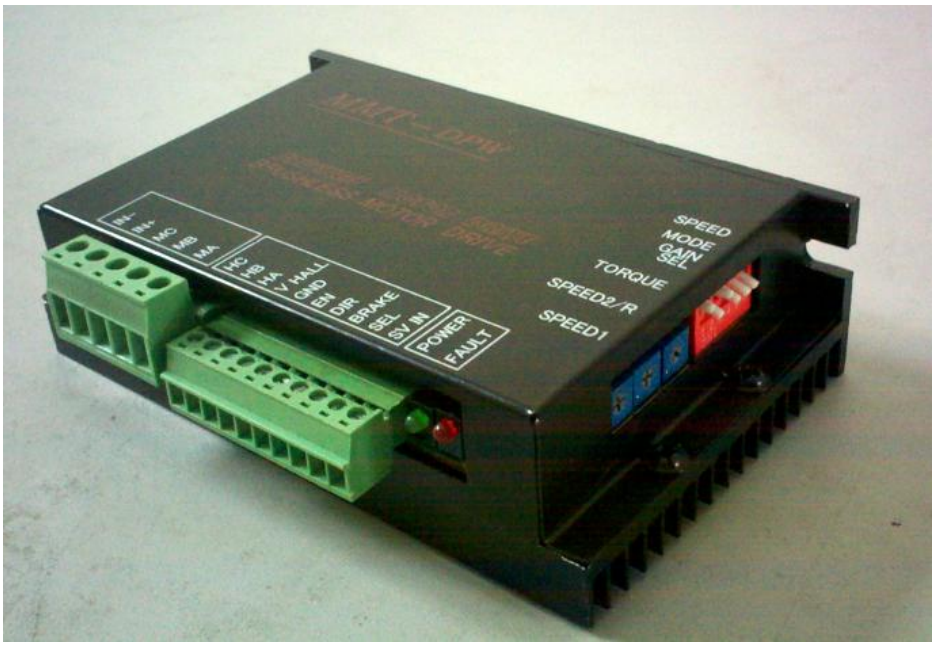
MMT -

DC10/50DPW15BL

Brushless Controller Operation Instruction



JiNan KeYa Electron Science and Technology Co., Ltd

Please read the operation instruction carefully prior to using this product.

Any fault and loss due to not complying with the cautions of operation and installation instructions is not within the scope of the warranty, and manufacturer will not undertake the related responsibility for that. Please keep all documents handy, and for any enquiry, please contact the manufacturer.

Safe Cautions

- Please arrange professional technicians for installation, connection and debugging of the equipment.
- In the charged case, it is forbidden to install, remove or change the circuit of equipment.
- Please equip with necessary protector between the power input terminals and the power supply (storage battery) for this product to avoid dangerous accidents or critical damages; over current protector, fuse, emergency switch, etc. shall be installed.
- Please keep isolation and insulation protection for the product, earth, and all equipments.
- If should it be deemed necessary to debugging the equipment in a charged case, please select non-metal special screwdriver or special debugging tool
- The produce shall be installed under a good ventilation circumstance.
- This product can not be used under abnormal circumstance of high humid, dust, corrosion gas and strong vibration.

 This sign means an important prompt or warning

Catalogue

Specification and model:

Model	Maximum Output current DC: (A)	Maximum Output voltage DC: (V)	Direct voltage Working range DC: (V)
DC 10/50DPW15BL	15	10-50	10-50 (95%)

I: Features:

- This produce has three manners of working: speed control, current control and open-loop control.
- Control functions of braking, direction, enable, first-magnification, dual speed setting, etc. can be realized.
- Maximum current limit can be adjusted.
- 0-5V signal control mode for external potentiometer, interior potentiometer and external analog quantity and soft start function.
- Time setting function for soft start.
- Overcurrent protection function and locked-rotor protection.
- High-speed control, which has a full speed of one pole pair motor can reach 120000RPM.

Details refer to relevant contents.

II: Performance Indexes:

1. Power supply voltage VCC: 10—50VDC (error <5% is better).
2. Maximum output voltage: Vout=0.95 VCC.
3. Maximum output current: 15A.
4. Switching frequency: 39KHz.
5. Maximum speed (one pole pair motor): 120，000rpm.
6. Hall power supply voltage range: 7—12VDC Maximum output current is 30mA.
7. Locked-rotor protection time: 1.5 seconds.
8. Ambient temperature: -10-- +60^{0}C.
   Ambient humidity: relative humidity≤80RH.
9. Analog quantity output: 0-- +5VDC.
10. Soft start time: 20ms—10S.
11. Regulation voltage of external potentiometer: 0--+5V potentiometer (10KΩ/2W).
10. Overall dimension (including radiator): 122*35*72mm.
11. Weight: approximate 300g.

