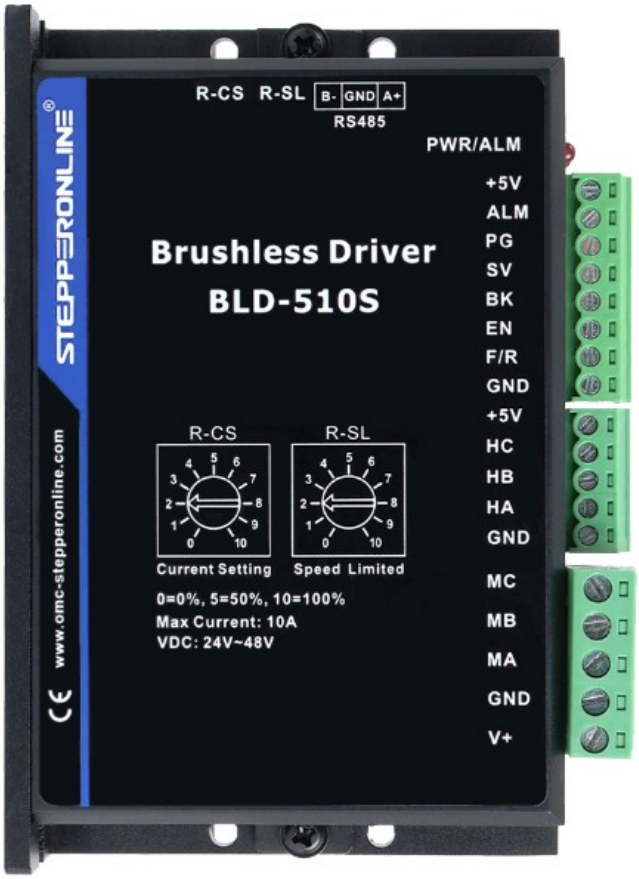
User Manual

BLD-510S

Brushless DC Motor Driver



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

Introduction

This brushless motor driver is a driver independently developed by STEPPERONLINE to cooperate with the field of modern industrial automatic control. It mainly uses high-performance dedicated brushless DC motor driver chips, which have high integration, small size, complete protection, simple and clear wiring, and high reliability. The driver is suitable for driving small and medium-sized brushless DC motors with a rated power below 200W. The driver adopts a new type of PWM technology to make the brushless motor run at high speed, low vibration, low noise, good stability and high reliability.

1. Features

- High performance and low price
- PID speed, current double loop regulator
- 20KHZ chopper frequency
- 2 times overloading capacity
- Build with over-voltage, under-voltage, over-current, over-temperature, Hall signal illegal and other error alarm functions

