KYDBL4875-2E

Operating Instruction of Intelligent Controller

`

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

KYDBL4875-2E is an intelligent brushless DC dual-motor controller. The brushless dual-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 current AC : (A)	Max Output voltage DC：(V)	Input voltage range DC：(V)
KYDBL4875-2E	75	55	10-55

III. Product Features:

* Wide-range voltage input, 10-55V, max limit voltage 60V.

* 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 control.

* 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 overcurrent, overheating, overvoltage 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.

* USB communication, see the detailed communication protocol when using it.

IV. Performance Index:

1. Power voltage: 10-55VDC.

2. At the ambient temperature 25℃, continuous working current 40A, transient current up to 75A 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 ≤1KHz, recommend to use the frequency of 250Hz).

8. Temperature protection status: When the temperature is 70℃, the controller will reduce output by

overheating protection and will stop output when the temperature is 80℃.

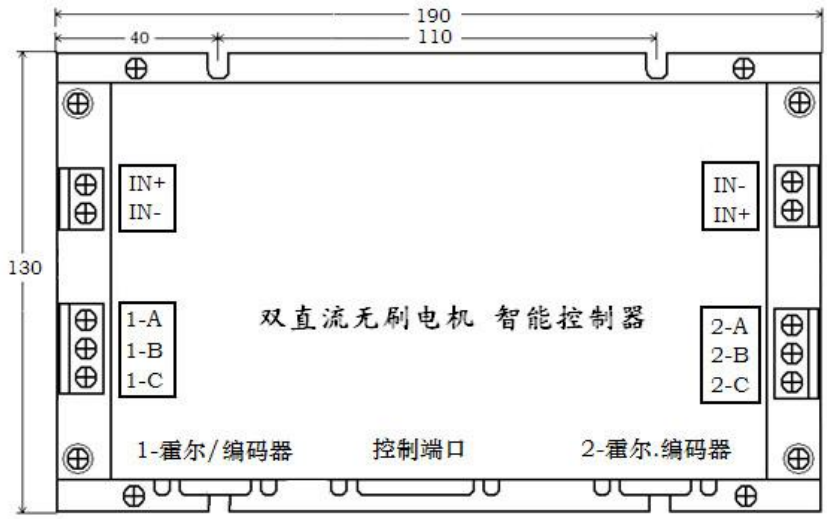
9. Working temperature: -20℃-- +60℃.

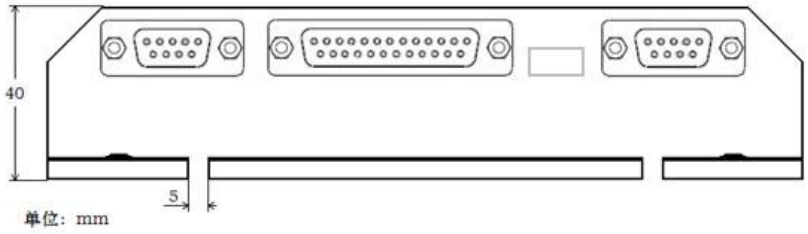
10. Ambient humidity: Relative humidity≤80RH.

11. Boundary dimension: L * W * H = 190mm * 130mm * 77mm

12. Weight: 1000g

V. Boundary Dimension:





外形尺寸图

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^2)	Max. wire length (m)
Power input wire:	75	6	15
Motor output wire:	75	6	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.

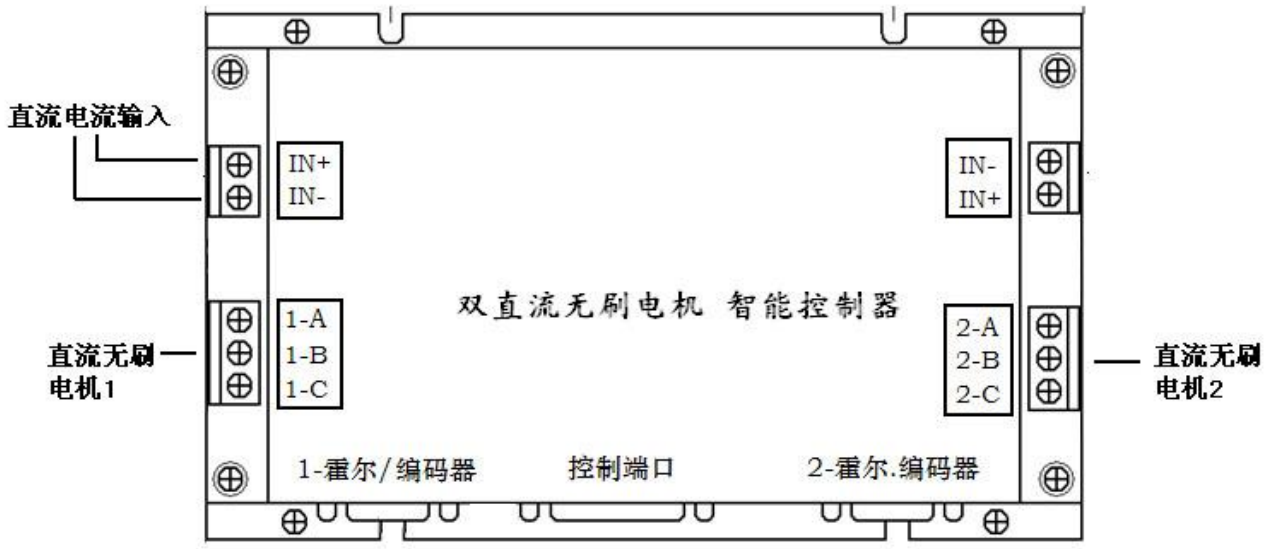
4. Please use proper tools to connect wires and must ensure correct wiring.