III: Overall dimension: see Figure 1

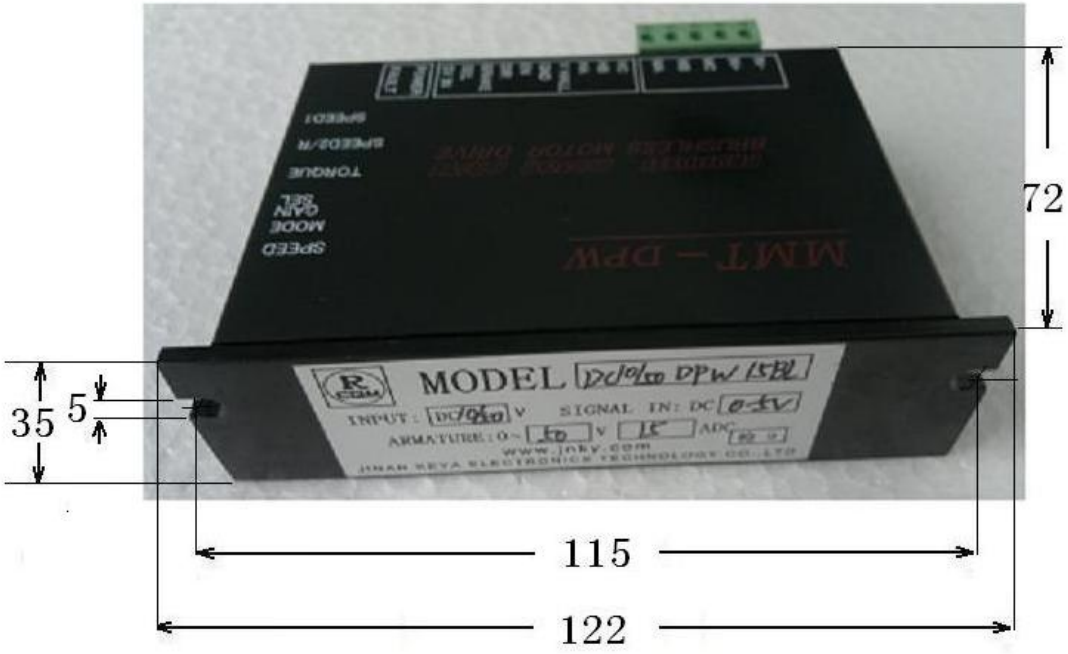


Figure 1

IV. Installation Requirements:

Warning

1. It is forbidden to install, wire or remove controller in a charged case, otherwise, it may cause accident or grievous injury. Prior to the installation, please carefully read and acknowledge the "Safety warning content" (page 1) and strictly comply with regulated requirements.
2. Drive elements are very sensitive to the disturbance of electromagnetic field, therefore, avoid installation under the circumstance with potential incident of static.Otherwise, it will cause damage to speed controller.
3. Keep driver far away from dust and high humidity environment, in the meantime, avoid accidental contact. Leave enough space for the driver to be easy for ventilation and adjustment.
4. Keep the driver far away from other heat sources when fixing the controller to ensure the driver works within specified ambient temperature range.
5. Avoid installation on the equipment with much vibration; if necessary, please take good quake-proof measures.
6. Driver can be installed on horizontal or vertical direction, and there is an installation fixed orifice of 2*Φ5mm on under chassis

V. Wiring requirements:

1. Do not connect wires in a charged case.
2. Please select compatible insulated conductor and shielding line with the voltage and current of driver for connection, and specification of driver power input line and motor connecting line complies with Table 1 as follows:

Line specification and length table

Current (A)	Line specification (m ㎡)	Maximum line length(m)
15	**3**	**15**

3. Please select shielding line for connecting signal wire and control line, and separately arrange to wire for power inlet line and output line.

> ⚠ Warning
>
> In any case, the signal wire and logic control line are forbidden to bind and mix with the power inlet line, output line (motor line) and other power line for wiring because it will generate induced voltage, which will cause interference, malfunction or direct damage of the driver .

4. There is no reverse connection protection inside the driver, so please ensure positive and negative poles of driver power input and external power supply are consistent, otherwise it will cause damage to driver.
5. Please use suitable tools for connecting and ensure accurate wiring.