2. Specifications

2.1 Electrical Specification

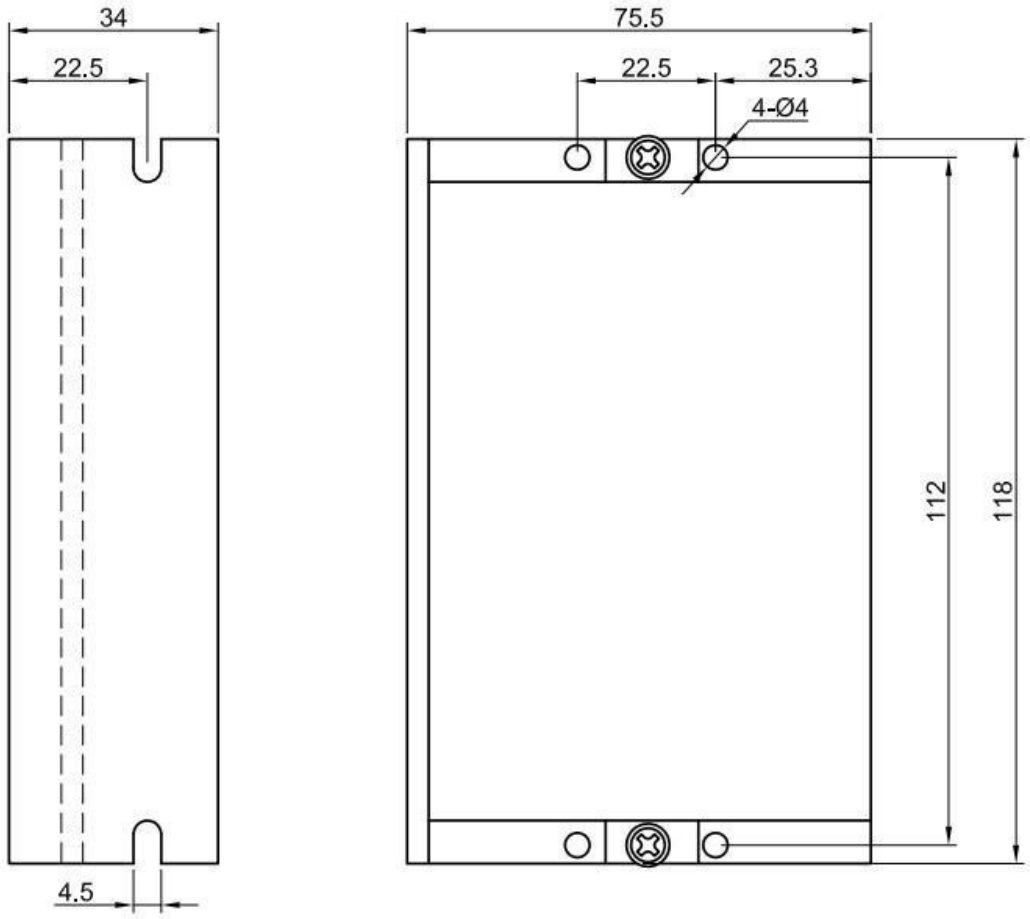
Parameters	BLD-510S			
Input voltage（VDC）	12	24	36	48
Continuous Output Current（A）	10	8.3	5.5	4.2
Rated Output Power（W）	120	200	200	200
Peak Current(A)	13			

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: 118x75.5x34mm

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+	24VDC~48VDC input
2	GND	GND input

3.2 Motor Input

No.	Terminal Name	Description
1	MA	Motor A phase
2	MB	Motor B phase
3	MC	Motor C phase
4	GND	GND
5	HA	Hall signal A phase input
6	HB	Hall signal B phase input
7	HC	Hall signal C phase input
8	+5V	Hall signal power line

3.3 Control the Signal

No.	Terminal Name	Description
1	GND	Signal ground
2	F/R	CW/CCW terminal
3	EN	Stop/Start terminal
4	BK	Brake terminal
5	SV	Analogy signal input terminal
6	PG	Speed output terminal
7	ALM	Alarm output terminal
8	+5V	+5V power output terminal

Built-in potentiometer R-SL: Adjust the motor speed gain, which can be adjusted from 0~100%.

Built-in potentiometer R-CS: Maximum protection current setting, built-in potentiometer can be set 0%~100% continuous current protection.

4. Function and Usage

4.1 Speed Adjustment Method

The driver offers the following three speed adjustment methods, one of which can be selected by the user as follows: Inner potentiometer speed adjustment: turn the potentiometer on the drive panel counterclockwise to reduce the motor speed and clockwise to increase it. The potentiometer must be set to minimum when the user uses an external input for speed adjustment.

External input speed adjustment: connect the two fixed terminals of the external potentiometer to the GND and +5v terminals of the driver respectively, and connect the adjustment terminal to the SV terminal to adjust the speed using the external potentiometer (10K~50K), or through other control units (e.g. PLC, microcontroller, etc.) to input the analogue voltage to the SV terminal to achieve speed adjustment (relative to GND), the SV port accepts a range of DC 0V~+5V, corresponding to the motor rotation speed of 0~rated speed.

