Brushless DC Motor Drive

NSP-BLDC4830B V2.0 User and Operation Manual

Main Features

- Current-loop controller design, high torque at low speeds, smooth operation.
- High torque and high speed output, the maximum speed is 10000rpm/min (Depending on the motor speed).
- Speed control methods: Analog (0-5V), PWM(10Hz-300Hz).
- Equipped with signal input terminals including EN (Start/Stop), DIR (Direction), and Brake (Electromagnetic Brake).
- Protections include overcurrent, overvoltage, undervoltage, and motor stall.

Product Overview

The NSP-BLDC4830B brushless DC (BLDC) motor drive is the latest high-tech product launched by our company, targeting the medium-power brushless motor drive field. This product adopts large-scale integrated circuits (LSIC) to replace the original hardware design, featuring higher anti-interference capability and fast response performance. It is suitable for driving any three-phase low-voltage BLDC motor (with or without Hall sensors) with a peak current of less than 35A and a power supply voltage ranging from DC 18V to 60V, and boasts the characteristic of low temperature during high-current operation. The product is applied in a series of electrical automation control fields such as knitting equipment, medical equipment, food packaging machinery, and power tools.

Function Overview

1. Square Wave Hall Sensor-based Open-Loop Speed Control
2. Square Wave Hall Sensor-based Closed-Loop Speed Control
3. Square Wave Hall Sensorless Open-Loop Speed Control
4. Square Wave Hall Sensorless Closed-Loop Speed Control
5. Sine Wave Hall Sensor-based Open-Loop Speed Control
6. Sine Wave Hall Sensor-based Closed-Loop Speed Control
7. Sine Wave Hall Sensorless Open-Loop Speed Control
8. Sine Wave Hall Sensorless Closed-Loop Speed Control

Electrical Specifications

Electrical Performance (at ambient temperature Tj=25°C)

Parameter	Specification
Power Supply	DC18V - 60V
Rated Current	≤35A (Depending on the matched motor and rated load)
Rated Power	Max. 1500W (Do not use with motors exceeding the drive's power rating)

Insulation Resistance	>500MΩ at room temperature
Insulation Strength	0.5 KV for 1 minute at normal temperature and pressure

Environmental Parameters

Parameter		**Specification**
Cooling Method		Natural air cooling (Forced air cooling is recommended)
Environment	Application	Avoid dust, oil mist and corrosive gases
	Temperature	0℃～+50℃
	Humidity	<80%RH, non-condensing, no frost
	Vibration	＜0.5G（4.9 m/s²）10Hz-60Hz (non-continuous operation)
Storage Temperature		-20℃～+65℃
Dimensions		178 × 108.5 × 68 mm
Weight		886.7g

Note: Due to drastic temperature changes during storage/transportation, condensation or frost may form. In this case, allow the drive to sit for at least 12 hours so its temperature equalizes with the ambient temperature before powering on.

Port Wiring Instructions

Function	**Label**	**Description**
Indicators	POWER	Green power indicator light: Illuminates when powered on, indicating a normal power supply.
	ALARM	Red status indicator. Slow flash: Waiting. Fast flash: Running. Solid on: Fault or off-line.
Communication Ports	RS232/RS485/CAN	For configuring drive parameters and controlling the drive via a computer.
Control Signal Terminals	+5V	Control signal power positive (built-in power output).
	VSP	External speed control signal. Control method: Adjust the voltage at the VSP terminal via an external potentiometer to achieve 0~100% speed regulation (voltage range: 0~5V).