VI: Wiring instruction on driver's terminals and schematic drawing of terminal functions: see Figure 2

Terminal 1: IN- external connection with power negative pole.
Terminal 2: IN+ external connection with power positive pole.
Terminal 3: MC motor winding C phase.
Terminal 4: MB motor winding B phase.
Terminal 5: MA motor winding A phase.
Terminal 6: HC motor HALL C phase.
Terminal 7: HB motor HALL B phase.
Terminal 8: HA motor HALL A phase.
Terminal 9: V HALL power positive pole, and HALL power voltage range:7—12VDC.
Terminal10: GND HALL area (common area).
Terminal11: EN Enable.
Terminal12: DIR direction selection.
Terminal13: BRAKE.
Terminal14: SEL assisted selection. ON for dial switch, the foot output is +5V conjunction with terminal 10 foot (GND) and terminal 15 foot(SV IN); while OFF for it, directed at two kinds of speed control ways as input port.
Terminal15: SV IN 0 -- +5V analog quantity input port conjunction with 10 foot (GND) and 14 foot (SEL).

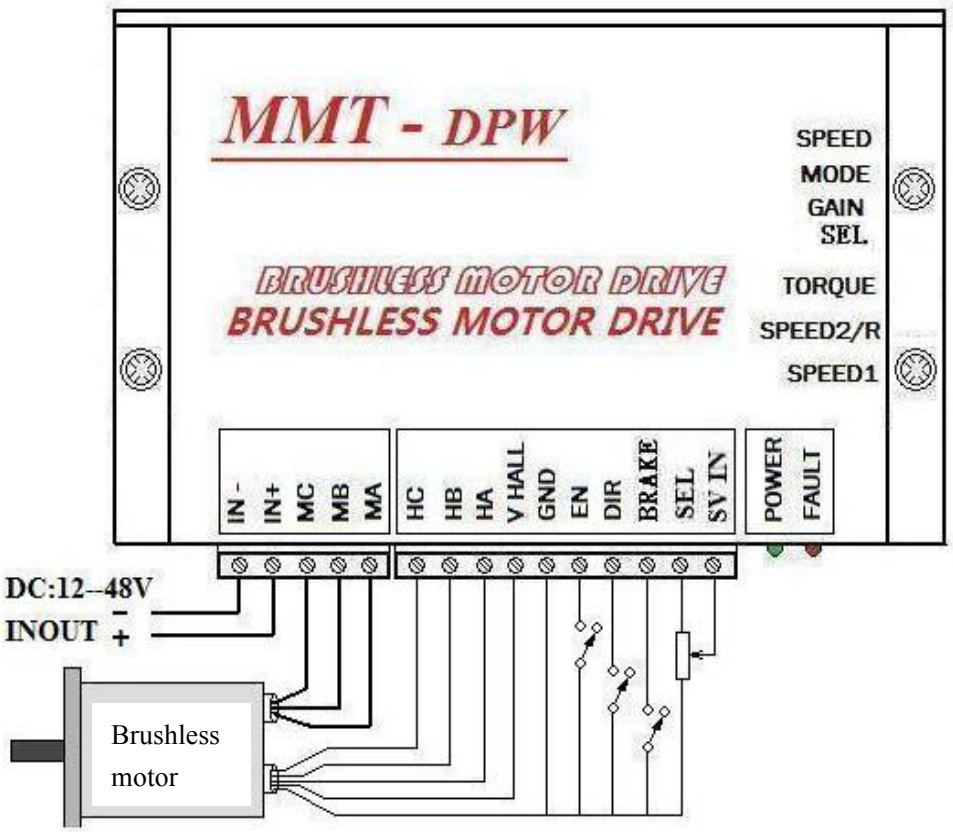


Figure 2

VII. Connection for fuse, power switch and motor

1. It must be equipped with a fast fuse and electromagnetic relay contactor between power input end of driver and power (storage battery) to realize emergency power off in case of suddenly power cut. See Figure 3

(Note: selection for fast fuse and electromagnetic relay contactor: rated current value should be bigger or equal to 150-200% of motor rated current.)

Note: please confirm if the voltage rated value of motor matches with the output voltage of the driver.