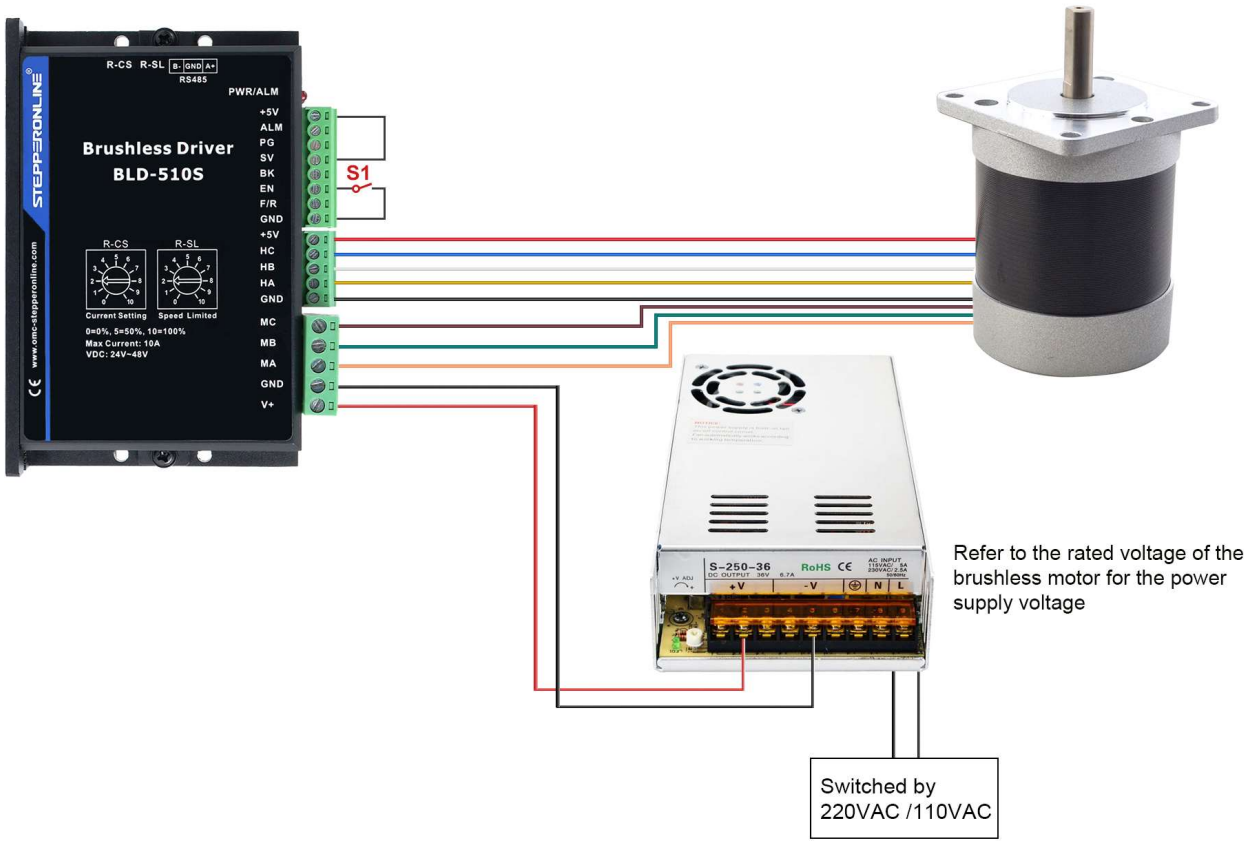
An external digital signal can also be used to regulate the speed: A pulse width digital signal (PWM) with amplitude of 5V and frequency of 1KHz to 2KHz can be applied between SV and GND for speed adjustment, and the motor speed is adjusted linearly according to the duty cycle. In this case, the SV digital signal amplitude can be attenuated by adjusting the R-SL potentiometer by a ratio of 0 to 1.0, usually by setting the R-SL to 1.0. No attenuation is applied to the SV input digital signal.

The motor speed can also be changed by command via communication method.

When the speed control voltage is below 0.3V, the motor will stop.

4.2 Built-in Potentiometer Speed Control Wiring Diagram

Currently the driver has 2 versions, V2.0 and V2.4. For V2.0 Version, motor runs when the terminal is switched on and conversely the motor stops. While for V2.4 version, motors only runs when the terminal is switched off and conversely the motor stops.



