

*MMT* –

© DC24DP100-400BL-B01/R01

© DC36DP100-400BL-B01/R01

© DC48DP100-400BL-B01/R01

© DC72DP100-400BL-B01/R01

## Electrical Control for Electric Vehicle Product 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 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

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## Reference indication for specification and model:

### I. Performance index

Product model	Rated voltage	Rated current	1 hour current	Minimum voltage	Highest voltage	Referenced motor power
DC24DP100BL-B01/R01	24V	100A	50A	19V	36V	1.5KW
DC24DP200BL-B01/R01	24V	200A	70A	19V	36V	2.2KW
DC24DP300BL-B01/R01	24V	300A	110A	19V	36V	3KW
DC24DP400BL-B01/R01	24V	400A	150A	19V	36V	4KW
DC36DP100BL-B01/R01	36V	100A	60A	28V	44V	1.5KW
DC36DP200BL-B01/R01	36V	200A	80A	28V	44V	2.2KW
DC36DP300BL-B01/R01	36V	300A	120A	28V	44V	3KW
DC36DP400BL-B01/R01	36V	400A	160A	28V	44V	4KW
DC48DP100BL-B01/R01	48V	100A	70A	36V	60V	1.5KW
DC48DP200BL-B01/R01	48V	200A	90A	36V	60V	2.2KW
DC48DP300BL-B01/R01	48V	300A	130A	36V	60V	3KW
DC48DP400BL-B01/R01	48V	400A	170A	36V	60V	4KW
DC72DP100BL-B01/R01	72V	100A	80A	54V	90V	1.5KW
DC72DP200BL-B01/R01	72V	200A	100A	54V	90V	2.2KW
DC72DP300BL-B01/R01	72V	300A	140A	54V	90V	3KW
DC72DP400BL-B01/R01	72V	400A	180A	54V	90V	4KW

1. PWM pulse width modulation

2. Speed regulation ratio: 1:60

3. Speed regulation mode:

Model suffix with R01 means speed regulation mode of:

Potentiometer (10K $\Omega$ /2W)/signal isolator (0-5V,0-10V,4-20mA)

Model suffix with B01 means speed regulation mode of:

Foot accelerator/the Hall handle

4. Input impedance:  $\geq 10\text{K}\Omega$

5. Working voltage range:  $\pm 25\%$  of nominal voltage

6. Soft start time: 1-5 S

7. Ambient temperature:  $-10^{\circ}\text{C}\sim +60^{\circ}\text{C}$

8. Ambient humidity: relative humidity  $\leq 80\text{RH}$ .(non condensing)

9. Current restriction protection

10. Remote start-stop can be realized

11. Applied for permanent magnet, separate excitation and series-excited motor

12. Thermal protection for controller cutting off output in case of overheating for controller to effectively protect controller and traveling crane safety.

13. Able to directly judge source of fault through luminous diode under working condition.

14. Stepless speed regulating and anti-phase braking control

15. Built-in precharging resistor and polarity protection diode provide convenience for installation and use

16. Under voltage and over voltage protection effectively protects storage battery and all components of controller assembly

17. 90 seconds no acceleration signal input can automatically cut off the power of contactor magnet coil to save the energy of storage battery.

II. 1) Overall dimension of the controller: See Figure1

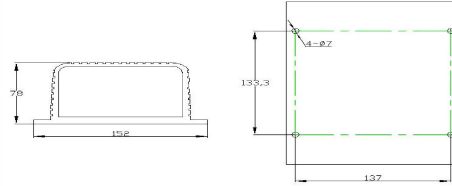


Figure1

2) Overall dimension of the controller assembly: See Figure 2

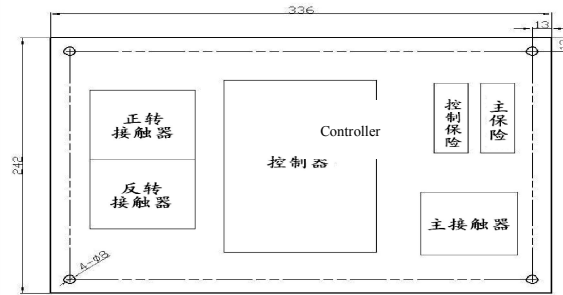


图 2

Figure 2

### III. Installation requirements:



#### Warning

1. It is forbidden to install, wire or remove controller in a charged case. Due to high voltage of controller, prior to installation, insulation gloves and discharge electricity shall be wore through the connection of one 220V/100W lamp bulb with both terminals of B+ and B-, or it maybe cause accident or serious injury. Prior to installation, please carefully read and acknowledge the "Safety warning content" (page 2) and strictly comply with the regulated requirements.
2. Controller components 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 controller.
3. Keep the controller far away from dust and high humidity environment, in the meantime, avoid accidental contact. Leave enough space for the controller to be easy for ventilation and adjustment.
4. Keep the controller far away from other heat sources when fixing the controller to ensure the controller works within specified ambient temperature range.
5. Avoid installation on the equipment with much vibration; if necessary, please take good quake-proof measures.
6. Controller can be installed on horizontal or vertical direction, and there is an installation fixed orifice of 4\*Φ7mm on under chassis.

### IV. 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 the controller for connection, and specification of the controller power input line and the motor connecting line complies with Table 1 as follows:

#### Line specification and length table

Current (A)	Line specification (m m <sup>2</sup> )	Maximum line length(m)
-------------	--	------------------------

<b>100</b>	<b>12</b>	<b>10</b>
<b>200</b>	<b>25</b>	<b>10</b>
<b>300</b>	<b>40</b>	<b>10</b>
<b>400</b>	<b>55</b>	<b>10</b>

3. Select shielding line for the connecting signal wire and the 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 controller.