2. Motor connecting: see Figure 3

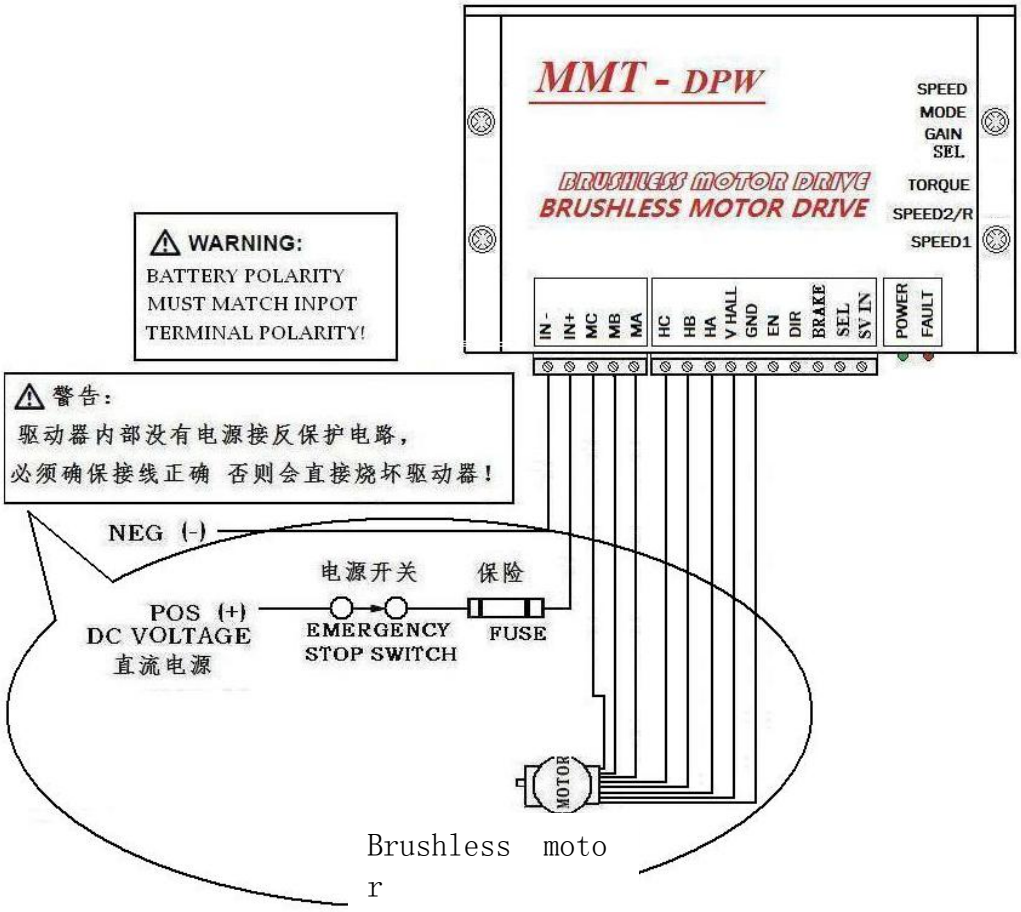


Figure 3

图片	
中文	英文
警告： 驱动器内部没有电源接反保护电路，必须确保接线正确，否则会直接烧坏驱动器	Warning There is no storage battery polarity transposition inside the driver to protect circuit, therefore, please ensure correctly connect wires, otherwise, it will directly cause burnout of the driver.

3. Power input connection

Warning

There is no storage battery polarity transposition for power input end inside the driver to protect circuit. Please ensure the POS (+) be connected with B+ terminal and NEG (-) with B- terminal.

1. Prior to connecting power supply (storage battery) for driver, please confirm the positive and negative poles of power supply (storage battery) in accordance with D.C positive and negative poles of driver.
2. Complying with the requirements of Table 1 in page 6, select suitable wires for connection.
3. Confirm if the voltage of power supply (storage battery) can meet working requirements of the driver and the capacity of power supply (storage battery) can bear load current of the

motor.

VII. Function and connection of control terminal: see Figure 4

Warning

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

To avoid unnecessary signal interference, shorten wire length of control terminal as possible, and in case of above 0.5m, please select shielded wire.