	DIR	Motor forward/reverse control. - Connect DIR to GND: Motor rotates in reverse (CCW: counterclockwise). - DIR not connected or connected to +5V: Motor rotates forward (CW: clockwise).
	EN	Motor enable control. - Connect EN to GND: Drive disabled. - EN not connected or connected to +5V: Drive enabled.
	FG	Motor speed pulse output. The motor's actual speed can be calculated by measuring the frequency of this signal.
	ALM	Fault Alarm Output (Active High)
	Brake	Motor Enable Control: Connect Brake to GND to stop the drive; Leave Brake unconnected or connect to +5V to allow the drive to operate.
	GND	Control signal power supply ground.
Hall Sensor Terminals	+5V	Motor Hall power supply positive.
	HA	Hall phase A signal input.
	HB	Hall phase B signal input.
	HC	Hall phase C signal input.
	GND	Motor Hall power ground.
Motor & Power Terminals	U, V, W	Motor three-phase output signals. Connect to motor windings.
	GND, V+	DC power supply input (DC 18V to 60V).

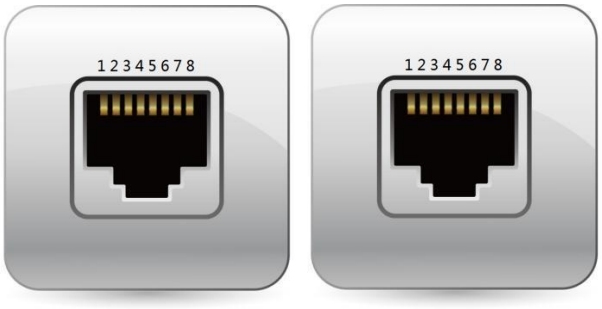
Function Instruction

Speed Control Method (VSP)	1. External potentiometer speed control via VSP port: Connect the two fixed terminals of an external potentiometer (5KΩ–10KΩ) to the drive’ s GND and +5V terminals respectively, and the adjustable terminal to the VSP port. Speed control can be achieved either by the external potentiometer, or by inputting an analog voltage (relative to GND) to the VSP port via other control units (e.g., PLC, MCU, etc.). The voltage range of the VSP port is DC 0V – +5V, corresponding to a motor speed range of 0 to rated speed.
	2. PWM signal speed control via VSP port: Connect the positive terminal of the PWM signal to the VSP port and the negative terminal to GND. Speed control is realized by changing the PWM duty cycle, with the PWM signal set at a frequency of 100Hz –

	100KHz and an amplitude of +5V.
Motor Forward/Reverse Signal (DIR)	The motor’s forward/reverse rotation can be controlled by switching the high/low level of the DIR terminal. **Note:** in order to avoid sudden commutation when the motor is running at high speed, which will cause a huge impact on the motor and mechanical equipment, when the DIR terminal receives the commutation signal, the drive will decelerate the motor until it stops, and then the motor will change direction and accelerate to the set speed.
Motor Start/Stop Signal (EN)	The motor’s stop and operation can be controlled by switching the high/low level of the EN terminal. - When EN is at a high level or not connected: The motor operates normally. - When EN is at a low level: The motor stops working. - When the start/stop terminal is used to control the motor to stop, the motor stops naturally, and its movement law is related to load inertia. The factory setting is EN enabled (motor allowed to operate).
Speed Signal Output (FG)	Speed Measurement Signal Output (FG) The drive provides a motor speed measurement pulse signal, which is proportional to the motor speed. Speed Calculation Formula: Motor speed (RPM) = F ÷ N × 60 Where: F = Actual frequency measured at the FG pin with a frequency meter. N = Number of motor pole pairs (N=2 for 2-pole-pair motors; N=4 for 4-pole-pair motors). Example: If a 4-pole-pair motor is used and the measured FG signal frequency is 200 Hz, the motor speed = 200 ÷ 4 × 60 = 3000 RPM.
Alarm Signal Output (ALM)	Low level = Drive fault-free; High level = Drive faulty.
Electromagnetic Brake (Brake)	Stops drive immediately; Locks motor when motor is disabled.

Communication Interface

(1) Front View Diagram of Ethernet Port



(2) RS232 Interface

Ethernet Port No.	DB9 Pin No.	Notes
6-RXD	2	External computer serial port TXD
5-TXD	3	External computer serial port RXD
3-GND	5	Signal Ground

Table 2

(3) Bus Interface (Pin numbers 1-8 according to the direction of the film text):

Pin No.	Name	Notes
8	CAN_H	CAN Bus H
7	CAN_L	CAN Bus L
2	RS485B	RS485 Bus B
1	RS485A	RS485 Bus A

Table 3

Note: The RS485/CAN communication termination resistor DIP switch is located on the side of the drive. Toggle down to enable the resistor. R120Ω is the RS485 termination resistor. C120Ω is the CAN termination resistor.