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-

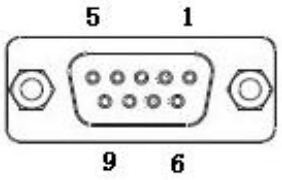
The left terminals IN+ and IN- are DC input (10-55V) and the right terminals are expansion ports, and they can not be used to input power.

2. Terminals A, B, C:

Brushless DC motor controller output terminal, connected with brushless DC motor.

3. Hall/encoder signal input:

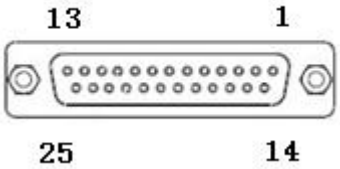
Adopts standard connector DR9, 1-5 connect with the brushless motor Hall wire; 6-9 connect with the external encoder. The detailed definitions of interfaces are as follows:



Interface	Function	Remark
①	Controller output DC 5V (20mA)	
②	Brushless motor Hall wire---A	
③	Brushless motor Hall wire---B	
④	Brushless motor Hall wire---C	
⑤	GND	

⑥	Controller output DC 5V (20mA)	
⑦	Encoder A	
⑧	Encoder B	
⑨	GND	

4. Control port: Adopts standard DR25



Interface	**Function**	**Remark**	
①	0V	0 V	
②	Tx	RS232_Tx	
③	Rx	RS232_Rx	
④	Control input 1	Analog/pulse input of Motor 1	P/AIN1
⑤	GND	0 V	
⑥	Control input 2	Analog/pulse input of Motor 2	P/AIN2
⑦	Enable control 1	Enable control of Motor 1	DIN3
⑧	Forward and reverse control 1	Forward and reverse control of Motor 1	DIN4
⑨	Brake braking 1	Brake braking of Motor 1	DIN5
⑩	Enable control 2	Enable control of Motor 2	DIN6
⑪	Forward and reverse control 2	Forward and reverse control of Motor 2	DIN7
⑫			
⑬	5V output	Reference voltage of control signal	

⑭	5V output	Reference voltage of control signal	
⑮	Brake braking 2	Brake braking of Motor 2	DIN13
⑯	Failure alarm output terminal 1	It can be set	DOUT 3
⑰	Failure alarm output terminal 2	It can be set	DOUT 4
⑱	0V	0 V	
⑲	Failure alarm output terminal 3	It can be set	DOUT 5
⑳	Failure alarm output terminal 4	It can be set	DOUT 6
㉑	Failure alarm output terminal 5	It can be set	DOUT7
㉒	Failure alarm output terminal 6	It can be set	DOUT8
㉓	CAN-H	CAN-High	
㉔	CAN-L	CAN-Low	
㉕	0V	0V	

Terminals 2, 3, 5: for the connection between the controller and RS232 serial port of PC.

Terminals 4, 6: Analog/pulse input terminals

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

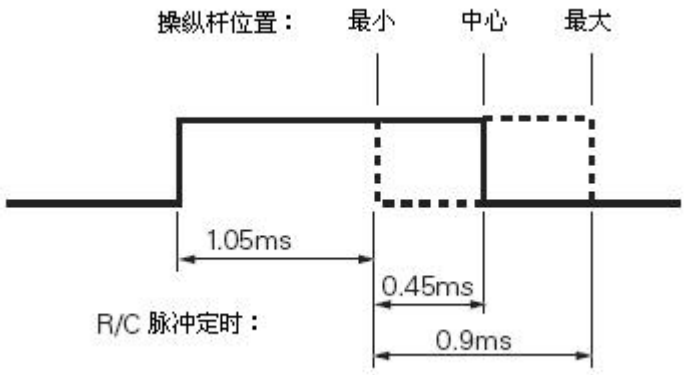
When using the external potentiometer as the command signal, connect terminals GND, analogy 1 and analog 2, +5V. Default factory settings: 0-5V analog command signal or potentiometer command signal, unidirectional control. It also can be adjusted as 0-2.5v-5v bilateral control as required by the customer. 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 500Hz—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 0％-- 100%.