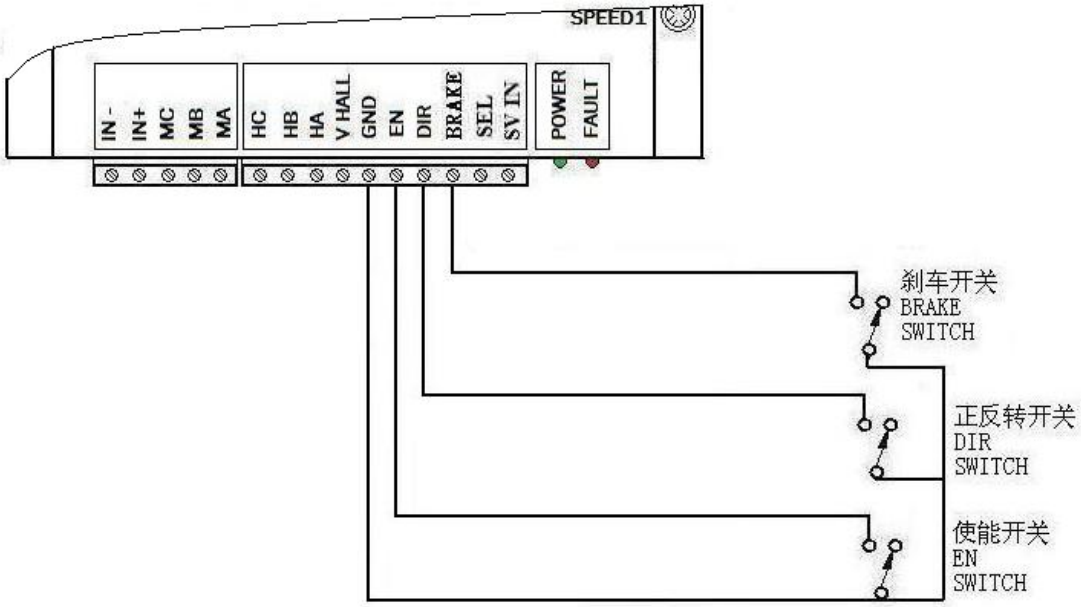


Figure 4

1. **BRAKE**: braking control terminal

   Braking control terminal: in case of realizing rapid stop of the motor, select this control function.

   The moment close braking switch, driver will quickly brake for motor to stop.

2. **DIR**: direction control terminal

   Motor rotation direction control: control motor rotation direction through on/off of direction control switch.

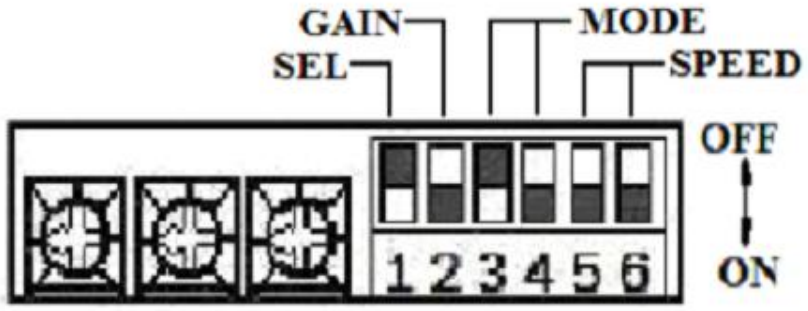
3. **EN**: enable control terminal

   Enable control: control start-stop of the motor

   On for enable switch, driver will automatically lock interior circuit to stop output;

   Off for enable switch, motor will run at the setting value of potentiometer or input signal;

IX. Function Instruction on dial switch. See enclosed figure:



1. Function:

SEL(S1): in case of dialing to ON, select 10K potentiometer for external speed regulation that terminal 14-foot (SEL) supplies power of +5V for external potentiometer at this moment. In case of OFF, other speed control modes are available. (Details of dialing setting refer to functional instructions).

GAIN (S2): Gain is low without amplification in case of ON, while gain is high with amplifier stage in case of OFF.

Note: if motor is not stable with vibration or noise, dial to ON.

MODE (S3, S4): selection for speed control mode.

SPEED (S5, S5) speed selection: the speed will be the maximum in case that OFF is for both of S5 and S6.

2. Speed range setting

Under the speed control mode, set given value to 0--+5V corresponding to the following speed range:

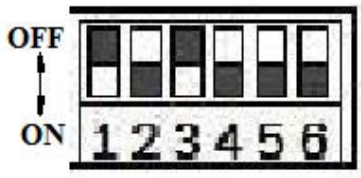
Switch		Poles quantity							
		1		2		4		8	
S5	S6	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
ON	ON	500	6000	250	3000	125	1500	67	750
ON	OFF	500	25000	250	12500	125	6250	67	3125
OFF	ON	500	60000	250	30000	125	15000	67	7500
OFF	OFF	500	120000	250	60000	125	30000	67	15000

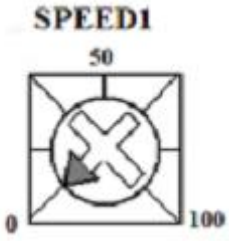
Instructions: Under the current control mode, after setting S5 and S6, it is available for one-pole motor to choose 500—25000rpm as maximum rotating speed through the adjustment of P1 SPEED1. For multi-poles motor, bigger quantity of poles means smaller range of maximum speed. Under speed open-loop control, 0V is corresponding to 0V voltage of motor. And on condition that the positions of S5 and S6 complete to set, maximum speed depends on relevant parameters of power voltage and motor speed.

