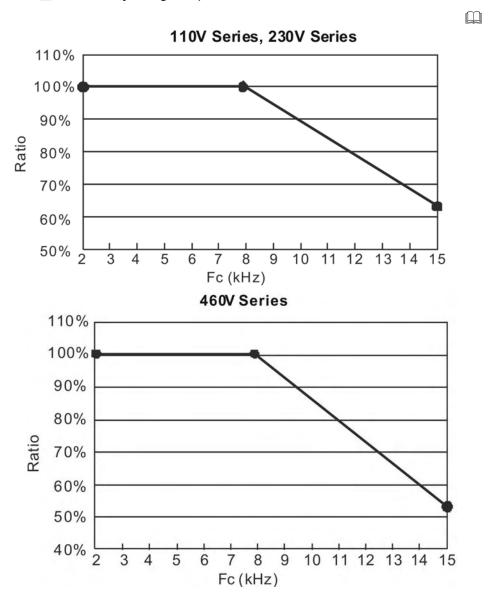
This parameter determinates the PWM carrier frequency of the brushless DC motor drive.

Carrier Frequency	Acoustic Noise	Electromagnetic Noise or Leakage Current	Heat Dissipation	Current Wave
2kHz	Significant	Minimal	Minimal	
8kHz		l Î l	1	
15kHz	↓		 	- √ / √ / √ ↓
	Minimal	Significant	Significant	

- From the table, we see that the PWM carrier frequency has a significant influence on the electromagnetic noise, brushless DC motor drive heat dissipation, and motor acoustic noise.
- If the ambient noise is greater than motor acoustic noise, lower PWM carrier frequency would allow better heat dissipation.
- Though a higher PWM carrier frequency will provide quiet operation, it is necessary to check if the wiring system and anti-interference function support this action.
- If carrier frequency is higher than default setting and must be lowered but meanwhile overload has reaches the adjusting limit, then the carrier frequency (Fc) will self-adjust in response to the ambient temperature and current level.
- For example, a 460V series under ambient temperature 40 °C, carrier frequency 15kHz and rated output current 55%; if rated output current is now 87%, in responding to the ambient

temperature, carrier frequency will be lowered to 10kHz, moreover, overload condition will be adjust, e.g. Fc= 15kHz, rated output current= 50% * 55% = 82.5% and continues for 1 minute, the carrier frequency (Fc) will be reduced to the default setting.

Overload Adjusting Graph



- The control of maximum running speed differ upon PWM setting, therefore, carrier frequency setting must be 27 times greater than the actual outputted frequency to attain best speed control response.
- For example, if Pr.00-12 setting is 2K, in order to attain best rotation speed control response, the max. output frequency must be less than 74.07Hz. When number of motor poles is 5, the rotation speed is controlled to around 888rpm; in this case, it is recommend to set carrier frequency to 2K and speed command to 900rpm. When carrier frequency (Pr. 00-12) setting is 6K or lower, please refer to the following chart for value of carrier frequency and rotation speed:

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2K (Pr. 00-12 = 2)	900rpm
3K (Pr. 00-12 = 3)	1350rpm
4K (Pr. 00-12 = 4)	1800rpm
5K (Pr. 00-12 = 5)	2250rpm
6K (Pr. 00-12 = 6)	2700rpm
Greater than 7K (Pr. 00-12 >7K)	3000rpm

00-13						
Contro	· VI	VFPG	FOCPM Factory setting: 0			
	Settings	0	Enable AVR			
		1	Disable AVR			
		2	Disable AVR when deceleration			
	It is used to	o selec	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 the deceleration will be smoother and faster.

00-14	✓ Source of the Master Frequency Command							
Control mode	VF		FOCPM	Factory setting: 2				
	Settings	0	Digital keypad input					
		1	RS-485 serial communication input					
		2	External analog input (Pr. 03-00~03-02)					
		3	Digital terminals input (Pr.04-00~04-15)					

This parameter determines the drive's master frequency source.

00-15	-15 ✓ Source of the Operation Command							
Control mode	VF	VFPG	FOCPM	Factory setting: 0				
	Settings	0	Digital keypad control	_				
		1	External terminal control					
		2	RS-485 serial communication or digital keypad (KF	PVL-CC01) control				

Chapter 4 Parameters	BLD-E1 Series
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BLE-E1 series is shipped without digital keypad and users can use external terminals or RS-
485 to control the operation command.

When the LED PU is light, the operation command can be controlled by the optional digital keypad (KPC-CE01). Refer to appendix B for details.

Group 01 Basic Parameters

01-0	Maximum Output Frequency								
Contro	- · VI	VFPG	FOCPM	Factory setting: 3000(250)					
	Settings		120~4000rpm (10~400z)						
	•			motor drive's Maximum Output Frequency. All mand sources (analog frequency inputs 0 to					

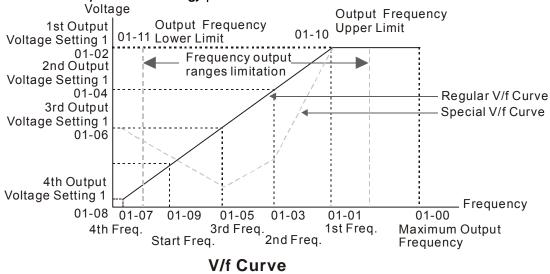
+10V and 4 to 20mA) are scaled to correspond to the output frequency range.

01-01	1st Ou	tput Fred	quency Se	tting			
Contro mode	· vi	VFPG	FOCPM	Factory setting: 60.00			
	Setting	IS .	0.00~	400.00Hz			
	It is for the	e base fi	requency	and motor rated frequency.			
	This value should be set according to the rated frequency of the motor as indicated on the						
	motor nar	neplate.	If the mo	or is 60Hz, the setting should be 60Hz. If the motor is 50Hz, it			
	should be	set to 5	0Hz.				

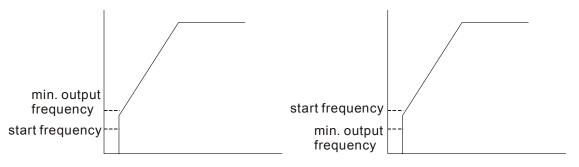
01-02	1st Outp	1st Output Voltage Setting						
Control mode	VF	VFPG	FOCPM					
	Settings	230V	series 0.1 to 255.0V	Factory Setting: 220.0				
		460V	series 0.1 to 510.0V	Factory Setting: 440.0				

- lt 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 brushless DC 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.

					Chapter 4 Paramete	ers BLD-E1 Series
01-03	2nd O	utput Frequenc	y Setting			
Control mode	VF	VFPG			Fac	tory setting: 0.50
	Setting	s 0.00~40	00.00Hz			
01-04	⊮ 2nd	Output Voltage	Setting			
Control mode	VF	VFPG				
	Setting	s 230V se	eries	0.1 to 255.0V	Fa	actory Setting: 5.0
		460V se	eries	0.1 to 510.0V	Fac	ctory Setting: 10.0
01-05	3rd Ou	tput Frequency	/ Setting			_
Control mode	VF	VFPG			Fac	tory setting: 0.50
	Setting	s 0.00~40	00.00Hz			
01-06	 ∕⁄ 3rd	Output Voltage	Setting			
Control mode	VF	VFPG				
	Setting	s 230V se	eries	0.1 to 255.0V	Fa	actory Setting: 5.0
		460V se	eries	0.1 to 510.0V	Fac	ctory Setting: 10.0
01-07	4th Ou	tput Frequency	/ Setting			
Control mode	VF	VFPG				
	Setting	s 0.00~40	00.00Hz			Factory Setting: 0
01-08	 ∕4th	Output Voltage	Setting			
Control mode	VF	VFPG				
	Setting	s 230V se	eries	0.1 to 255.0V	Fa	actory Setting: 0.0
		460V se	eries	0.1 to 510.0V	Fa	actory Setting: 0.0
<u> </u>	//f curve	setting is usua	lly set by	the motor's allowal	ole loading characterist	ics. Pay special
а	ttention	to the motor's	neat dissi	pation, dynamic ba	lance, and bearing lubr	ricity, if the loading
C	haracter	istics exceed t	ne loading	limit of the motor.		
₽ F	or the V	/f curve setting	, it should	be Pr.01-01≥ Pr.0	1-03≥ Pr.01-05≥ Pr.01-	-07. There is no
li	mit for th	ne voltage setti	ng, but a	high voltage at the	low frequency may cau	use motor damage
C	verheat,	stall preventio	n or over-	current protection.	Therefore, please use	the low voltage at
tl	ne low fr	equency to pre	vent moto	or damage.		
<u> </u>	//F curve	would only fur	nction as	Pr. 00-09= 0 or 1 (เ	under V/F control mode	e) and Pr. 00-10=0



01-09	Start Freq	uency	
Control mode	VF \	/FPG	Factory setting: 6
	Settings	0 00~400 00Hz	

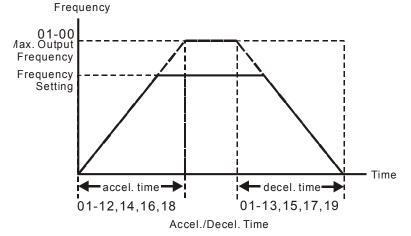


01-10	✓ Output Frequency Upper Limit	
Control mode	VF VFPG FOCPM	Factory setting: 3000
	Settings 0.00~4800rpm	
01-11	✓ Output Frequency Lower Limit ✓	_
Control mode	VF VFPG FOCPM	Factory setting: 0.00
	Settings 0.00~4800rpm	

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.

		Chapter 4 Parameters BLD-E1 Series
01-12	⊮Accel. Time 1	Factory setting: 3.00
01-14	⊮Accel. Time 2	Factory setting: 3.00
01-16	⊮Accel. Time 3	Factory setting: 3.00
01-18	⊮Accel. Time 4	Factory setting: 3.00
Control mode	VF VFPG FOCPM	
	Settings 0.00~600.00 sec	_
01-13		Factory setting: 2.00
01-15		Factory setting: 2.00
01-17		Factory setting: 2.00
01-19		Factory setting: 2.00
Control mode	VF VFPG FOCPM	
	Settings 0.00~600.00 sec	

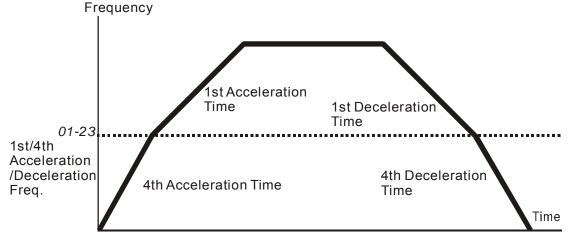
- The Acceleration Time is used to determine the time required for the brushless DC motor drive to ramp from 0Hz to Maximum Output Frequency (Pr.01-00).
- The Deceleration Time is used to determine the time require for the brushless DC motor drive to decelerate from the Maximum Output Frequency (Pr.01-00) down to 0Hz.
- The Acceleration/Deceleration Time 1, 2, 3, 4 are selected according to the Multi-function Input Terminals settings. The factory settings are acceleration time 1 and deceleration time 1.
- The larger against torque and inertia torque of the load and the accel./decel. time setting is less than the necessary value, it will enable torque limit and stall prevention function. When it happens, actual accel./decel. time will be longer than the action above.



01-20	
0-21	
0-22	

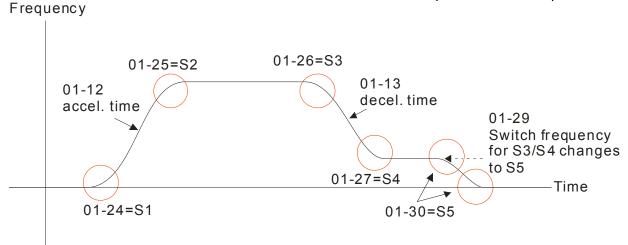
01-23	✓ Switc	✓ Switch Frequency between 1st/4th Accel/decel Factory setting: 0		
Control mode	VF	VF VFPG FOCPM		
	Settings	0.0	0~400.00Hz	_

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



1st/4th Acceleration/Deceleration Switching

01-24		Factory setting: 1.00			
01-25		Factory setting: 1.00			
01-26					
01-27		Factory setting: 1.00			
01-30		Factory setting: 1.00			
Control mode	VF VFPG FOCPM	Factory setting: 1.00			
	Settings 0.00~25.00 sec				
01-29	✓ Switch Frequency for S Changes to S5				
Control mode	VF VFPG FOCPM	Factory setting: 0.00			
	VF VFPG FOCPM Settings 0.00~4800rpm	Factory setting: 0.00			
mode	VI VII O I OCI IVI				
mode	Settings 0.00~4800rpm	he accel./decel. curve			
mode	Settings 0.00~4800rpm It is used to give the smoothest transition between speed changes. T	he accel./decel. curve			
mode	Settings 0.00~4800rpm It is used to give the smoothest transition between speed changes. To can adjust the S-curve of the accel./decel. When it is enabled, the dri	he accel./decel. curve			
mode	Settings 0.00~4800rpm It is used to give the smoothest transition between speed changes. T can adjust the S-curve of the accel./decel. When it is enabled, the driaccel./decel. curve by the accel./decel. time.	the accel./decel. curve ve will have different			



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	
	Fmin (4th output frequency setting)			

- When the Brushless DC motor drive is at 0rpm, 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			
Control mode	VF VFPG	FOCPM	Factory setting: 2.00
	Settings 0.0	0~600.00 Sec	

The brushless DC motor drive will stop by the setting of this parameter when canceling RUN command. Refer to the figure in Pr.01-29 for details.

Group 2 Digital Input/Output Parameters This parameter can be set during operation.

02-00	2-wire/3-wire Operation Control				
Control mode	VF	VFPG	FOCPM		Factory setting: 0
	Settings	0	FWE	O/STOP, REV/STOP	
		1	FWE	D/STOP, REV/STOP (Line Start Lockout)	
		2	RUN	I/STOP, REV/FWD	
		3	RUN	I/STOP, REV/FWD (Line Start Lockout)	
		4	3-wir	re	
		5	3-wii	re (Line Start Lockout)	

- 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.
- This parameter is used to control operation from external terminals. There are three different control modes.