4.3 Motor run/stop control (EN)

The motor can be controlled to run and stop by controlling the switch-on and switch-off of the terminal EN in relation to GND. Currently the driver has 2 versions, V2.0 and V2.4. For V2.0 Version, motor runs when the

terminal is switched on and conversely the motor stops. While for V2.4 version, motors only runs when the terminal is switched off and conversely the motor stops. When the motor is stopped using the run/stop terminal control, the motor is stopped naturally. The law of motion is related to the load inertia.

4.4 Motor forward/reverse control (F/R)

The direction of motor operation can be controlled by controlling the connection of terminal F/R to terminal GND. When F/R and terminal GND are not switched on, the motor runs clockwise (facing the motor shaft), and vice versa, the motor runs counterclockwise. To avoid damage to the drive, when changing the motor steering, the motor should be stopped before operating to change the steering. Changing the direction of operation while the motor is running should be avoided.

4.5 Braking Stop (BK)

The braking stop of the motor can be controlled by the connection of control terminal BK to terminal GND. When control terminal BK is disconnected from terminal GND, the motor runs, when it is switched on the motor quickly brakes to a stop, braking stop is faster than natural stop, the specific stopping time is related to the load inertia of the user's system.

Attention: As the brake stop has a bad impact on both the electrical and the mechanical, a natural stop should be used if there are no special stopping requirements.

4.6 Motor Speed Signal Output (PG)

The speed pulse output is a 5V pulse output, to obtain the signal a pull-up resistor of 3K ohm ~10K ohm should be connected to the power supply. The number of output pulses per revolution of the motor is 3 x N, N being the number of pairs of poles of the motor. For example: 2 pairs of poles, i.e. a four-pole motor, 6 pulses per revolution. When the motor speed is 500 rpm, the output pulse of the terminal PG is 3000.

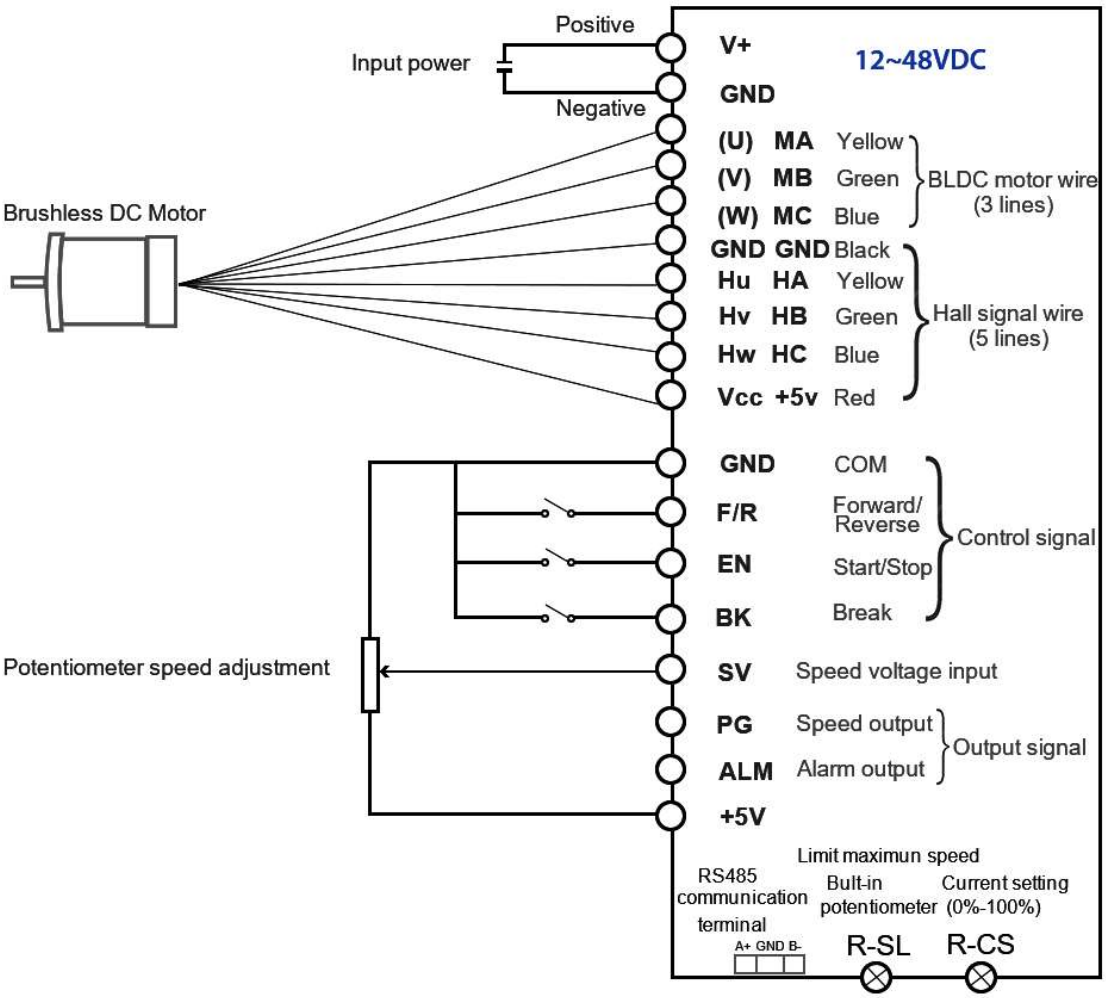
4.7 Alarm Output (ALM)

