KYDBL4850-1E

Intelligent Brushless DC Motor Controller

Jinan Keya Electronic Technology Co., Ltd

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.

KYDBL4850-1E is an intelligent brushless DC controller. It adopts 32-bit high-performance MCU,Advanced motion control algorithm is suitable to the outside of the quadrature encoder input to complete the open loop and closed loop speed, under the closed loop torque of motor sport.Controller with multiple analog input port, the pulse input port and digital I/O port, can through the special software to redefine its functions.Universal RS232 serial port communication, CAN bus, CAN be widely used in automation.

I. Specification and Model：

Model	Max output current AC : (A)	Max output volt DC：(V)	Voltage Range DC：(V)
KYDBL4850-1E	50	48	10- 50

II. Product Features:

- Wide-range voltage input, 10-55V.

- 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.

- 2-way digital (MOS tube open-drain) output, Generally as 24V 1A output

- (maximum load capacity of 40V 1A), can be used to loosen the brake or

- other attachments.

- 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.

III. Performance Index:

- Power voltage: 10-55VDC.
- At the ambient temperature 25℃, continuous working current 30A, transient current up to 50A 30S.
- Out+5VDC power (It can power up the encoder): 5V DC   20mA
- Analog input range: 0-- 5VDC
- Impulse input range: 500Hz—5000Hz (corresponding maximum speed)
- [Note] The minimum impulse frequency may change along with the setting of maximum speed.
- Input range of duty ratio 0%-- 100% (input frequency range f ≤1KHz, recommend to use the frequency of 250Hz).
- the digital output interface: 2 road, open drain, maximum load capacity of 40 V 1 A
- 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℃.
- Working temperature: -30℃-- +60℃.
- Ambient humidity: Relative humidity≤80RH.
- Boundary dimension: L * W * H = 148mm * 117mm * 40mm
- Weight: 600g

IV. Dimension:

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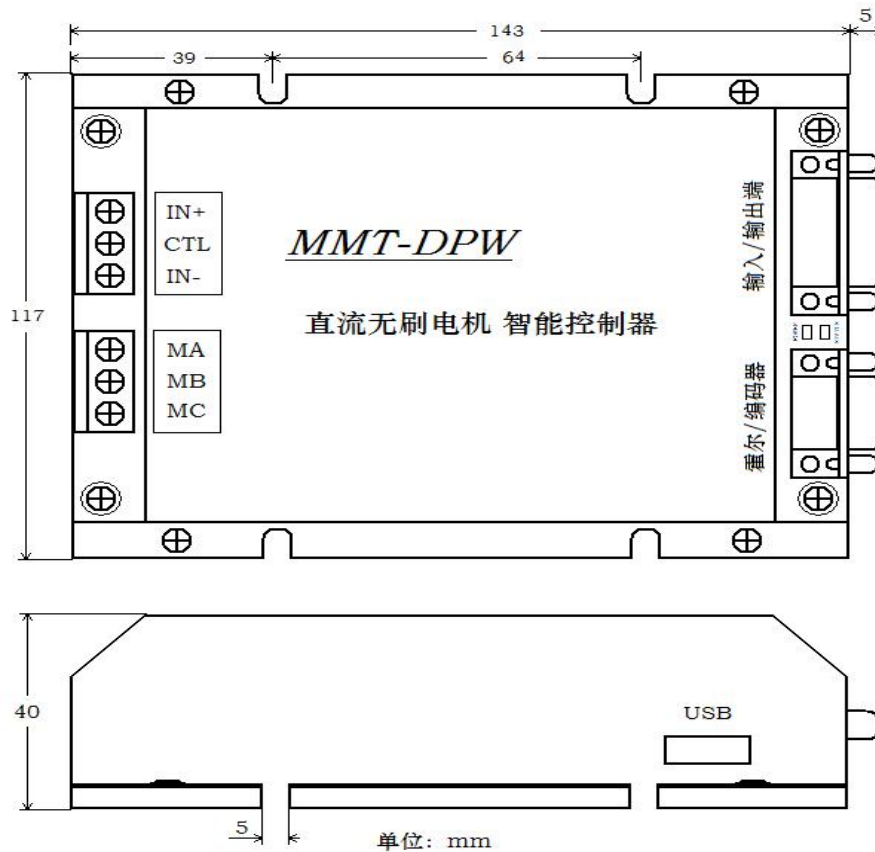
Note: The bottom of controller shell has 4*Φ5mm holes for installation and fixing, and installation can be conducted in the horizontal direction.