02-00 Control Circuits of the External Terminal 0, 1 MI1 FWD:(COPEN":STOP) -00 FWD/STOP 2-wire operation control (1) ("CLOSE":FWD) FWD/STOP REV/STOP -00 MI2 REV:("OPEN": STOP) ("CLOSE": REV) **REV/STOP** COM 2, 3 FWD:("OPEN":STOP) MI1 2-wire operation control (2) RUN/STOP ("CLOSE":RUN) **RUN/STOP** REV:("OPEN": FWD) FWD/REV MI2 ("CLOSE": REV) **REV/FWD** COM 4, 5 90 MI1 FWD "CLOSE":RUN 3-wire operation control RUN STOP MI3 OPEN":STOP MI2 REV/FWD "OPEN": FWD 0.0 REV/FWD CLOSE": REV COM

	Cha	pter 4 Parameter	s BLD-E1 Series
02-01 Multi-Function Input Command 3 (MI3)			
		Fa	actory Setting: 1
02-02 Multi-Function Input Command 4 (MI4)			
		Fa	actory Setting: 2
02-03 Multi-Function Input Command 5 (MI5)			
		Fa	actory Setting: 3
02-04 Multi-Function Input Command 6 (MI6)			
		Fa	actory Setting: 4
Settings	VF	VFPG	FOCPM
0 : no function	\circ	0	0
1 : Multi-step command 1	0	0	0
2 : Multi-step command 2	0	0	0
3 : Multi-step command 3	0	0	0
4 : Multi-step command 4	0	0	0
5 : Reset	\circ	0	0
6 : Reserved			
7 : acceleration/deceleration speed inhibit	0	0	0
8 : the 1st, 2nd acceleration/deceleration time	\bigcirc	0	\circ
selection			
9 : the 3rd, 4th acceleration/deceleration time	\bigcirc	\circ	\circ
selection			
10: EF input (Pr.07-28)	0	0	0
11: Reserved			
12: Stop output	0	0	0
13~14: Reserved			
15 : Running speed command from VR	0	0	0
16 : Running speed command from ACI	0	0	0
17 : Running speed command from AVI	0	0	0
18 : Emergency Stop (Pr.07-28)	0	0	0
19~26 : Reserved			
27 : ASR1/ASR2 Selection	0	0	0
28 : Emergency stop (EF1) (Motor coasts to stop)	\circ	0	0
29~30 : Reserved			
31: High torque bias (by Pr.07-21)	\bigcirc	0	0
32: Middle torque bias (by Pr.07-22)	\circ		0

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Thapter 41 trainition of 1 11 trainition of 1 1				
Settings	VF	VFPG	FOCPM	
33: Low torque bias (by Pr.07-23)	0	0	0	
34-37: Reserved				
38: Disable EEPROM write function	0	0	0	
39 : Reserved				
40 : Enable drive to function	0	0	0	

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	15 step speeds could be conducted through the digital	
2	Multi-step speed command 2	statuses of the 4 terminals, and 17 in total if the master speed and JOG are included. (Refer to Pr. 04-00~04-15)	
3	Multi-step speed command 3		
4	Multi-step speed command 4	When using communication to control the multi-step speed, setting 1 to 4 will be invalid.	
5	Reset	After the error of the drive is eliminated, use this terminal to reset the drive.	
6	Reserved		
7	Acceleration/deceleration Speed Inhibit	When this function is enabled, acceleration and deceleration is stopped and the brushless DC motor drive starts to accel./decel. from the inhibit point.	

				Chapter 4 Parameters	BLD-E1 Ser		
Settings	Functions	Descriptions					
		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.					
	The 1 st , 2 nd acceleration	Bit 0	Bit	Descriptions			
8	or deceleration time selection		1				
	Selection	0	0	First acceleration/deceleration	ation		
				time			
				When output frequency is	less		
				than Pr.01-23 (Switch			
				Frequency between 1st/4t			
				Accel/decel), it will output	: 4 ^{tn}		
	The 3 rd , 4 th acceleration		_	accel/decel time.			
9	or deceleration time	0	1	2 rd accel./decel. time			
	selection	1 1	0 1	3 rd accel./decel. time 4 th accel./decel. time			
		If the drive receives STOP command, it will decelerate to stop by Pr.01-31.					
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 VR	When the source of operation speed command is set to VR, ACI and AVI at the same time and two or above terminals are ON, the priority is VR>ACI>AVI. When this function is enabled, the source of the					
		frequency will force to be VR.					
16	Operation speed command form ACI			on is enabled, the source of the ce to be ACI.	e		
17	Operation speed command form AVI			on is enabled, the source of the ce to be AVI.	e		
18	Emergency Stop	When this		on is enabled, the drive will rar	np to stop		
19-26	Reserved						

Settings	metersAT Troubleshooting} Functions		ns						
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 with fault code 50 (EF1)							
29-30	Reserved								
31	High torque bias	When Pr.0	7-19 is set	to 3:					
32	Middle torque bias	31: The high torque bias is according to the Pr.07-21							
33	Low torque bias	setting. 32: The middle torque bias is according to the Pr.07-22 setting. 33: The low torque bias is according to the Pr.07-23 setting. 31 32 33 Torque Bias OFF OFF OFF No OFF OFF ON 07-23 OFF ON OFF 07-22 OFF ON ON 07-23+07-22 ON OFF ON 07-21 ON OFF ON 07-21+07-23 ON ON OFF ON 07-21+07-22							
34-37	Reserved								
38	Disable write EEPROM function	When this EEPROM.	function is 6	enabled, yo	ou can't write into				
39	Reserved	•							
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).							

02-05	Reserved
02-06	Reserved
02-07	Reserved
02-08	Reserved

02-0	9 ^	/ Digit	al Inpu	t Resp	onse	Time			
Contr mod		VF	VFPG	FOC	РМ			Fact	cory setting: 0.005
	S	etting	s	0.001	~ 30.0	00 se	С		
	Thi	s para	meter i	s use	d for d	igital	nput terminal signal dela	ay and confirmat	ion. The delay time
	is c	onfirm	ation ti	me to	preve	nt sor	ne uncertain interferenc	es that would res	sult in error (except
	for	the co	unter ir	nput) i	n the i	nput	of the digital terminals (F	WD, REV and M	II1~6). Under this
	cor	dition	, confirr	matior	n for th	is par	ameter could be improv	ed effectively, bu	ıt the response time
	will	be so	mewha	it dela	yed.				
02-1	0	√ Digi	tal Inpu	ıt Ope	ration	Direc	tion		
Cont		VF	VFPG	FO	СРМ				Factory setting: 0
	5	Setting	S	0 ~ 6	5535				
	Thi	s para	meter i	s use	d to se	t the	nput signal level and it w	von't be affected	by the
	SIN	IK/SO	URCE	status	i.				
	Bit0) is for	FWD t	termin	al, bit	l is fo	REV terminal and bit2	to bit9 is for MI1	to MI8.
	Use	er can	change	e term	inal st	atus t	y communicating.		
	For	exam	ple, MI	1 is s	et to 1	(mult	-step speed command 1	l), MI2 is set to 2	(multi-step speed
			•				2 nd step speed command		, ,
	nee	ed to s	et Pr.02	2-10=	9 by c	ommu	inication and it can forwa	ard with 2 nd step	speed. It doesn't
~~	nee	ed to w	ire any	/ multi	-functi	on ter	minal.		
				1	l		1		
-	bit5	bit4	bit3	bit2	bit1	bit0			
	MI6	MI5	MI4	MI3	MI2	MI1			
02-1	11	⊮ Rese	erved						
02-1	2	⊮ Rese	erved						
02-1	3	৵ Mult	i-functio	on Ou	tput 3	(MO1)		
02-1	4	৵ Mult	i-functio	on Ou	tput 4	(MO2)		
									Factory Setting: 0
	(Setting	js				VF	VFPG	FOCPM
0 : No	fund	ction					0	0	0
1: Op	eratio	n indi	cation				0	0	0
2: Op	eratio	n spe	ed attai	ined			0	0	0

Chapter 4 ParametersAT Troubleshooting} BLD-E1 Series			
3 : Desired frequency attained 1 (Pr. 02-25, 02-26)	\bigcirc	\bigcirc	\bigcirc
4: Desired frequency attained 2 (Pr. 02-27, 02-28)	0	0	0
5: Zero speed (frequency command)	\circ	0	0
6: Zero speed with stop (frequency command)	0	0	0
7: Over torque (OT1)	0	0	0
8: Over torque (OT2)	\circ	0	0
9: Drive ready	0	0	0
10 : Low-voltage Detection (LV)	\bigcirc	\bigcirc	\bigcirc
11 : Malfunction indication	\circ	\circ	0
12 : Reserved			
13 : Overheat warning (Pr. 06-14)	0	0	0
14~16 : Reserved	0	0	0
17 : Malfunction indication 1	0	0	0
18~19 : Reserved			
20 : Warning output	0	0	0
21 : Ove voltage warning	0	0	0
22 : Over-current stall prevention warning	0	0	0
23 : Over-voltage stall prevention warning	0	0	0
24 : Drive operation mode(Pr. 00-21=0)	0	0	0
25: Forward running command	0	0	0
26: Reverse running command	0	0	0
27~30 : Reserved			
31 : Forward running input	0	0	0
32 : Reverse running input	0	0	0
33 : Zero-speed (Actual output frequency)	0	0	0
34 : Zero speed with Stop (actual output frequency)	0	0	0
35~39 : Reserved			
40 : Speed attained (including zero speed)	0	0	0

Settings	Functions	Descriptions		
0	No Function			
1	AC Drive Operational	Active when there is an output from the drive or RUN command is ON.		
2	Operation speed attained	Active when the brushless DC motor drive reaches the output frequency setting.		
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)	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). (Pr.06-05~06-07)		
8	Over Torque (OT2)	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). (Pr.06-08~06-10)		
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	Reserved			
13	Overheat (Pr.06-14)	Active when IGBT or heat sink overheats to prevent OH turn off the drive. (refer to Pr.06-14)		
14~16	Reserved			
17	Malfunction indication 1	Activate after 10ms when fault occurs (except Lv stop).		
18~19	Reserved			
20	Warning Output	Active when the warning is detected.		
21	Over-voltage Warning	Active when the over-voltage is detected.		

Settings	Functions	Descriptions
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.
27~30	Reserved	
31	Forward running input	Motor forward run (FWD).
32	Reverse running input	Motor Reverse run (REV).
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)
35~39	Reserved	
40	Speed Attained (including zero speed)	Active when the output frequency reaches frequency setting.
	₩ Reserved	
02-22		
02-23	✓ Multi-output Direction	
Control mode	VF VFPG FOCPM	Factory setting: 0
	Settings 0 ~ 65535	

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.02-13 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; if multi-function output terminal is set to opposite direction, Relay will be OFF when the drive is running and ON when the drive is stop.

Bit 1	Bit 0
MO2	MO1

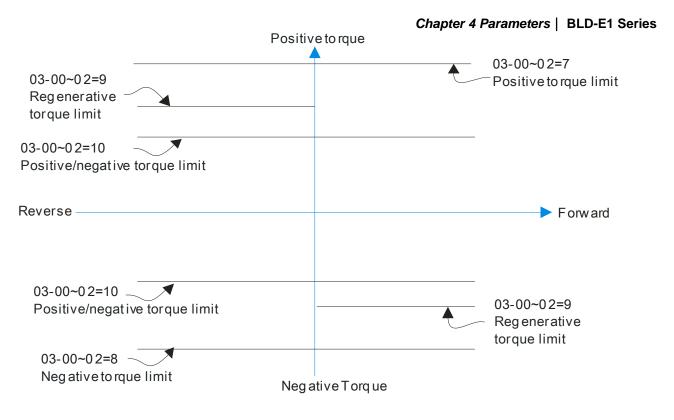
02-24	Reserved	
02-25		
Control mode	VF VFPG FOCPM	Factory setting: 0
02-26	★ The Width of the Desired Frequency	uency Attained 1
Control mode	VF VFPG FOCPM	Factory setting: 24
02-27		
Control mode	VF VFPG FOCPM	Factory setting: 0
02-28	★ The Width of the Desired Frequency	uency Attained 2
Control mode	VF VFPG FOCPM	Factory setting: 24
	Settings 0.00 ~ 4800rpm	

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.

Group 3 Analog Input/Output Parameters	
--	--

03-00 ✓ Analog Input 1 (VR)								
Factory Setting: 1								
03-01 ✓ Analog Input 2 (ACI)								
Factory Setting: 0								
03-02 ✓ Analog Input 3 (AVI)								
		Fa	ectory Setting: 0					
Settings	VF	VFPG	FOCPM					
0: No function	0	0	0					
1: Frequency command (torque limit under TQR control mode)	0	0	0					
2: Reserved								
3: Preload input	0	0	0					
4-6: Reserved								
7: Positive torque limit								
8: Negative torque limit			0					
9: Regenerative torque limit								
10: Positive/negative torque limit			0					
When it is frequency command or TQR spectage 10V/4~20mA is 0 – max. output frequency(F		sponding value	for 0~±					

- 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).
- When it is torque compensation, the corresponding value for $0\sim\pm10\text{V}/4\sim20\text{mA}$ is 0-rated torque.



03-03									
Control mode	VF V	FPG FOCPM					Factory setting: 0.0		
	Settings	-100.0~100.0%							
∞					, .				

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

03-04						
Control mode	VF	VFPG	FOCPM	Factory setting: 0.0		
	Settings	-	100.0~100.0%			