4. Please use suitable tools for connecting and must ensure accurate wiring.



## V. Wiring diagram of controller terminals: See Figure 3

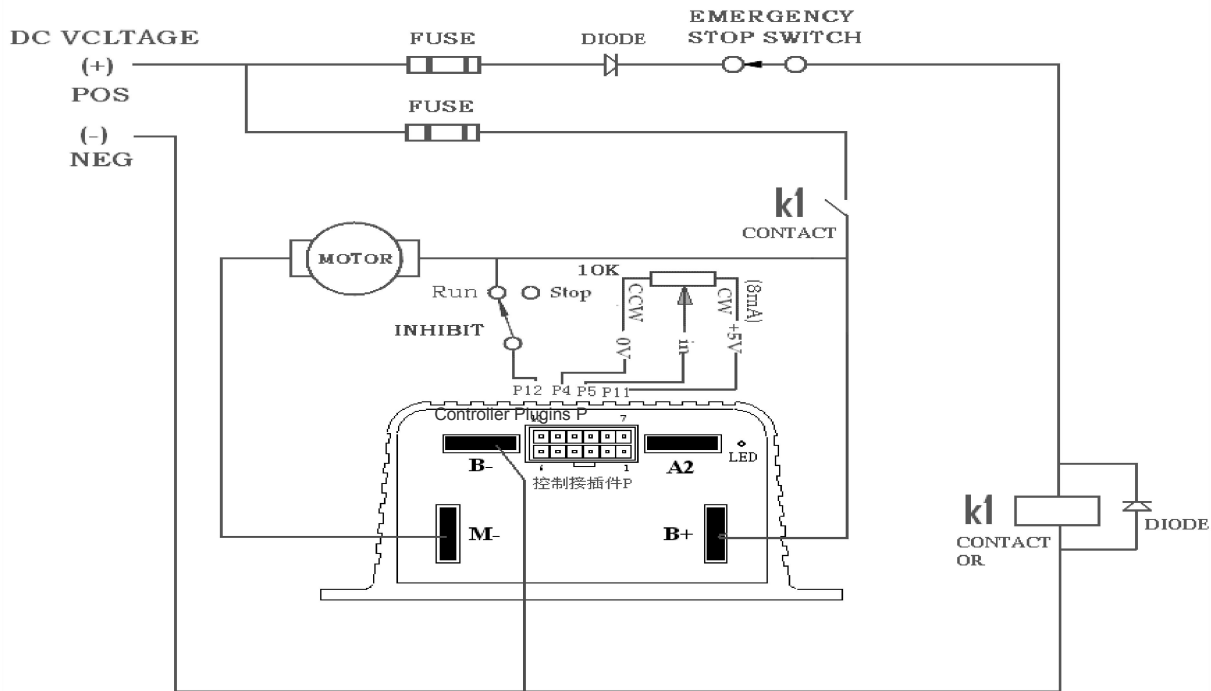


Figure3

## VI. Connection for fuse, power switch and motor

1. It must be equipped with a fast fuse and electromagnetic relay contactor between power input terminals of the controller and the power supply (storage battery) to realize emergency power cut in case of emergency. A fast fuse shall also be equipped between the control circuit input terminals of the controller and the power supply (storage battery) in case of short circuit of the control circuit. See Figure 4

(Note: selection for the fast fuse and electromagnetic relay contactor: the rated current value should be bigger or equal to 150-200% of the motor rated current, and recommend selection of 10A fuse for the control circuit)

2. Motor connection:
3. Connect the DC motor to B+ and M- of the bus bar. See Figure 4 (Permanent magnet motor or separate excitation motor)

Controller offers voltage to the motor through two terminals of B+ and M - . It assumes that the motor realizes clockwise rotation in the case of B+ connecting with motor positive pole while M - connecting with negative pole, if requiring anticlockwise rotation, only simply reversing for connecting wires of B+ and M - can realize that.

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

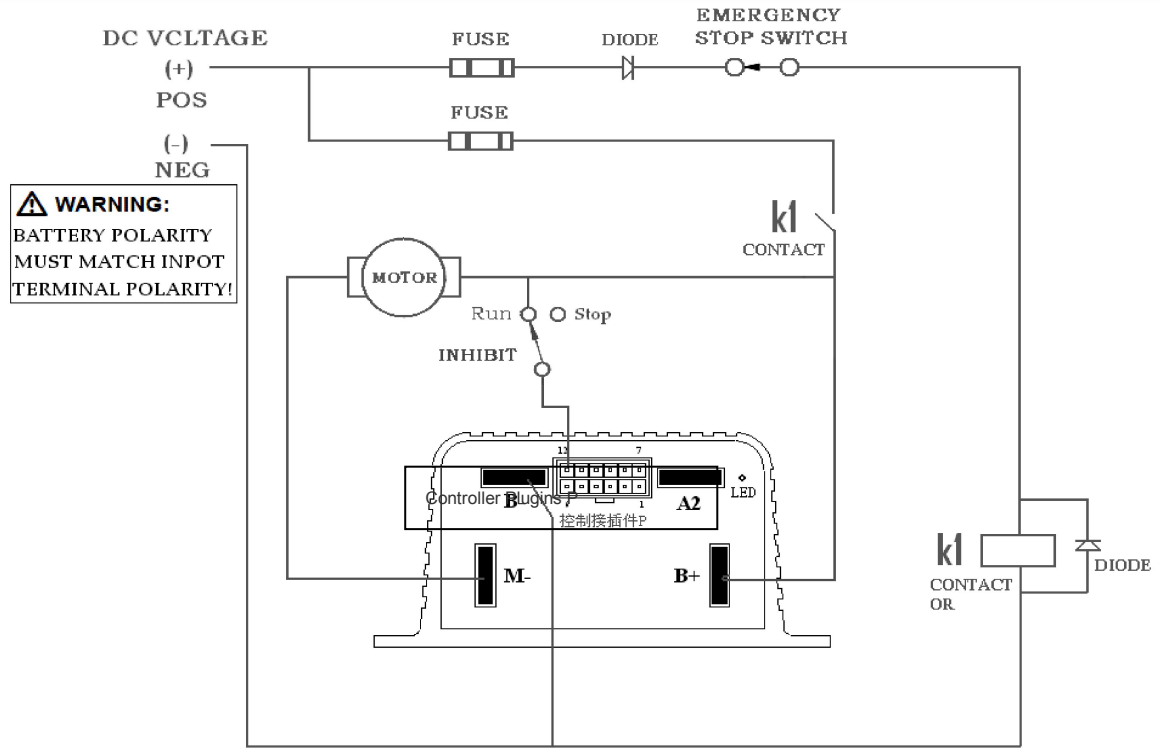


Figure 4

#### 4. Power input connection



Warning

There is no storage battery polarity transposition for power input terminals of the controller to protect the circuit. Please confirm the POS (+) has been connected with B+ terminal and NEG (-) with B- terminal.

