BLDC MOTOR DRIVES
Built-in Brushless DC Motor Driver

Manual2.3-0621

Please read the manual carefully before powering on

IBL-D

(Input Voltage 24~48VDC)

Summary

The IBL-D brushless DC motor driver is a driver independently developed by Dingtuo Technology to coordinate with the modern industrial automatic control field. It mainly adopts high-performance dedicated brushless DC motor driver chips to form a driver with a high degree of integration, small size, comprehensive protection, simple and clear wiring, and high reliability. This driver is suitable for driving medium and small brushless DC motors with maximum power below 400W, and can be used with sensored and sensorless motors. This driver adopts new PWM technology, which allows the brushless motor to operate at high speed, low vibration, low noise, good stability and high reliability.

Specification and Description

- PID speed and current double closed-loop controller
- High-performance and low-price
- 20KHZ chopper frequency
- Electric brake function for quick motor response
- Over-voltage, under-voltage, over-current, current peak value, Hall signal and other fault alarm functions
- Communication mode adopts standard Modbus protocol, complies with national standard GB/T 19582.1—2008. Uses RS485 two-wire serial link communication based on RTU transmission mode.

Product Characteristic

System Characteristic:

Input voltage: 24VDC~48VDC

Under voltage protection: 11.3VDC, Over voltage protection: 58VDC

Dimension: the outer diameter of the PCB board is 75mm

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Safety Precautions

***This product is professional electrical equipment and should be installed, commissioned, operated and maintained by professional technicians. Incorrect use can lead to electric shock, fire, explosion and other hazards.**

***This product is DC powered. Please confirm the positive and negative terminals are connected correctly before powering on.**

***Do not plug and unplug connection cables while energized. Short circuits in cables are not allowed during power on, otherwise product damage may occur.**

***The driver is a high power device. Please maintain good ventilation and heat dissipation in the working environment as much as possible.**

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Warranty limitations

Dingtuo's warranty scope is limited to the components and workmanship (i.e. consistency) of the products.

Dingtuo does not guarantee that its products are suitable for the customer's specific applications, because suitability also depends on the technical index requirements, usage conditions and environment for that application.

Terminal Connection

1. Hall Sensor of the Motor Input CN1

1	+5V	Hall signal Power Line
2	HA	Hall signal A phase
3	HB	Hall signal B phase
4	HC	Hall signal C phase
5	GND	Hall signal Ground Lead

2. Control Signal CN2

No.	Terminal Name	Description
1	485+	485+
2	485-	485-
3	GND	Common port
4	CCW	Connect to GND, then run counterclockwise
5	CW	Connect to GND, then run clockwise
6	PG	Pulse speed signal output
7	SV	Analog voltage input
8	+5V	5V speed voltage output

3. Power Input CN3

1	VCC	24VDC~48VDC input
2	GND	GND input

4. Motor Phase Input CN4

1	MA	Motor A phase
2	MB	Motor B phase
3	MC	Motor C phase

Control Signal

GND: Signal GND
CW: Connect to GND and the motor will rotate forward; if not connected, it will stop
CCW: Connect to GND and the motor will rotate reverse; if not connected, it will stop
SV: Analog input 0-5V
PG: Motor speed pulse output, when the number of pole pairs is P, output 3P pulses per revolution
+5V: Adjustable speed voltage output, the potentiometer can be used to connect SV and GND
Communication port: RS485 two-wire serial link communication, which can be controlled by communication connection or connected with a computer to modify parameters.

Function and Usage

Speed adjust method

This driver provides the user below speed control method:

External input adjustment: Connect the terminals of the external potentiometer(10K~50K) to the GND and +5V terminal, connect the regulator terminal to SV, then you can adjust the speed by using an external potentiometer. It also can achieve speed adjust through other control units (Such as PLC, SCM, etc) input analog voltage to SV. The acceptance of SV is DC 0V~+5V, and the corresponding motor rotate speed is 0 to rated speed.

You also can use the external digital signal to adjust speed: A pulse width digital signal (**PWM**) with an amplitude of 5V and a frequency of 1KHz~2KHz can be applied between SV and GND for speed regulation, and the motor speed is linearly adjusted by its duty cycle.

It is also possible to change the motor speed by command through **Communication.**

Motor operate/stop control (CW)

The motor can be run by controlling the connection of terminal CW with GND. If it is not connected, it will stop.

Motor rotation direction control (CCW)

The motor can be reversed by controlling the connection between terminal CCW and terminal GND. If not connected, the motor will stop.

Speed signal output(PG)

This port is a 5V pulse output. To obtain a signal, a 3KΩ~10KΩ pull-up resistor should be connected to the power supply. The number of output pulses per revolution of the motor is 3 x P, where P is the number of pole pairs of the motor. Example: 2 pairs of poles means a four-pole motor has 6 pulses per revolution. When the motor speed is 500 rpm, the output pulses of terminal PG are 3000.

Drive failure

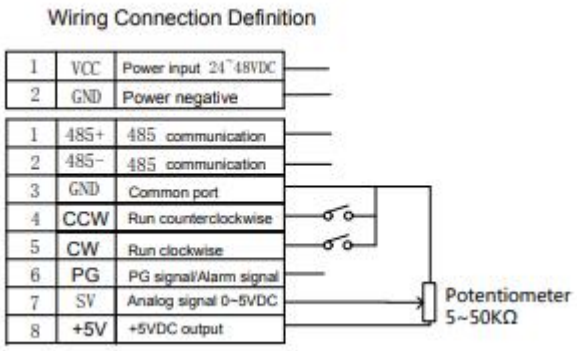
Over-voltage or over-current will lead the driver to a protection status, the driver will automatically stop working, the motor stop and blue light are flashing. As long as you

enable terminals to reset (EN and GND disconnected) or power off, the driver will disarm the alarm. Please check the motor wiring once this failure occurred.