[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 7, 10: Enable control terminals

The terminals are the enable control terminals of Motor 1 and Motor 2. When they are connected with +5VDC respectively, the motor will stop freely, when the power level output is cut off. Disconnect the connection with +5VDC, and the motor will run. It is recommended to use the terminals to realize the safety control over the start and stop of motor.

Terminals 8, 11: 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 +5VDC respectively, the motor will reverse.

Terminals 9, 15: Brake braking

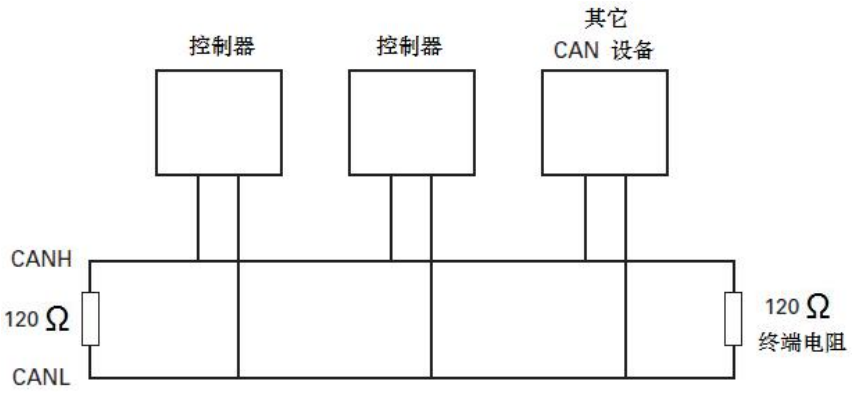
The terminals are the brake braking terminals of Motor 1 and Motor 2, and when they are respectively connected with +5VDC, the motor brake will brake, and at the time, the power level output will be cut off.

Note: When restoring start, first disconnect the terminals and +5VDC and remove the brake braking command. Then, disconnect the enable control terminal and +5VDC when they are connected, and

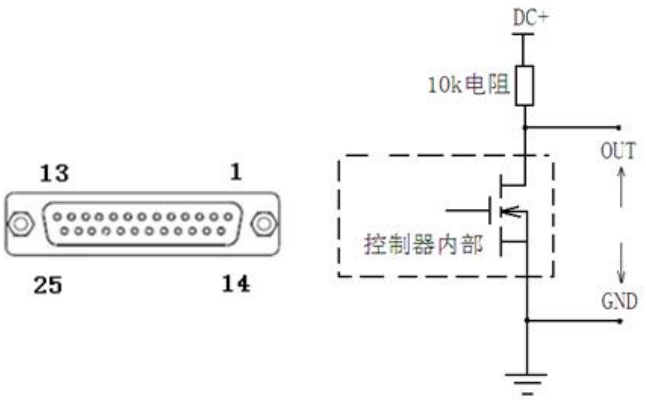
then the resetting is completed and the controller is in stand-by status. At the time, if the external control signal input is not zero, then the controller will have output and the motor will run.

Terminals 23, 24: CAN bus connection

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



Terminals 16, 17, 19, 20, 21, 22: digital output ports



The controller provides 6-way (8-way at most) 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.

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.

