BLDL720 Universal Low Voltage Brushless DC Motor Driver Operating Instructions Manual

Main Features

◆Can be connected to an external display operation panel to display the speed; can also be connected to a computer to set the drive parameters;

◆Current-speed dual closed-loop design, large low-speed torque and stable operation;

◆High torque and high speed output, the maximum speed is 8000rpm/min; (depending on the user's motor)

◆Speed regulation mode: external PWM speed regulation or external potentiometer speed regulation;

◆With EN (enable), DIR (direction), X1 (brake) signal control terminals;

◆Can output speed measurement pulse FG , (photoelectric isolation, gate output);

◆Can output alarm signal ALM for user detection (photoelectric isolation, gate output);

◆ With over-current, over-voltage, under-voltage, fan control, Hall sensor phase error, motor stall and other protection functions

Product Overview

This brushless DC motor driver is our company's latest high-tech product for medium-power motor transmission. This product uses large-scale integrated circuits to replace the original hardware design, with higher anti-interference and fast response performance. This product is suitable for driving any low-voltage three-phase brushless DC motor with or without Hall with an input current below **15A** and a power supply voltage within **DC24V~48V** , and has the characteristics of low temperature when working with large current. The product is used in a series of electrical automation control fields such as knitting equipment, medical equipment, food packaging machinery, and power tools.

Functional Overview

The factory default setting of this product is square wave with Hall closed-loop mode. You can set the working mode yourself according to the handheld debugger provided by our company to realize various control modes such as square wave with Hall speed closed-loop control, square wave with Hall speed open-loop control, square wave without Hall speed closed-loop control, square wave without Hall speed open-loop control, etc.

Electrical performance indicators

Electrical performance (ambient temperature Tj = 2 5° C)

Power supply	DC 24 V ~ 48 V DC power supply (capacity is selected according to motor power)
Maximum output current	No more than 15A (depending on the motor and rated load)
Adaptive motor	Suitable for motors with output power ≤720W

Insulation resistance	At room temperature > 500MΩ
Dielectric strength	0.5KV , 1 minute at normal temperature and pressure

Use environment parameters:

Cooling method		Natural air cooling & forced air cooling
Usage Environment	occasion	Try to avoid dust, oil mist and corrosive gas
	temperature	0 ℃ ～ +50 ℃
	humidity	< 80%RH , no condensation, no frost
	shock	< 0.5G (4.9m/s2) 10Hz-60Hz (non-continuous operation)
Storage temperature		-20 ℃ ～ +65 ℃
Dimensions		150mm x 97.2mm x 54mm
weight		About 0.42Kg

[Note] Due to the drastic changes in storage and transportation ambient temperature, condensation or frost is likely to occur. At this time, the
driver should be left for more than 12 hours and powered on only after the driver temperature is consistent with the ambient temperature