Alarm output of the driver: this terminal is low during an alarm. To obtain a signal, a pull-up resistor of 3K ohm to 10K ohm should be connected to the power supply. When the alarm is on, this terminal is connected to GND (low level) and the driver stops itself and is in alarm.

4.8 Driver Failure

If a fault occurs inside the driver such as overvoltage or overcurrent, the driver enters a protection state, the driver will automatically stop working, the motor stops and the red light on the driver is always on. The driver can only disarm the alarm if the enable terminal is reset (i.e. EN is disconnected from GND) or if power is cut off. Please check the motor wiring or remove the load if this fault occurs.

4.9 Connection Diagram of Brushless Motor and Driver



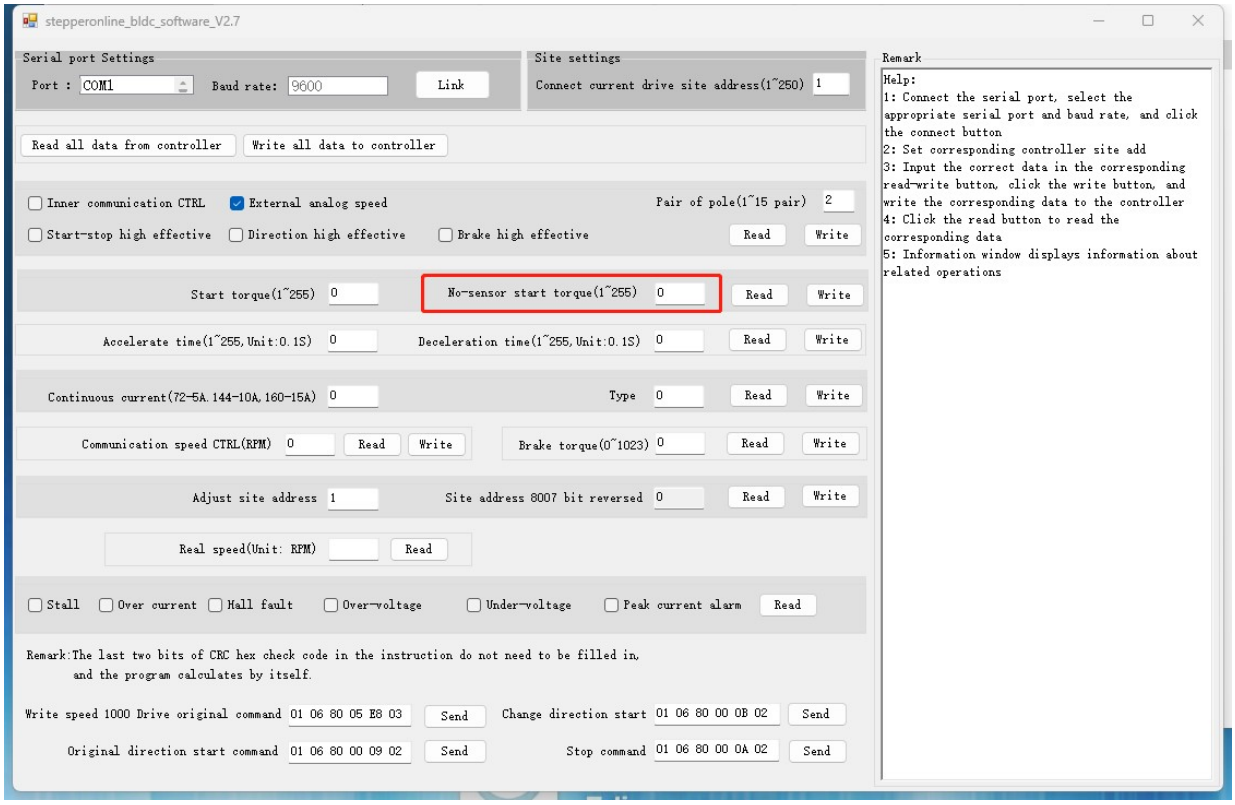
4.10 Sensorless control mode

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 dual-line serial communication based on RS485, and the physical interface adopts a conventional 3-pin 2.54 wiring terminal (A+, GND, B-) which is easy to connect in series. The transmission mode is RTU, and the verification mode is CRC, with the CRC starting word being FFFFH. The data mode is 8-bit asynchronous serial, with 1 stop bit and no parity bit. It supports multiple communication speeds (see parameter table for details) Function parameter support 03H multi-register read, 06H single register write.

Site address: 00: Broadcast address

1-250: User address

251-255: Special address, not available to users

No.	Addres	Name	Setting Range	Default	Unit	
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 NW=1: 485 control start stop speed regulation, NW=0: External IO control start/stop, analog to adjust speed Bit4: MDX(invalid) Bit5:X12(invalid) Bit6: KH Second byte: Bit0-3: number of pole pairs 1-15 Bit4-7: hall angle 0:120	00H 04H		