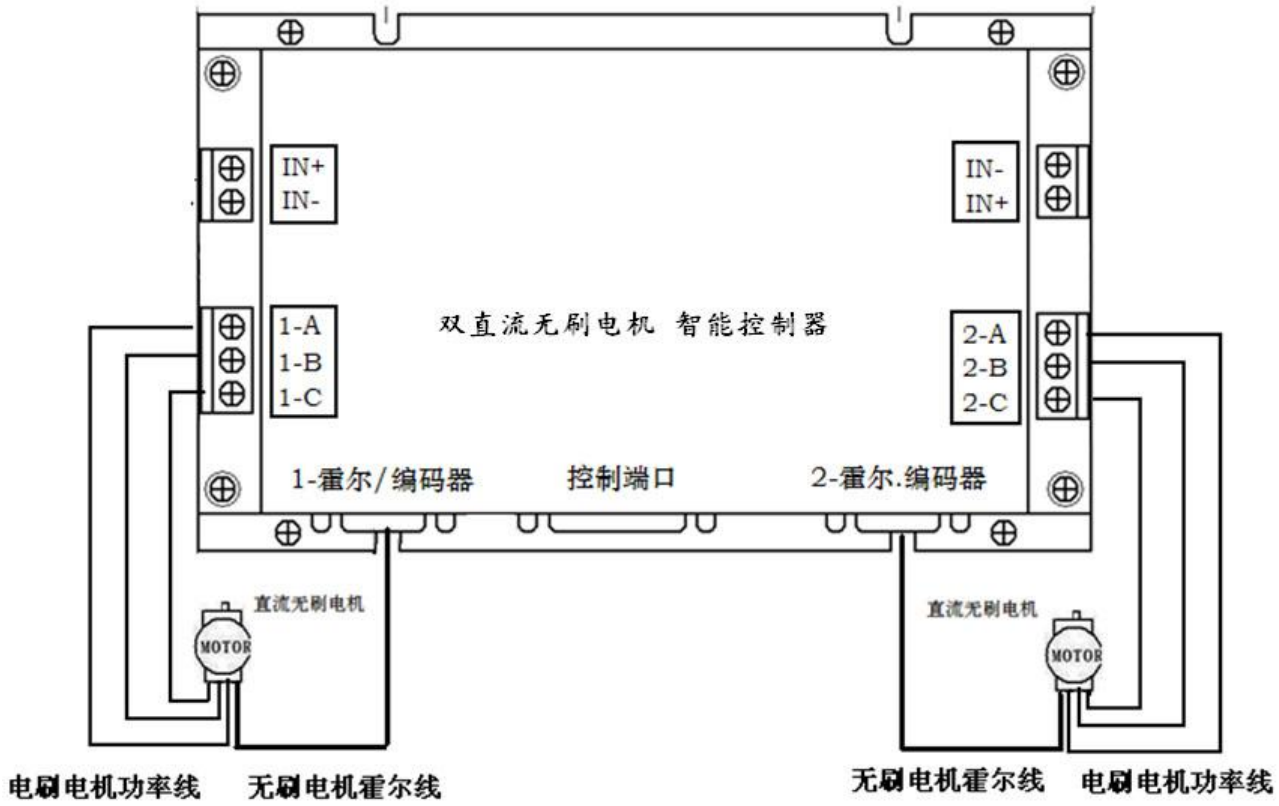
6-way digital output can choose different event statuses.

	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	Overvoltage	When the power voltage exceeds the maximum limiting value, the digital port outputs high/low.
4	Overheating	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 6-way digital output are as follows:

Digital output terminal 1	When Motor 1 runs, the digital port outputs low.
Digital output terminal 2	When the controller has excessive voltage, the digital port outputs low.
Digital output terminal 3	When the power tube of Motor 1 is not damaged, the digital port outputs low.
Digital output terminal 4	When Motor 1 runs, the digital port outputs low.
Digital output terminal 5	When the controller overheats, the digital port outputs low.
Digital output terminal 6	When the power tube of Motor 2 is not damaged, the digital port outputs low.

VIII. Connection and Explanation of Brushless DC Motor



1. Power wire connection of brushless motor

The controller output terminals A, B and C are used to connect the brushless motor and shall be connected according to the three power wires of brushless motor.

[Note]: When connecting the power wire of brushless DC motor, it shall be noted that the phases of three power wires A, B and C 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 A (yellow), Phase B (green) and Phase C (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 supply the Hall sensor of brushless motor with working power and three phases output signals A, B and C 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 A, B and C 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.

IX. 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 RS 232 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.

Notes: In this mode, the controller must use an external current sensor as feedback; otherwise the motor will run at full speed.

X. Description of LED Indicator Status

Normal status (POWER green light is on for a long time; STATUS red light indicates given signal modes)	
Status indicator (cycle 2S)	Description of mode
STATUS red light flashes once	Digital signal input mode

STATUS red light flashes twice	Pulse input mode
STATUS red light flashes three times	Analog input mode

Failure status (POWER green light is on for a long time; STATUS red light flashing indicates failures)	
Status indicator (cycle 2S)	Description of failure
STATUS red light flashes (quickly)	Short circuit
STATUS red light quickly flashes four times, and is on again for 1s	Overheating
STATUS red light quickly flashes twice, and is on again for 1. 5s	Under voltage or over voltage
STATUS red light is quickly off once, and is on again for 1.875s	Power level turn-off