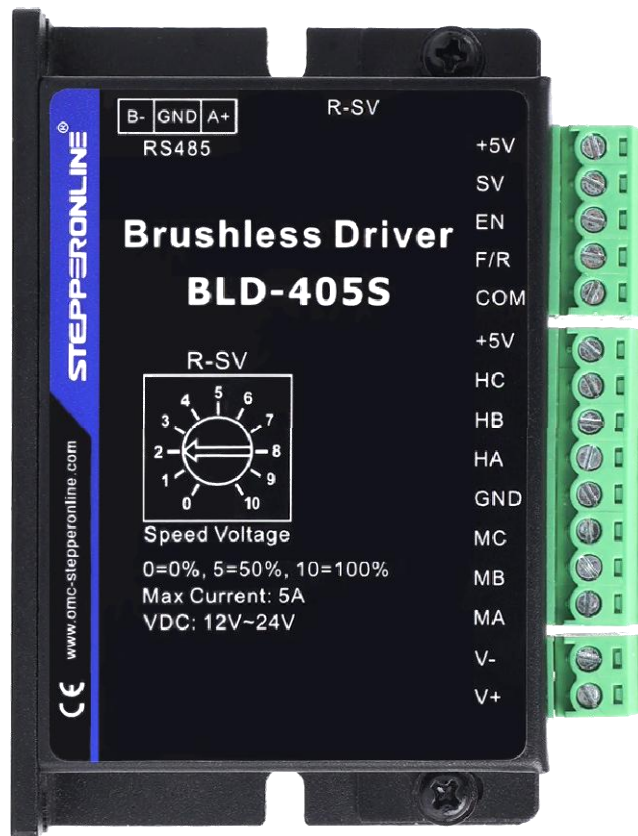




User Manual

BLD-405S

Brushless DC Motor Driver



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Read the operating instructions carefully before putting the driver into operation with power

Introduction

This series of control drivers uses a closed-loop speed controller and employs IGBT and MOS power devices. It utilizes the Hall signals of the DC brushless motor after frequency multiplication to achieve closed-loop speed control. The control loop has a PID speed regulator, making the system control stable and reliable. Especially at low speeds, it can always reach the maximum torque. The speed control range is from 150 to 20,000 rpm.

1. Features

- PID speed and current dual-loop regulator
- High performance at a low price
- 20kHz PWM frequency
- Electrical brake function to enable rapid motor response
- Overload factor greater than 2, enabling maximum torque at low speed
- Fault alarm functions for overvoltage, under-voltage, over-current, over-temperature, peak current, and Hall signals
- Communication mode using standard Modbus protocol, compliant with national standard GB/T 19582.1-2008. Uses RS485 two-wire serial link communication with RTU transmission mode.

2. Specifications

2.1 Electrical Specification

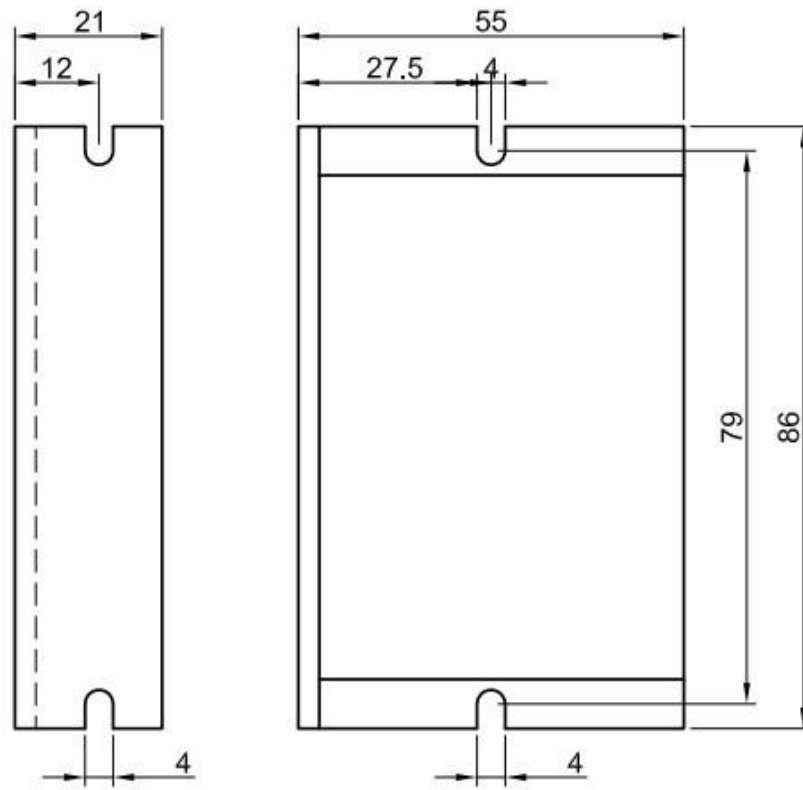
Parameters	BLD-405S		
Input voltage (VDC)	12	24	36
Continuous Output Current (A)	4	4	3.3
Rated Output Power (W)	50	100	120
Peak Current(A)	5		