1. Prior to connecting power supply (storage battery) for controller, please confirm the positive and negative poles of power supply (storage battery) in accordance with D.C positive and negative poles of controller,
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 controller and if the capacity of power supply (storage battery) can bear load current of the motor.

#### VII. Connection methods for speed adjustment and controller:



Warning

Please ensure the dielectric resistance between exposed lead terminal of speed regulator and installed shell  $\geq 20M\Omega$



Warning

Connecting wires of speed regulator will not be close to the wires of power source and output terminals.

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

1. Wiring and installation for potentiometer-type speed regulator and controller (please select potentiometer-type controller) (see Figure 5 for installment).

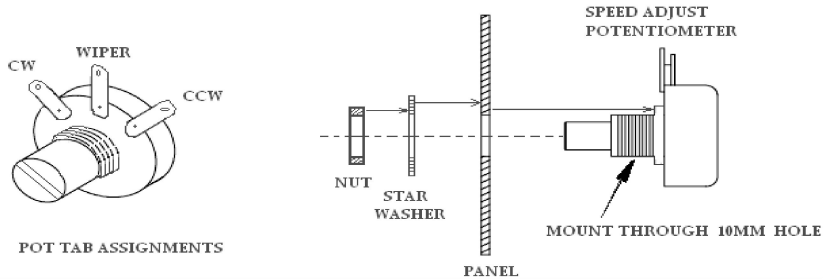


Figure5

Connection: see Figure 6

Use speed regulating potentiometer complying with Figure 6, and connect regulating potentiometer of 10k resistance among terminals, P11, P4 and P5.

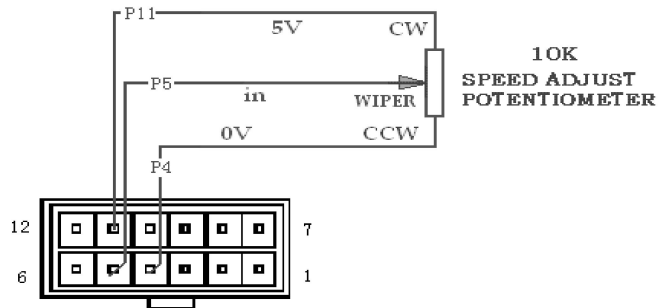


Figure6

2. Wiring and installation for signal isolator type speed regulator and controller (please select signal isolator type controller) (refers to Figure 7).  
Use speed regulating signal isolator complying with Figure 7, and connect regulating signal isolator among terminals, P2, P4 and P5.

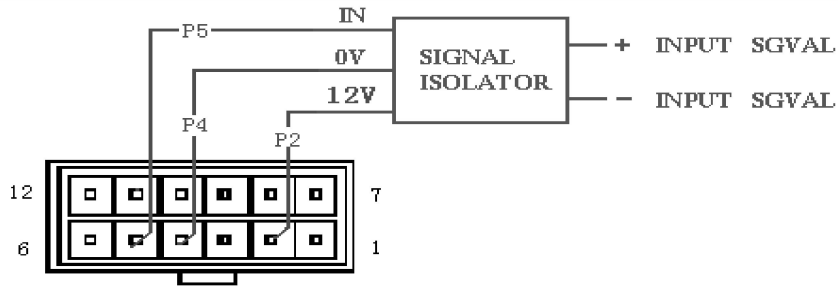


Figure7



**Warning**

1. In case of external analog signal for control, control signal 0V is unacceptable to be used together with the main power supply 0V; after isolation of external signal, input it to signal input terminals of the controller.
2. In case of using 0~5V, 0~10V, 4-20mA analog signal, please choose special signal isolator manufactured by Keya.

To ensure product work reliably, please choose special signal isolator manufactured by Keya. For specific details, please contact our technical engineers.

3. Wiring for the hall handle and the controller (please choose the hall handle type controller) refers to Figure 8.

Use speed regulating hall handle complying with Figure 8, and connect regulating signal isolator among terminals, P11, P4 and P5.

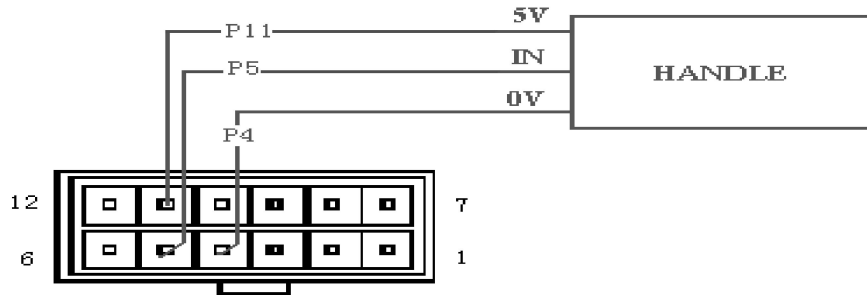


Figure 8

4. Wiring for the foot accelerator and the controller (please choose the foot accelerator type controller) refers to Figure 9.

Use the speed regulating foot accelerator complying with Figure 9, and connect regulating foot accelerator among terminals, P3, P4, P5 and B+. (Note: if adopt resistance-type accelerator as foot accelerator, wiring method should refer to Figure 6: potentiometer-type wiring diagram).