Port Description

<table>
<tr><th>Function</th><th>Logo</th><th>Illustrate</th></tr>
<tr><td rowspan="2">Indicator Lights</td><td>POWER</td><td>Green power indicator light, when powered on, it means the power is normal</td></tr>
<tr><td>AL AR M</td><td>Red status indicator
(1) The red light is off under normal circumstances;
(2) When EN is not connected to GND1, the red light is always on;
(3) In case of parameter storage failure , the red light flashes once and stops for 1s;
(4) In case of undervoltage fault , the red light flashes twice and then stops for 1 second;
(5) In case of overvoltage fault , the red light flashes 3 times and stops for 1 second;
(6) When the Hall signal fails, the red light flashes 4 times and stops for 1 second;
(7) When the motor is short-circuited , the red light flashes 5 times and then stops for 1 second;
(8) When the motor is stalled, the red light flashes 6 times and stops for 1 second;
(9) When the motor is overloaded, the red light flashes 7 times and stops for 1 second;
(10) When the motor speed is abnormal, the red light flashes 9 times and then stops for 1 second.</td></tr>
<tr><td>485 communicatio n port</td><td>RS485</td><td>Can be connected to a handheld debugger to display the speed and can also be used to set drive parameters. (Only -1 model optional)
<table>
<tr><th>Pin number</th><th>Signal</th></tr>
<tr><td>1</td><td>NC</td></tr>
</table>
</td></tr>
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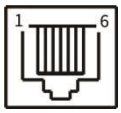
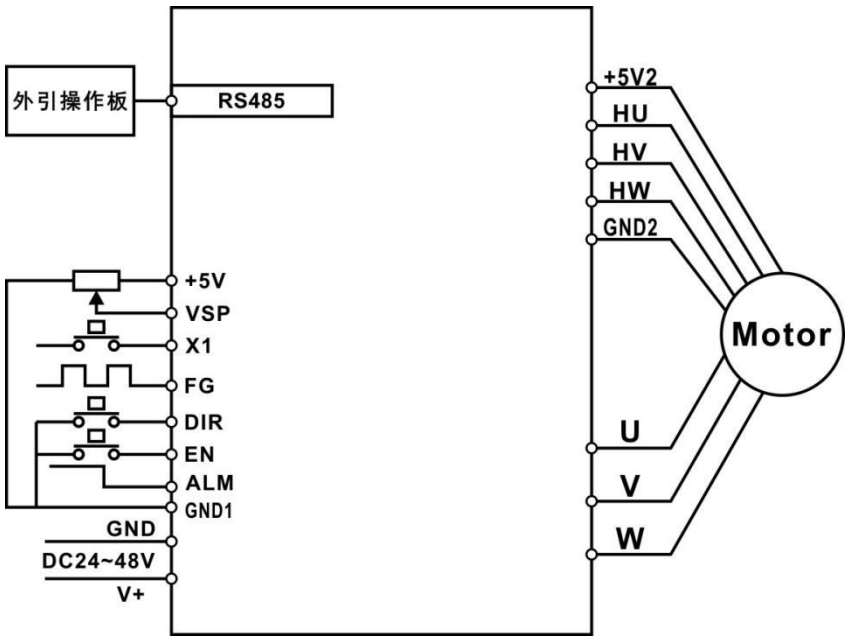
			2	NC
			3	485+
			4	GND
			5	485-
			6	GND
Control signal terminal	+5V1	Control signal power positive (built-in power output)		
	VSP	External speed control signal Control method: 1. Speed regulation is achieved by changing the VSP terminal voltage through an external potentiometer, ranging from 0 to 5.0V 2. Speed regulation is achieved by changing the PWM duty cycle through an external PWM signal with a frequency of 50 Hz -300Hz and an amplitude of +5V .		
	X1	Brake signal input, low level brake, brake status red light is always off (brake force can be adjusted according to user requirements)		
	DIR	High and low levels control the motor forward and reverse rotation. Connect GND1 and the motor will reverse (counterclockwise). If GND 1 is not connected, the motor will rotate forward (clockwise).		
	EN	Motor enable control, EN connected to GND1, the motor rotates (online state), EN not connected, the motor does not rotate (offline state, this state red light is always on)		
	GND1	Control signal power ground		
Hall signal terminal	+5V2	Motor Hall power supply positive		
	HU	Hall sensor signal U phase input		
	HV	Hall sensor signal V phase input		
	H W	Hall sensor signal W phase input		
	GND2	Motor Hall power ground		
Motor and power supply	U , V , W	Motor three-phase output signal, connected to motor winding		
	V+, GND	DC 18 V ~ 50 V power supply input (do not connect the power supply with reverse polarity)		

Functional Description

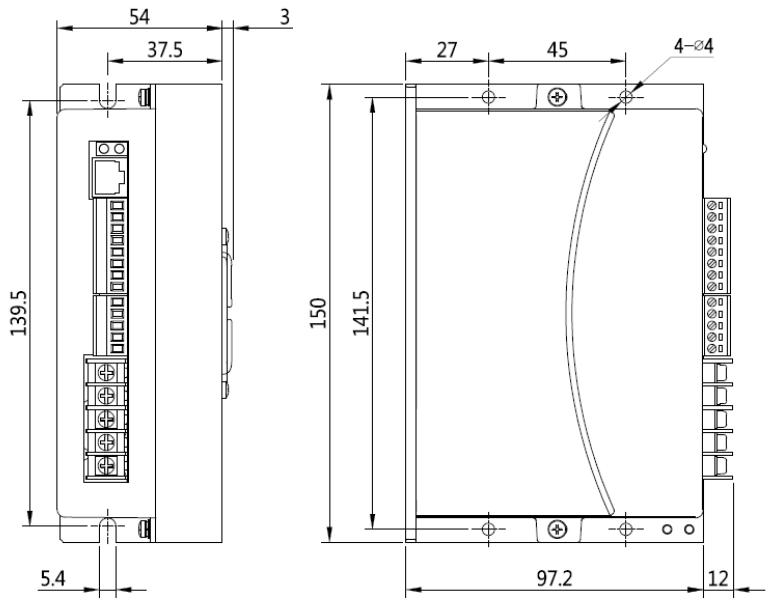
Speed regulation mode selection (VSP/PWM)	1. External input speed control : Connect the two fixed ends of the external potentiometer to the GND 1 and +5V1 ends of the driver respectively, and connect the adjustment end to the VSP end. You can use the external potentiometer (5K ~ 10K) to adjust the speed, or you can input analog voltage to the VSP end through other control units (such as PLC , single-chip microcomputer, etc.) to achieve speed control (relative to GND 1) . The acceptance range of the VSP port is DC 0V ~+5V , and the corresponding motor speed is 0~ rated speed. 2. **PWM** speed regulation: Connect the positive terminal of PWM to VSP and the negative terminal to GND1. The input frequency must be greater than 50Hz (100Hz is recommended) and the duty cycle can be changed to adjust the speed.
Braking (X1)	by switching between high and low levels of the control terminal **X1** . When X1 is at a low level, the motor stops running and the red light goes out when the brake is applied. When X1 is disconnected, the motor is allowed to run. (The braking force can be adjusted according to user requirements)