2.2 Environment

Cooling	Radiator
Control Signal I/O	Full Isolation
Working Temperature	0~+45°C
Storage Temperature	-20~+85°C
Working & Storage Humidity	<85% (No Frosting)
Protection Functions	Over-current, overheat, over-speed, over-voltage, under-voltage, power supply abnormality control

2.3 Mechanical Specification

(Unit: mm [1inch=25.4mm])



Dimension: 86x55x21mm

2.4 Safety Precautions

Do not measure or touch any components without housing while operating

This product is powered by a DC power supply.

Please confirm that the positive and negative poles of the power supply are correct before powering on.

Do not plug or unplug the connecting cable when the power is on, and no short-circuiting of the cable is allowed when the power is on, otherwise the product will be damaged.

Should check soleplate or change fuse 1minter later after power off.

Operating without housing is forbidden

Make sure to connect the ground terminal, otherwise the brushless motor will work unsteadily

If the motor needs to change direction while it is running, it must first decelerate till stop, and then change direction.

The driver is a power device and it is important to maintain good heat dissipation and ventilation in the working environment.

Sudden damage while drives working, our company only renders the service and replace in guarantee. Personal injury and motor damage caused by the accident will invalidate the guarantee

This product is professional electrical equipment and should be installed, debugged, operated and maintained by professional and technical personnel. Improper use will cause electric shock, fire, explosion and other dangers.

3. Terminal Connection

3.1 Power Input

No.	Terminal Name	Description
1	V+	12VDC~36VDC input
2	GND	GND input

3.2 Motor Input

No.	Terminal Name	Description
1	MA	Motor phase A
2	MB	Motor phase B
3	MC	Motor phase C
4	GND	Negative ground wire of Hall signal
5	HA	Hall signal A phase input terminal
6	HB	Hall signal B phase input terminal
7	HC	Hall signal C phase input terminal
8	+5V	Positive power supply of Hall signal

3.3 Control the Signal

No.	Name	Description
1	GND	Signal ground
2	FR	Forward / Reverse
3	EN	Start / Stop
4	SV	Analogy signal input
5	+5V	Ground

GND: Signal ground

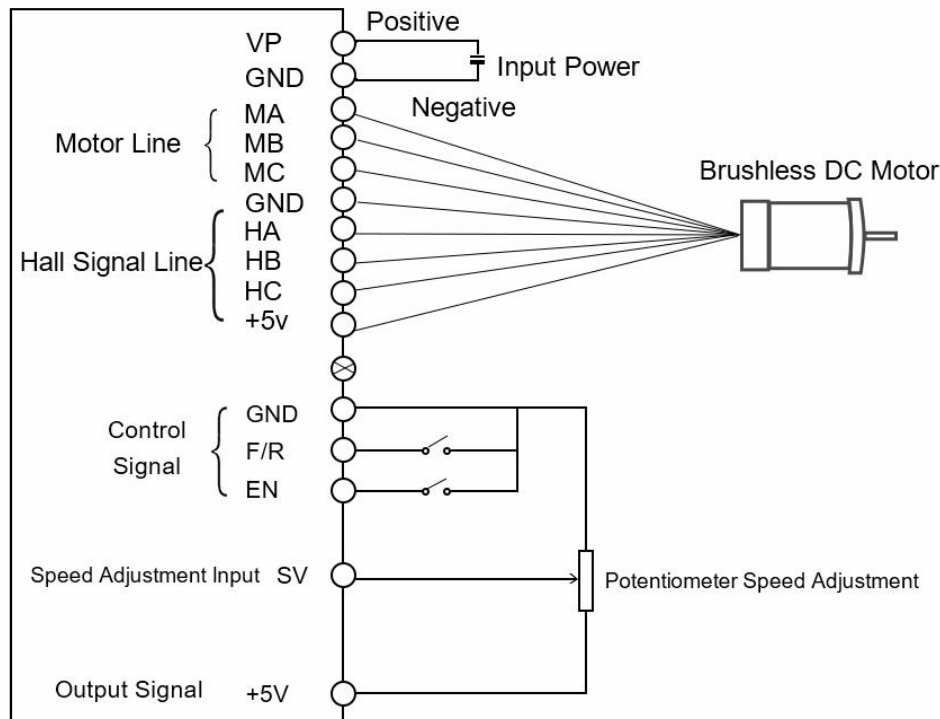
F/R: Forward/Reverse control. To reverse the motor, connect it to GND and do not connect it to switch it in the forward direction. When switching between forward and reverse, the EN should be turned off first.