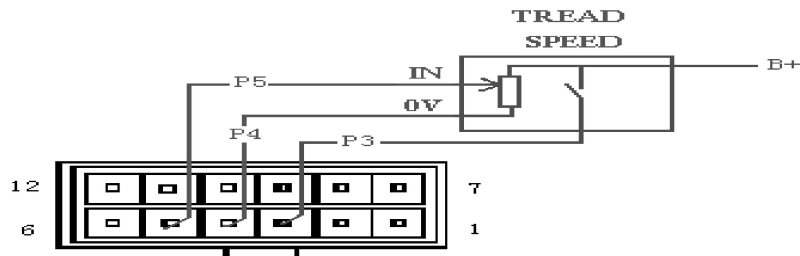


Figure9

### VIII. Connection for enable switch (INHIBIT):

1. Adopt mechanical contact switch to control the start-stop of motor: See Figure 10

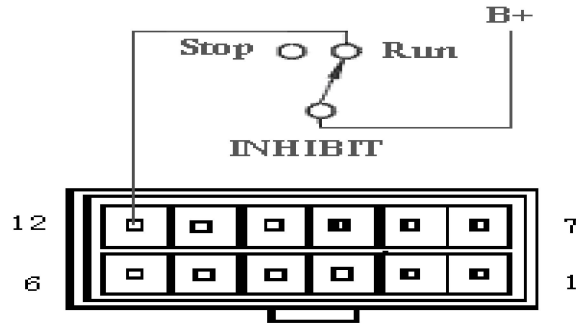


Figure10



Warning

Connecting wires of enable switch (INHIBIT) shall not be close to the wires of power supply terminals and output terminals.

To avoid unnecessary signal interference, shorten wire length of enable switch (INHIBIT) as possible, and in the case of above 0.5m, please select shielded wire.

### IX. Check prior to power on



1. Firstly, check if positive and negative poles connection between battery and controller is correct, reliable and input power supply is within the scope of the voltage application of the controller.
2. Please confirm all wires are correct.
3. Please confirm all wires are reliable.
4. Please confirm that there is no short circuit, open circuit, damage, wire head exposure, etc for wiring.

## X. Energizing operation steps

1. Prior to the operation with charge, should counter-clockwise spin speed regulating potentiometer to bottom (given signal is 0).
2. Connect the D.C power supply.
3. Connect the enable switch (INHIBIT).
4. Clockwise slowly increase signal (potentiometer) and motor will speed up as signal. Persist in above operation till reaching scheduled speed.
5. When disconnect the enable switch (INHIBIT), the motor sliding will stop in case of turning-off energizing switch.
6. When disconnect the D.C input power supply of controller, the motor will stop rotating.

Note: If the motor or the controller cannot work as above descriptions, please immediately disconnect the D.C input power supply and look for reasons referencing to enclosed fault compatible.

## XI. Methods of run/stop

Control methods: See Figure 11:

Equip one SPDT switch between B+ and P12 that can control the start-stop of the motor through its “close/break”

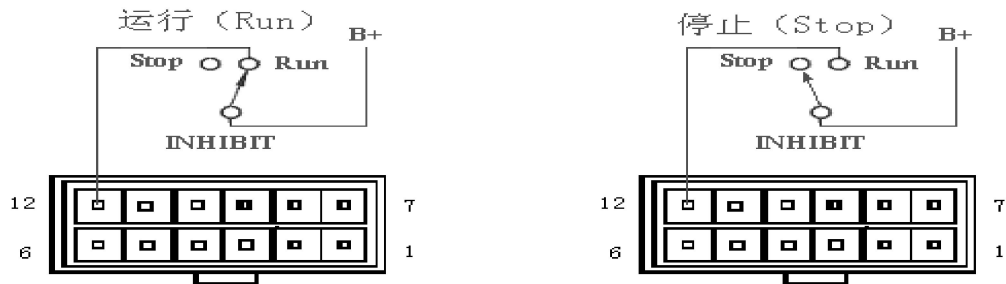


Figure11

Note: in case of state of emergency, immediately break D.C input power supply to stop motor to slide.

## XII: Motor switchover for positive and negative direction:



### Warning

Rated current value of power contactor and dual-pole dual-throw change-over switch (positive and negative contactor) should be bigger or equal to 150-200% of the motor rated current, (control contact capacity should be greater than 6A). In case of reversing for the motor, please select dual-pole dual-throw change-over switch (or electromagnetic contactor) for switchover, the motor must be under stop position when using change-over switch for switchover, or it will cause serious demagnetization of the motor, damage to the controller and accidents of the mechanical equipment.

