



## Dual Channel Brushless DC Motor Controller

### KYDBL4830-2E



Jinan Keya Electron Science And Technology Co.,Ltd



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**Please carefully read the operating instruction before using the product.**

Any failure and loss resulting from failure to follow the precautions specified in the use and installation instruction are not covered in the warranty scope of manufacturer, and the manufacturer will not assume any responsibility for such cases. Please properly keep related documents and contact the manufacturer if having any question.

**Safety precautions**

Please invite professionals to install, connect and debug the equipment.

Do not install, remove or change the equipment circuit when the equipment is live.

Please install necessary protective devices between the power input terminal of the product and the power (storage battery) so as to avoid dangerous accidents or fatal injury; it is necessary to install overcurrent protector, fuse, as well as emergency switch.

Please complete the isolation and insulation protection between the product and the ground and devices.

If it is necessary to debug the product with electrification, please choose special non-metal screwdrivers or special debugging tools with good insulating property.

The product shall be installed in the environment with good ventilation conditions.

The product shall not be directly used in the abnormal environment with high humidity, dust, corrosive gas and violent shaking.



The sign means an important prompt or alarm.



## I. Overview

KYDBL4830-2E is an intelligent brushless DC dual channel motor controller. The brushless dual-channel motor driver can control two brushless DC motors at the same time. It adopts 32-bit high-performance MCU and advanced movement processing algorithm to realize internal electric differential function. The controller uses the Hall signal inside the motor as the rotor position feedback and works with the external incremental encoder (1000—2500 line) signal to control the movement of motor, realizing speed open-loop, close-loop modes, position mode and torque mode. It has two-way independent driver chip, two-way encoder processing chip, two-way Hall signal processing chip. Meanwhile, it has multiple failure alarm functions. It has two working modes: independent mode and mixed mode.

**Independent mode:** It can realize fully independent control of two-way motor, and the control signal part is controlled by two-way input signals. Two-way brushless DC motor can control the speed and direction of motor, separately.

**Mixed mode:** It can realize the synchronous control (forward, backward, left and right rotation) of two brushless motors.

The control signal has as many as 8 modes (wireless remote control, rocker, potentiometer, analog quantity, frequency, pulse width, RS232, CAN bus).

## II. Specification and Model

MODEL	MAX OUTPUT AMP AC : (A)	MAX OUTPUT VOLT DC: (V)	DC RANGE DC: (V)
KYDBL4830-2E	30	55	10-55

## III. Product Features:

- \* Wide-range voltage input, 10-55VDC.
- \* Intelligent PID control loop.
- \* Working mode: Speed open-loop, close-loop control, torque close-loop control, position close-loop control.