Alarm Information Query

Red LED flashes when a fault occurs:

Alarm Status	
Fault Cause	**Red LED Flash Count**
Undervoltage	2 on/off
Overvoltage	3 on/off
Overcurrent	4 on/off
Overspeed	5 on/off
Overload	6 on/off
Hall Sensor Fault	7 on/off
Short Circuit Fault	8 on/off

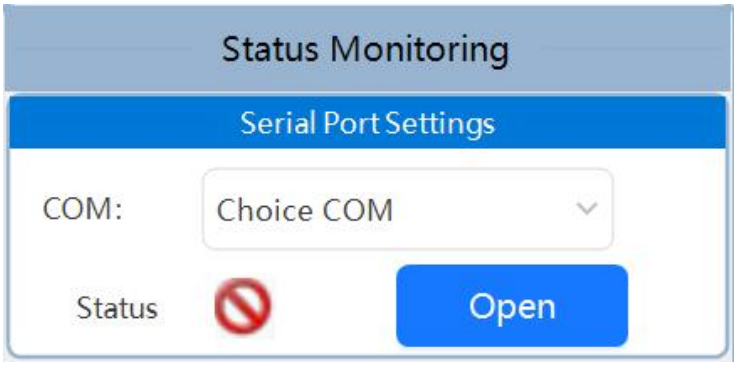
Table 4

Debugging Software Setup Example

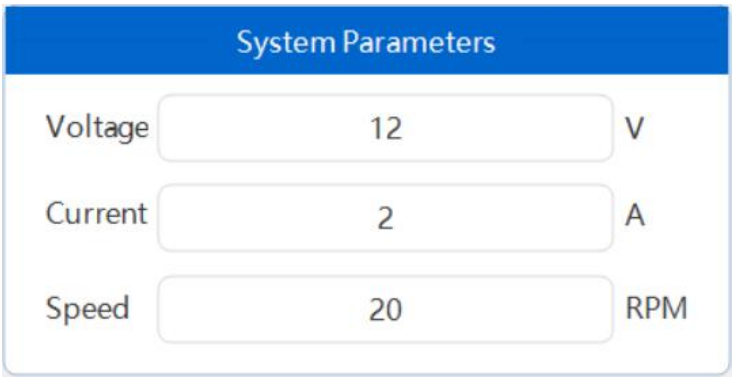
(1) Establishing Communication: First, establish the hardware connection by attaching the debugging cable to the RS232 interface of the drive and connecting the other end to a USB-to-serial adapter.

(2) Check the computer's serial port number: In Device Manager, check the Ports section to identify which COM port corresponds to the USB-to-serial adapter. The figure below shows normal port details. If the serial port has no drive installed, a yellow exclamation mark will appear, indicating that the drive needs to be installed.

