

**MMT-**

# **MMT-DC24RT30BL**

## **4Q Braking-Reversible, PWM series DC Drive**



**JINAN KEYA ELECTRONIC CO., LTD**

Advise you to read this operation manual before use this equipment.

Any fault or damage caused by not following caution and note in this operating manual are not in warranty range promised by us. Therefore we will don't take any responsibility in this matter. Please this Operating Manual well. If any doubt, contact with us.

#### Safe application

1. Only experienced, skilled personnel should install ,connect and adjust this equipment.
2. Ensure no power supply is connected during installation, remove and replacement of equipment wires with this motor controller.
3. The essential safety device must be fitted between this motor controller's power input end and power supply, in case of damaging on personnels and equipments. Overcurrent protector, safety apparatus, EMS (emergency switch) must be equipped.
4. Please ensure to isolate and insulate this motor controller from earth and other equipments and devices.
5. If adjustment during power on is necessary, we recommend special insulative and nonmetallic screwdriver or proper debugging tools to be used.
6. Installing this equipment in proper ventilation environment is recommend.
7. High humidity,dust, corrosive gas or violent shake is not suitable for this equipment.



This mark indicates important notes or warning.

#### Model and specification

Model	Max.output current (A)	Max.output voltage(V)	Operating DVC: (V)
DC 12RT30BL	30	12	8-18
DC 24RT30BL	30	24	18-36
DC 48RT30BL	30	48	36-62

Chart 1

#### 1. Product features:

This motor controller is low voltage,four-quadrant regeneration and pulse-width modulation speed controlling system. The MCU (Microcontroller Unit) intelligent control makes quick response speed,smooth running,reliable operation and complete proportions,etc.

##### ◆ PWM( pulse width modulation)

The PWM makes motor low noise, high efficiency and little maintenance.Service life of DC motor can be furtherly increased.

##### ◆ Four-quadrant regeneration in operating mode.

##### ◆ Regenerative braking function

External directional(or reversing)contactor is not required and components or parts of motor can be protected from superheated or burnout.

##### ◆ Enable/Brake/Reversing terminal

One of above functions can be achieved with help of passive switching value or open (or broken)circuit of transistor collector.

- ◆ Status Light  
Power light and various fault warning lights make the status of motor controller visible.
- ◆ Speed value of Forward or Reverse can be set respectively.
- ◆ Value of output current can be set.
- ◆ Value of brake current can be set.
- ◆ Torque compensation
- ◆ Double closed loop PI regulation(Voltage and current)
- ◆ Standard analog signal  
Analog quantity (0-5V) or potentiometer are suitable for controlling.
- ◆ Overvoltage or undervoltage protection
- ◆ Overheating protection  
When temperature is overtop,motor controller will reduce output current to prevent from superheated with help of decision circuit.if the temperature is still overtop,the controller will stop output and protect motor and motor controller.

## 2. Technical performance

1. PWM( pulse width modulation)
2. Speed ratio:1:80
3. Speed control mode: potentiometer(10K $\Omega$ /2W)
4. Input impedance:  $\geq 50K$
5. Speed accuracy: 1 %
6. Soft start time. Soft stop : 0.2-20 seconds
7. Ambient temperature:  $-10^{\circ}C \sim +60^{\circ}C$
8. Ambient humidity: Relative humidity $\leq 80RH$  (non condensing)
9. Instantaneous short circuit protection (50us)
- 10.Outline dimension: 134\*135\*70mm
- 11.Weight: 0.9Kg
13. Adopted SMT technology makes motor controller small size.
- 14.Current setting and limiting protection
15. ACCEL/DECEL
- 16.Quick stopping
- 17.Huge torque at low speed start up.
- 18.This motor controller is suitable for lanthanide (rare earth)motor, permanent magnet motor and separately excited motor.

## 4. Installation requirement:

**Caution:**

1. Installation, wiring or remove during power on is forbidden. If not, it will damage equipments or personnel. Therefore, please read the "Caution" and strictly follow its content .
2. Internal driving cells are sensitive to electromagnetostatic field, thus static electrostatic incident environment should be avoided or the equipment will be damaged.
3. The motor controller must be avoided from dust, high temperature environment and personnels. Large enough space is necessary for the sake of ventilation and adjustment.
4. During installation the motor controller must be kept away from other heat source and the instructed ambient temperature must be provided.
5. This motor controller is not able to installed on excessive shaking machines. If you must, precautions should be carried out.
6. Horizontal installation or vertical installation is permissible. 6 pieces of 5.5mm holes on mounting plate are used to fixed the equipment.

Wiring requirements:

1. Before wiring, the power supply must be disconnected.
2. Choose insulated conductors and shielding cables which are capable of motor controller's voltage and current. Specification of power input wire of motor controller and connecting wire of motor must meet the following requirements in chart 2.