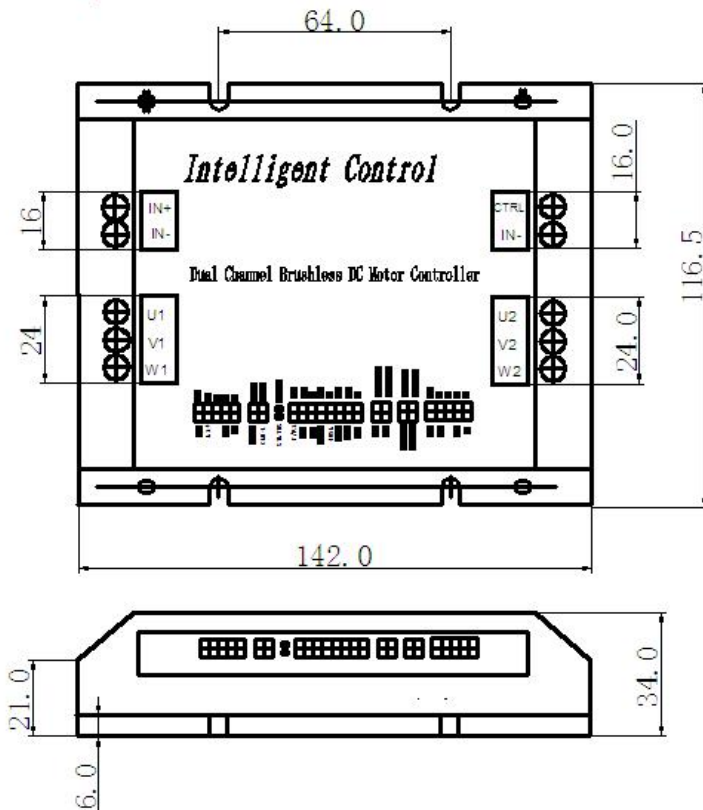
- \* External potentiometer, 0-5V analog quantity or pulse command control mode, RC (pulse width signal outputted by the receiver of aeromodelling remote control) control mode.
- \* Safety forward & reverse control, four-quadrant operation, support regeneration.
- \* Enable control function.
- \* Maximum current limit.
- \* 4-way input port; the function can be defined as analog input, pulse input or digital input functions.
- \* 6-way digital (MOS tube open-drain) output, which can serve as the failure alarm status output of controller and can control the external relay to realize actions such as automatic disconnection of power.
- \* Abnormalities like over current, overheating, over voltage and short circuit will start the protection function.
- \* LED status indicator.
- \* CAN bus communication, see the detailed communication protocol when using it.
- \* RS232 communication, see the detailed communication protocol when using it.

#### **IV. Performance Index:**

1. Power voltage: 10-55VDC (voltage limit 5V-62V)
2. At the ambient temperature 25°C, continuous working current 15A, transient current up to 30A 30S.
3. Minimum speed: 10 RPM in the speed close-loop mode; 1 RPM in the position mode.
4. Out +5VDC power (It can power up the encoder): 5V DC 20mA
5. Analog input range: 0-- 5VDC
6. Impulse input range: 500Hz—5000Hz (corresponding maximum speed)  
[Note] The minimum impulse frequency may change along with the setting of maximum speed.
7. Input range of duty ratio 0%-- 100% (input frequency range  $f \leq 1\text{KHz}$ , recommend to use the frequency of 250Hz).
8. Temperature protection status: When the temperature is 70°C, the controller will reduce output by overheating protection and will stop output when the temperature is 80°C.

- 9. Working temperature:  $-30^{\circ}\text{C}$ --  $+60^{\circ}\text{C}$ .
- 10. Ambient humidity: Relative humidity $\leq 80\text{RH}$ .
- 11. Boundary dimension:  $L * W * H = 142\text{mm} * 116.5\text{mm} * 34\text{mm}$
- 11. Weight: 600g

### V. Boundary Dimension:



Note: The bottom of controller shell has 4\*Φ5mm holes for installation and fixing, and installation can be conducted in the horizontal direction.

Keep the controller away from dust and high temperature environment, and avoid unexpected contact. Keep sufficient space around the controller for ventilation and adjustment.

When fixing the controller, keep it from other heat sources. Ensure the controller works within the specified ambient temperature range.

Avoid to install the controller to devices excessively vibrating; if it is necessary, please take good vibration-proof measures.

### VI. Wiring Requirements:

1. Do not connect wires when they are live.
2. Please choose the insulated wires and shielded wires matched with the voltage and current of controller and connect them with the controller. The specification choice of power input wire of controller and motor connecting wire shall follow the table below:

**Table 1 Wire Specification and Length Table**

	Current (A)	Wire specification (mm <sup>2</sup> )	Max. wire length (m)
Power input wire:	30	4	15
Motor output wire	30	4	15



**Warning**

Under any circumstance, the signal wire and the logic control wire shall not be bound or mixed with the power input wire, output wire (motor wire) and other power wires for the purpose of arrangement of wire, which will produce induced voltage causing interference and false operation to the controller or direct damages of controller.