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.

V. 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:

 Wire Specification and Length Table

Current (A)	Wire specification (mm2)	Max. wire length (m)
Power input wire: 50	6	15
Motor output wire: 50	6	15

Warning

1. 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.

VI. 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.
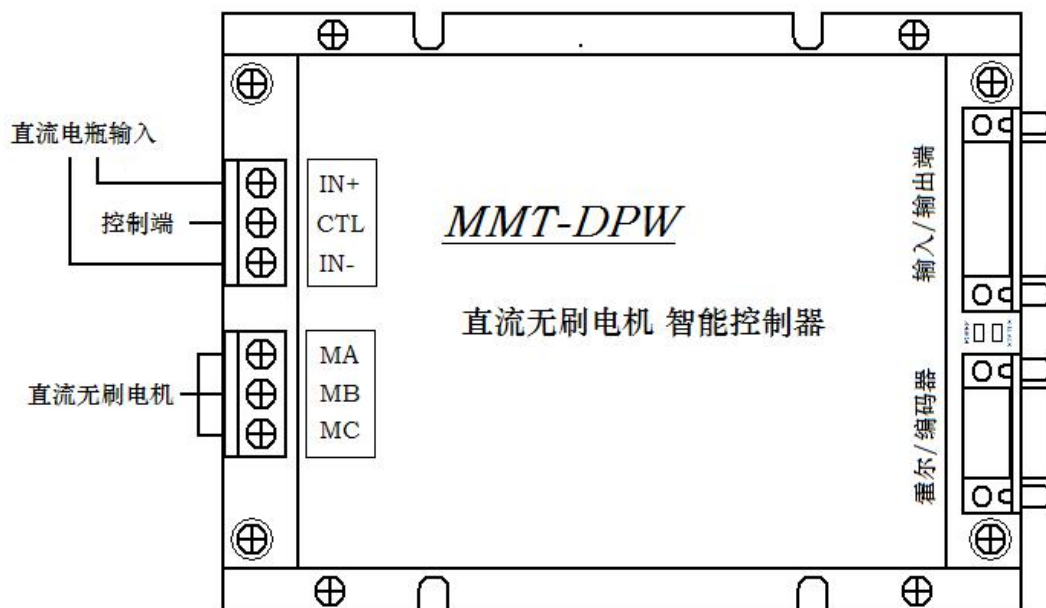

Description of connection terminals

1. Terminals IN+ and IN-,DC input (10-55V)

2. CTL control port: control unit working state choice, the port and the GND connected, shut off the control unit.Suspension or external 7 v to input power supply dc voltage, the control unit to work properly.The port can be used as an emergency stop.

3. MA,MB,MC:Brushless DC motor controller output terminal, connected with brushless DC motor.

3. Hall/encoder signal input:

Adopts standard DR9 bus seat, 1-5 connect with the brushless motor Hall wire; 6-9

connect with the external encoder. The detailed definitions of interfaces are as follows:

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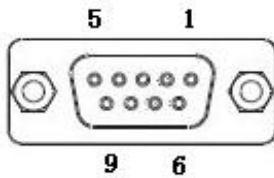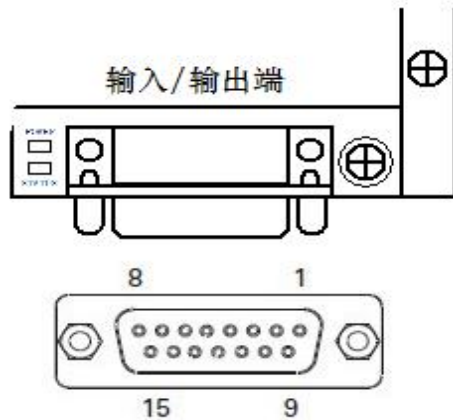

Definition of interfac	Function	Remark
①	Controller output DC 5V (20mA)	
②	Brushless motor Hall wire---A	
③	Brushless motor Hall wire---B	
④	Brushless motor Hall wire---C	
⑤	GND	
⑥	Controller output DC 5V (20mA)	
⑦	Encoder feedback input---A+	
⑧	Encoder feedback input---B+	
⑨	GND	