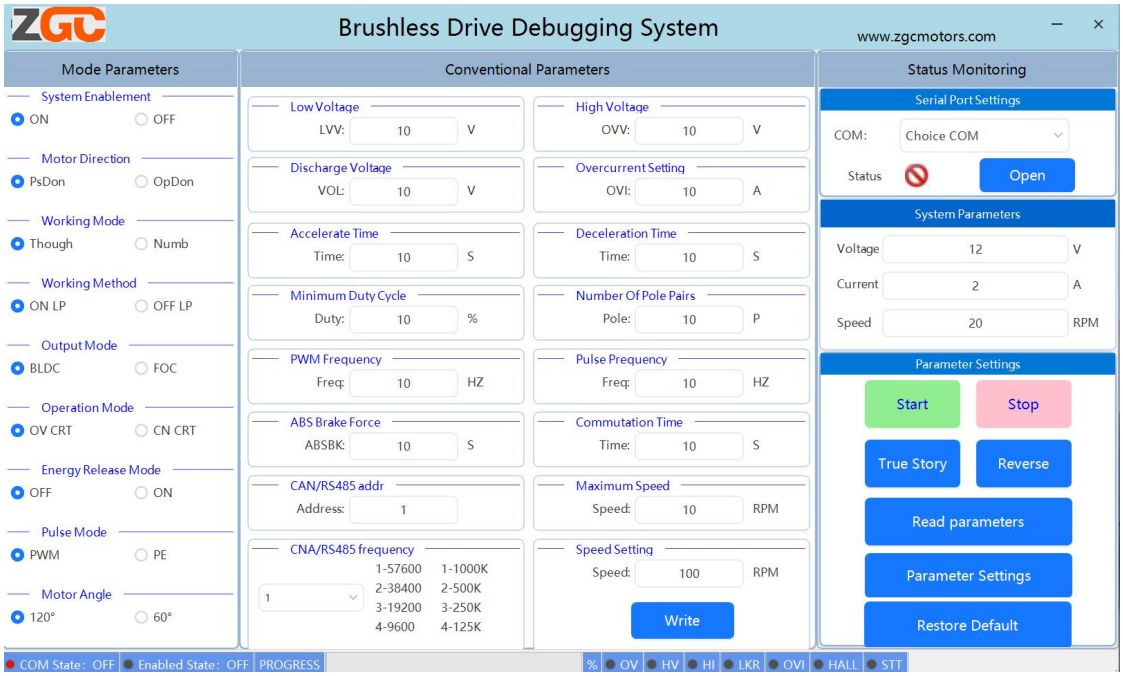
(3) Once confirmed, power on the driver, open the debugging software, navigate to Serial Port Settings, select the corresponding COM port, and then open the serial port.



(4) After opening the serial port, the software will automatically read the driver's internal parameter settings for the first time. If communication fails, "Communication Fault" or "Failed to Read Parameters" will be displayed in the lower-left corner. Successful communication is determined by whether the driver parameters are read. If not, please check the hardware connection.