3. The controller has no reverse power connection protection, so please ensure the power input of controller is consistent with the positive and negative electrode phase of external power supply, otherwise it will cause damages to the controller.
4. Please use proper tools to connect wires and must ensure correct wiring

## VII. Description of Controller Terminal Wiring and Schematic Diagram of

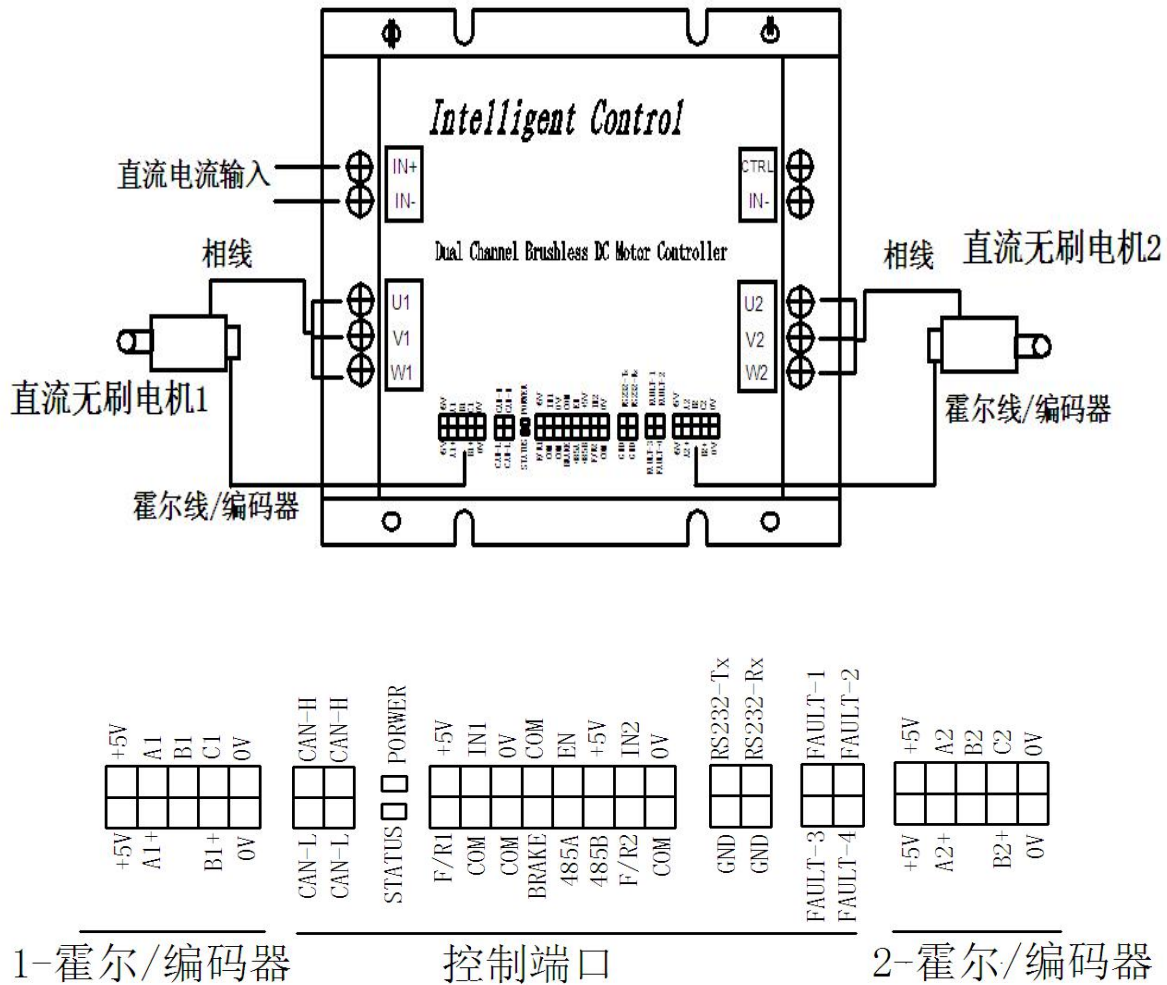
### Terminal Function:



**Warning**

All outgoing connecting wires of control terminals shall not be close to the wires of both power supply terminal and output terminal.