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

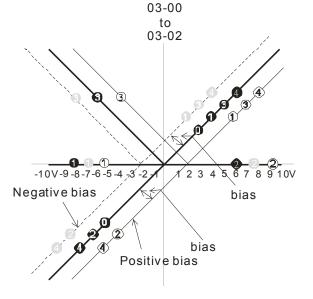
03-05						
Control mode	VF VI	FPG FOCPM	Factory setting: 0.0			
	Settings	-100.0~100.0%				
~~~		100.0 100.070				

- It is used to set the corresponding AVI voltage of the external analog input 0.
- The relation between external input voltage/current and setting frequency is equal to -10~+10V (4-20mA) corresponds to 0~3000rpm.

03-06	✓ Positive/negative Bias Mode (VR)						
Control mode	VF	VFPG	FOCPM	Factory setting: 0			

Onaptor 1	arameters AT   Troubleshooting   DED-ET octios				
03-07	✓ Posit	✓ Positive/negative Bias Mode (ACI) (can be set to 0 or 1 only)			
Control mode	VF	VFPG	FOCPM	Factory setting: 0	
03-08					
Control mode	VF	VFPG	FOCPM	Factory setting: 0	
	Settings	0	Zero	bias	
		1	Serv	e bias as the center, lower than bias=bias	
		2	Serv	e bias as the center, greater than bias=bias	
	The absolute value of the bias voltage while serving as the center (unipolar)				
		4	Serv	e bias as the center (unipolar)	

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.



03-09~03-11 gain is positive

- 0 Zero 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				
Control mode	VF VFPG	FOCPM	Factory setting: 100.0	
03-10	∧ Analog Inpu	t Gain 1 (ACI)		
Control mode	VF VFPG	FOCPM	Factory setting: 100.0	
03-11	∧ Analog Inpu	t Gain 1 (AVI)		
Control mode	VF VFPG	FOCPM	Factory setting: 100.0	
	Settings 0	.0~500.0%		

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

				Chapter 4 Parameters   BLD-E1 Series	
03-12	✓ Ana	log Inpu	t Delay 1	ime (VR)	
Control mode	VF	VFPG	FOCPM	Factory setting: 0.05	
03-13	✓ Ana	log Inpu	t Delay 1	ime (ACI)	
Control mode	VF	VFPG	FOCPM	Factory setting: 0.05	
03-14	✓ Ana	log Inpu	t Delay 1	ime (AVI)	
Control mode	VF	VFPG	FOCPM	Factory setting: 0.05	
	Setting	s C	0.00 to 2.	00 sec	
TI Fi If tir	Interferences commonly exist with analog signals, such as those entering VR, ACI and AVI.  These interferences constantly affect the stability of analog control and using the Input Noise Filter will create a more stable system.  If time setting is large, the control will be stable, yet the response to the input will be slow. If time setting is small, the control may be unstable, yet the response to the input will fast.				
03-15	Los:	s of the A	ACI Sign		
Control mode	VF	VFPG	FOCPM	Factory setting: 0	
	Setting	s C	) Disa	able	
		1	l Cor	tinue operation at the last frequency	
		2	2 Dec	elerate to stop 0Hz	
		3	3 Sto	o immediately and display E.F.	

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

## Group 4 Multi-Step Speed Parameters **This parameter can be set during operation.

04-00									
04-01									
04-02									
04-03	✓ 3rd Step Speed Frequency								
04-04									
04-05	✓ 5th Step Speed Frequency								
04-06									
04-07									
04-08	★8th Step Speed Frequency								
04-09	9   ✓ 9th Step Speed Frequency								
04-10									
04-11									
04-12									
04-13									
04-14									
04-15	<b>04-15</b> ✓ 15th Step Speed Frequency								
Control mode	VF VFPG FOCPM	Factory setting: 0							
	Settings 0 to 8000rpm								

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

# **Group 5 IM Parameters**

05-18 Accumulative Motor Operation Time (Min.)				
Control mode	VF VFPG FOCPM	Factory setting: 00		
	Settings 00 to1439			
05-19	Accumulative Motor Operation Time (Day)			
Control mode	VF VFPG FOCPM	Factory setting: 00		
	Settings 00 to 65535			
P	r. 05-18 and Pr.05-19 are used to record the motor operation time.	They can be cleared by		

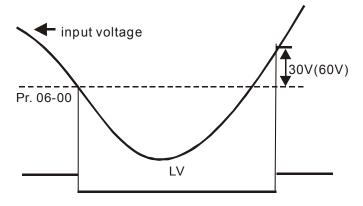
Pr. 05-18 and Pr.05-19 are used to record the motor operation time. They can be cleared by
setting to 00 and time which is less than 60 seconds will not be recorded.

05-20	Accumulative Drive Power-on Time (Min.)				
Control mode	VF VFPG FOCPM	Factory setting: 00			
	Settings 00 to 1439				
05-21	Accumulative Drive Power-on Time (day)				
Control	VF VFPG FOCPM	Factory setting: 00			
mode					

## Group 6 Protection Parameters

O6-00				
			FOCPM	
	Settings	230V	series 160.0~220.0Vdc	Factory Setting: 180.0
		460V	series 320.0~440.0Vdc	Factory Setting: 360.0

It is used to set the Lv level.

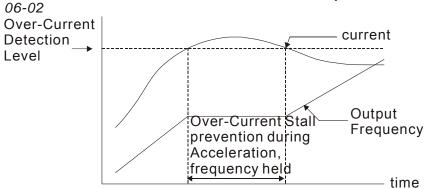


06-01						
Control mode	VF	VFPG	FOCPM	Factory setting: 2		
	Settings	0	Warn and keep operation			
		1	Warn and ramp to stop			
		2	Warn and coast to stop			

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

06-02				
Control mode	VF	VFPG	Factory setting: 00	
	Settings	00: disable		
		00~250%		

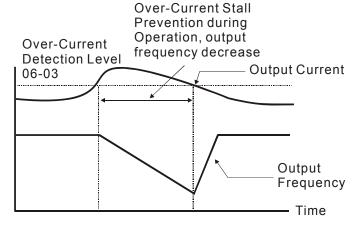
During acceleration, the AC drive output current may increase abruptly and exceed the value specified by Pr.06-02 due to rapid acceleration or excessive load on the motor. When this function is enabled, the AC drive will stop accelerating and keep the output frequency constant until the current drops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



actual acceleration time when over-current stall prevention is enabled

06-03					
Control mode	VF	VFPG	Factory setting: 00		
	Settings	00: disable 00 to 250%			

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.



over-current stall prevention during operation

06-04					
Control mode	VF	VFPG		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		

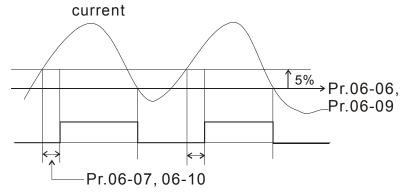
It is used to set the accel./decel. time selection when stall prevention occurs at constant speed.

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06-05	<b></b> ✓ Over-	torque	Detection Selection (OT1)	
Control mode	VF	VFPG	FOCPM	Factory setting: 0
	Settings	0	Over-Torque detection disabled.	
		1	Over-torque detection during cons operate after detection	stant speed operation, continue to
		2	Over-torque detection during cons operation after detection	stant speed operation, stop
		3	Over-torque detection during oper detection	ation, continue to operate after
		4	Over-torque detection during oper detection	ation, stop operation after
06-06	✓ Over-t	orque [	Petection Level (OT1)	
Control mode	VF	VFPG	FOCPM	Factory setting: 150
	Settings	1	0 to 250%	
06-07	✓ Over-t	orque [	Petection Time (OT1)	
Control mode	VF	VFPG	FOCPM	Factory setting: 0.1
	Settings	0	0 to 60.0 sec	
06-08	✓ Over-t	orque [	etection Selection (OT2)	
Control mode	VF	VFPG	FOCPM	Factory setting: 0
	Settings	0	Over-Torque detection disabled.	
		1	Over-torque detection during consoperate after detection	stant speed operation, continue to
		2	Over-torque detection during consoperation after detection	tant speed operation, stop
		3	Over-torque detection during oper detection	ation, continue to operate after
		4	Over-torque detection during oper detection	ation, stop operation after
06-09	✓ Over-t	orque [	Petection Level (OT2)	
Control mode	VF	VFPG	FOCPM	Factory setting: 150
	Settings		0 to 250%	

<b>06-10</b> ✓ Over-torque Detection Time (OT2)				
Control mode	VF	VFPG	FOCPM	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.

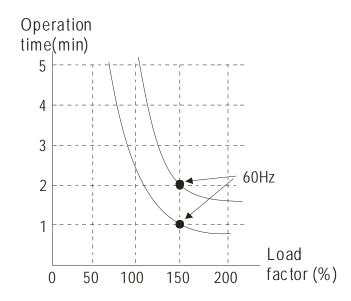


06-11	✓ Current Limit					
Control mode	FOCPG	TQCPG	FOCPM	Factory setting: 200		
	Settings	0	to 250%			
П	his paran	neter is	used to s	set the current limit.		
06-12	Electron	ic Ther	mal Rela	y Selection		
Control mode	VF	VFPG	FOCPM	Factory setting: 2		
	Settings	0	Inv	verter motor		
		1	Sta	andard motor		
		2	Dis	abled		
☐ It	It is used to prevent self-cooled motor overheats under low speed. User can use electrical					
th	thermal relay to limit driver's output power.					
06-13	-13   ✓ Electronic Thermal Characteristic					
Control mode	VF	VFPG	FOCPM	Factory setting: 60.0		

Settings

30.0 to 600.0 sec

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



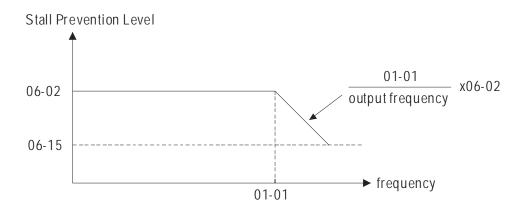
06-14	✓ Heat					
Control mode	VF	VFPG	FOCPM	Factory setting: 85	.0	
	Settings	0	.0 to 110.0 °C			

06-15	✓ Stall					
Control mode	VF	VFPG	FOCPM	Factory setting: 50		
	Settings	, 0	to 100% (refer to Pr.06-02, Pr.06-03)			

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%.



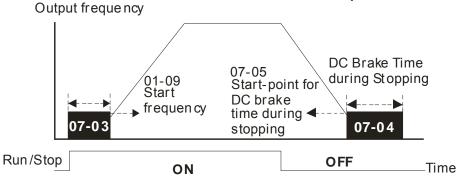
06-16	Drocont Fo	ult Door	d		
	Present Fault Record				
06-17	Second Most Recent Fault Record				
06-18	Third Most Recent Fault Record				
06-19	Fourth Rec	ent Fault	Record		
06-20	Fifth Most I	Recent Fa	ault Record		
06-21	Sixth Most	Recent F	ault Record		
Control mode	VF VF	PG FOC	PM	Factory setting: 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	Reserved		
		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 40HP above (oH2)		
		18	TH1 open loop error (tH1o)		
		19	Reserved		
		20	Reserved		
		21	Over-load (oL) (150% 1Min)		
		22	Motor over-load (EoL1)		
		23	Reserved		
		24	Reserved		
		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 (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)			
39	Ground current detection error (Hd3)			
40	Auto tuning error (AuE)			
41	Reserved			
42	PG feedback error (PGF1)			
43	PG feedback loss (PGF2)			
44	PG feedback stall (PGF3)			
45	PG slip error (PGF4)			
46	Reserved			
47	Reserved			
48	Analog current input error (ACE)			
49	External fault input (EF)			
50	Emergency stop (EF1)			
51	B.B. (Base Block)			
52	Reserved			
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)

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.

Group 7 Special Parameters	★ This parameter can be set during operation.
07-00 Reserved	
07-01 Reserved	
-	
<b>07-02</b> ✓ DC Brake Current Level	
Control VF VFPG mode	Factory Setting: 0.0
Settings 0 to 100%	
This parameter sets the level of DC Brake Cu	urrent output to the motor during start-up and
stopping. When setting DC Brake Current, th	e Rated Current (Pr.00-01) is regarded as 100%.
It is recommended to start with a low DC Bra	ke Current Level and then increase until proper
holding torque has been attained.	
When it is FOCPM mode, it can enable DC b	rake function by setting to any value.
<b>07-03</b> ✓ DC Brake Time during Start-up	
Control VF VFPG FOCPM mode	Factory Setting: 0.0
Settings 0.0 to 60.0 sec	
This parameter determines the duration of the	e DC Brake current after a RUN command.
<b>07-04</b> ✓ DC Brake Time during Stopping	
Control VF VFPG FOCPM mode	Factory Setting: 0.0
Settings 0.0 to 60.0 sec	
This parameter determines the duration of the	e DC Brake current during stopping.
<b>07-05</b> ✓ Start-Point for DC Brake	
Control VF VFPG mode	Factory Setting: 0
Settings 0.00 to 48000rpm	
This parameter determines the frequency wh	en 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.	



DC Brake Time

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

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

07-07	
07-08	
07-09	
07-10	

07-11	✓ Fan C	Control		
Control mode	VF	VFPG	FOCPM	Factory Setting: 1
	Settings	0	Fa	n always ON
		1	1 r	minute after DC brushless motor drive stops, fan will be OFF
		2		ushless DC motor drive runs and fan ON, brushless DC motor ve stops and fan OFF
		3	Fa	n ON to run when preliminary heat sink temperature attained
		4	Fa	n always 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.

<b>07-12 ★</b> Reserved	
<b>07-13 ★</b> Reserved	

<b>07-</b> 1	✓ Maximu	Maximum Torque Command					
Cont	1 001 111	Factory Setting: 100					
	Settings	0 to 300%					
	This paramet	er is for the max. torque command (motor rated torque is 100%).					

07-15	
07-16	
07-17	
07-18	

07-19	✓ Source of the second of	✓ Source of Torque Offset		
Control mode	FOCPM		Factory Setting: 0	
	Settings	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)	

- This parameter is the source of torque offset.
- 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 (31, 32 or 33).

		,	
02-01~02-08 is set to 31	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

<b>07-20</b> ✓ Torque Offset Setting				
Contro	. • •		Factory Setting: 0.0	
	Settings	0.0 to 100.0%		