4. Control port: Adopts standard DR25 bus seat

| Interface definition	Function	Remark	Software I/O
①	Failure alarm output terminal	IT CAN BE SET	DOUT2
②	Tx-out	RS232_Tx	
③	Rx-in	RS232_Rx	
④	SUSPEND		
⑤	GND	0 V	
⑥	CANL	CAN-low	
⑦	CANH	CAN-high	
⑧	SUSPEND		
⑨	Fault alarm output	IT CAN BE SET	
⑩	Enable control EN	Effective for high level	DIN5
⑪	Forward and reverse control DIR	Effective for high level	DIN4
⑫	Speed Signal input IN	Frequency/Analog	P/AIN3
⑬	GND		

⑭	Controller output DC 5V（20mA）		
⑮	Brake Stop	Effective for high level	DIN6

1. ① ⑨ ,2 Road alarm output:

For MOS tube drain open circuit output, according to the preset event status choose to make or break, gm is 24 v 1 a output, the maximum output of 40 v 1 a, the need when using external 10 k pull-up resistor.

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

3. ⑥ , ⑦ Connect for CAN
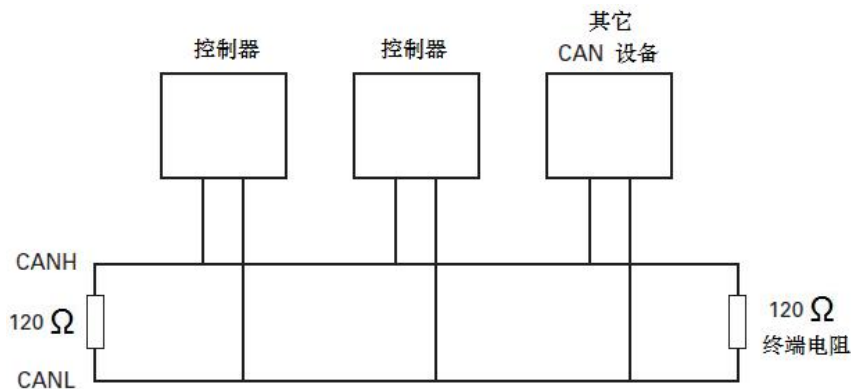
4. ⑩ ,Enable control: EN,When they are connected with +5VDC respectively, the motor will stop freely, when the power level output is cut off. Disconnect the connection with +5VDC, and the motor will run. It is recommended to use the terminals to realize the safety control over the start and stop of motor.

5. ⑪ ,Forward&reverse control,DIR

The motor commutator terminals connected with + 5 VDC.Factory set the default to 0 to 5 v a given signal to control in the operation of single direction.If a given signal is 0-2.5 v to 5 v two-way control, can be given by external signal commutator, can also use DIR terminal digital signal to control the reversing.

6. (12) ,signal input, IN,

(12) As an analog input,Definition for a given analog signal input. When using external 0 to 5 v analog signals,pls connect (12) and (13) ,When using external potentiometer as a given signal,pls connect (12) , (13) and (14) ,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.

(12) ,As digital signal input,Defined as input or input pulse PWM signals.In actual use, the port can be used as an external given signal input, can also be used as the feedback signal input.It can customize according to customer's actual needs.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 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.

操纵杆位置： 最小 中心 最大

1.05ms

0.45ms

R/C 脉冲定时：

0.9ms
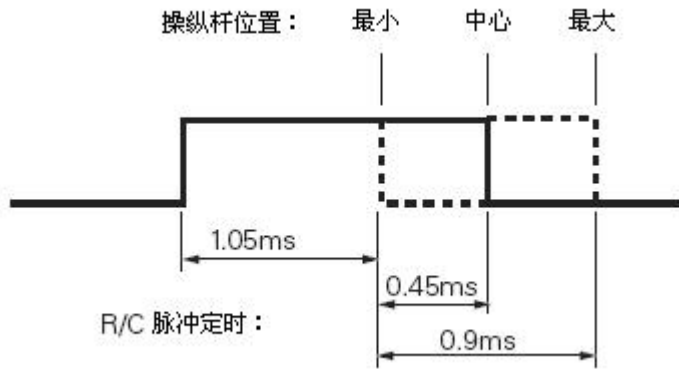
7. ⑮ ,Brake.

when it 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.