In order to reduce unnecessary electronic signal interference, please shorten the wire length of control terminals as much as possible; when the wire is longer than 0.5m, please use the shielded cable.



### Description of connection terminals

#### 1. Terminals IN+ and IN-

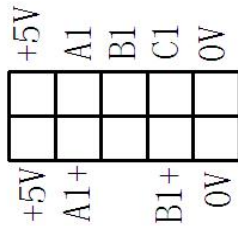
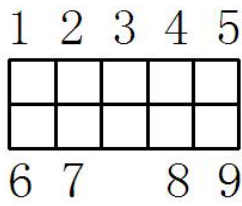
The left terminals IN+ and IN- are DC input (10-55V) and the right terminals are expansion ports, and they can not be used to input power.

#### 2. Terminals U1, V1, W1

Output terminal, connected with brushless DC motor.

#### 3. Hall/encoder signal input:

Adopts standard C3030WR-2\*5P, 1-5 connect with the brushless motor Hall wire; 6-9 connect with the external encoder. The detailed definitions of interfaces are as follows:



Interface	Function	Remark
①	Controller output DC 5V (20mA)	
②	Brushless motor Hall wire---A1	
③	Brushless motor Hall wire---B1	
④	Brushless motor Hall wire---C1	
⑤	0V	
⑥	Controller output DC 5V (20mA)	
⑦	Encoder output phase A+	
⑧	Encoder output phase B+	
⑨	0V	

4. Control port: Adopts standard C3030WR-2\*8P.

Interface	Function	Remark	Software I/O
1	5V output	Control signal voltage	
2	Control Input IN1	Analog/pulse input of Motor 1	A/PIN1
3	0v	0V	
4	com	COM	
5	Enable EN	Motor's enable control	DIN3





6	5V output	Control signal voltage	
7	Control input IN2	Analog/pulse input of Motor 2	A/PIN2
8	0V	0V	
9	F/R1	Forward and reverse control of Motor 1	DIN4
10	COM	<b>COM</b>	
11	COM	<b>COM</b>	
12	BRAKE	Brake braking of Motor	DIN10
13			
14			
15	F/R2	Forward and reverse control of Motor 2	DIN9
16	COM	COM	

### Terminals 2, 7: Analog/pulse input terminals

In practical use, the port can work as external demand signal input and feedback signal input.

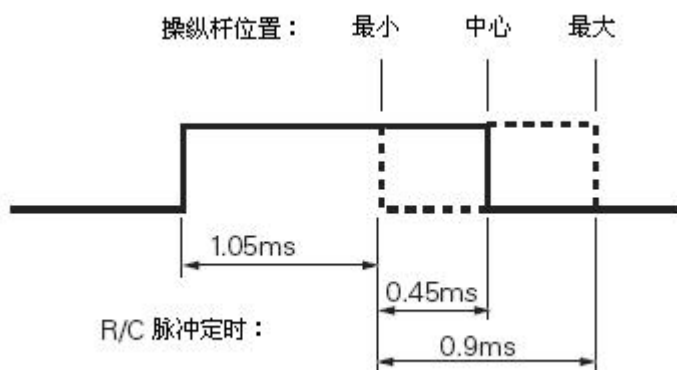
When using the external potentiometer as the command signal, connect terminals GND, analogy 1 and analog 2, +5V. Default factory settings: 0-5V analog command signal or potentiometer command signal, unidirectional control. It also can be adjusted as 0-2.5v-5v bilateral control as required by the customer. That is, 0-2.5v is forward control, and 2.5v-5v is reverse control.

When using the pulse signal, the pulse input range is 50Hz—5000Hz, and the upper limit of pulse input corresponds to the maximum speed of motor. When using the PWM signal input, the frequency shall not exceed 1KHz, recommending using 250Hz; the input range of duty ratio shall be 20%-- 80%.