Speed signal output (FG)	The driver provides a motor speed measurement pulse signal, which is proportional to the motor speed, and the pulse output mode is optocoupler isolation output. Motor speed (RPM) = F ÷ N × 60 F = the frequency actually measured on the FG pin using a frequency meter N is the number of motor pole pairs, and an 8-pole motor has 4 pairs of poles. For example: the user selects a 4-pole motor, then: when the output SPEED signal is 200Hz , the motor speed = 200 ÷ 4 × 60 = 3000 rpm . 2. Photoelectric isolation, gate output
Motor forward/reverse signal (DIR)	By switching the high and low levels of the control terminal DIR, the forward and reverse rotation of the motor can be controlled. **Note** : To avoid sudden reversal when the motor is running at high speed, which may cause huge impact on the motor and mechanical equipment, when the DIR terminal receives the reversal signal, the driver first decelerates the motor until it stops. After stopping for about 1 second, the motor changes direction and speeds up to the set speed.
Motor start/stop signal (EN)	By switching between high and low levels of the control terminal EN . When EN is at a low level, the motor runs normally; when EN is not connected, the motor stops working and is in a free state, and the fault light is always on. When the motor is stopped by the run/stop terminal, the motor stops naturally, and its movement law is related to the load inertia.
Alarm indication (ALM)	During normal operation, the output is 5V high level (relative to GND1). When there is overvoltage, overcurrent, Hall signal error, or motor stall, the signal is 0V (relative to GND1), and the red indicator light is on.

Wiring Diagram



Dimensions (unit: mm)



Safety Matters

★ The wiring of the motor and driver must be carried out when the power is off. Do not wire with power on.

★ According to the diagram, correctly connect the power line, motor winding line and Hall signal line. Note that the order of the three phases U, V, W must be consistent with the Hall signals HU, HV, HW.

★ Please do not disassemble the driver at will to avoid damage to the device.

★ It is strictly forbidden to touch all wiring terminals during power-on operation

★ It is forbidden to operate the drive without a casing

★ Impacting the drive may cause damage

Attachment: Low voltage brushless external lead box operating instructions

1. Instructions for operating the external lead box buttons

If the handshake is successful after power-on, the monitoring parameters of the P0 area will be displayed. If the handshake is unsuccessful, -Econ- will be displayed. ▼The parameters to be monitored can be adjusted by adjusting FUNC and pressing ▲the key. Press the key to enter the specific parameter monitoring interface. Long press ▼to switch to the parameter setting interface to display Px — xx. ◀Select the bit to be set, set the parameter by adjusting ▼and ▲pressing FUNC the key, and press the key to enter the parameter value setting interface. ◀Select the bit to be set, ▼set the parameter by adjusting proc and pressing the key. After setting the parameter value, press ▲to save the setting parameter. If press FUNC, exit the parameter value setting and return to the parameter selection interface. The parameter is not saved.