1. Diagrammatic drawing of using electromagnetic contactor for switchover

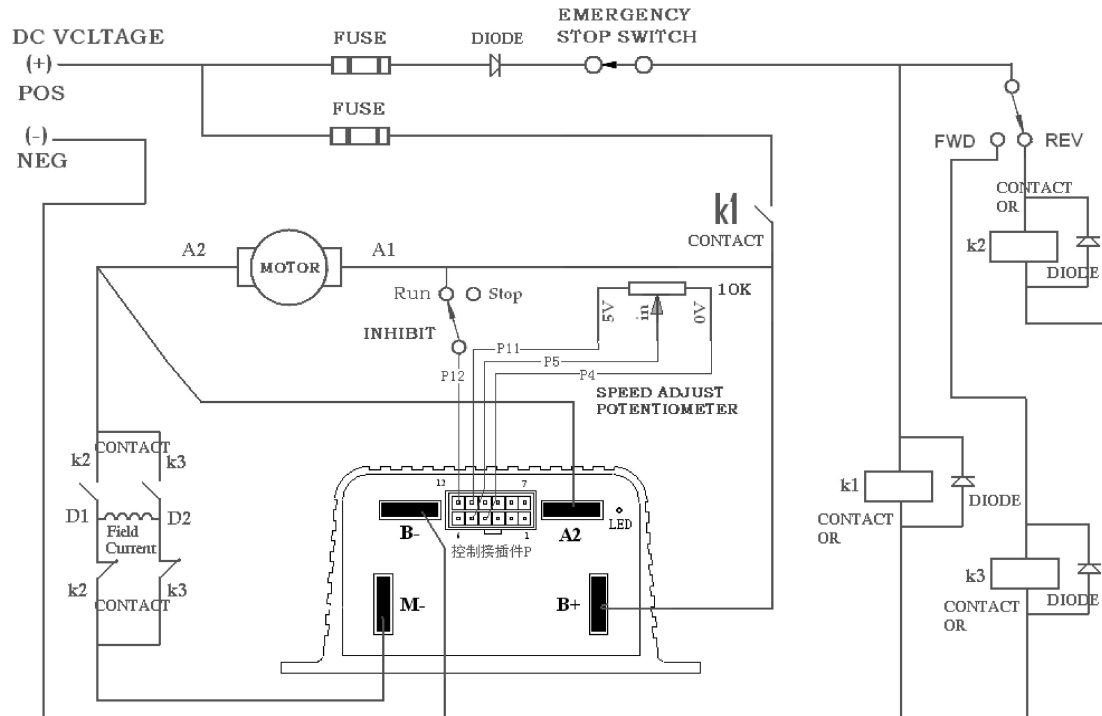
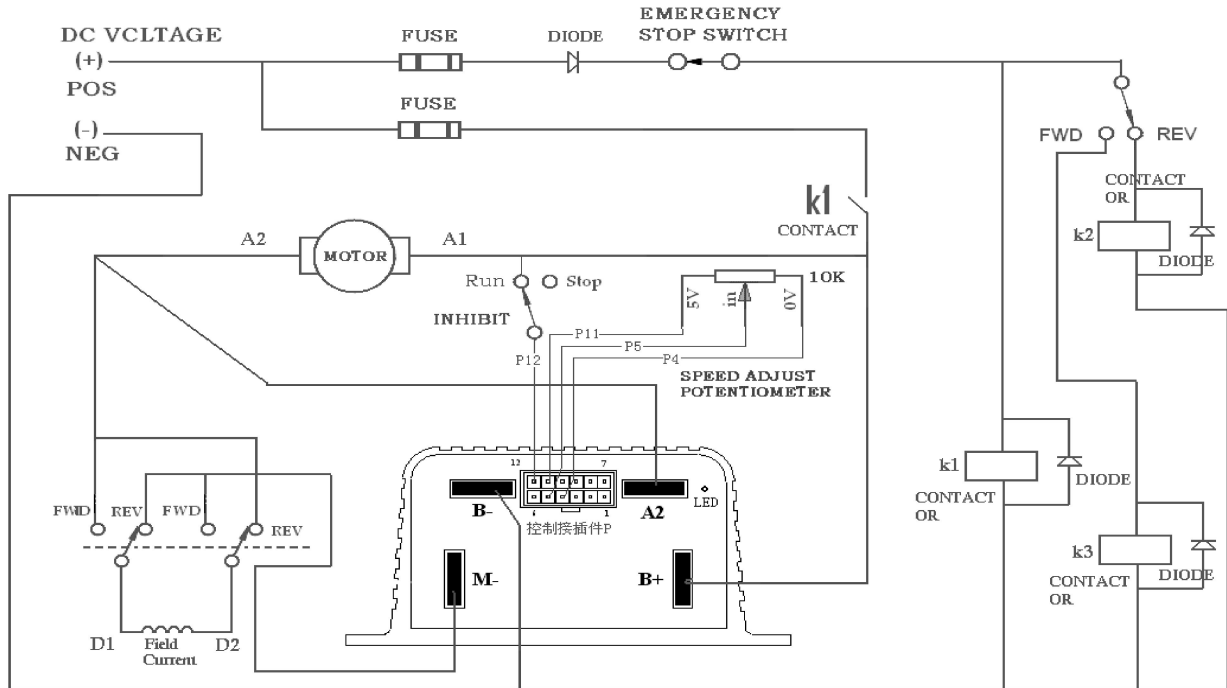


Figure12

2. Diagrammatic drawing of dual-pole dual-throw change-over switch for switchover. See the following figure



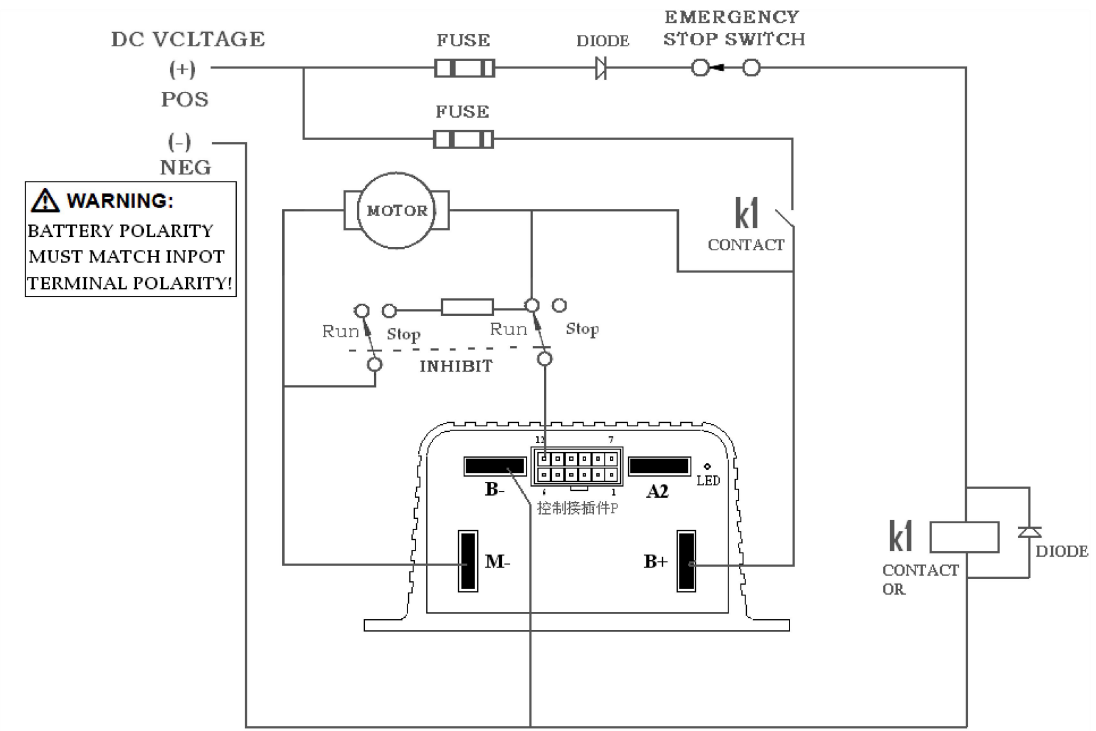
### XIII. Motor braking

In case of requiring quick stop for the motor, adopt methods of dynamic energy consumption braking and contracting brake to realize.