$\Box$	This paramete	er is torque offset. T	the motor rated torque is 100%	

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

07-21					
Control mode	FOCPM		Factory Setting: 30.0		
	Settings	0.0 to 100.0%			

Settings

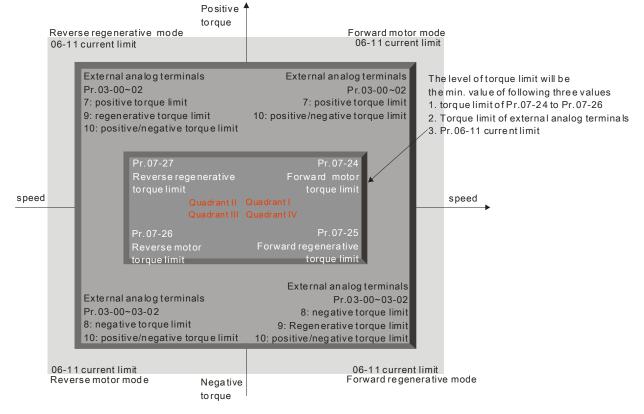
			Chapter 4 Parameters   BLD-E1 Series
07-22		orque Offset	
Control mode	FOCPM		Factory Setting: 20.0
	Settings	0.0 to 100.0%	
07-23	✓ Low Tore	que Offset	
Control mode	FOCPM		Factory Setting: 10.0

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	✓ Forward Motor	or Torque Limit			
07-25					
07-26	✓ Reverse Motor	or Torque Limit			
07-27					
Control mode	FOCPM	Factory Setting: 200			
	Settings 0 t	to 300%			

0.0 to 100.0%

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.

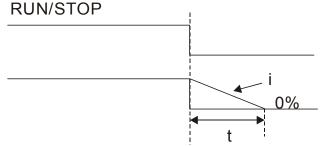


07-28	✓ Emer	gency	Stop	(EF) & Forced Stop Selection	
Control mode	VF	VFPG	FC	СРМ	Factory Setting: 0
	Settings		0	Coast to stop	
			1	By deceleration Time 1	
			2	By deceleration Time 2	
			3	By deceleration Time 3	
			4	By deceleration Time 4	
			5	By Pr.01-31	

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

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

- When the drive stop output 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.
- It is used to set the time for decreasing torque to 0%.



$$\frac{i}{00-01} \times \frac{100\%}{300\%} \times (07-29) = t$$

## Group 8 PM Parameters

08-00	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 (Pr. 08-09)	
		2	For PM parameters	
	Auto measure the angle between magnetic pole and PG origin (Pr. 08-09)			

- 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.
- 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, Lq).

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

- 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 brushless DC 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.
  - 3. If brake is controlled by the host controller, it needs to make sure that brake is in release state before tuning.
  - 4. Please ensure Encoder Input Type Setting (Pr.10-02) is accurate. A false setting would affect the position detection of magnetic pole and cause inaccurate angle between Magnetic Pole and PG Origin (Pr.08-09).

## NOTE BLD-E1 Series

- 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 brushless DC 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.

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- 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 brushless DC motor drive or human factor to show the failed detection. At this moment, please check the connections of the wirings of the brushless DC 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%).

08-02		wer of Motor
Contro mode	I FOCPM	Factory setting: #.##
	Settings	0.00 to 655.35 kW
	It is used to s	et rated power of the motor. The factory setting is the power of the drive.
00.00	(5 ( 10	and of Makey (ways)

08-03					
Control mode	FOCPM		Factory setting: 1710		
	Settings	0 to $65535\Omega$			

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

08-04	Number of N	Motor Poles	
Control mode	FOCPM		Factory setting: 4
	Settings	2 to 96	
u It	is used to se	t the number of motor poles (must be an even number).	
08-05	Rs of Motor	•	
Control mode	FOCPM		Factory setting: #
	Settings	0.000~65.535Ω	_
08-06	Ld of Motor		
Control mode	FOCPM		Factory setting: #
08-07	Lq of Motor		
Control mode	FOCPM		Factory setting: #
	Settings	0.0~6553.5mH	
08-08	Back Electro	omotive Force	
Control mode	FOCPM		Factory setting: #
	Settings	0.0~6553.5Vrms	
T T	his paramete	r is used to set back electromotive force (phase-phase RN	//S value) when the
n	notor is opera	ted in the rated speed.	
<b>Q</b> It	can get RMS	S value by Pr.08-00=2 (Motor Auto Tuning).	
08-09	Angle between	een Magnetic Pole and PG Origin	
Control mode	FOCPM	Fa	actory setting: 360.0
	Settings	0.0~360.0°	

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

08-1	Magnetic Pole Re-orientation							
Contr	FOCEM							
	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 magi	netic p	pole orientation.					

## Group 9: Communication Parameters This parameter can be set during operation.

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

Serial interface 6←1 1: +EV 2: GND 3: SG-4: SG+ RS-485 5: NC

09-00	<b>⊮</b> Commun	ication Address	
Control mode			Factory Setting: 1
	Settings	1 to 254	

If the brushless DC 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 brushless DC motor drive must be different and unique.

09-01	✓ Trans	missior	n Speed	
Control mode	VF	VFPG	FOCPM	Factory Setting: 9.6
	Settings	4	.8 to 115.2kbits/s	

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

09-02	✓ Trans	mission I	Fault Treatment	
Control mode	VF	VFPG F	ГОСРМ	Factory Setting: 3
	Settings	0	Warn and keep operating	
		1	Warn and RAMP to stop	
		2	Reserved	
		3	No action and no display	

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

<b>09-03</b> // Time-out De		-out De	tection	
Control mode	VI VII O		FOCPM	Factory Setting: 0.0
	Settings	1	0.0 ~ 100.0 sec (0.0: disable)	

It is used to set the communication time-out time for the protocol and the keypad.

09-04	✓ Comr	nunicat	ion Protocol	_
Control mode	VF	VFPG	FOCPM	Factory Setting: 1
	Settings	0	Modbus ASCII mode, protocol <7,N,1>	_
		1	Modbus ASCII mode, protocol <7,N,2>	
		2	Modbus ASCII mode, protocol <7,E,1>	
		3	Modbus ASCII mode, protocol <7,O,1>	
		4	Modbus ASCII mode, protocol <7,E,2>	
		5	Modbus ASCII mode, protocol <7,O,2>	
		6	Modbus ASCII mode, protocol <8,N,1>	
		7	Modbus ASCII mode, protocol <8,N,2>	
		8	Modbus ASCII mode, protocol <8,E,1>	
		9	Modbus ASCII mode, protocol <8,O,1>	
		1	0 Modbus ASCII mode, protocol <8,E,2>	
		1	1 Modbus ASCII mode, protocol <8,O,2>	
		1	2 Modbus RTU mode, protocol <8,N,1>	
		1	Modbus RTU mode, protocol <8,N,2>	
		1	4 Modbus RTU mode, protocol <8,E,1>	
		1	Modbus RTU mode, protocol <8,0,1>	
		1	6 Modbus RTU mode, protocol <8,E,2>	
		1	7 Modbus RTU mode, protocol <8,0,2>	

- Computer Control /Computer Link
- Before using RS-485 Serial Interface, each drive needs to pre-assign a communication address specified by Pr.9-00. The computer then controls each brushless DC drive according to its communication address
- A BLD-E1 can be set up to communicate in MODBUS networking using ASCII mode(American Standard Code for Information Interchange), each 8-bit data is a combination of 2 ASCII character. For example, a 1-byte data: 64Hex, shown as '64' in ASCII, consists of '6' (36Hex) and '4' (34Hex).
  - 1. Code Description:

#### **ASCII** mode:

Each 8-bit data is the combination of two ASCII character. For example, a 1-byte data:

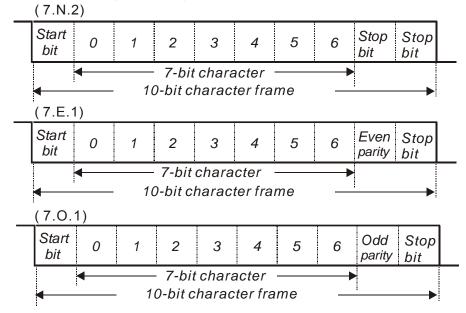
64 Hex, shown as '64' in ASCII, consists of '6' (36Hex) and '4' (34Hex).

ASCII code   30H   31H   32H   33H   34H   35H   36H   37H	Character	'O'	'1'	'2'	'3'	'4'	<b>'</b> 5'	'6'	<b>'7</b> '
	ASCII code	30H	31H	32H	33H	34H	35H	36H	37H

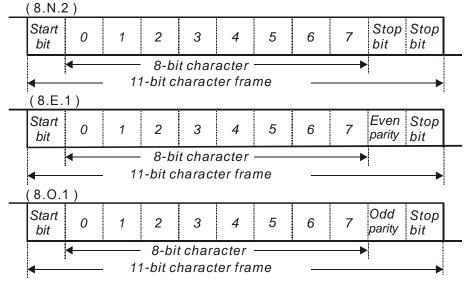
Character	'8'	'9'	'A'	'B'	'C'	'D'	'E'	'F'
ASCII code	38H	39H	41H	42H	43H	44H	45H	46H

#### 2. Data Format

10-bit character frame (For ASCII):



## 11-bit character frame (For RTU):



## 3. 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)

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#### 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)

00H: broadcast to all brushless DC drives

01H: brushless DC drive of address 01

0FH: brushless DC drive of address 15

10H: brushless DC drive of address 16

:

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

The format of data characters depends on the function code.

03H: read data from register

06H: write single register

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

## ASCII mode:

## Command message:

STX	·.·
Address	'0'
Addiess	'1'
F (:	'0'
Function	'3'
	'2'
Starting data	'1'
address	'0'
	'2'
	'0'
Number of data	'0'
(count by word)	'0'
	'2'
LRC Check	'D'
LIVO CHECK	<b>'7'</b>
END	CR
LIND	LF

## Response message:

STX	· . ·
Address	'0'
Audicss	'1'
- ··	'0'
Function	'3'
Number of data	'0'
(Count by byte)	<b>'4'</b>
Content of starting	'1'
Content of starting address	<b>'7'</b>
2102H	<b>'7'</b>
210211	'0'
	'0'
Content of address	'0'
2103H	'0'
	'0'
LRC Check	<b>'7</b> '
LING CHECK	<b>'1'</b>
END	CR

#### Chapter 4 Parameters | BLD-E1 Series Response message: Command message:

response message.	

RTU mode:

Command message:

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:

Address	01H
Function	03H
Number of data (count by byte)	04H
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:

STX	
Address	'0'
	'1'
Function	'0'
Function	·6'
	·0'
Data address	<b>'1'</b>
Data address	'0'
	·0'
Data content	'1'
	<b>'7'</b>
	'7'
	'0'
LRC Check	'7'
LKC CHECK	<b>'1'</b>
END	CR
	LF

#### Response message:

. toop one o moodage.		
STX	· . ·	
Address	'0'	
Address	'1'	
- Cumption	'0'	
Function	<b>'6</b> '	
	'0'	
Data address	'1'	
	'0'	
	'0'	
Data content	'1'	
	<b>'7</b> '	
	<b>'7'</b>	
	<b>'</b> 0'	
LRC Check	<b>'7'</b>	
	'1'	
END	CR	
	LF	

RTU mode:

## Command message:

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

#### Response message:

Address	01H
Function	06H
Data address	01H
Data address	00H
Data content	17H
Data Content	70H
CRC CHK Low	86H
CRC CHK High	22H

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

## Response message:

STX	.,,
Address 1	'0'
Address 0	<b>'1'</b>
Function 1	<b>'1'</b>
Function 0	<b>'</b> 0'
	<b>'</b> 0'
Starting data	<b>'</b> 5'
address	<b>'</b> 0'
	<b>'</b> 0'
Number of data (count by word)	<b>'</b> 0'
	<b>'</b> 0'
	<b>'</b> 0'
	'2'
LRC Check	'E'
	'8'
END	CR
END	LF

## RTU mode:

Command message:

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

Response message:

1 (Coponiac micoo	age.
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

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	<b>'</b> 0'
Function 0	<b>'3'</b>
	'0'
Starting data address	<b>'4'</b>
Starting data address	<b>'</b> 0'
	'1'
	'0'
Number of data	'0'
Number of data	<b>'</b> 0'
	'1'
LRC Check 1	'F'
LRC Check 0	<b>'6'</b>
END 1	CR
END 0	LF

01H+03H+04H+01H+00H+01H=0AH, the 2's-complement negation of 0AH is <u>F6</u>H.

#### 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.

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	GGnnH	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.		
Command Write only	2000H	Bit 0-3	0: No function 1: Stop 2: Run 3: Jog + Run	

			Chapter 4 Parameters   BLD-E	: i Series	
Content	Address		Function		
			00B: No function	· · · · · · · · · · · · · · · · · · ·	
		D:4 4 5	01B: FWD		
		Bit 4-5	10B: REV		
			11B: Change direction		
			00B: 1st accel/decel		
			01B: 2nd accel/decel		
		Bit 6-7	10B: 3rd accel/decel		
			11B: 4th accel/decel		
		Bit 8-11	Represented 16 step speeds.		
		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	command		
		Bit 0	1: EF (external fault) on		
	000011	Bit 1	1: Reset		
	2002H	Bit 2	1: B.B. ON		
		Bit 3-15	Reserved		
Status	2100H	Error code: refer to Pr.06-16 to Pr.06-21			
monitor Read		Bit 0-Bit 1			
only			01: deceleration		
			10: Ready for operation		
			11: operation		
		Bit 2	1:JOG command		
		5.02	00: FWD command, FWD output		
			01: FWD command, REV output		
	2119H	Bit 3-Bit 4	10: REV command, FWD output		
			11: Reserved		
		Bit 5	Reserved		
		Bit 6	Reserved		
		Bit 7	Reserved		
			1: Master frequency Controlled by commun	nication	
		Bit 8	interface	iloation	
		Bit 9	1: Master frequency controlled by analog/e	xternal	
			terminals signal  1: Operation command controlled by		
		Bit 10	communication interface		
		Bit 11	1: Parameters have been locked		
		Bit 12	1: enable to copy parameter from keypad		
	<b> </b>	Bit 13-15	Reserved		
	2102H	Frequency	command (F)		
			quency (H)		
	2104H	Output curi	rent (AXXX.X)		
	2105H				