EN: When EN is connected to GND, the motor rotates (online state). When EN is not connected, the motor does not rotate (offline state).

SV: External speed attenuation: It can be attenuated from 0 to 100%. When the external speed command is connected to 5V, the speed can be adjusted through this potentiometer.

+5V: Speed control voltage output, which can be continuously adjusted by the potentiometer on SV and GND.

Wiring diagram of the driver and the brushless motor:



4. Functions and Usage

4.1 Speed Adjustment Method

4.1.1 External input speed regulation: Connect the two fixed terminals of an external potentiometer to the GND and +5v terminals of the driver respectively, and connect the adjustment terminal to the SV terminal, and then you can use the external potentiometer (10K~50K) to adjust the speed.

4.1.2 Through other control units (such as PLC, single-chip microcomputer, etc.) input analog voltage to the SV terminal to adjust the speed (relative to GND). The acceptance range of the SV port is DC 0V~+5V, and the corresponding motor speed is 0~rated speed.

4.1.3 You can also change the motor speed by command through communication mode.

⚠ When the speed control voltage is below 0.3V, the motor will stop. Therefore, the minimum speed of the motor is approximately 5% of the rated speed, which is 150rpm.

4.2 Motor Operate/Stop Control (EN)

By controlling the on/off state of the EN terminal relative to GND, the operation and stop of the motor can be controlled. When the terminal is connected, the motor runs, and vice versa, the motor stops. When the motor is stopped by using the run/stop terminal, it will come to a natural stop, and its motion characteristics are related to the load inertia.

4.3 Motor Rotation Direction Control (F/R)

The direction of the motor can be controlled by connecting or disconnecting terminal F/R and terminal GND. When F/R is not connected to terminal GND, the motor runs clockwise (facing the motor shaft) and vice versa for counterclockwise rotation. Attention: To avoid damage to the driver when changing the motor direction, the motor should be stopped before the direction changing to avoid performing direction operations while the motor is running.

4.4 Driver Failure

When there is over-voltage or over-current inside the drive, the drive will enter a protection state, automatically stop working, the motor will stop, and the blue light on the drive will go out. To clear the alarm, the enable terminal (that is, disconnecting EN and GND) or power must be disconnected. If this fault occurs, please check the motor wiring or motor

load.