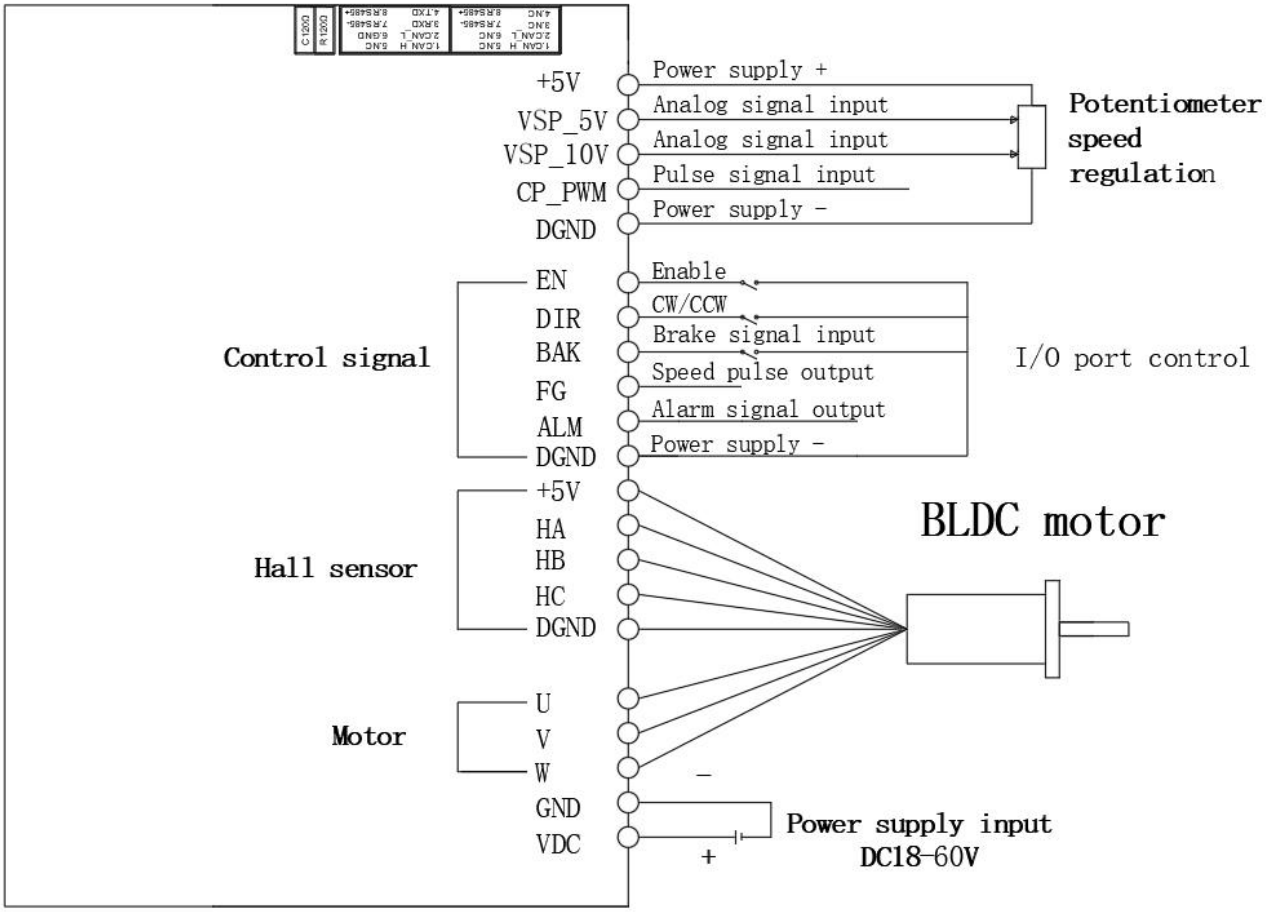


Upon successful communication, the following parameters will be read:

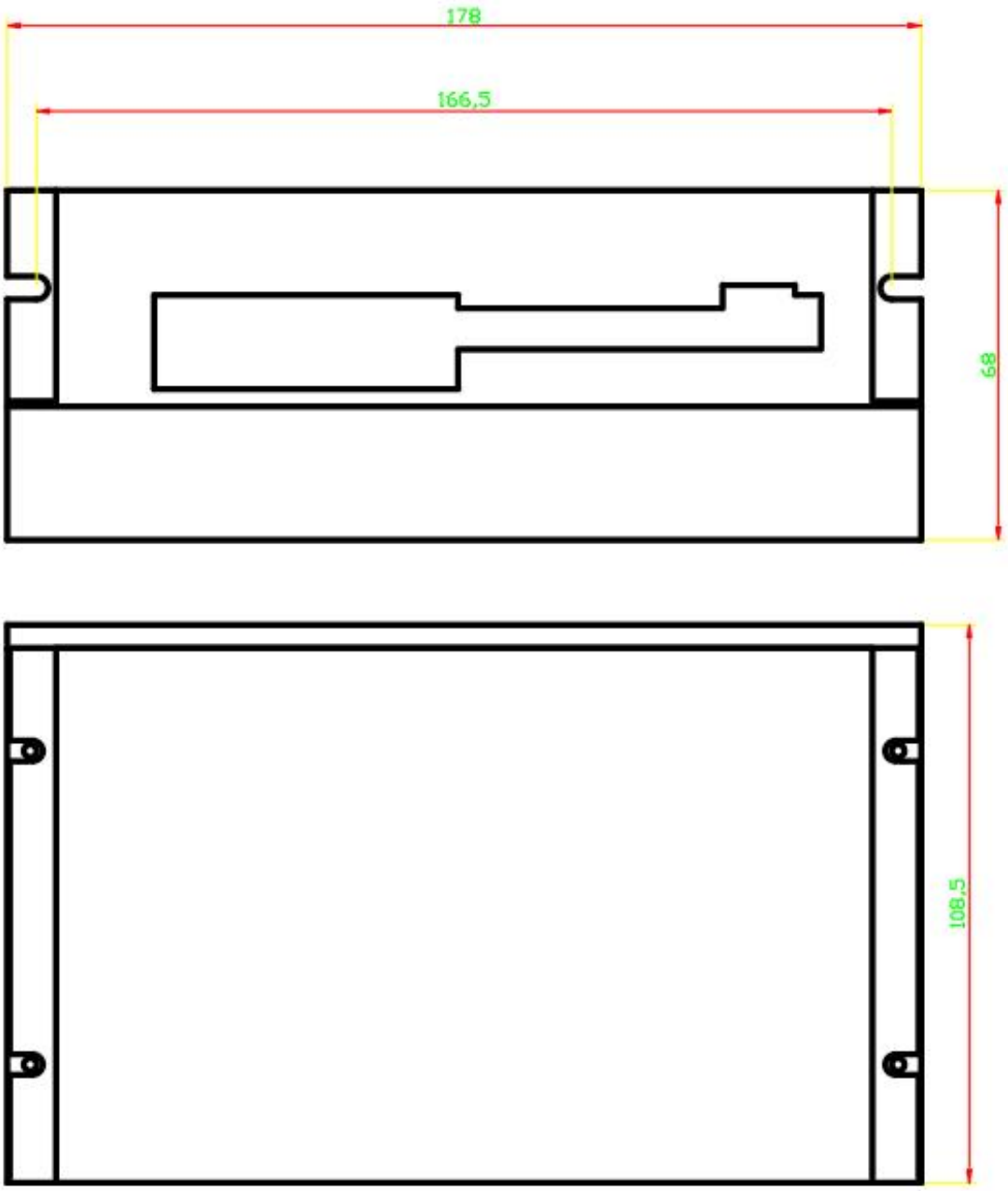


◆ When adjusting the drive's operating parameters, modifications can be made, debugged, and saved based on the parameters shown in the debugging software.

Wiring Diagram



Dimension (mm)



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Safety Precautions

- Wiring of the motor and drive must be performed under power-off conditions; never connect while powered on.
- Connect the power supply wires, motor winding wires, and Hall signal wires correctly according to the diagram. Note that the order of UVW three phases must be consistent.
- Do not disassemble the drive arbitrarily, as this may cause component damage.
- Do not touch any wiring terminals under any circumstances during power-on operation.
- Do not operate the drive without its housing.
- Physical impact to the drive may cause damage.

Frequently Asked Questions (FAQs)

1. For first-time use of this drive, how can I get started quickly?

After correctly connecting the power, motor, and Hall sensor wires, use an external potentiometer to accelerate slowly. Once the motor rotates correctly, test functions like start/stop and direction. If unfamiliar with this product, conduct thorough testing before installing it in the actual application.

2. What happens if the power supply is reversed?

The drive will be damaged immediately.

3. What is the maximum voltage of the upper-level control signal?

The maximum voltage of the speed control signal is 5V; exceeding this voltage will burn out the drive.

4. Is it normal for the drive's housing to get quite hot after prolonged operation?

Yes, it is normal. At room temperature, the housing temperature reaching 90℃ during long-term operation will not affect performance.

5. The POWER LED is on, but the motor doesn't rotate and just vibrates. What could be the cause?

This is likely due to incorrect wiring of the motor phases or Hall sensor wires. Please check the wiring according to the motor's documentation and re-test.

6. Can this drive adjust my motor's speed to 6000 rpm?

The maximum speed of a brushless motor is determined by its own parameters. The drive can control the motor speed from 0 to its maximum rated speed.

7. I already have a motor. How do I wire it after purchasing this drive?

You must first identify the pinout/definition of your motor's phase wires and Hall sensor wires. If unsure, contact the motor manufacturer. Incorrect wiring can damage the drive.

8. Can we add features to this drive or use it for new product development?

Yes, please contact our company.

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