X. Instruction on function and mode

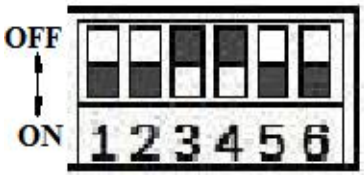
1. Speed control mode

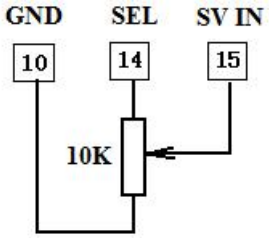
(1) Interior potentiometer control with speed adjustment of interior potentiometer SPEED1. (This mode is default)





(2) Select 10K potentiometer for external potentiometer control.





Warning

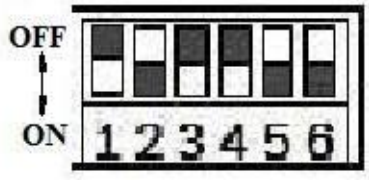
Please ensure the dielectric resistance between exposed lead terminal of speed regulator and installed shell ≥20MΩ.

Warning

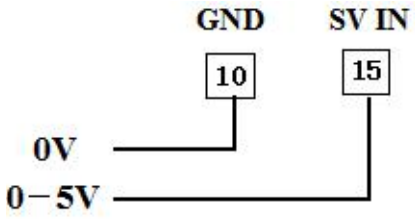
All connecting wires of control terminal shall not be close to the wires of power source and output terminals.

To avoid unnecessary signal interference, shorten wire length of control terminal as possible, and in case of above 0.5m, please select shielded wire.

(3) The input range of external analog quantity control: 0--+5VDC.



Analog signal input

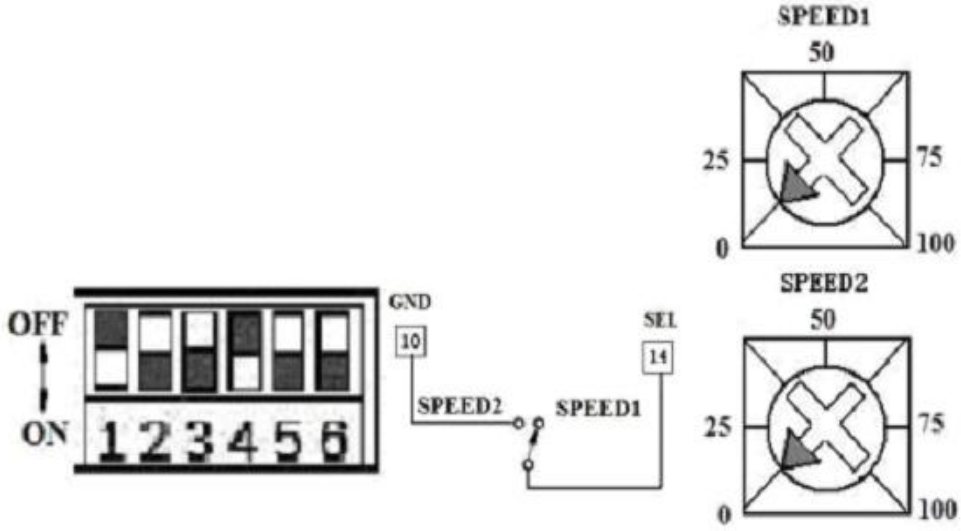


Warning

All connecting wires of control terminal shall not be close to the wires of power source and output ends.

To avoid unnecessary signal interference, shorten wire length of control terminal as possible, and in case of above 0.5m, please select shielded wire.

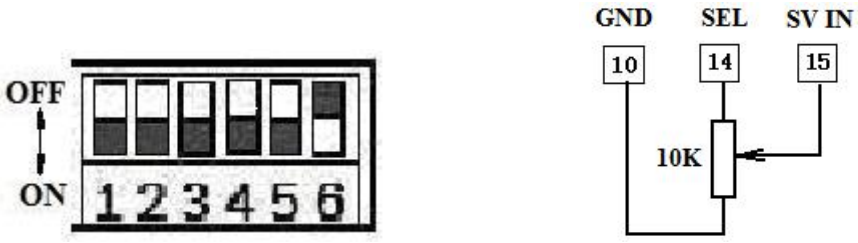
(4) Two speed controls of regulating potentiometer SPEED1 and SPEED2. In case of terminal 14-foot (SEL) hanging in the air, SPEED1 potentiometer is available for speed control, while 14-foot (SEL) is connected to the ground, SPEED2 potentiometer is available for speed control.