Attention:

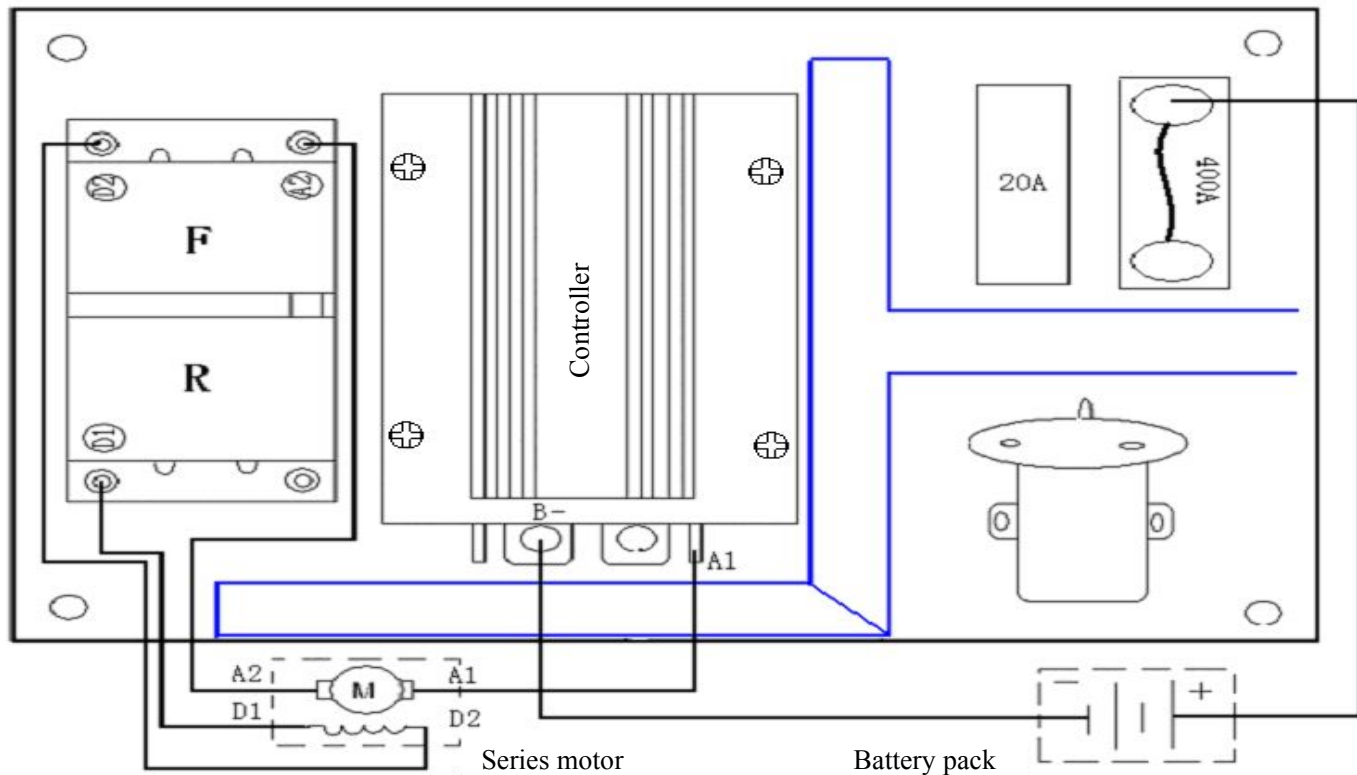
1. In the condition of adopting dynamic energy consumption braking, should calculate its power and resistance value for selected brake resistor according to the motor power, armature voltage, rated current, load inertia and required braking time, and the resistance value of brake resistor should not be too small, otherwise, it will cause serious demagnetization or overburning of the motor in case of frequent braking. While adopting contracting brake, it should be selected according to the load inertia and required braking time, and the restraining quantity should not be too small, otherwise, it will cause serious damage to the motor and mechanical parts.
2. Please select dual-pole dual-throw change-over switch (or electromagnetic contactor) to realize switchover function of motor start-stop. It requires that in case of switchover through this change-over switch, it must simultaneously realize linkage switching with "INHIBIT enable control terminal" of controller, otherwise, it will cause serious overburning to controller.

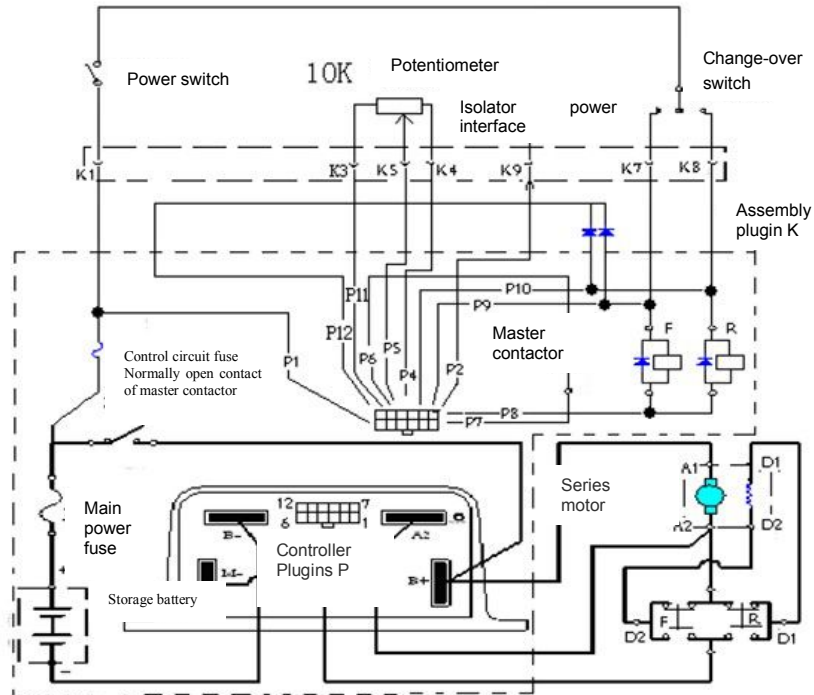
Figure diagrammatic drawing of switchover. See following figure