**[Note]** The minimum pulse frequency will vary with the difference of actual maximum speed. The port can be used to connect RC RADIO (aeromodelling output signal) and receive effective R/C signal control. The details are as follows: In this working mode, the controller

works as the Radio receiver of R/C model remote control and receives the pulse width signal from R/C radio; the pulse width 1.0ms at minimum corresponds to the minimum position of joystick and the pulse width 2.0ms corresponds to the maximum position of joystick. When the joystick is in the central position, the pulse width shall be 1.5ms.

**[Note]** In order to reach the best control precision, please ensure the pulse width of RC radio signal is within the range of 1.0ms-2.0ms.



### Terminals 5: Enable control terminals

This terminal is the enable control terminals of Motor 1 and Motor 2. When it is connected with COM, the motor will run, when disconnect with COM, the motor will stop freely. It is recommended to use the terminals to realize the safety control over the start and stop of motor.

### Terminals 9, 15: forward and reverse control terminals

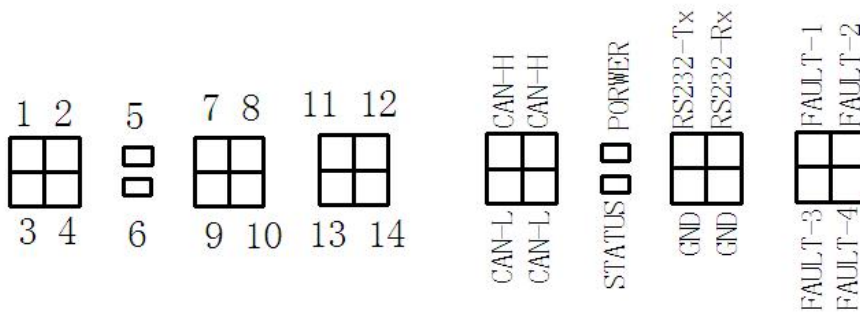
The terminals are the forward and reverse control terminals of Motor 1 and Motor 2. When they are connected with COM respectively, the motor will reverse.

### Terminals 12: Brake braking

The terminal is the braking terminals of Motor 1 and Motor 2, and when it is connected with COM, the motor will brake, and the power level output will be cut off.

**Note:** When restoring start, disconnect the terminals and COM at first, remove the brake braking command. Then, disconnect the enable control terminal and COM when they are connected, and then the resetting is completed and the controller is in stand-by status. At the time, if the external control signal input is not zero, then the controller will have output and the motor will run.

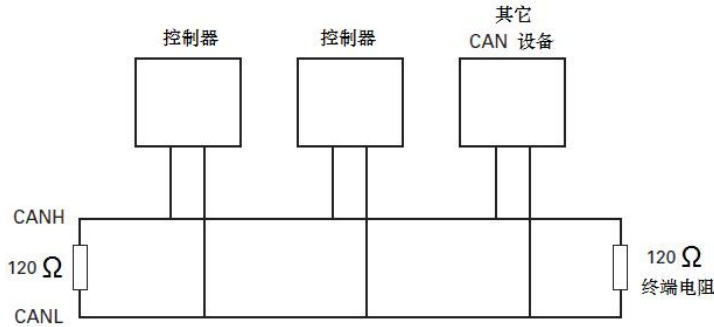
Control port: Adopts standard C3030WR-2\*2P:



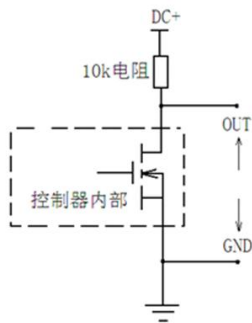
Interface definition	Function	Remark	Software I/O
1	CAN-H	CAN-HIGH	
2	CAN-H	CAN-HIGH	
3	CAN-L	CAN-LOW	
4	CAN-L	CAN-LOW	
5	PORWER	POWER INDICATOR	
6	STATUS	status indicator	
7	RS232_Tx	Serial Connection	
8	RS232_Rx	Serial Connection	
9	GND	GND	
10	GND	GND	
11	FAULT-1	Fault alarm output 1	DOUT1
12	FAULT-2	Fault alarm output 2	DOUT2
13	FAULT-3	Fault alarm output 3	DOUT3
14	FAULT-4	Fault alarm output 4	DOUT4

**Terminals 1, 2, 3, 4:** CAN bus connection

Note: In internal default, the controller is not matched to 120 Ohm resistance.