2. Parameter table

Function code	Name	Parameter Range	Default Parameters	Parameter Description
P0-00	System version			
P0-01	Restore factory settings	0~1	0	
P0-02	Operation panel setting speed	50~10000	50	
P0-03	Acceleration time	1~2000	30	Unit: 0.1S
P0-04	Deceleration time	1~2000	30	Unit: 0.1S
P0-05	Motor rated speed	100~10000	3000	
P0-06	Motor pole pairs	1~32	2	
P0-07	Braking ratio	10~100	30	
P0-08	Speed command setting source	0~ 2	0	0: External potentiometer input 1: Operation panel setting 2:485 communication settings
P0-09	Potentiometer filter coefficient 1	0~1000	5	
P0-10	Potentiometer filter factor 2	0~100	5	
P0-11	External terminal filter coefficient 1	0~1000	10	
P0-12	External terminal filter coefficient 2	0~1000	2	
P0-13	Machine station number	1~250	1	
P0-14	Communication Format	0~1	0	0: 8,N,1 1: 8,N, 2
P0-15	Communication baud rate	0~4	2	0: 2400 1: 4800 2: 9600 3: 19200 4: 38400
P0-16	Bus current setting	1~100	75	Unit 0.1A
P0-17	Open loop closed loop selection	0~3	0	0: Inductive closed loop 1: Inductive open loop 2: Inductive closed loop 3: Inductive open loop
P0-18	Open loop duty cycle	5~96	5	
P0-20	Forward and reverse dead time	0~1000	10	Unit: 0.1S
P0-21	Open loop stall protection disabled	0~1	0	0: Stall protection is valid in open loop mode 1: Stall protection is invalid in open loop mode
P0-22	Motor control cycle T	1~1000	20	Unit: ms
P0-24	Motor control ratio P	0~1000	11	
P0-25	Motor Control Integral I	1~10000	3	
P0-28	Motor Control Integral I (Speed Prediction)	1~10000	10	Speed prediction integral coefficient
P0-29	Motor control	0~1500	180	

	proportional limiting			
P0-30	Sensorless starting torque	0~1000	70	
P0-31	No-sense start speed	1~500	4	

3. Monitoring display interface

dP-00	Bus voltage
dP-01	Bus current
dP-02	Potentiometer voltage
dP-03	Running speed
dP-04	Error Code
dP-05	Drive operating status
dP-06	Bus current AD sampling value

BLDL720 low voltage DC brushless driver communication protocol

The communication mode uses the standard Modbus RTU protocol. The communication format can be changed through parameter P0-14, and the communication baud rate can be changed through parameter P0-15. If 485 communication is required to control the drive, parameter P0-08 needs to be changed to 2.

The communication parameter addresses are as follows (all in decimal):

Function code	Correspondence address	Name	Parameter range	Default Parameters	Unit
P0-00	0	System version			
P0-01	1	Restore factory settings	0~1	0	
P0-02	2	Operation panel setting speed	50~10000	50	RPM
P0-03	3	Acceleration time	1~2000	30	0.1S
P0-04	4	Deceleration time	1~2000	30	0.1S
P0-05	5	Motor rated speed	100~10000	3000	RPM
P0-06	6	Motor pole pairs	1~32	2	
P0-07	7	Braking ratio	10~100	30	
P0-08	8	Speed command setting source	0~2	0	
P0-09	9	Potentiometer filter coefficient 1	0~1000	5	
P0-10	10	Potentiometer filter factor 2	0~100	5	
P0-11	11	External terminal filter coefficient 1	0~1000	10	
P0-12	12	External terminal filter coefficient 2	0.~1000	2	
P0-13	13	Machine station number	1~250	1	
P0-14	14	Communication Format	0~1	0	
P0-15	15	Communication baud rate	0~4	2	
P0-16	16	Bus current setting	1~100	75	0.1A

P0-17	17	Open loop closed loop selection	0~1	0	
P0-18	18	Open loop duty cycle	5~96	5	
P0-19	19	Fan operation mode	0~1	0	0:The system temperature exceeds 40 degrees and the fan is running 1: When the enable pin is short-circuited, the fan runs
P0-20	20	Forward and reverse dead time	0~1000	10	Unit: 0.1S
P0-21	21	Open loop stall protection disabled	0~1	0	0: Stall protection is valid in open loop mode 1: Stall protection is invalid in open loop mode
P0-22	22	Motor control cycle T	1~1000	20	Unit: ms
P0-24	24	Motor control ratio P (low speed)	0~1000	11	
P0-25	25	Motor control integral I (low speed 1)	1~10000	3	
P0-28	28	Motor Control Integral I (Low Speed 2)	1~10000	10	
P0-29	29	Motor control proportional limiting	0~1500	180	
P0-30	30	Sensorless starting torque	0~1000	70	
P0-31	31	No-sense start speed	1~500	4	

The operation status addresses are as follows (all in decimal):

Correspondence address	Name	Unit
200	Bus voltage	V
201	Bus current	0.1A
203	Running speed	RPM
204	Fault number	

The running command addresses are as follows (all in decimal):

Correspondence address	Name	Scope
1000	Motor start and stop control	0: Motor stopped 1: Motor running
1001	Motor running direction	0: Forward 1: Reverse

Address 0 is read-only, 1~31 are readable and writable, 200~203 are read-only, and 1000~1001 are write-only.

Example

Motor start running: 01 06 03 E8 00 01 C8 7A

Motor stops running: 01 06 03 E8 00 00 09 BA

Set the motor speed to 1000RPM: 01 06 00 02 03 E8 28 B4

Actual motor speed: 01 03 00 CB 00 01 F5 F4