	2106H	Output voltage (EXXX.X)			
	2107H	Current step number of Multi-Step Speed Operation			
	2116H		on display (Pr.00-04)		
- '					

Content	Address	Function		
	2120H	Frequency command when malfunction		
	2121H	Output frequency when malfunction		
	2122H	Output current when malfunction		
	2123H	Motor frequency when malfunction		
	2124H	Output voltage when malfunction		
	2125H	DC-bus voltage when malfunction		
	2126H	Output power when malfunction		
	2127H	Output torque when malfunction		
	2128H	IGBT Temperature of Power Module at Present Fault		
	2129H	Input status of multi-function terminal when malfunction		
		(format is the same as Pr.00-04=16)		
	212AH	Output status of multi-function terminal when malfunction		
		(format is the same as Pr.00-04=17)		
	212BH	Drive status when malfunction (format is the same as 2119H)		
	2201H	Pr.00-05 user-defined setting		
	2203H	VR analog input (XXX.XX %)		
	2204H	ACI analog input (XXX.XX %)		
	2205H	AVI analog input (XXX.XX %)		
	2206H	Display temperature of IGBT (°C)		
	2207H	Reserved		
	2208H	Digital input state		
	2209H	Digital output state		

## 3.6 Exception response:

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

The brushless DC 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 brushless DC 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:

#### ASCII mode:

STX	· . ·
Address Low	·0'
Address High	'1'
Function Low	'8'
Function High	<b>'6'</b>

#### RTU mode:

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

Exception code	<b>'</b> 0'
Exception code	'2'
LRC CHK Low	'7'
LRC CHK High	'7'
END 1	CR
END 0	LF

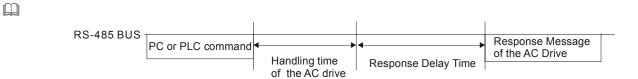
The explanation of exception codes:

_			
The	 of aware	4:	

Exception code	Explanation				
01	Illegal function code: The function code received in the command message is not available for the brushless DC motor drive.				
02	Illegal data address: The data address received in the command message is not available for the brushless DC motor drive.				
03	Illegal data value: The data value received in the command message is not available for the brushless DC motor drive.				
04	Slave device failure: The brushless DC 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), "cE10" will be shown on the keypad.				

09-05	✓ Response	onse De	elay Time	
Control mode	VF	VFPG	FOCPM	Factory Setting: 2.0
	Settings	0	.0 ~ 200.0 ms	

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



# Chapter 4 Parameters AT | Troubleshooting | BLD-E1 Series Group 10 Speed Feedback Control Parameters

In this section, Adjust Speed Regulator is abbreviated as ASR and Pulse Generator as PG.

10-00	Encoder	Туре			
Control mode	VFPG	FOCPG	TQC	PG FOCPM	Factory Setting: 3
	Settings		0	No function	
			1	ABZ	
			2	ABZ+UVW	
			3	AB+PWM	

Detection of the magnetic pole:

Setting 1: The brushless DC 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 brushless DC motor drive will detect the position of the magnetic pole by the UVW signal of encoder.

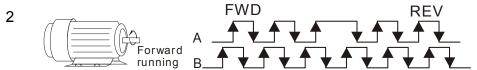
Setting 3: The brushless DC motor drive will detect the position of the magnetic pole by the sine signal of encoder.

10-01	Encoder Puls	e	
Control mode	VFPG FOCE	PM	Factory Setting: 256
	Settings	1 to 25000	

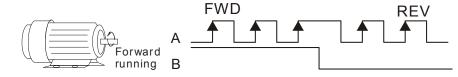
A Pulse Generator (PG) or encoder is used as a sensor that provides a feedback signal of the motor speed. This parameter defines the number of pulses for each cycle of the PG control.

10-02	Encoder Input Type Setting					
Control mode	VFPG FOC	PM	Factory Setting: 0			
	Settings	0	Disable			
			Phase A leads in a forward run command and phase B leads in a reverse run command			
		1	FWD REV			
		,	Forward running B			

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)



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

3

10-03	✓ Encoder Feedback Fault Treatment (PGF1, PGF2)					
Control mode	VFPG			Factory Setting: 2		
-	Settings	s 0	Warn and keep operation			
		1	Warn and RAMP to stop			
		2	Warn and stop operation			
10-04	✓ Dete	ction Time f	or Encoder Feedback Fault			
Control mode	VFPG	FOCPM		Factory Setting: 3.0		
	Settings	o.0 to	10.0 sec			
th	ne detect	ion time for		g error or signal error, if time exceeds ), the PG signal error will occur. Refer		
10-05	✓ Enco	oder Stall Le	vel (PGF3)			
Control mode	VFPG	FOCPM		Factory Setting: 115		
	Settings	0 to 1 0: dis				
	•		nines the maximum encoder feed requency Pr.01-00 =100%)	back signal allowed before a fault		
10-06		✓ Encoder	Stall Detection Time			
Control mode	VFPG	FOCPM		Factory Setting: 0.1		
	Settings	0.0 to	2.0 sec			

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

10-0	67   ✓ Encoder Slip Range (PGF4)							
Contr	- VIIG IO	CPM Factory Sett	ting: 50					
	Settings	0 to 50% (0: disable)						
	This paramete	er determines the maximum encoder feedback signal allowed before a fa	ault					
	occurs. (max. output frequency Pr.01-00 =100%)							

10-08	►08					
Control mode	VFPG FOCPM	Factory Setting: 0.5				

Settings 0.0 to 10.0 sec

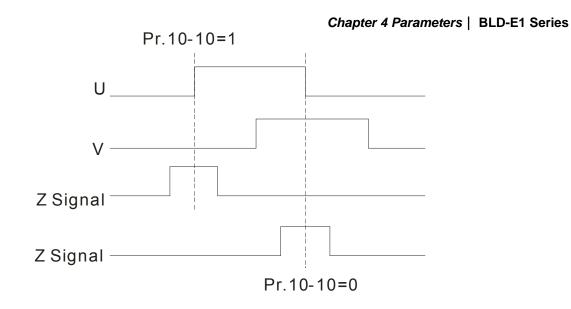
This parameter determines the maximum encoder feedback signal allowed before a fault occurs. (max. output frequency Pr.01-00 =100%)

10-09							
Control mode	VFPG FO	СРМ		Factory Setting: 2			
	Settings	0	Warn and keep operating				
		1	Warn and RAMP to stop				
		2	Warn and COAST to stop				

- This parameter determines the maximum encoder feedback signal allowed before a fault occurs. (max. output frequency Pr.01-00 =100%)
- 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 Selection for UVW Input						
Control mode	VFPG FO	СРМ		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				

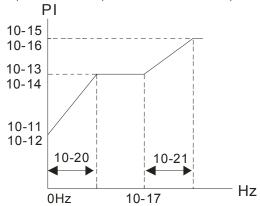
Setting 0: when the operation is U->V->W, Z signal is at the falling edge of U-phase. Setting 1: when the operation is U->V->W, Z signal is at the rising edge of U-phase.



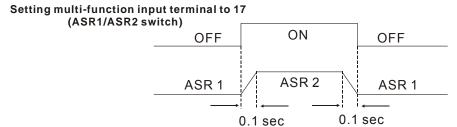
10-11	₩ ASR	(Auto S	peed Regulation) Control (P) of Zero Speed	
Control mode	VF	VFPG	FOCPM	Factory Setting: 100.0
	Settings	s 0	.0 to 500.0%	
10-12	✓ ASR	(Auto S	peed Regulation) Control (I) of Zero Speed	
Control mode	VF	VFPG	FOCPM	Factory Setting: 0.200
	Settings	s 0	.000 to 10.000 sec	
10-13	<b>∦</b> ASR	(Auto Sp	peed Regulation) control (P) 1	
Control mode	VF	VFPG	FOCPM	Factory Setting: 100.0
	Settings	s 0	.0 to 500.0%	
10-14	✓ ASR	(Auto S	peed Regulation) control (I) 1	
Control mode	VF	VFPG	FOCPM	Factory Setting: 0.200
	Settings	s 0	.000 to 10.000 sec	
10-15	<b>∦</b> ASR	(Auto S	peed Regulation) control (P) 2	
Control mode	VF	VFPG	FOCPM	Factory Setting: 100.0
	Settings	s 0	.0 to 500.0%	
10-16	<b>∦</b> ASR	(Auto S	peed Regulation) control (I) 2	
Control mode	VF	VFPG	FOCPM	Factory Setting: 0.200
	Settings	s 0	.000 to 10.000 sec	
10-17	✓ ASR	1/ASR2	Switch Frequency	

Control mode	VF	VFPG FOCPM	Factory Setting: 84
	Settings	0 to 4800rpm	
		0: disable	

- 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).



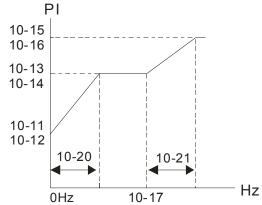
When using multi-function input terminals to switch ASR1/ASR2, the diagram will be shown as follows.



10-18	✓ ASR Primary	Low Pass Filter Gain	
Control mode	VF VFPG	FOCPM	Factory Setting: 0.008
	Settings 0.0	000 to 0.350 sec	
	t defines the filter t	ime of the ASR command.	
	When setting to 1,	his function is disabled.	
10-19	✓ Zero Speed G	ain (P)	
Control mode	FOCPM		Factory Setting: 80.00
	Settings 0.0	00 to 655.00%	
Q V	When Pr.11-00 is s	et to Bit 7=1, Pr.10-19 is valid.	
10-20	✓ Zero Speed/A	SR1 Width Adjustment	

		Chapter 4 Parameters	BLD-E1 Series
Control mode	VFPG FOCPM	Facto	ory Setting: 60
	Settings 0 to 4800rpm		
10-21			
Control mode	VFPG FOCPM	Facto	ory Setting: 60
	Settings 0 to 4800rpm		

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.



10-22	✓ Operation	✓ Operation Time of Zero Speed						
Control mode	FOCPM		Factory Setting: 0.250					
	Settings	0.001 to 65.535sec						
10-23	✓ Filter Tin	ne of Zero Speed	Unit: 0.001					
Control mode	FOCPM		Factory Setting: 0.004					
	Settings	0.001 to 65.535sec						

Group		•		neters	
11-00	System	Control			
Control mode	VF	FOCPG	FOCPM		Factory Setting: 0
	Settings	S E	Bit 7=1	When position con (DC Brake Current	trol is enabled, it doesn't need to set Pr.07-02 Level)
		В	it 15=0	when power is app again	lied, it will detect the position of magnetic pole
11-01	Reserv	ed			
11-02	Reserv	ed			
11-03	Reserv	ed			
11-04	Reserv	ed			
11-05	Reserv	ed			
11-06	✓ Zero	-speed	Bandwid ⁻	th	
Control mode	FOCPM				Factory Setting: 10
	Settings	s (	) to 40Hz	2	_
11-07	✓ Low-	-speed E	Bandwidt	h	
Control mode	FOCPM				Factory Setting: 10
	Settings	s (	to 40 H	Z	
11-08	High	-speed	Bandwid	th	
Control mode	FOCPM				Factory Setting: 10
	Setting	s (	) to 40Hz		
<u> </u>	fter estir	nating ir	nertia and	d set Pr.11-00=1 (au	uto tuning), user can adjust parameters Pr.11-06,
1	1-07 and	11-08	separate	y by speed respons	se. The larger number you set, the faster
re	esponse	you will	get. Pr.1	0-08 is the switch fi	requency for low-speed/high-speed bandwidth.
11-09	✓ Rese	erved			
11-10	✓ Rese	erved			
11-11	✓ Rese	erved			
11-12	✓ Rese	erved			
11-13	✓ Rese	erved			

		Chapter 4 Parameters	BLD-E1 Series						
11-14									
11-15									
,									
11-16									
Control mode	VF VFPG FOCPM	Fac	tory Setting: 0						
	Settings 0X0000~0XFFFF								

Group 12 User-defined Parameters 

**This parameter can be set during operation.

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

required				
12-00	✓ Prese	ent Faul	t Record	
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	0	616	
12-01	✓ Prese	ent Faul	t Time of	Motor Operation (min.)
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	0	632	
12-02	✓ Prese	ent Faul	t Time of	Motor Operation (day)
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	0	633	
12-03	✓ Frequency	uency C	ommand	at Present Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	2	132	_
12-04	✓ Outp	ut Frequ	iency at F	Preset Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	2	133	
12-05	✓ Outp	ut Curre	nt at Pre	sent Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	2	134	
12-06	✓ Moto	r Freque	ency at P	resent Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	2	135	

				Chapter 4 Parameters   BLD-E1 Series
12-07	✓ Outp	ut Volta	ge at Pre	sent Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	2	2136	
12-08	<b>⊮</b> DC-E	Bus Volta	age at Pre	esent Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	2	137	
12-09	✓ Outp	ut Powe	er at Prese	ent Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	2	2138	
12-10	✓ Outp	ut Torqu	ue at Pres	ent Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	2	2139	
12-11	<b>⊮</b> IGBT	Tempe	rature of	Power Module at Present Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	2	2140	
12-12	✓ Multi-	-functior	n Termina	I Input Status at Present Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	2	2141	
12-13	✓ Multi-	-functior	n Termina	I Output Status at Present Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##
	Setting	2	2142	
12-14	✓ Drive	Status	at Preser	t Fault
Control mode	VF	VFPG	FOCPM	Factory Setting: #.##

Chapter 4				oting}   BLD-E1 Series	
	Setting	2	143		
12-15	✓ Second	nd Most	t Recent	Fault Record	
Control mode	VF	VFPG	FOCPM		Factory Setting: #.##
	Setting	0	617		
10.10		1.54		- II.T. (M.)	
12-16	✗ Second	na iviosi	Recent	Fault Time of Motor Operation (min.)	
Control mode	VF	VFPG	FOCPM		Factory Setting: #.##
	Setting	0	634		
12-17	✓ Second	nd Most	t Recent	Fault Time of Motor Operation (day)	
Control mode	VF	VFPG	FOCPM		Factory Setting: #.##
	Setting	0	635		
12-18	✓ Third	Most R	ecent Fa	ult Record	
Control mode	VF	VFPG	FOCPM		Factory Setting: #.##
	Setting	0	618		
12-19	★ Third	Most R	ecent Fa	ult Time of Motor Operation (min.)	