VII. Brushless dc motor connection and instructions
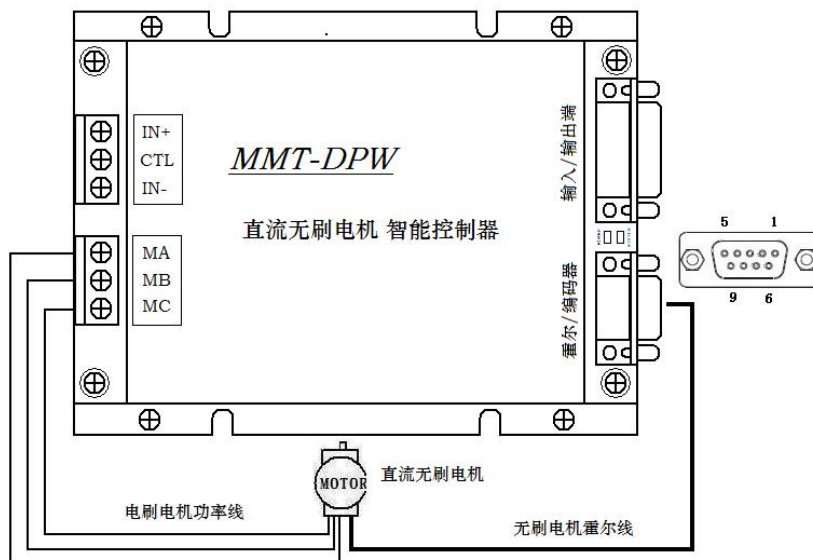
The controller output terminals A, B and C are used to connect the brushless motor

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.

VIII. Hall wire connection of brushless motor

Terminals ①, 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、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. Encoder's connection and explanation:

The controller can work in open loop mode, closed loop speed mode,closed-loop position ,closed-loop torque mode.

When the controller works in closed-loop control, need to follow the motor speed feedback signal. Recommending use of incremental encoder used as a feedback

device. In most applications, a 1000 - 2500 line encoder is selected.
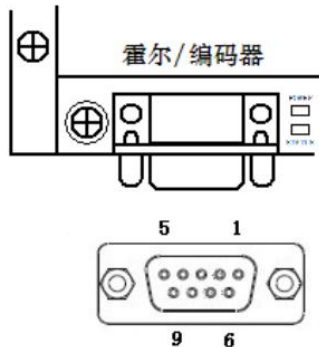
⑥ ⑨ is supply power supply for controller,The two phase output quadrature signal A+ B+ of the encoder as the input feedback signal is directly connected to the terminal ⑦ and ⑧ on the controller.

Note: when connecting motor and encoder, we need to notice that the A B phase signal of the encoder must match the connection of the controller to the motor. If the connection of the encoder is reversed, will cause the motor back and forth shaking uncontrollably, at this time, please exchange A, B encoder signal .

X. Connection of insurance and power switch

Between the power supply of the controller and the power supply (battery),It is necessary to install a fast fuse and power emergency switch, so as to prevent emergency power failure if necessary.

(Note:the selection of fast insurance and power switch: rated current of the power switch value will be greater than 150-200% of the rated current of the motor).

Note: please make sure that the value of the motor voltage does match the output voltage of the controller.

Warming: The power input of the controller has no power polarity reverse protection circuit. POS (+) connection must be connected To the "+" of the controller, NEG (-) connected to the "-" of the controller.

Please confirm the "positive" "negative" polarity of the power supply (battery).

It is necessary to correspond to the "positive" polarity of the DC power input of the
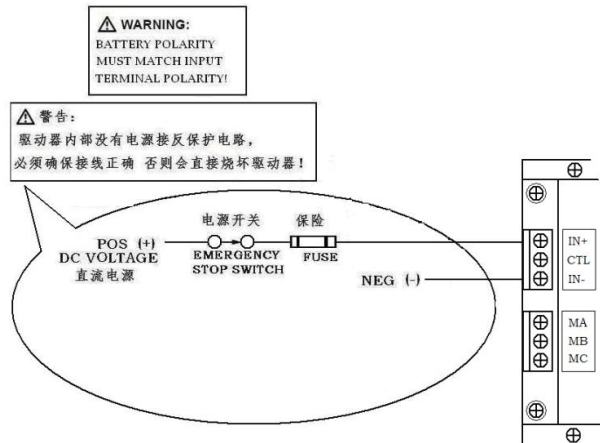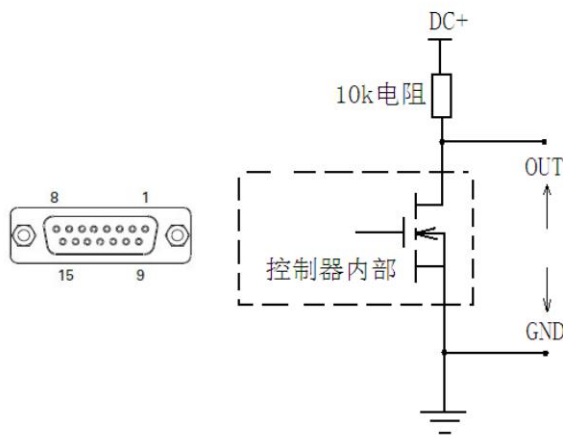
controller.