Drive protection function and definition of flashing times of alarm light:

1. Stalled: the green light flashes once every 1S (the motor will alarm and stop when the motor is connected to the wrong wiring sequence or the motor Hall is damaged or the driver is damaged)
2. Overcurrent: the green light flashes 2 times every 1S (the input current reaches 7A for 3S consecutively, then the alarm will stop)
3. Hall: the green light flashes 3 times every 1S (when the Hall positive and negative poles are connected incorrectly or the Hall terminal is loose, it will alarm and stop)
4. Undervoltage: the green light flashes 4 times every 1S (alarm and shutdown when the input voltage is lower than 10.3VDC)
5. Overvoltage: the green light flashes 5 times every 1S (alarm and shutdown when the input voltage is lower than 40VDC)
6. Peak current fault: the green light flashes 6 times every 1S (the driver will alarm and stop due to damage to the power MOS tube)

Connection Diagram of motor and driver



Communication Method

The communication mode adopts the standard Modbus protocol and complies with the national standard GB/T 19582.1-2008. Using RS485 two-wire serial link communication, the physical interface uses Phoenix terminals, and the serial connection is very convenient. Transmission mode RTU, verification mode CRC, CRC start word FFFFH. Data mode: 8-bit asynchronous serial, 1 stop bit, invalid parity bit, communication rate 9600bps. After the

driver is powered on again, EN remains in the state before the power was cut off.

Modification of parameters must be done when the motor is stopped.

Site Address: 00: Broadcast Address

1-250: User Address

251-255: Special address, user cannot use

No.	address	name	Setting range	Default	Unit/Remark
00	$8000	First byte: control bit state Second byte: Hall angle and motor pole pairs	First byte： Bit0: CW Bit1: CCW Bit2: Bit3: Bit4: Bit5: Bit6: Second byte: Bit0-3: pole pairs 1-15 Bit4-7:	00H 04H	
01	$8001	Maximum speed in analog adjustment	0-65535	4000	RPM *Low byte in front and high byte in back
02	$8002	First byte: start torque Second byte:	1-255 1-255	18H 00H	
03	$8003	TBD	1-255	0	s
04	$8004	First byte: accelerate time Second byte: decelerate time	0-255 0-255	20H 00H	
05	$8005	Communication motor speed setting	0-65535	800	RPM *Low byte in front and high byte in back
06	$8006	Brake force	0-1023	1008	
07	$8007	First byte: station address Second byte: TBD	1-250	1 0	
08	$8008	First byte: low voltage alarm Second byte: high voltage alarm	0-255 0-255	19H 9CH	
09	$8009	First byte: current coefficient	0-255 0-255	D8H 32H	

		Second byte: speed coefficient			
0A	$800A	Current protection	0-65535	AE01 H	*Low byte in front and high byte in back
0B	$800B	Min. speed	0-32767	200	RPM *Low byte in front and high byte in back
0C	$800C	First byte: speed closed loop parameter C Second byte:	0-255 0	20H	
0D	$800D	Closed loop parameters	0	40H	
0E	$800E	TBD	0	0	
0F	$800F	TBD	0	0	
10-17		TBD	0		
18	$8018	Actual speed			The return value is converted from Hex. to Dec., multiplied by 20 and divided by the number of motor poles
19	$8019	First byte: bus voltage Second byte: bus current			invalid
1A	$801A	First byte: control port state Second: analog port value	Bit0: SW1 Bit1: SW2 Bit2: SW3 Bit3: SW4		invalid
1B	$801B	First byte: fault state Second byte: motor running state	Bit0: stall Bit1: over current Bit2: hall abnormal Bit3: low bus voltage Bit4: over bus voltage Bit5: peak current alarm Bit6: TBD Bit7: TBD		
1C		$801C-$801F	TBD		
20		$8020 above invalid			

Address 8000H-8017H Read-Write register

Write 00h to address 80017H. After 00h, the system is powered on again and the parameters are restored to factory settings.

Address 8018H-801FH Read-Only register

Other address is invalid

8000: first byte:

CW: when NW=0, 0: external EN low level effective 1: external EN high level effective

when NW=1, 0: EN ineffective 1: EN effective

CCW: when NW=0, 0: external FR low level effective 1: external FR high level effective

when NW=1, 0: FR ineffective 1: FR effective

BK: when NW=0, 0: external BK low level effective 1: external BK high level effective

when NW=1, 0: BK ineffective 1: BK effective

NW: 0: external control 1: communication control

MDX: 0: external regulation 1: communication regulation

KH: 0: closed loop regulation 1: open loop regulation

For example:

1. Start 01 06 80 00 19 05 6B 99
2. Change direction 01 06 80 00 1B 05 6A F9
3. Stop 01 06 80 00 18 05 6A 09
4. Write speed 1000 01 06 80 05 E8 03 BE 0A
5. Write speed 3000 01 06 80 05 B8 0B 83 CC
6. Read control byte and number of pole pairs 01 03 80 00 00 01 AD CA
7. Write 5 pairs of poles 01 06 80 00 00 05 60 09