XIV. Assembly real arrangement diagram of controller

336\*242\*130





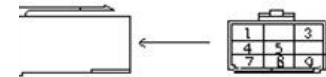
\*Hidden line means the wirings within controller assembly

— 0.75mm  
 — 20mm

## MMT Type of Controller Assembly Typical Wiring Diagram

### R01 series

Controller assembly  
 plugs K



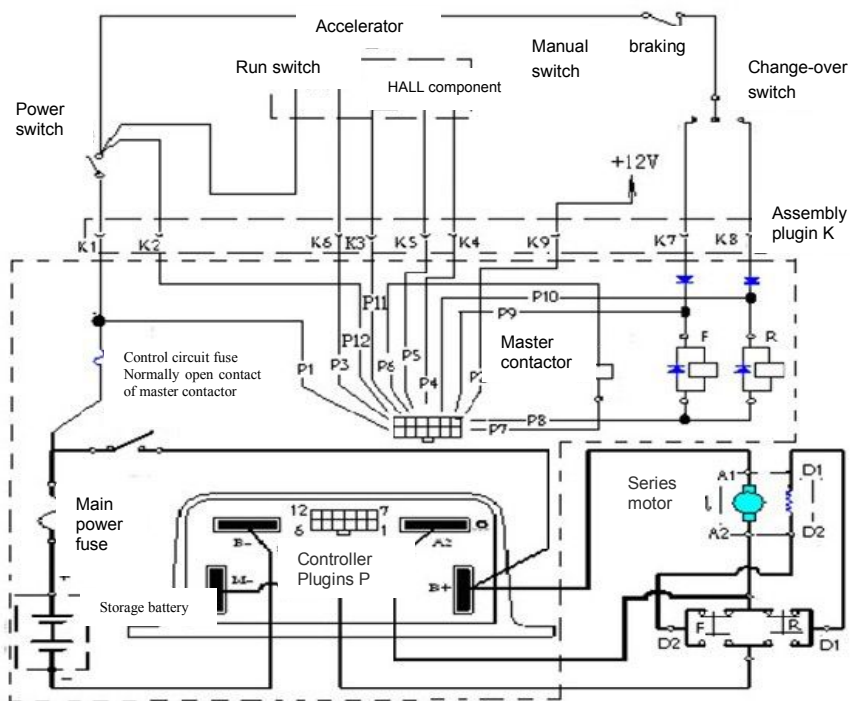
#### Controller Assembly Connector wire outlet definition

- K1 (green yellow) Electric lock switch input
- K3 (red) accelerator power anode
- K4 (black) accelerator power cathode
- K5 (green) accelerator signal input
- K7 (grey) forward contactor control source input
- K8 (White) backward contactor control source input
- K9 (blue) isolator power interface

#### Controller connector wire outlet definition

- P1 (red) precharge power
- P2 (blue) isolator power interface
- P4 (black) accelerator power cathode
- P5 (green) accelerator signal input
- P6 (yellow) main contactor coil source input
- P7 (brown) main contactor coil driving circuit
- P8 (brown) forward-backward contactor coil driving circuit
- P9 (grey) forward contactor signal input
- P10 (white) backward contactor signal input
- P11 (red) accelerator power anode
- P12 (green yellow) power controller input line



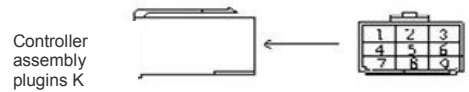


\*Hidden line means the wirings within controller assembly

— 0.75mm  
 — 25mm

## MMT Type of Controller Assembly Typical Wiring Diagram

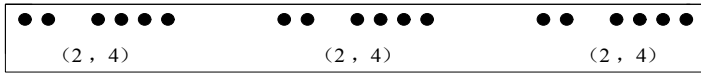
### B01 series



- Controller assembly  
 plug-ins K
- Controller Assembly Connector wire outlet definition**
- K1 (green yellow) Electric lock switch input
  - K2 (yellow) Electric lock switch output
  - K3 (red) accelerator power anode
  - K4 (black) accelerator power cathode
  - K5 (green) accelerator signal input
  - K6 (blue) accelerator position detection
  - K7 (grey) forward contactor control source input
  - K8 (white) backward contactor control source input
  - K9 (purple) for +12V isolator
- Controller connector wire outlet definition**
- P1 (red) precharge power
  - P2 (purple) for +12V isolator
  - P3 (blue) accelerator position detection
  - P4 (black) accelerator power cathode
  - P5 (green) accelerator signal input
  - P6 (green yellow) main contactor coil source input
  - P7 (brown) main contactor coil driving circuit
  - P8 (brown) forward-backward contactor coil driving circuit
  - P9 (grey) forward contactor signal input
  - P10 (white) backward contactor signal input

## Attached List: Compatible for controller assembly and fault code

There is a LED diagnositor (luminotron) on the controller close to the main circuit connection terminals copper bar to show fault source through different flashing methods of LED. In case of normal operation, LED conducts single flashing at an interval of 4 seconds, and in case of fault, conducts combined flashing of 2 unit code to show fault code, and details see following figure. (black means light on). For example, flashing method of "2,4" code is that each group conducts twice flashing and then start quartic flashing after slight pause, and circulating-continuous flashing will always last prior to fault source being eliminated.



### LED Code Display Format

Fault code and fault compatible see Table 1

Table 1 LED fault or misoperation code table

LED Code	Definition	Potential fault cause and solution
LED is off	No power	1.Power is off, and check if main power correctly and reliably connects with controller system or not; main fuse and control circuit protection is open circuit or not; voltage is present at control wiring terminal of controller "P12" or not. 2.If still not work in case of all wires and power supply under normal condition, controller is broken
LED is on normally	Controller fault	1. Controller is broken
Single flashing of LED	Normal running	1. Spacing interval of single flashing is 4 seconds
Quick single flashing of LED	Normal running	1. Spacing interval of single flashing is 0.13 seconds, and controller is on the position of reverse gear
1, 2	Overheating of the controller	1. Temperature within controller is higher than 85 Celsius Degree. 2. Vehicle continues be under overload operation. 3. Installation position of controller assembly is not suitable with bad ventilation. 4. Be in used under hot environment. 5. Selection for controller assembly power is not suitable, and please select suitable controller assembly power.