**Terminals 11,12,13,14** digital output ports



The controller provides 4-way digital output. The terminals are the MOS tube open-drain, the universal output amplitude is 24V 1A, and the maximum output is 40V 1A. In practical use, it is essential to connect a 10k pull-up resistor (as appropriate), as shown in the figure. For the digital output of every way, MOS tube breakover or turn-off can be chosen according to a preset event status.

### VIII. Controller state of response

The event statuses listed as follows are those that the controller allows to correspond to and only one of those event statuses can be chosen to trigger the digital output.

6-way digital output can choose different event statuses.

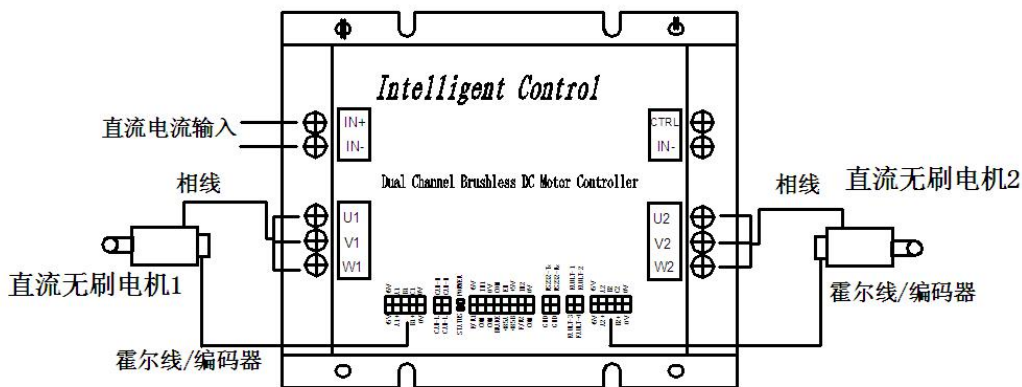
	Event status	Description of digital output description
1	Motor running	When the motor runs, the digital port outputs high/low.
2	Motor reversing	When the motor reverses, the digital port outputs high/low.
3	Over voltage	When the power voltage exceeds the maximum limiting value, the digital port outputs high/low.
4	Over heating	When the controller temperature exceeds the overheating limit, the digital port outputs high/low.

5	LED status	The output of digital port synchronizes with the status of LED.
6	Power tube status	If the power tube is not damaged, the digital port outputs high/low.

The default event statuses of 4-way digital output are as follows:

Fault 1	When Motor 1 runs, the digital port outputs low.
Fault 2	When the controller over voltage, the digital port outputs low.
Fault 3	When the power tube of Motor 1 is not damaged, the digital port outputs low.
Fault 4	When Motor 2 runs, the digital port outputs low.

### IX. Connection and Explanation of Brushless DC Motor



#### 1. Power wire connection of brushless motor

The controller output terminals U1, V1, W1, U2, V2, W2 are used to connect the brushless motor power wires.

**[Note]** When connecting the power wire of brushless DC motor, it shall be noted that the phases of three power wires U, V and W must be matched with the connection of controller output. The controller’s two ways outputs are independent and every way has three phases, which are respectively connected with Phase U (yellow), Phase V (green) and Phase W (blue) of brushless motor.

If the wires are connected wrong, it will cause the motor to shake back and forth and out of control.

#### 2. Hall wire connection of brushless motor

Terminals 1 and 5 power for the Hall sensor of brushless motor.