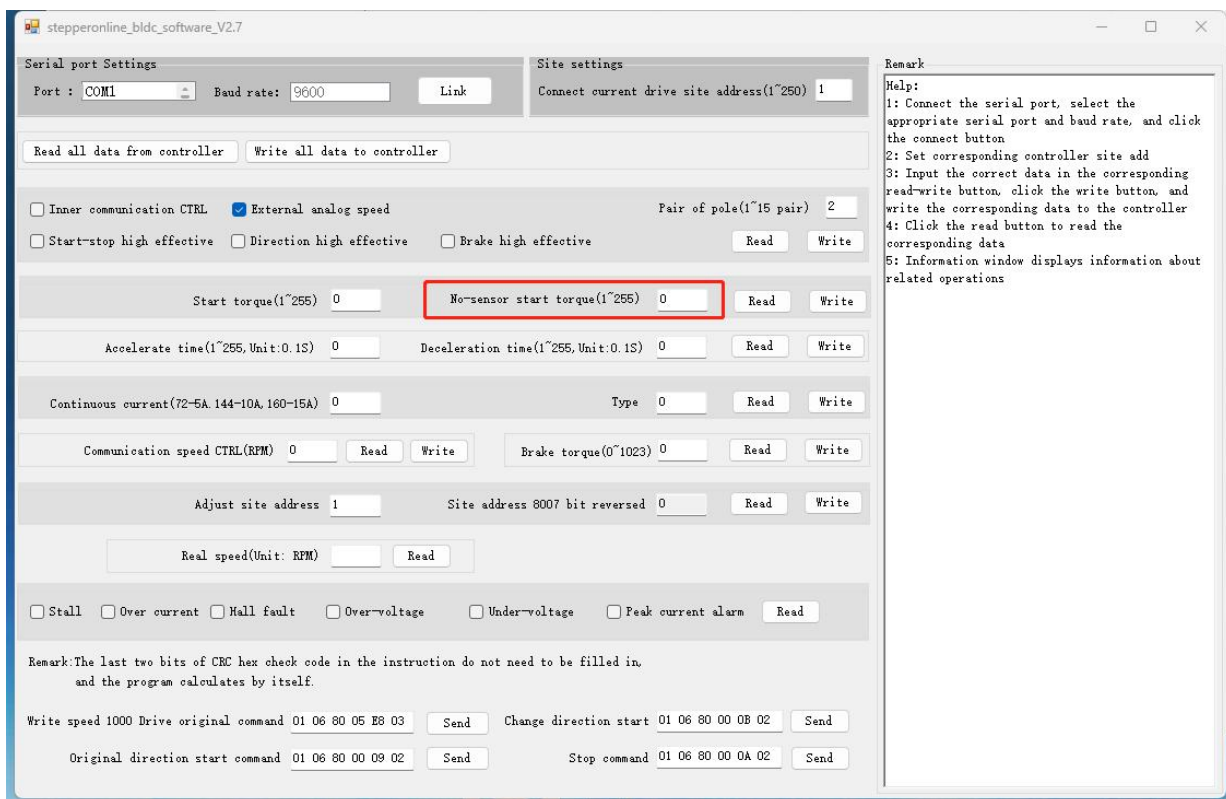
4.5 Sensorless control mode

STEPPERONLINE drivers can be used for sensorless brushless motors.

But it should be noted that since our brushless driver is mainly used for our brushless motor with sensors, its built-in program is also used for motors with sensors.

Although our brushless driver can be used for sensorless brushless motors, the program of the driver is not fully compatible and can only be used in simple scenarios. Our brushless drives are not recommended if the motor needs to be started and stopped frequently.

When using a brushless driver to drive a sensorless motor, it is necessary to use software to set the sensorless starting torque according to the parameters of the motor.



5. Communication Method

The communication mode uses the standard Modbus protocol, which complies with the national standard GB/T 19582.1-2008. It uses a serial RS485 two-wire communication line, and the physical interface uses a conventional 3-pin 2.54 wiring port (A+, GND, B-) terminal, making serial connections very convenient. The transmission mode is RTU, the verification mode is CRC, and the CRC starting word is FFFFH. The data mode is 8-bit asynchronous serial with 1 stop bit and no parity bit, and supports a communication rate of 57600.

Function code 03H supports reading multiple registers, while function code 06H supports writing to a single register.

Site addresses are as follows:

00: broadcast address

1-250: user address

251-255: Special address, users can not use.

No.	Address	Parameter name	Setting range	Default	unit	Remark
00	\$8000	First byte: control bit state Second byte: Hall angle and number of pole pairs of motors	First byte: Bit0: EN Bit1: FR Bit2: BK Bit3: NW Bit4: MDX Bit5: X12 Bit6: KH Second byte: Bit0-3: number of pole pairs 1-15 Bit4-7: hall angle 0: 120	00H 02H		
01	\$8001	The maximum rotational speed of analogue speed regulation	0-65535	6000	Rpm	
02	\$8002	First byte: start torque Second byte: sensorless start speed	1-255	40H		
03	\$8003	First byte: acceleration time Second byte: deceleration time	1-255	0	0.1s	
04	\$8004	First byte: Maximum current The second byte: the model		90H 0FH		144 corresponds to 13A 15 Have a feeling 16 No feeling
05	\$8005	Communication speed setting	(Closed-loop 0-65535) (Open loop 0-255)	2000 81%	RPM	
06	\$8006	Braking force	0-1023	1023		
07	\$8007	First byte: site address Second byte: reserve	1-250	1 0		
10-17		\$8010-\$8017	Reserved			
18	\$8018	Actual motor speed				
19	\$8019	First byte: bus voltage The second byte: bus current				Invalid
1A	\$801A	First byte: control port status Second byte: the analog port value	Bit0: SW1 Bit1: SW2 Bit2: SW3 Bit3: SW4			Invalid

1B	\$801B	First byte: the fault status The second byte: Motor running state	Bit0: locked rotor Bit1: over current Bit2: hall value abnormal Bit3: Bus voltage too low Bit4: Bus voltage too high Bit5: Current peak alarm Bit6: Reserved Bit7: Reserved			
1C		\$801C-\$801F	Reserved			
20		Over \$8020 illegal				

Addresses 8000H—8017H are read and write registers

Addresses 8018H-801FH are read-only registers

Other addresses are illegal

8000: first byte:

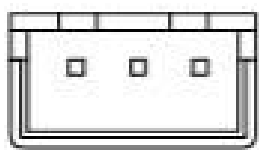
EN: when NW=0,	0: external EN low level effective	1: external EN high level effective
when NW=1,	0: EN ineffective	1: EN effective
FR: when NW=0,	0: FR low level effective	1: external FR high level effective
when NW=1,	0: FR ineffective	1: FR effective
BK: when NW=0,	0: external BK low level effective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

NW	MDX	X12	Function
0	0	X	External analog speed
1	X	X	Internal communication control

6. Communication Wires Connection

RS-485 communication can be carried out through a regular 3-pin 2.54 wiring port.

The pin definitions of a regular 3-pin 2.54 wiring port are as follows:



Pin	Function
1	A
2	GND
3	B