01	$8001	Maximum speed for analogue speed regulation	0-65535	6000	RPM	Jumper cap control
02	$8002	First byte: start torque Second byte: sensorless start speed	1-255 1-255	40H 04H		
03	$8003	First byte: acceleration time Second byte: deceleration time	1-255	0 0	0.1s	
04	$8004	First byte: maximum current Second byte: model		90H 0FH		144 corresponds to 13A 15 Sensored, 16: Sensorless
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				Return value hexadecimal to decimal multiplied by 20 divided by the number of motor poles
1B	$801B	First byte: fault state 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				

Address: 8000H-8017H are read and write registers

Address: 8018H-801FH are read-only registers

Other addresses are illegal

8000: First byte:

EN: At NW=0,	0: external EN low valid	1: external EN high valid
At NW=1,	0: EN not valid	1: EN valid
FR: At NW=0,	0: external FR low valid	1: external FR high valid
At NW=1,	0: FR not valid	1: FR valid
BK: At NW=0,	0: external BK low valid	1: external BK high valid
At NW=1,	0: BK not valid	1: BK valid
KH:	0: Speed closed-loop mode	1: Speed open-loop mode

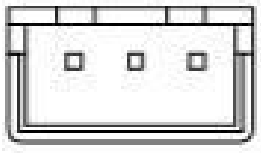
NW	MDX	X12	Function
0	0	X	External analog speed
1	X	X	Internal communication control

2 pole pair start	01 06 80 00 09 02 27 9B
Write speed 1000	01 06 80 05 E8 03 BE 0A
Write speed 1500	01 06 80 05 DC 05 28 C8
Natural stop	01 06 80 00 08 02 26 0B
Braking stop	01 06 80 00 0D 02 25 5B

6. Communication Wires Connection

RS-485 communications can be made by driving a conventional 3-pin 2.54 wiring port device.

The pinout of the conventional 3-pin 2.54 wiring port is defined as follows:



Pin	Function
1	A
2	GND
3	B