Control mode	VF	VFPG	FOCPM		Factory Setting: #.##
	Setting	0	636		
12-20	★ Third	Most R	ecent Fa	ult Time of Motor Operation (day)	
Control mode	VF	VFPG	FOCPM		Factory Setting: #.##
	Setting	0	637		
12-21	Four	th Most	Recent F	ault Record	
Control mode	VF	VFPG	FOCPM		Factory Setting: #.##
	Setting	0	619		

				Chapter 4	<i>Parameters</i> ∣ BLD-	E1 Series
12-22	✓ Four	th Most	Recent Fa	ault Time of Motor Operation (min.)		
Control mode	VF	VFPG	FOCPM		Factory Setti	ng: #.##
	Setting	(	)638			
12-23	Four	th Most	Recent Fa	ault Time of Motor Operation (day)		
Control mode	VF	VFPG	FOCPM		Factory Setti	ng: #.##
	Setting	(	0639			
12-24	✓ Fifth	Most Re	ecent Fau	It Record		
Control mode	VF	VFPG	FOCPM		Factory Setti	ng: #.##
	Setting	(	0620			
12-25		Most Re	ecent Fau	It Time of Motor Operation (min.)		
Control mode	VF	VFPG	FOCPM	· · · · · · · · · · · · · · · · · · ·	Factory Setti	ng: #.##
	Setting	(	0640			
12-26		Most Re	ecent Fau	It Time of Motor Operation (day)		
Control mode	VF	VFPG	FOCPM		Factory Setti	ng: #.##
	Setting	(	)641			
12-27	✓ Sixth	Most R	Recent Fau	ult Record		
Control mode	VF	VFPG	FOCPM		Factory Setti	ng: #.##
	Setting	(	)621			
12-28	✓ Sixth	Most R	Recent Fau	ult Time of Motor Operation (min.)		
Control mode	VF	VFPG	FOCPM		Factory Setti	ng: #.##
	Setting	C	0642			

Chapter 4 ParametersAT |Troubleshooting} | BLD-E1 Series

✓ Sixth Most Recent Fault Time of Motor Opera	tion (day)
VF VFPG FOCPM	Factory Setting: #.##
Setting 0643	
✓ No Factory Setting	

12-00

12-31

✓ User-defined Parameters

Control vF vFPG 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).
- The setting method of 211BH
- Convert 211BH (hexadecimal) to decimal value:

$$211B$$
  
 $1x16^{1}+11x16^{0}=16+11=27$  input 2127

### Chapter 4 Parameters | BLD-E1 Series

# Group 13 View User-defined Parameters

13-00   13-31	View User-defi	ned Parameters	
Control mode	VF VFPG	FOCPM	Factory Setting: -
	Settings	-	

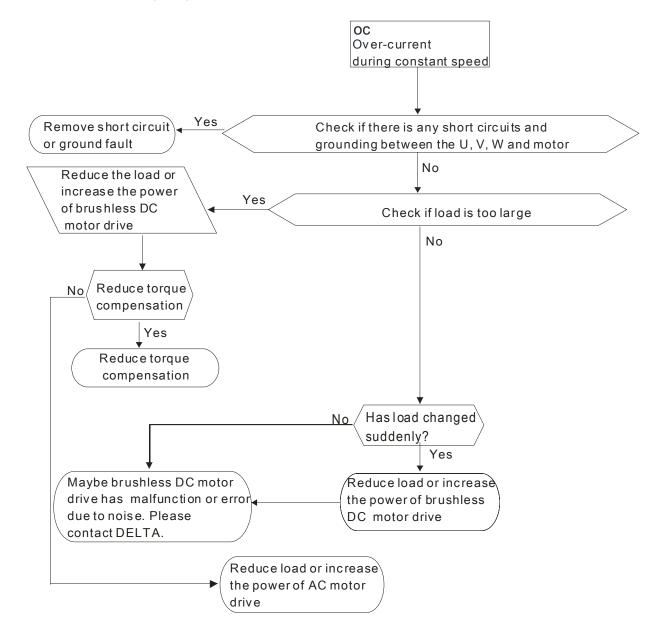
Refer to group 12 for details.

Chapter 4 ParametersAT |Troubleshooting} | BLD-E1 Series

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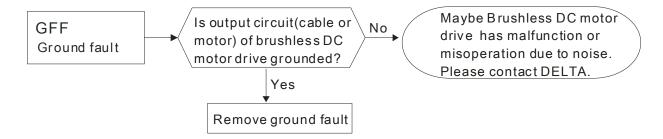
# Chapter 5 Troubleshooting

# 5.1 Over Current (OC)

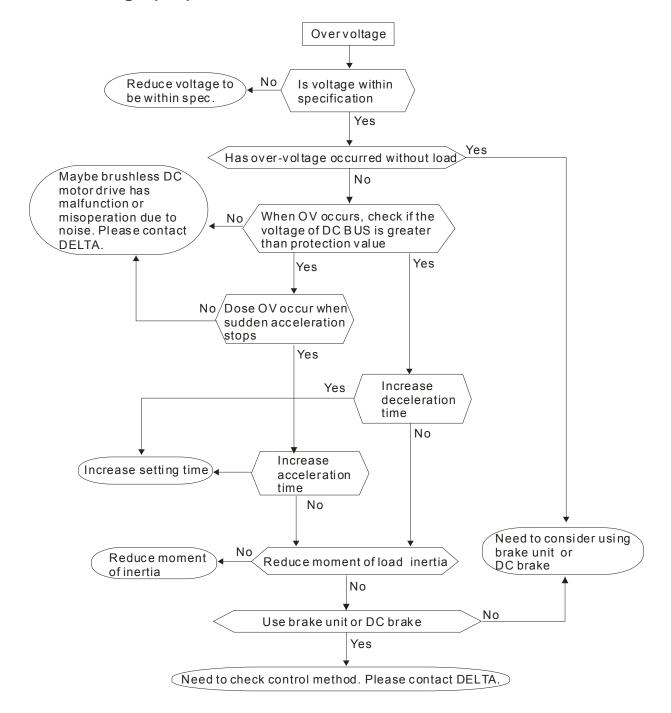


### Chapter 4 ParametersAT |Troubleshooting} | BLD-E1 Series

# 5.2 Ground Fault

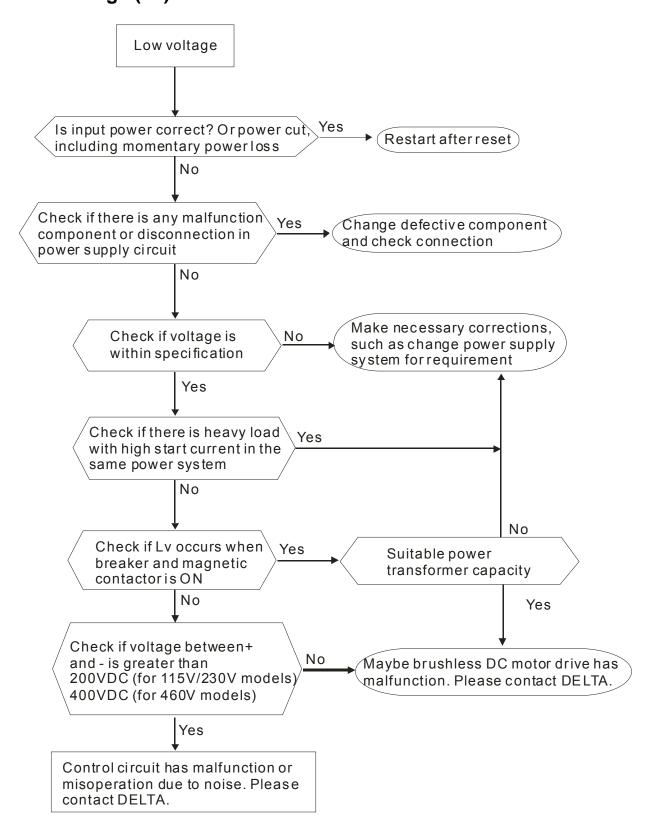


# 5.3 Over Voltage (OV)



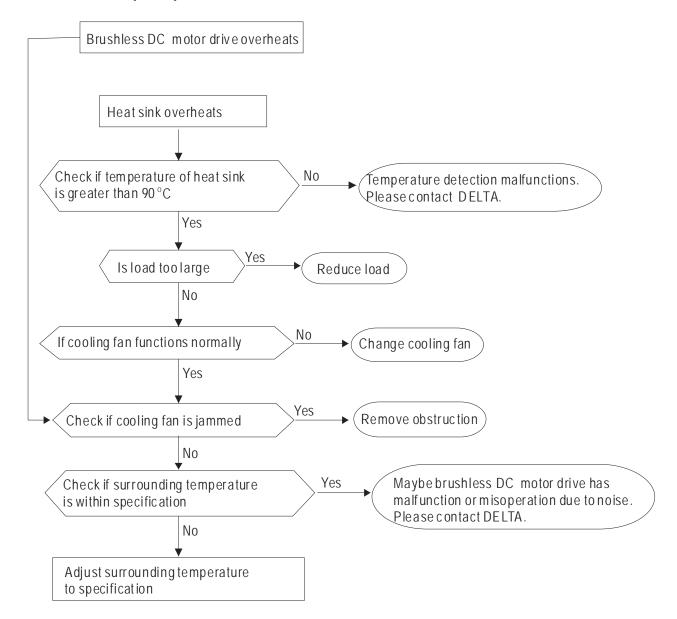
### | BLD-E1 Series

# 5.4 Low Voltage (Lv)

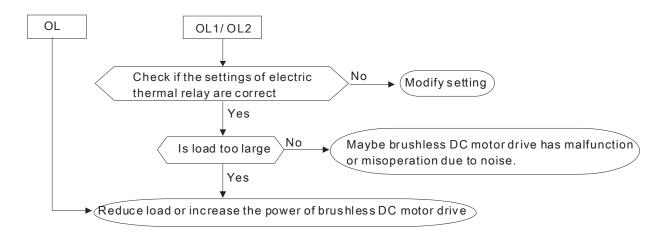


### Chapter 4 ParametersAT |Troubleshooting} | BLD-E1 Series

# 5.5 Over Heat (oH1)

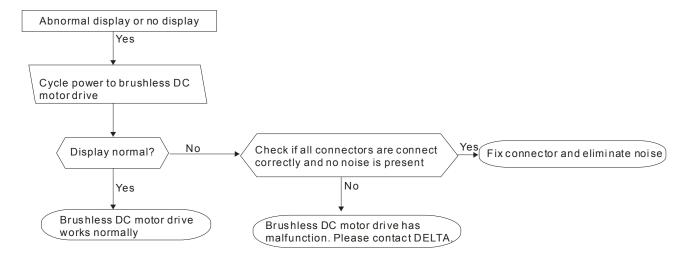


### 5.6 Overload

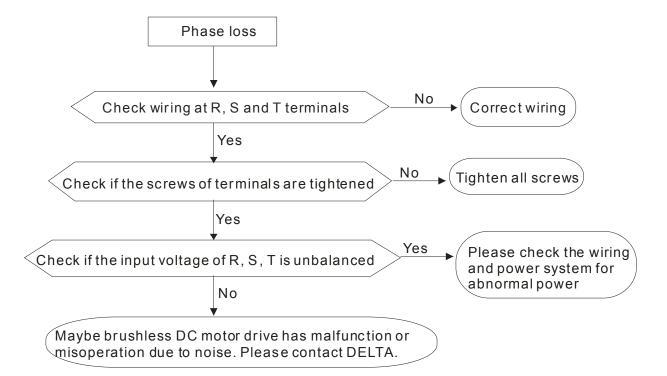


### **BLD-E1 Series**

# 5.7 Keypad Display is Abnormal

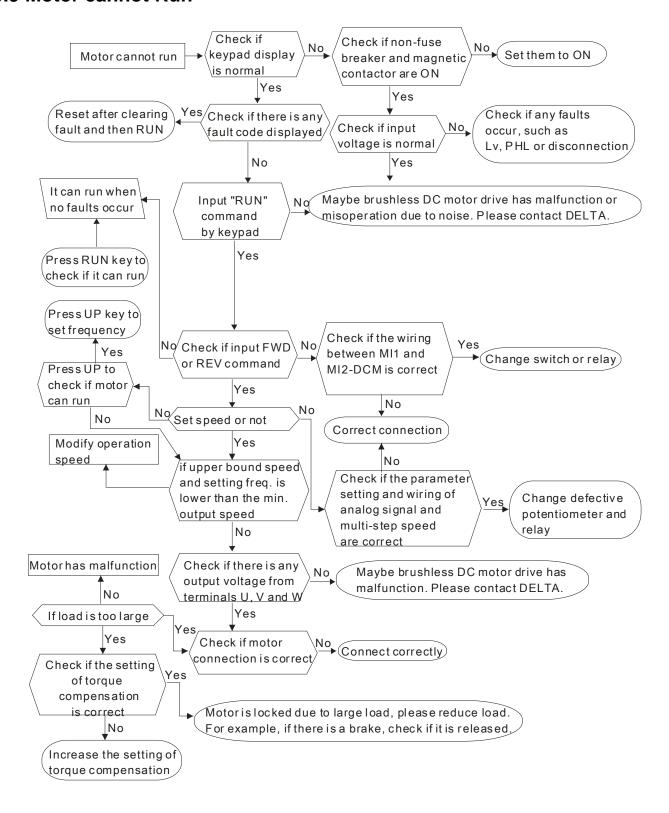


# 5.8 Phase Loss (PHL)



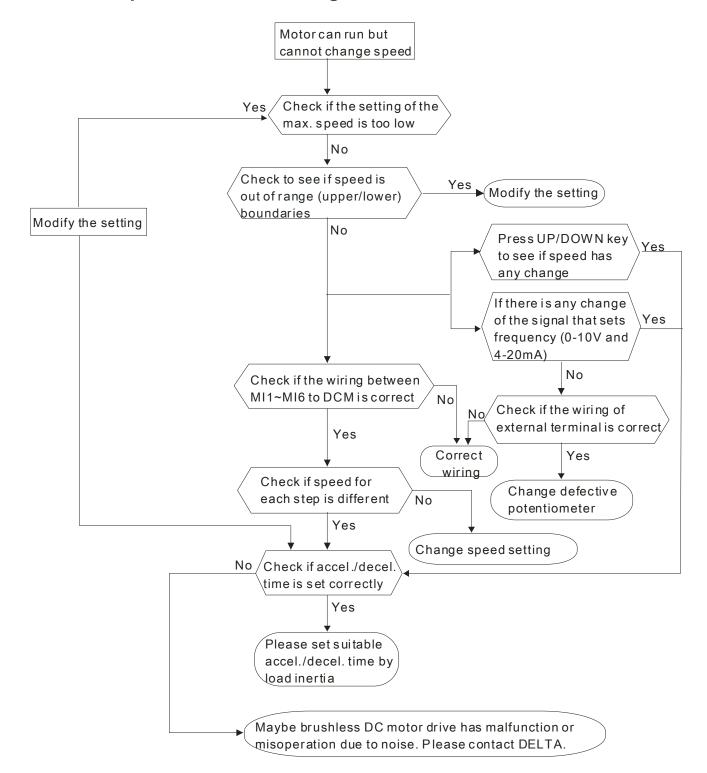
### Chapter 4 Parameters AT | Troubleshooting | BLD-E1 Series

### 5.9 Motor cannot Run



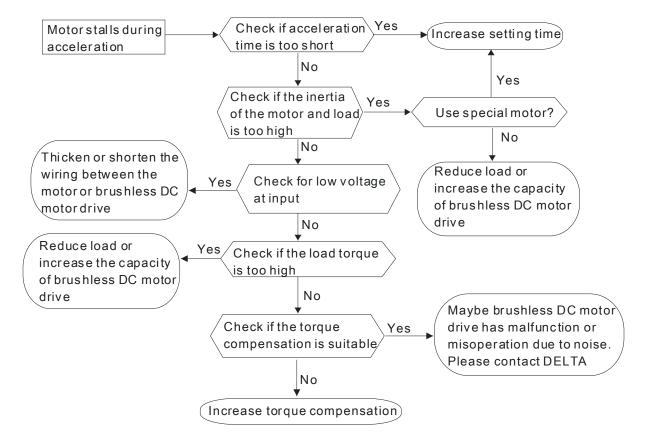
### **BLD-E1 Series**

# 5.10 Motor Speed cannot be Changed



### Chapter 4 ParametersAT |Troubleshooting} | BLD-E1 Series

# 5.11 Motor Stalls during Acceleration



### **BLD-E1 Series**

# 5.12 Electromagnetic/Induction Noise

Many sources of noise surround brushless DC motor drives and penetrate it by radiation or conduction. It may cause malfunction of the control circuits and even damage the brushless DC motor drive. Of course, there are solutions to increase the noise tolerance of a brushless DC motor drive. But this has its limits. Therefore, solving it from the outside as follows will be the best.

- 1. Add surge suppressor on the relays and contacts to suppress switching surges.
- 2. Shorten the wiring length of the control circuit or serial communication and keep them separated from the power circuit wiring.
- Comply with the wiring regulations by using shielded wires and isolation amplifiers for long length.
- 4. The grounding terminal should comply with the local regulations and be grounded independently, i.e. not to have common ground with electric welding machines and other power equipment.
- 5. Connect a noise filter at the mains input terminal of the brushless DC motor drive to filter noise from the power circuit.

In short, solutions for electromagnetic noise exist of "no product" (disconnect disturbing equipment), "no spread" (limit emission for disturbing equipment) and "no receive" (enhance immunity).

### **5.13 Environmental Condition**

Since the brushless DC motor drive is an electronic device, you should comply with the environmental conditions. Here are some remedial measures if necessary.

- 1. To prevent vibration, the use of anti-vibration dampers is the last choice. Vibrations must be within the specification. Vibration causes mechanical stress and it should not occur frequently, continuously or repeatedly to prevent damage to the brushless DC motor drive.
- 2. Store the brushless DC motor drive in a clean and dry location, free from corrosive fumes/dust to prevent corrosion and poor contacts. Poor insulation in a humid location can cause short-circuits. If necessary, install the brushless DC motor drive in a dust-proof and painted enclosure and in particular situations, use a completely sealed enclosure.
- 3. The ambient temperature should be within the specification. Too high or too 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 periodically check air quality and the cooling fan and provide extra cooling of necessary. In addition, the microcomputer may not work in extremely low temperatures, making cabinet heating necessary.

### Chapter 4 ParametersAT |Troubleshooting} | BLD-E1 Series

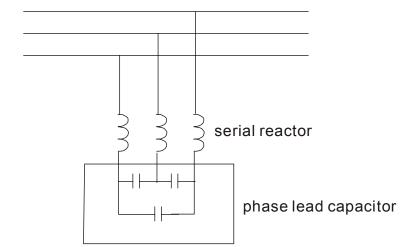
4. Store within a relative humidity range of 0% to 90% and non-condensing environment.
Please use an air conditioner and/or exsiccator when the brushless DC motor drive will not be used for a long time.

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# 5.14 Affecting Other Machines

A brushless DC motor drive may affect the operation of other machines due to many reasons. Some solutions are:

- High Harmonics at Power SideHigh harmonics at power side during running can be improved by:
- 1. Separate the power system: use a transformer for the brushless DC motor drive.
- 2. Use a reactor at the power input terminal of the brushless DC motor drive.
- 3. If phase lead capacitors are used (never on the brushless DC motor drive output!!), use serial reactors to prevent damage to the capacitors damage from high harmonics.



# Chapter 6 Fault Code Information and Maintenance

### 6.1 Fault Code Information

The brushless DC 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 brushless DC motor drive digital keypad display. The five most recent faults can be read from the digital keypad or communication.

The brushless DC motor drive is made up of multiple components, including electric components (IC, resistor, capacitor and resistor), cooling fan and relay. These components have the life time and may cause malfunction when exceeding the life time. Therefore, it is necessary to have periodic inspection to find out antiquated components in time to keep the brushless DC motor drive in its optimal condition.

Please always perform a visual inspection and a check-up regularly for the brushless DC motor drive according to the following items to make sure that the brushless DC motor drive runs normally.



- 1. Wait 5 seconds after a fault has been cleared before performing reset via keypad of input terminal.
- 2. Before the check-up, always turn off the power and remove the cover. Wait at least 10 minutes for ≥ 30kW models (5 minutes for ≤ 22kW) after all display lamps have gone out, and then confirm that the capacitors have fully discharged by measuring the voltage between ⊕ ~ ⊕. It should be less than 25VDC.
- 3. Only qualified personnel can install, wire and maintain brushless DC motor drives. Please take off any metal objects, such as watches and rings, before operation. And only insulated tools are allowed.
- 4. Never reassemble internal components or wiring.
- 5. The operation characteristics and surrounding environment should comply with the specifications, such as no abnormal noise, vibration and smell.
- 6. Make sure that the keypad display is normal without overheat or color change.
- 7. Prevent static electricity.

# **6.1.1 Common Problems and Solutions**

Fault Name	Fault Descriptions	Corrective Actions
oc 8	Over current during acceleration Output current exceeds triple of the rated current during acceleration.	<ol> <li>Short-circuit at motor output: Check for possible poor insulation at the output line.</li> <li>Deceleration Time too short: Increase the Deceleration Time.</li> <li>Brushless DC motor drive output power is too small: Replace the brushless DC motor drive with the next higher power model.</li> </ol>
೦೭ರ	Over current during deceleration Output current exceeds triple of the rated current during deceleration.	<ol> <li>Short-circuit at motor output: Check for possible poor insulation at the output line.</li> <li>Deceleration Time too short: Increase the Deceleration Time.</li> <li>Brushless DC motor drive output power is too small: Replace the brushless DC motor drive with the next higher power model.</li> </ol>
0000	Over-current during steady state operation Output current exceeds triple of the rated current during constant speed.	<ol> <li>Short-circuit at motor output: Check for possible poor insulation at the output line.</li> <li>Deceleration Time too short: Increase the Deceleration Time.</li> <li>Brushless DC motor drive output power is too small: Replace the brushless DC motor drive with the next higher power mode</li> </ol>
See	Ground fault When (one of) the output terminal(s) is grounded, short circuit current is more than 75% of brushless DC motor drive rated current, the brushless DC motor drive power module may be damaged  NOTE: The short circuit protection is provided for brushless DC motor drive protection, not for protection of the user.	<ol> <li>Check the wiring connections between the brushless DC motor drive and motor for possible short circuits, also to ground.</li> <li>Check whether the IGBT power module is damaged.</li> <li>Check for possible poor insulation at the output line.</li> </ol>
oc S	Over-current at stop	Return to the factory

	Chapter 6 Fault Code Information and Maintenance   BLD-E1 Serie			
Fault Name	Fault Descriptions	Corrective Actions		
ouß	DC BUS over-voltage during acceleration (230V: DC 405V; 460V: DC 810V)	<ol> <li>Check if the input voltage falls within the rated brushless DC motor drive input voltage range.</li> <li>Check for possible voltage transients.</li> <li>If DC BUS over-voltage due to regenerative voltage, please increase the Deceleration Time or add an optional brake resistor</li> </ol>		
ისძ	DC BUS over-voltage during deceleration 230V: DC 405V; 460V: DC 810V	<ol> <li>Check if the input voltage falls within the rated brushless DC motor drive input voltage range.</li> <li>Check for possible voltage transients.</li> <li>If DC BUS over-voltage due to regenerative voltage, please increase the Deceleration Time or add an optional brake resistor</li> </ol>		
٥٥٥	DC BUS over-voltage during constant speed 230V: DC 405V; 460V: DC 810V	<ol> <li>Check if the input voltage falls within the rated brushless DC motor drive input voltage range.</li> <li>Check for possible voltage transients.</li> <li>If DC BUS over-voltage due to regenerative voltage, please increase the Deceleration Time or add an optional brake resistor</li> </ol>		
005	DC BUS over-voltage at stop	<ol> <li>Check if the input voltage falls within the rated brushless DC motor drive input voltage range.</li> <li>Check for possible voltage transients.</li> </ol>		