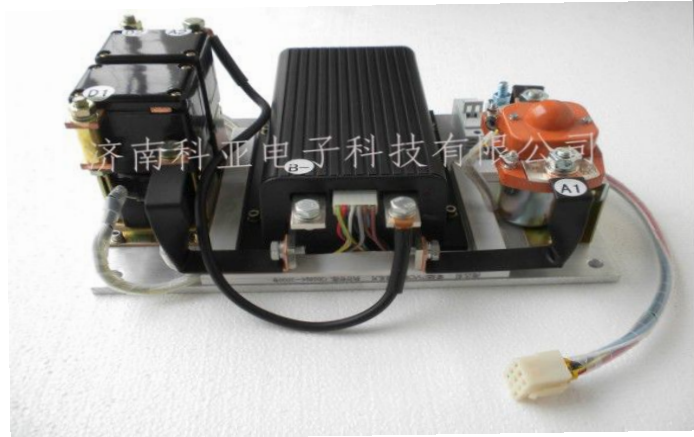
1, 4	Operation sequence error	<ol style="list-style-type: none"> <li>1. In case of sequence error, only reset and re-speed up the footstep of accelerator to remove fault.</li> <li>2. In case of fault for accelerator, the output voltage signal voltage is higher than 1.5V under reset state for accelerator. (normal value &lt; 0.8V).</li> </ol>
2, 1	Accelerator micro switch fault	<ol style="list-style-type: none"> <li>1. In case of reset for accelerator, there is high potential for controlling terminal P3 of controller (same as power voltage).</li> <li>2. Contact adhesion of micro switch.</li> </ol>
2, 2	M-output fault	<ol style="list-style-type: none"> <li>1. B- Short circuit of M-output.</li> <li>2. Open circuit of testing line for accelerator position. In case of stepping footstep of accelerator, there will be high potential for controlling terminal P3 of controller.</li> <li>3. Motor short circuit</li> </ol>
2, 3	Contact adhesion of main contactor	<ol style="list-style-type: none"> <li>1. Measure the resistance of two ends of main contactors prior to un-closing electric lock switch, and resistance of 0Ω means contactors adhesion. Dismantle the top cover of contactor points, reinstall it after grinding burned-out contactor point with fine sand paper, and replace the contactor with serious damage.</li> <li>2. In case of fault, controller assembly will cut off output current and last alarm for 15 seconds. It is not safe if continue to use vehicle.</li> </ol>
2, 4	Power supply overpressure protection	<ol style="list-style-type: none"> <li>1. Voltage of storage battery exceeds voltage application range of controller assembly</li> <li>2. Voltage of storage battery should not exceed 125% of the voltage of controller assembly.</li> </ol>
3, 1	Contactor driving circuit fault	<ol style="list-style-type: none"> <li>1. For overcurrent of driving circuit, maximum current of allowed long time of working for contactor's driving circuit is 2A, and overcurrent protection is 3A.</li> <li>2. Short circuit for contactor magnet coils.</li> <li>3. Reversed connection for diode in parallel of contactor magnet coils.</li> <li>4. Excessive working current of contactor magnet coils.</li> </ol>
3, 2	Main contactor fault	<ol style="list-style-type: none"> <li>1. Voltage drop of contactor points is greater than 0.7V.</li> <li>2. Poor connection for contactor points. The sucking sound from main contactor can be heard in case of stepping footstep of accelerator, the voltage of two ends of measuring points is zero when controller assembly working, and there must be poor connection for contactor if voltage not equal to zero; Dismantle the top cover of contactor points, and reinstall it after grinding burned-out contactor point with fine sand paper. If dust exists, clear it. And replace the contactor with serious damage.</li> <li>3. If contactor coils do not work and the sucking sound from main contactor can not be heard in case of stepping footstep of accelerator, the reason generally is that contactor magnet coils is open circuit.</li> </ol>
3, 3	Reversing contactor fault	<p>This fault is used for testing motor. For reversing contactor circuit, it can display results after 60 seconds since stepping the footstep of accelerator.</p> <ol style="list-style-type: none"> <li>1. If there is poor contact for reversing contactor points, the sucking sound of forward/back from contactor can be heard.</li> </ol>

		<ol style="list-style-type: none"> <li>2. If the sucking sound from contactor can not be heard in case of switching for change-over switch, the reason generally is that contactor magnet coils is open circuit. For forward/back of vehicle, normal operation for one side and abnormal operation for the other side shows that there is fault for the contactor with abnormal operation. Dismantle the top cover of contactor points, and reinstall it after grinding burned-out contactor point with fine sand paper. If dust exists, clear it. And replace the contactor with serious damage.</li> <li>3. In case of open circuit for electromotor, if the sucking sound from contactor can not be heard in case of switching for change-over switch and vehicle do not work forward and back, check if the wires of motor is correct and stable, and if there is good contact for carbon brush of motor.</li> </ol>
4, 1	Acceleration signal input fault	<ol style="list-style-type: none"> <li>1. Accelerator output signal exceeds the voltage of signal input range of chopper.</li> <li>2. Error of acceleration wiring</li> <li>3. Acceleration is broken</li> <li>4. Poor contact or open circuit of negative wires of acceleration power</li> </ol>
4, 2	Precharge fails	<ol style="list-style-type: none"> <li>1. Short circuit of M-output to B-</li> <li>2. Short circuit of motor outlet to B-</li> <li>3. Interior short circuit of controller</li> </ol>
4, 3	Controller fault	<ol style="list-style-type: none"> <li>1. Controller fault</li> </ol>

## JiNan KeYa Electron Product Warranty Undertaking System

Dear clients, welcome use the special electric control products for electric vehicle of KeYa, we wish every product you purchase will bring you satisfaction and faith to our quality.

1. One-year warranty for the client purchasing the following products under normal usage:  
Controller series products and controller assembly series products
2. Charge cost for following products which is damaged within a year:  
Fuse seat, fuse wire, contactor, accelerator /potentiometer
3. After warranty, all the products belong to our company free of labor maintenance cost will only charge cost and freight of components.
4. For all incomplete products, accessory, dismantle and transformed voluntarily or product marking damage, our company will not be responsible for warranty.



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