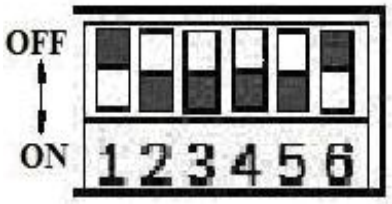
2. Current control mode

Two ways under this mode:

(1) External potentiometer control:

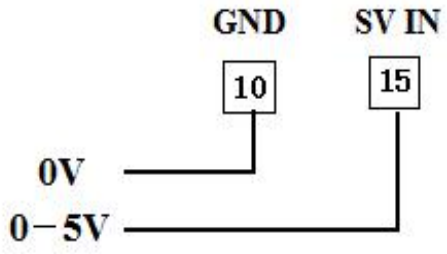


(2) External analog quantity control:



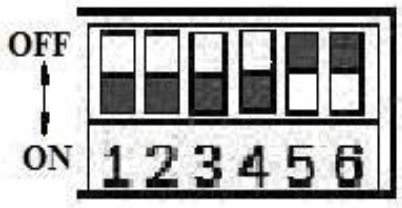
Analog signal input

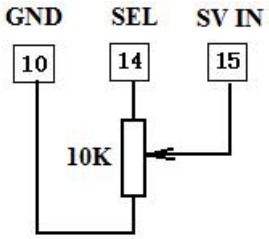
DC: IN



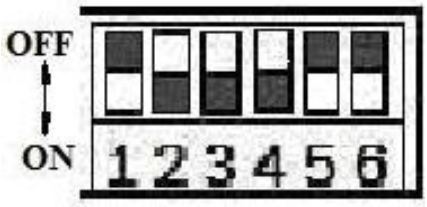
3. Open-loop control mode

(1) External potentiometer control:

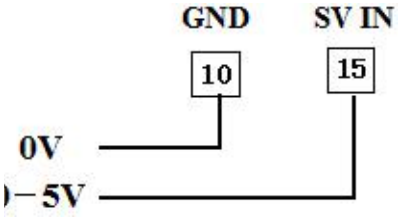




(2) External analog quantity control:



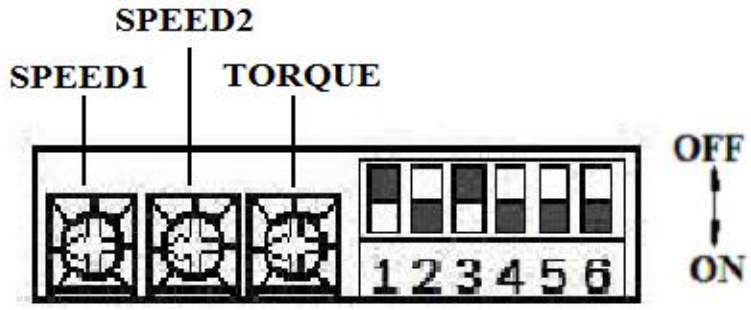
Analog signal input



XI Function instruction and setting for adjustable potentiometer:

(1) Presetting adjustment: The presetting value of factory potentiometer increases if clockwise and decreases if anticlockwise.

Factory default value of potentiometer SPEED1 and SEED2 is 50%, and TORQUE is 80%.



SPEED1: Interior potentiometer adjustment that increases clockwise and decreases anticlockwise.

SPEED2/R: Speed 2(Details refer to Mode 4)/soft start time setting is that increases clockwise and decreases anticlockwise.

Adjust this potentiometer "PEED2/R" that set up the rate of rise from initial speed to setting speed. (i.e. the rising time, and the setting time is adjustable within 20ms---10s).

Note: The adjustment for potentiometer with anticlockwise direction is to reduce starting time, and clockwise direction is to increase soft stating time.

TORQUE: Current restriction adjustment that increases clockwise and decreases anticlockwise.

According to the maximum current of limit driving plate and rated current of selected motor, adjust this potentiometer to make the maximum current of limit driving plate to be equal to 120%~200% of the motor rated current.

Potentiometer	Mode							
	Speed control (closed loop)				Current control		Open-loop control	
	Interior setting speed	External potentiometer setting speed	External analog quantity 0--+5V	Different speeds	External potentiometer setting speed	External analog quantity 0--+5V	External potentiometer setting speed	External analog quantity 0--+5V
SPEED1	Y			Y	Y	Y		
SPEED2				Y				
R	Y	Y	Y					
TORQUE	Y	Y	Y	Y			Y	Y

Remark: Y means operative while blank space means inoperative. Control mode of the controller refers to other related contents.

(2) Potentiometer adjustment instruction:

1) Under speed mode:

1. According to operation mode, adjust settings in advance in order to reach the relevant requirements. If speed is not able to reach requirements, adjust S5 and S6. (Relevant contents refer to speed setting)
2. Clockwise adjust potentiometer TORQUE to the maximum that is adjusting current-limiting to the maximum of 0—15A.
3. Gain switch S2 to required value (S2OFF: high gain, S2ON:low gain).