108	DC BUS voltage is less than Pr.06-00 during acceleration.	<ol> <li>Check if the input voltage is normal</li> <li>Check for possible sudden load</li> </ol>		
Lud	DC BUS voltage is less than Pr.06-00 during deceleration	<ol> <li>Check if the input voltage is normal</li> <li>Check for possible sudden load</li> </ol>		
Lun	DC BUS voltage is less than Pr.06-00 during constant speed.	<ol> <li>Check if the input voltage is normal</li> <li>Check for possible sudden load</li> </ol>		
٤٥5	Low voltage at stop	<ol> <li>Check if the input voltage is normal</li> <li>Check for possible sudden load</li> </ol>		
285	Phase loss	Check Power Source Input if all 3 input phases are connected without loose contacts.		

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Fault Name	Fault Descriptions	Corrective Actions
o# :	IGBT overheating IGBT temperature exceeds protection level 1 to 30HP: 100 °C	<ol> <li>Ensure that the ambient temperature falls within the specified temperature range.</li> <li>Make sure that the ventilation holes are not obstructed.</li> <li>Remove any objects from the heatsinks and check for possible dirty heat sink fins.</li> <li>Check the fan and clean it.</li> <li>Provide enough spacing for adequate ventilation.</li> </ol>
£ X 10	IGBT overheating	Return to the factory
οĹ	Overload The brushless DC motor drive detects excessive drive output current.  NOTE: The brushless DC motor drive can withstand up to 150% of the rated current for a maximum of 60 seconds.	<ol> <li>Check whether the motor is overloaded.</li> <li>Take the next higher power brushless DC motor drive model.</li> </ol>
Eoi ;	Motor 1 overload	<ol> <li>Check whether the motor is overloaded.</li> <li>Check whether the rated current of motor (Pr.05-01) is suitable</li> <li>Take the next higher power brushless DC motor drive model.</li> </ol>
ob :	Electronic Thermal Relay 1 Protection	<ol> <li>Check whether the motor is overloaded.</li> <li>Check whether motor rated current setting (Pr.05-01) is suitable</li> <li>Check electronic thermal relay function (Pr.06-05~ Pr.06-07)</li> <li>Take the next higher power brushless DC motor drive model.</li> </ol>
062	Electronic Thermal Relay 2 Protection	<ol> <li>Check whether the motor is overloaded.</li> <li>Check whether motor rated current setting (Pr.05-01) is suitable</li> <li>Check electronic thermal relay function (Pr.06-05~ Pr.06-07)</li> <li>Take the next higher power brushless DC motor drive model.</li> </ol>

-	Chapter 6 Fault Code Information and Maintenance   BLD-E1 Serie			
Fault Name	Fault Descriptions	Corrective Actions		
	Internal EEPROM can not be programmed.	1. Press "RESET" key to the factory setting.		
c F 1	programmeu.	2. If Internal EEPROM still can not be		
		programmed, return to the factory.		
	Internal EEPROM can not be	Press "RESET" key to the factory setting.		
c F 2	read.	2. If Internal EEPROM again can not be read,		
		return to the factory.		
	Hardware failure in current	1. Reapply the power.		
cdÛ	detection	2. If fault code is still displayed on the keypad,		
		please return to the factory.		
	U-phase error	Reapply the power.		
cd :		2. If fault code is still displayed on the keypad,		
		please return to the factory.		
	V-phase error	Reapply the power.		
⊂ઇ∂		2. If fault code is still displayed on the keypad,		
		please return to the factory.		
	W-phase error	Reapply the power.		
cd3		2. If fault code is still displayed on the keypad,		
		return to the factory.		
	CC (current clamp)	Reapply the power.		
XdO		2. If fault code is still displayed on the keypad,		
		return to the factory.		
	OC hardware error	Reapply the power.		
Xd:		2. If fault code is still displayed on the keypad,		
		return to the factory.		
	OV hardware error	Reapply the power.		
XGS		2. If fault code is still displayed on the keypad,		
		return to the factory.		
	GFF hardware error	Reapply the power.		
ЖďЗ		2. If fault code is still displayed on the keypad,		
		return to the factory.		
	Auto tuning error	Check cabling between drive and motor.		
o c		2. Check the motor capacity and parameters		
8.8		settings.		
		3. Retry		

Fault Name	Fault Descriptions	Corrective Actions
PSF ;	PG feedback error	Check if Pr.10-01 is not set to 0 when it is PG feedback control.
P652	PG feedback loss	Check the wiring of the PG feedback.
PGF3	PG feedback stall	<ol> <li>Check the wiring of the PG feedback.</li> <li>Check if the setting of PI gain and deceleration is suitable (Pr.10-05~Pr.10-06).</li> <li>Return to the factory.</li> </ol>
የርዩዛ	PG slip error	<ol> <li>Check the wiring of the PG feedback.</li> <li>Check if the setting of PI gain and deceleration is suitable (Pr.10-07~Pr.10-08).</li> <li>Return to the factory.</li> </ol>
838	ACI loss	<ol> <li>Check the ACI wiring.</li> <li>Check if the ACI signal is less than 4mA.</li> </ol>
8.5	External Fault	<ol> <li>Input EF (N.O.) on external terminal is closed to GND. Output U, V, W will be turned off.</li> <li>Give RESET command after fault has been cleared.</li> </ol>
88 :	Emergency stop When the multi-function input terminals MI1 to MI6 are set to emergency stop and the brushless DC motor drive stops output.	Press RESET after fault has been cleared.
ε8 <i>i</i>	Illegal function code	Check if the function code is correct.
c 8 2	Illegal communication address	Check if the communication address is correct.
c 8 3	Illegal data length Data length should be 1~20 characters	Check if the communication data length is correct.
c 8 4	Illegal data value Communication address 0x2XXX, 0X22XXetc. are read only	Check if the communication address is correct.
c 8   10	Communication time-out (Pr.09-02~Pr.09-03)	Check if the wiring for the communication is correct.

Fault Name	Fault Descriptions	Corrective Actions		
	Keypad communication time-out	1.	Check if the wiring for the communication is	
c P 10			correct.	
		2.	Check if there is any wrong with the keypad.	

### **6.1.2 Reset**

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

- 1. Press STOP/RESET key on keypad.
- 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.

### **6.2 Maintenance and Inspections**

Before the check-up, always turn off the 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  $\bigcirc$  . It should be less than 25VDC.

### **Ambient environment**

Check Items	Mathada and Critarian	Maintenance Period		
	Methods and Criterion		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		
Check if there are any dangerous objects in the environment	Visual inspection	0		

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# Voltage

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

# Keypad

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

# **Mechanical parts**

Check Items	Methods and Criterion		Maintenance Period			
	Methods and Chterion	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

Chaok Itama	Methods and Criterion		Jaliv I I			
Check Items	Methods and Chterion	Daily	One Year			
If there are any loose or missing screws	Tighten or replace the screw	0				

Ch	napter 6 Fault Code Information and Maintena	nce   B	LD-E1	Series
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	Methods and Criterion		Maintenand Period		
Check items	Methods and Criterion	Daily	Half Year O	One Year	
If the wiring shows change of color change or deformation due to overheat	Visual inspection		0		
If the insulation of wiring is damaged or the color has changed	Visual inspection		0		
If there is any damage	Visual inspection		0		

DC capacity of main circuit

Check Items Methods and Criterion	Mathada and Critarian	Maintenance Period			
	Daily	Half Year	One Year		
If there is any leakage of liquid, change of color, cracks or deformation	Visual inspection	0			
If the valve has come out? If the valve is enlarged?	Visual inspection	0			
Measure static capacity when required			0		

### Resistor of main circuit

Check Items	Mathada and Oritorian	Ma	nce
	Methods and Criterion	Daily	Half Year

Oh a al Massa	Mathada and Onitarian	Maintenand Period		
Check Items	Methods and Criterion	Daily	Half Year	One Year
If there is any peculiar smell or insulator cracks due to overheating	Visual inspection, smell		0	
If there is any disconnection	Visual inspection		0	
If the connected terminal is normal?	Measure with multimeter with standard specification		0	

### Transformer and reactor of main circuit

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

# Magnetic contactor and relay of main circuit

Check Items		Mai		
	Methods and Criterion	Daily	One Year	
If there is any vibration noise during operation?	Aural inspection	0		
If the contact works correctly	Visual inspection	0		

### Printed circuit board and connector of main circuit

Oh a shalkama	Perio		Maintenand Period		
Check Items	tems 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 inspection and smell		0		

Check Items			Maintenand Period			
	Methods and Criterion	Daily	One Year			
If there is any crack, damage, deformation or corrosion	Visual inspection		0			

Cooling fan of cooling system

Ob a alla Massa		Ма	nce	
Check Items	tems 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 change of color due to overheating	Visual inspection			0

# Ventilation channel of cooling system

Oh sala Kama	Mathada and Critarian		intenar Period	
Check Items	Methods and Criterion	Daily	One Year	
If there is any obstruction in the heat sink, air intake or air outlet	Aural inspection		0	

# Appendix A Specifications

There are 115V, 230V and 460V models in the BLD-E1 series. For 115V models, it is 1-phase models. For 0.25 to 3HP of the 230V models, there are 1-phase/3-phase models. Refer to following specifications for details.

	Voltage Class		115V Class			
	Model Number BLD-XXXE1	002	004	007		
Max	. Applicable Motor Output (kW)	0.2	0.4	0.75		
Max	. Applicable Motor Output (hp)	0.25	0.5	1.0		
ם	Rated Output Capacity (kVA)	0.6	1.0	1.6		
aţi	Rated Output Current (A)	1.6	2.5	4.2		
t R	Maximum Output Voltage (V)	3-Phase Proportional to Twice the Input Voltage				
Output Rating	Output Speed (RPM)	1~4000 RPM				
ō	Carrier Frequency (kHz)	2-15				
g	Rated Input Current (A)	6.4	9	18		
Input Rating	Rated Voltage/Frequency	Single phase, 100-120V, 50/60Hz				
H.R	Voltage Tolerance	± 10%(90~132 V)				
Frequency Tolerance		± 5%(47~63 Hz)				
Cooling Method		Natura	Il Cooling	Fan Cooling		
Weight (kg)		1.1	1.1	1.4		

		Voltage Class			230V	Class			
	Model	Number BLD-XXXE1	002	004	007	015	022	037	
Ма	x. Applic	cable Motor Output (kW)	0.2	0.4	0.75	1.5	2.2	3.7	
Ма	x. Applic	cable Motor Output (hp)	0.25	0.5	1.0	2.0	3.0	5.0	
βL	Rated	Output Capacity (kVA)	0.6	1.0	1.6	2.9	4.2	6.5	
Rating	Rated	Output Current (A)	1.6	2.5	4.2	7.5	11.0	17	
utput F	Maxim	um Output Voltage (V)		3-Pha	ase Proportior	nal to Input Vo	oltage		
utp		Speed (RPM)			1~400	0RPM			
0	Carrier	Frequency (kHz)	2-15						
	XXXE	Rated Input Current (A)	4.9	6.5	9.3	15.7	24		
	121A	Rated Voltage/Frequency	Single 200-240 V, 50/60Hz						
g	XXXE	Rated Input Current (A)	1.9	2.7	4.9	9	15	20.6	
Rating	123A	Rated Voltage/Frequency	3-phase 200-240V, 50/60Hz						
Input	Rated Voltage/Frequency		3-phase 1-phase/3-phase 200-240V, 50/60Hz 200-240V, 50/60Hz						
	Voltage	e Tolerance	<u>+</u> 10%(180~264 V)						
	Freque	ency Tolerance	± 5%(47~63 Hz)						
Cooling Method			Natural Cooling Fan Cooling						
W	eight (kg	)	1.2	1.2	1.2	1.7	1.7	1.7	

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# Appendix A Specifications | BLD-E1 Series

	Voltage Class			460V Class				
N	lodel Number BLD-XXXE1	004	007	015	022	037		
Max. A	applicable Motor Output (kW)	0.4	0.75	1.5	2.2	3.7		
Max. A	applicable Motor Output (hp)	0.5	1.0	2.0	3.0	5.0		
	Rated Output Capacity (kVA)	1.2	2.0	3.3	4.4	6.8		