Reference table 1 selects the wire connection.

Be sure the voltage of the power supply can meet the operating voltage requirements of the controller, and whether the capacity of the power supply can carry the load current of the motor.

XI. Digital output:

The controller provides 2-way digital output ① ⑨ . 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.

	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	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.

XII. 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	RS232 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	Undervoltage or overvoltage
STATUS red light is quickly off once, and is on again for 1.875s	Power level turn-off

XIII. Protection function explanation：

The controller supply Overvoltage, undervoltage, overheat, short circuit, overcurrent protection..

1. Overvlotage,undervoltage:When the voltage of the external power supply exceeds the preset value or lower than the threshold, the controller will cut off the output. The normal operating voltage range of the controller is 10-50V. At the same time, according to the requirements of the customer, when there is overvoltage and under voltage protection, the 1 way digital output is used as the indicator. At the same time, the corresponding STATUS red light flash 4 times, indicating the failure state.

2. Overheat:The controller contains a temperature detection circuit. When the temperature is over 70℃, the output level of the controller will be completely shut off. At the same time, the corresponding STATUS red light flash 2 times, indicating the failure state.

3. Short Circult:When the controller detects that a very large current suddenly appears in the circuit, it will be regarded as a short circuit. When this condition occurs, the controller will turn off the output level in a few milliseconds. At the same time, the corresponding STATUS red light quickly has a regular flash and one flash, indicating the failure state.

[Note] when the above protection is present, please reconnect the electricity after

removal of fault.

4. Overcurrent:The controller contains a current detection circuit, when the output current of the controller is detected.When over current protection is reached, the controller enters the overcurrent protection state. There are three kinds of states for customers to choose:

1). Overcurrent safety stop. After the over current, the power level stops the output, and the given signal is adjusted to 0 or the back direction given signal is provided, then the protection can be relieved.

2). Emergency stop. When the Current is over, the controller completely stops the output, and the power must be reconnected to remove the protection.

3). Over current limit. When the current is over, the given signal continues to be increased, and the output current is kept constant. The protection is relieved by reducing the given signal.

The default of the factory is the overcurrent limit. Customers can customize the same over current protection function according to the actual use situation.

XIV. Control mode explanation:

1. Open-loop speed control mode:

When controller is the open loop speed control, the controller to drive an output power level according to the actual input signal, when the given signal is adjusted to the maximum value, the controller output voltage corresponding to the input power supply voltage. The given signal can accept 0-5V analog or digital input (pulse frequency signal, the duty cycle signal or RC signal). Since there is no speed feedback, the control accuracy is not high.

2. Close-loop speed control:

A set of PID control algorithm integrated controller, used in fast and steady speed control. In the closed-loop speed control mode, an analog or digital (potentiometer) speed sensor (encoder) will be measured by the actual value of the motor speed feedback controller, the controller will not the desired speed are compared, and

compare the value of automatic compensation according to the output. The factory default is to use the encoder speed feedback sensor, can be adjusted according to customer requirements for analog feedback (need to modify Hang factory). It is recommended to use incremental encoders. In this mode, the given signal can accept 0-5V analog or digital input (pulse frequency signal, the duty cycle signal or RC signal). The controller to drive an output power level according to the actual value is not given signal feedback speed signal back, more precise control. At this time, when the given signal is adjusted to the maximum, the corresponding output voltage of the controller is the voltage value corresponding to the maximum set speed.

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.

Contact:

Jinan Keya Electron Science and Technology Co., Ltd.

Address: NO.66-102 of Xinmao Qilu Technology Park, NO.1 of Zidong Road, Tianqiao District, Jinan City, Shandong Province, China

Tel: 0531- 88973078   87173975   88601737   88601217   Fax: 0531-85898028

Website: www.dcmotorkeya.com   Email: sales@jnky.com