Instructions: if there is instability, vibration, noise or bigger amplification, switch S2 to ON.

2) Current control mode

1. Adjust potentiometer SPEED1 to set the maximum value of the speed. In respect of maximum speed within 500—25000rpm (one-pole motor), it is available to select SPEED1 for linearity control that the positions of S5 and S6 determines the range of maximum speed. (Relevant contents refer to speed range setting)
2. Preset speed input to reach required torque.
   Instruction: speed input rang at a setting of 0—+5V is equal to a current adjustment range of 0—15A.

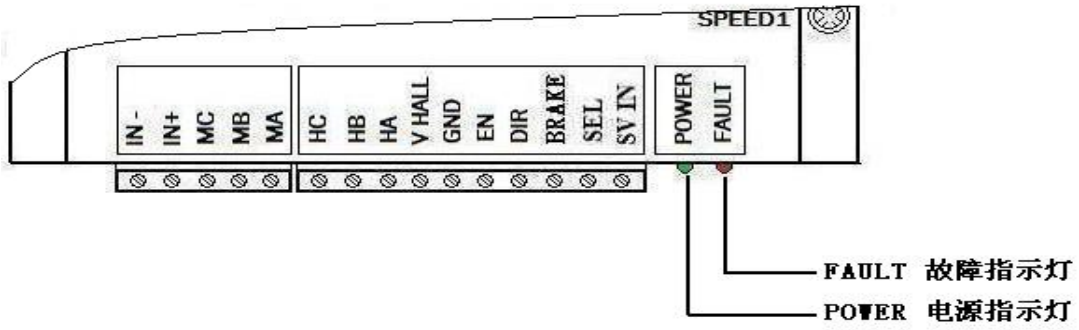
3) Open-loop control mode

1. Preset speed input to reach required speed. Set voltage range within 0--+5V, and maximum speed depends on power supply voltage, motor speed parameters, and positions of S5 and S6.
2. Adjust potentiometer TORQUE to reach required maximum current-limiting value of 0—15A.

XII. Checking steps prior to power:

1. At first, check if the connection of positive and negative poles of battery and driver is correct and reliable, and if power supply belongs to the application range of the driver.
2. Check if the bare parts of driver circuit plate are clean without existence of conductive metal, moist, water and sundries.
3. Check if peripheral connecting wires of driver is correct, and ensure there is no short circuit and be grounded.

XIII. Instruction on LED status lamp:



图片	
中文	英文
故障指示灯	Fault light
电源指示灯	Power light

POWER (green): Power light **FAULT** (red): Fault light

POWER (green): Power instructions see as the following table

Green light state	State instruction
Normally be on	Normal operation
One time of discontinuous flashing	EN is connected and operation stops
Two times of discontinuous flashing	Braking

FAULT (red): Fault light

Red light state	Abnormal state instruction
One time of continuous flashing	Overload thermal protection
Two times of continuous flashing	Motor is locked, load is too heavy, current-limiting value is too low, and wiring of motor is poor.
Three times of continuous flashing	Wiring of HALL sensor is abnormal or HALL signal is abnormal that is tested by controller.
Four times of continuous flashing	Error for S3-S10 setting operation mode

Common fault analysis and solution:

Fault	Possible Cause	Solution
Power light is off	Without power input.	1. Measure if the voltage of power input ends is equal to power supply voltage or not.
Motor is out of action	1. Given signal is 0V. 2. EN enable terminals close 3. Connecting wires are correct or not. 4. Excessive load and driver FAULT light on.	2. Adjust speed potentiometer. 3. Switch off EN enable: EN 4. Check connecting wires between driver and motor. 5. Check if load is excessive, and adjust current setting of driver or replace with suitable current and model.
Abnormal positive and reverse rotation.	No reversing	Check DIR change-over switch that if close DIR switch, the voltage of DIR to ground should be 0V, while if switch

		off DIR switch, the voltage should be 5V. Check switches and connecting wires if failing to meet.
Given signal is abnormal	No given signal	Check if the position of dial switch is corresponding to working mode; or potentiometer connecting wires.
Block up and FAILT red light flashes twice	1. Current potentiometer is not correct 2. Excessive load 3. Poor connection for phase fault	1. Adjust TORQUE potentiometer 2. Check if load is excessive, and adjust current setting of driver or replace with suitable current and model. 3. Check connecting wires between driver and motor
FAUL red light flashes three times	HALL signal is abnormal	Check if the HALL wiring is correctly connected.
FAUL red light flashes four times	Error for dial switch setting.	Check the selected operation mode corresponding to dial switch

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