	Rated Output Current (A)	1.5	2.5	4.2	5.5	8.2		
ing	Maximum Output Voltage (V)		3-Phase P	roportional to Inp	out Voltage			
Rat	Output Speed (RPM)	1 ~ 4000 RPM						
ont	Carrier Frequency (kHz)			2-15				
Output Rating	Rated Input Current (A)	1.8	3.2	4.3	7.1	9.0		
	Rated Voltage/Frequency	3-phase, 380-480V, 50/60Hz						
	Voltage Tolerance	± 10%(342~528V)						
	Frequency Tolerance	± 5%(47~63Hz)						
Coolir	ng Method	Natural	Cooling		Fan Cooling			
Weigh	nt (kg)	1.2	1.2	1.2	1.7	1.7		

	General Specifications						
	Control Sys	tem	Hall Sensor + 6-step close loop				
Ø	Speed Setting Resolution		1 RPM				
stic	Output Spe	ed Resolution	1 RPM				
Control Characteristics	Torque Cha	racteristics	Including the auto-torque compensation; starting torque can be 150% at 80RPM				
Cha	Overload E	ndurance	150% of rated current for 1 minute				
<u></u>	Accel/Dece	Time	0.1 to 600 seconds (2 Independent settings for Accel/Decel time)				
Sont	Stall Prever	ntion Level	Setting 20 to 250% of rated current				
	Regenerated Brake Torque		Approx. 20% (up to 125% possible with optional brake resistor or externally mounted brake unit				
	Speed Setting	Keypad	Setting by				
istics		External Signal	Potentiometer-5k $\Omega$ /0.5W, 0 to +10VDC, 4 to 20mA, RS-485 interface; Multifunction Inputs 3 to 6 (15 steps, up/down)				
cter	Operation	Keypad	Set by RUN and STOP				
Characteristics	Setting Signal	External Signal	2 wires/3 wires (MI1, MI2, MI3) and RS-485 serial interface				
Operating (	Multi-function Input Signal		Multi-step selection 0 to 15, accel/decel inhibit, 2 accel/decel switches, counter, Jog, driver reset, UP/DOWN key settings, ACI/AVI selections, NPN/PNP input selection				
о́ 	Multi-function Output Indication		AC drive operating, speed attained, zero speed, counter attained indication, status selections of input terminals, fault indication, overheat alarm and emergency stop				
	Protection	n Functions	Over voltage, over current, under voltage, external fault, motor overload, ground fault, drive overload and drive overheating				

		General Specifications
	Operation Functions	Built-in AVR, over-voltage/over-current stall prevention, 5 fault records, reverse inhibition, momentary power loss restart, auto torque compensation, adjustable carrier frequency, output speed limits, parameter reset, PID control, external counter, MODBUS communication, abnormal reset, abnormal re-start and NPN/PNP selection
	Display Keypad	6-key, 7-segment LED with 4-digit, 5 status LEDs, setting speed, display actual output speed, output current, custom units, parameter values for setup and lock, faults, RUN, STOP, RESET, FWD/REV
	Built-in EMI Filter	For 230V 1-phase and 460V 3-phase models.
	Enclosure Rating	IP20
tion	Pollution Degree	2
Condi	Installation Location	Altitude 1,000 m or lower, keep from corrosive gasses, liquid and dust
Environmental Conditions	Ambient Temperature	-10°C to 50°C (40°C for side-by-side mounting) Non-Condensing and not frozen
onr	Storage Temperature	-20 °C to 60 °C
invir	Ambient Humidity	Below 90% RH (non-condensing)
	Vibration	9.80665m/s² (1G) less than 20Hz, 5.88m/s² (0.6G) at 20 to 50Hz

Appendix A Specifications | BLD-E1 Series

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# Appendix B Accessories

# **B.1 All Brake Resistors & Brake Units Used in the Brushless DC Motor**

# **Drive**

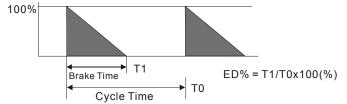
age	Applio Mo		Full Load	Equivalent Resistor Value	Brake Unit	Brake Resisto		Brake Torque	Min. Equivalent Resistor Value for
Volta	hp	kW	Torque KG-M	to the Brushless DC Motor Drive	Part No.	Part No. and Quantity		10%ED %	Each Brushless DC Motor Drive
\ 3S	0.25	0.2	0.110	200W 250 $\Omega$	BUE-20015	BR200W250	1	320	200 Ω
15V eries	0.5	0.4	0.216	200W 250 $\Omega$	BUE-20015	BR200W250	1	170	100Ω
S.	1	0.75	0.427	<b>200W 150</b> Ω	BUE-20015	BR200W150	1	140	<b>80</b> Ω
	0.25	0.2	0.110	<b>200W 250</b> Ω	BUE-20015	BR080W200	1	320	200Ω
es	0.5	0.4	0.216	<b>200W 250</b> Ω	BUE-20015	BR080W200	1	170	100Ω
Series	1	0.75	0.427	<b>200W</b> 150 Ω	BUE-20015	BR300W100	1	140	80Ω
>	2	1.5	0.849	300W 85 $\Omega$	BUE-20015	ı		125	<b>80</b> Ω
300	3	2.2	1.262	*	*	*			
2	5	3.7	2.080	*	*	*			
	0.5	0.4	0.216	300W 400 $\Omega$	BUE-40015	BR300W400	1	400	400Ω
> Se	1	0.75	0.427	300W 400 $\Omega$	BUE-40015	BR300W400	1	200	200Ω
460V Series	2	1.5	0.849	<b>400W 300</b> Ω	BUE-40015	BR200W150	2	140	<b>160</b> Ω
4 N	3	2.2	1.262	*	*	*			
	5	3.7	2.080	*	*	*			

NOTE: "*" under development

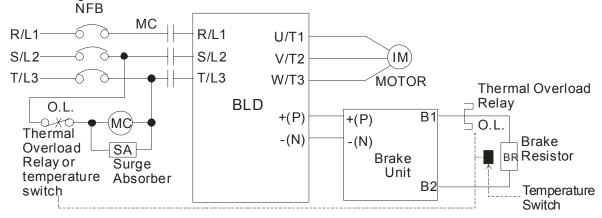


- 1. If damage to the drive or other equipment is due to the fact that the brake resistors and the brake modules in use are not provided by Delta, the warranty will be void.
- 2. Take into consideration the safety of the environment when installing the brake resistors.
- 3. Definition for Brake Usage ED%

Explanation: The definition of the barking 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. Suggested cycle time is one minute



- 4. Please select the brake unit and/or brake resistor according to the table. "-" means no Delta product. Please use the brake unit according to the Equivalent Resistor Value.
- 5. For safety reasons, install a thermal overload relay between brake unit and brake resistor. Together with the magnetic contactor (MC) in the mains supply circuit to the drive it offers protection in case of any malfunctioning. The purpose of installing the thermal overload relay is to protect the brake resistor against damage due to frequent brake or in case the brake unit is continuously on due to unusual high input voltage. Under these circumstances the thermal overload relay switches off the power to the drive. Never let the thermal overload relay switch off only the brake resistor as this will cause serious damage to the brushless DC motor drive.



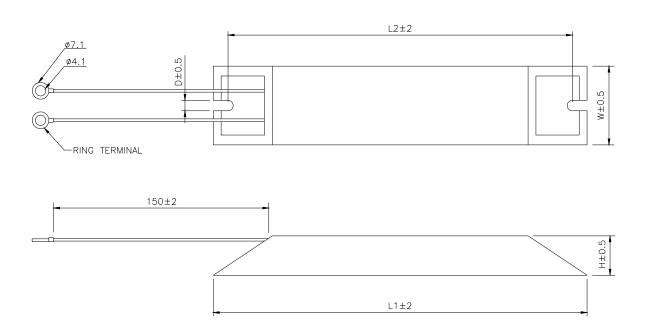
Note 1: When using the drive with DC reactor, please refer to wiring diagram in the drive user manual for the wiring of terminal +(P) of Brake unit.

Note 2: **Do NOT** wire terminal -(N) to the neutral point of power system.

# **B.1.1 Dimensions and Weights for Brake Resistors**

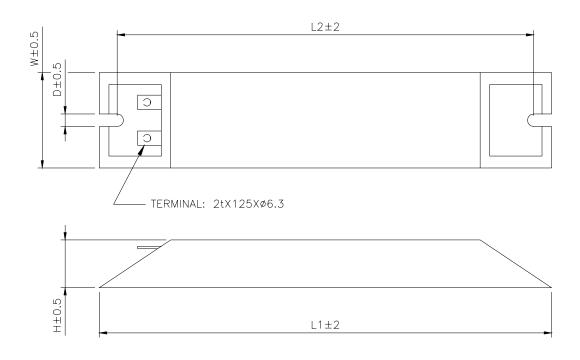
(Dimensions are in millimeter)

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



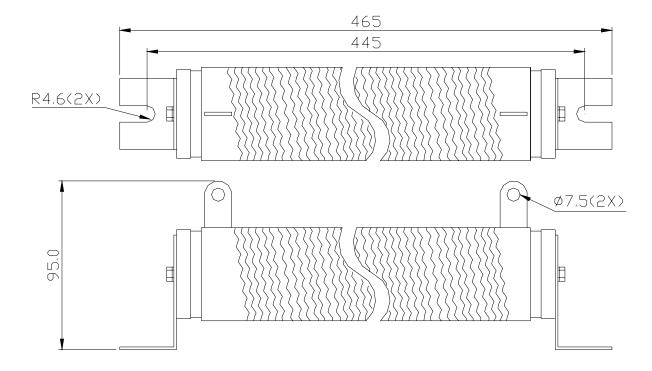
TYPE	L1	L2	Н	D	W	MAX. WEIGHT(g)
BR080W200	140	125	20	5.3	60	160
BR080W750	140	125	20	5.3	60	160
BR300W070	215	200	30	5.3	60	750
BR300W100	215	200	30	5.3	60	750
BR300W250	215	200	30	5.3	60	750
BR300W400	215	200	30	5.3	60	750
BR400W150	265	250	30	5.3	60	930
BR400W040	265	250	30	5.3	60	930

# Order P/N: BR500W030, BR500W100, BR1KW020, BR1KW075



Model no.	L1	L2	Н	D	W	Max. Weight (g)
BR500W030						
BR500W100	335	320	30	5.3	60	1100
BR1KW020	100	005		- 0	400	
BR1KW075	400	385	50	5.3	100	2800

# Order P/N: BR1K0W050, BR1K2W008, BR1K2W6P8, BR1K5W005, BR1K5W040



# **B.2 No-fuse Circuit Breaker Chart**

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

1-phas	е	3-phase	е
Model	Recommended no-fuse breaker (A)	Model	Recommended no-fuse breaker (A)
BLD002E111A	15	BLD002E123A	5
BLD002E121A	10	BLD004E123A	5
BLD004E111A	20	BLD004E143A	5
BLD004E121A	15	BLD007E123A	10
BLD007E111A	30	BLD007E143A	5
BLD007E121A	20	BLD015E123A	20
BLD015E121A	30	BLD015E143A	10
BLD022E121A	50	BLD022E123A	30
		BLD022E143A	15
		BLD037E123A	40
		BLD037E143A	20

# **B.3 Fuse Specification Chart**

Smaller fuses than those shown in the table are permitted.

Model	I (A)	I (A)		Line Fuse
iviodei	Input	Output	I (A)	Bussmann P/N
BLD002E111A	6.4	1.6	15	JJN-15
BLD002E121A	4.9	1.6	10	JJN-10
BLD002E123A	1.9	1.6	5	JJN-6
BLD004E111A	9	2.5	20	JJN-20
BLD004E121A	6.5	2.5	15	JJN-15
BLD004E123A	2.7	2.5	5	JJN-6
BLD004E143A	1.8	1.5	5	JJS-6
BLD007E111A	18	4.2	30	JJN-30
BLD007E121A	9.3	4.2	20	JJN-20
BLD007E123A	4.9	4.2	10	JJN-10
BLD007E143A	3.2	2.5	5	JJS-6
BLD015E121A	15.7	7.5	30	JJN-30
BLD015E123A	9	7.5	20	JJN-20
BLD015E143A	4.3	4.2	10	JJS-10
BLD022E121A	24	11	50	JJN-50
BLD022E123A	15	11	30	JJN-30
BLD022E143A	7.1	5.5	15	JJS-15
BLD037E123A	20.6	17	40	JJN-40
BLD037E143A	9.0	8.2	20	JJS-20

### **B.4 AC Reactor**

# **B.4.1 AC Input Reactor Recommended Value**

230V, 50/60Hz, 1-Phase

15/0/	HP	Fundamental	Max. continuous	Inductance (mH)
kW	ПР	Amps	Amps	3~5% impedance
0.2	0.25	4	6	6.5
0.4	0.5	5	7.5	3
0.75	1	8	12	1.5
1.5	2	12	18	1.25
2.2	3	18	27	0.8

460V, 50/60Hz, 3-Phase

14141	LID	Fundamental	Max.	Inductar	nce (mH)
kW	HP	Amps	continuous Amps	3% impedance	5% impedance
0.4	0.5	2	3	20	32
0.75	1	4	6	9	12
1.5	2	4	6	6.5	9
2.2	3	8	12	5	7.5
3.7	5	8	12	3	5

# **B.4.2 AC Output Reactor Recommended Value**

115V/230V, 50/60Hz, 3-Phase

kW	HP	Fundamental Amps	Max. continuous Amps	Inductance (mH)		
KVV				3% impedance	5% impedance	
0.2	0.25	4	6	9	12	
0.4	0.5	4	6	6.5	9	
0.75	1	8	12	3	5	
1.5	2	8	12	1.5	3	

Appendix B Accessories   BLD-E1 Serie							
kW	HP	Fundamental Amps	Max. continuous Amps	Inductance (mH)			
K V V				3% impedance	5% impedance		
2.2	3	12	18	1.25	2.5		
3.7	5	18	27	0.8	1.5		

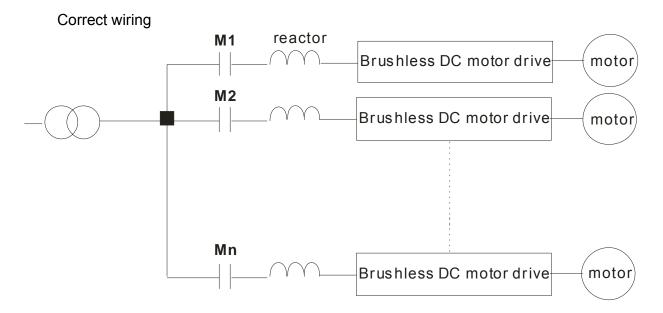
460V, 50/60Hz, 3-Phase

LAM	HP	Fundamental Amps	Max. continuous Amps	Inductance (mH)		
kW				3% impedance	5% impedance	
0.4	0.5	2	3	20	32	
0.75	1	4	6	9	12	
1.5	2	4	6	6.5	9	
2.2	3	8	12	5	7.5	
3.7	5	12	18	2.5	4.2	

# **B.4.3 Applications**

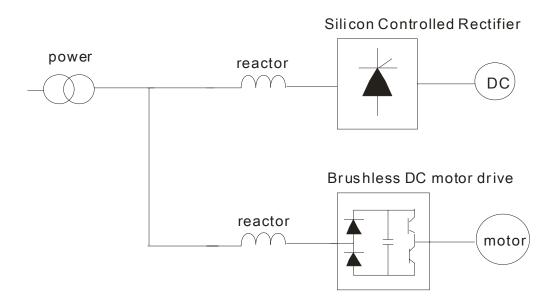
Connected in input circuit

Application 1	Question
When more than one brushless DC motor drive is connected to the same mains power, and one of them is ON during operation.	When applying power to one of the brushless DC motor drive, the charge current of the capacitors may cause voltage dip. The brushless DC motor drive may be damaged when over current occurs during operation.



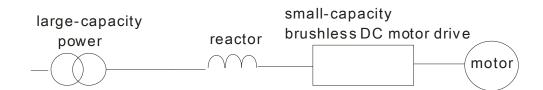
Application 2	Question		
	Switching spikes will be generated when the silicon rectifier switches on/off. These spikes may damage the mains circuit.		

### Correct wiring



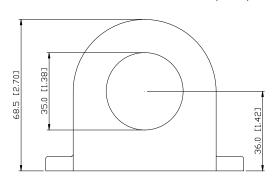
Application 3	Question
For the applications that power capacity is more than 10 times of power capacity of brushless DC motor drive.	When the mains power capacity is too large, line impedance will be small and the charge current will be too high. This may damage brushless DC motor drive due to higher rectifier temperature.

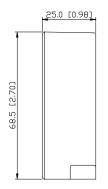
# Correct wiring

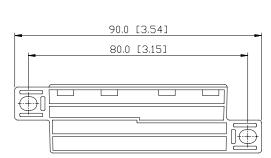


# **B.5 Zero Phase Reactor (RF220X00A)**

Dimensions are in millimeter and (inch)



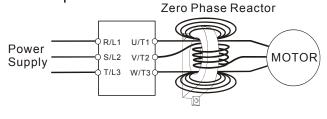




Cable type	Recommended Wire Size (mm²)			Qty.	Wiring
(Note)	AWG	mm ²	Nominal (mm²)	Qty.	Method
Single-	≤10	≤5.3	≤5.5	1	Diagram A
core	≤2	≤33.6	≤38	4	Diagram B
Three-	≤12	≤3.3	≤3.5	1	Diagram A
core	≤1	≤42.4	≤50	4	Diagram B

### Diagram A

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



Note: 600V Insulated unshielded Cable

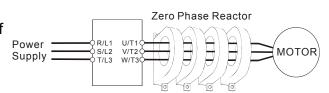
**Note 1:** The table above gives approximate wire size for the zero phase reactors but the selection is ultimately governed by the type and diameter of cable fitted i.e. the cable must fit through the center hole of zero phase reactors.

# **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

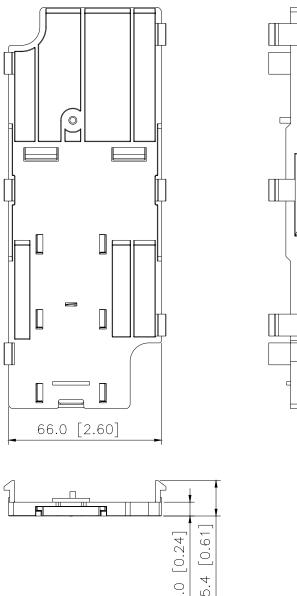
### Diagram B

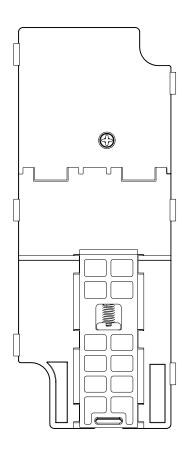
Please put all wires through 4 cores in series without winding.

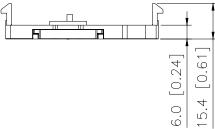


### **B.6 DIN Rail**

### **Dimensions**







This is only applicable for frame A. As for frame B, it is a standard accessory and please refer to chapter 1 for dimensions.



Frame A: BLD002E111A/121A/123A, BLD004E111A/121A/123A/143A, BLD007E121A/123A/143A,

BLD015E123A/143A

Frame B: BLD007E111A, BLD015E121A, BLD022E121A, BLD022E121A /123A/143A,

BLD037E123A/143A

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