Three phases output signals U, V and W of Hall, serving as the input feedback signal, are directly connected to the Terminals 2, 3 and 4 of the controller.

**[Note]:** When connecting the Hall wire of brushless DC motor, it shall be noted that the U, V and W phase signals must be matched with the connection of controller output to the motor. If the Hall wires are connected wrong, it will cause the motor to shake back and forth and out of control.



#### Warning

All outgoing connecting wires of control terminals shall not be close to the wires of both power supply terminal and output terminal.

In order to reduce unnecessary electronic signal interference, please shorten the wire length of control terminals as much as possible; when the wire is longer than 0.5m, please use the shielded cable.

## X. Description of Working Mode of Controller

Note: It is prohibited to save parameters through RS232 when the motor runs, otherwise it will seriously affect the running of motor.

### 1. Speed mode

The speed mode includes speed open-loop and speed close-loop.

A. In the case of speed open-loop, the controller will realize linear output according to the size of controlled quantity, and the controller will not control the motor speed.

Advantages: When the power supply voltage exceeds the rated voltage of motor, the motor can run at the rated speed or higher for a short time.

B. In the case of speed close-loop, it is essential to use an external encoder to serve as feedback so as to test the speed of motor rotor, or use the analog signal of speed measuring motor as feedback (poor precision, not recommend). In this mode, the controller can use analog signal, pulse signal and digital signal (use RS232 serial port, CAN bus communication) as the control signal of motor speed, and the motor running status is the same.

Notes: When the controller uses the speed close-loop mode, the factory settings must be matched with the resolution ratio of customer's encoder and the motor load so as to adjust such parameters as attenuation ratio, maximum dynamic deviation, steady-state error,



setting time and overshoot of dynamic response of the motor.

## **2. Position close-loop mode.**

The position close-loop mode includes relative position close-loop and absolute position close-loop. The position close-loop mode must use an external incremental encoder to test the position of rotor so as to precisely realize position control.

When using the relative position close-loop, analog signal and pulse signal can be used as control variables, and the target position of motor linearly varies with the control variables (voltage value, frequency and pulse width).

For example, when the analog signal input is 5V, the target position of motor is the maximum position (needing factory setting; the parameters are related to the resolution ratio of encoder). When the enable signal is controlled, the motor can quickly move back and forth between the initial position and the target position. The motor will realize follow-up control with the external potentiometer.

When using the absolute position close-loop, neither analog signal or pulse signal can be used as control variables, but only digital signal can be used. The control variables such as target position and speed will be transmitted to the controller through the protocol of RS232 or CAN bus communication.

### **Notes:**

- A. In the position close-loop mode, users can control the motor speed through RS232 or CAN bus.
- B. In the relative position close-loop mode, the maximum position needs factory setting (the parameters are related to the encoder).
- C. When the controller uses the absolute position close-loop mode, the minimum motor speed is 1RPM.

## **3. Close-loop torque mode**

The torque mode is a special close-loop operation, and in this mode, the motor command controls the current flowing through the motor, regardless of the actual motor speed. For the motor, the torque directly corresponds to current. Thus, to control current is to control torque.

In this mode, the controller can use analog signal, pulse signal and digital signal (suing RS



232 serial port and CAN bus communication) as the control signal of motor speed, and the motor running status is the same.

## XI. Description of LED Indicator Status

Normal status (POWER green light always, STATUS red light indicates given signal modes)	
Status indicator (period 1S)	Description of mode
Red light flashes once	Digital signal input mode
Red light flashes twice	Pulse input mode
Red light flashes three times	Analog input mode

Failure status (POWER green light always, STATUS red light flashing indicates failures)	
Status indicator (cycle 1S)	Description of failure
Red light flashes (quickly)	Short circuit
Red light quickly flashes four times, and light for 1s	Over heating
Red light quickly flashes twice, and light for 1. 5s	Under voltage or over voltage
Red light is quickly off once, and light for 1.875s	Power level turn-off

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