Specification and length of cable and wire

Current (A)	Spec of wires (mm <sup>2</sup> )	Max. length (m)
<b>50</b>	<b>10</b>	<b>15</b>

Chart 2

3. Use shielding cables to connect signal wire with control wires, separate them from power input wire and power output wire during wiring.

**Caution:**

In any case, signal wire and control wire are not be tied and banded together with power input wire and power output wire (motor wire) during wiring, or induced voltage will interference, issue false command to motor controller or directly damage it.

4. There is no input connection-reverse protection device in motor controller inside. Thus must ensure its power input ports are correspond with positive and negative polarities of external power supply.
  5. Please use appropriate tools during connection and must ensure correct connection during wiring.
  6. Diagrammatic sketch of connecting terminal
- Please see Figure 3.

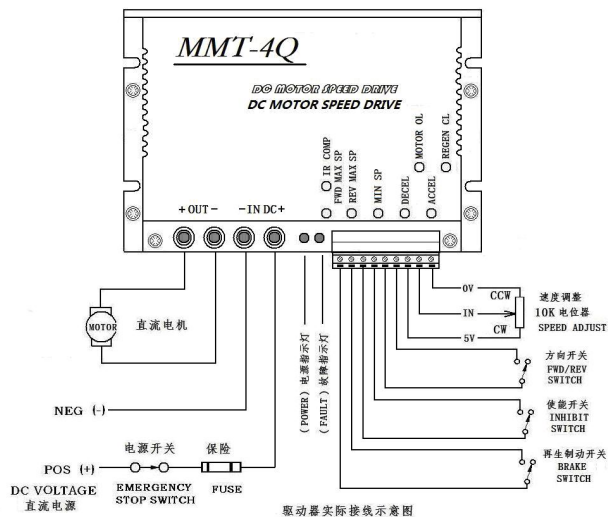


Figure 3

### 7.Connection about fuse, power switch and motor:

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- 1.One piece of quick-blowing fuse and power supply emergency switch must be added between power input port of motor controller and power supply in sake of emergency power off in some case. (See Figure 3)

Note: When select quick-blowing fuse and power supply emergency switch, the rated current value of switch should be equal or greater than 150-200% value of rated current of applied motor.

### 2.Connection of motor

OUT+ and OUT— terminals connected motor controller with DC motor are in Figure 3,please see it.

The voltage from motor controller are transferred to applied motor through connecting terminals of OUT+ and OUT. When OUT+ terminal is with positive polarity and OUT – terminal is connected with negative polarity, motor will rotate in clockwise while if connected inversely, motor will rotate in counter clockwise (See Figure 4). Just convert the Reversing switch(FWD/REV) to let motor rotate in clockwise.

Note: Please ensure the rated voltage value of motor must match with output voltage value of motor controller.

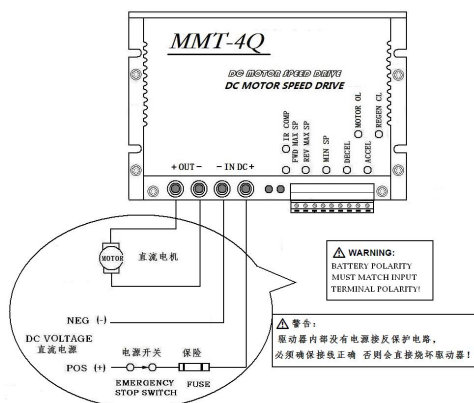


Figure 4

### 3. Connection of power input



#### Caution:

There is no input connection-reverse protection device in motor controller inside. Thus must

ensure POS(+) is connected with power input "+" and NEG(-) is connected with power input "-".

- 1.Ensure power supply( or Battery) 'positive pole and negative pole respectively connected with motor controller's power input "+" and power input "-" correctly.
- 2.According to Chart 1, select suitable cables and wires during wiring.
- 3.Inspect whether the power supply(or Battery)'s voltage match with motor controller's working voltage and whether the capacity of power supply(or Battery) bear the motor's load current.

#### 8.Connection about speed control potentiometer

Installation: See Figure

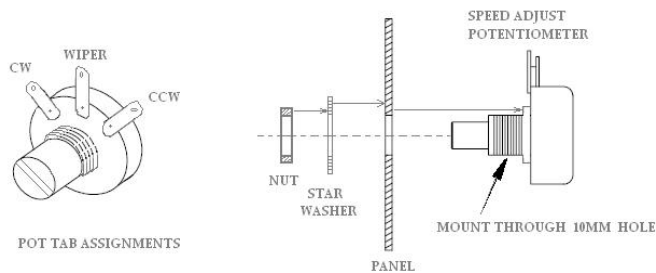


Figure 5



#### Caution:

Please ensure the external end of lead wire of speed control potentiometer is insulated from outside shell. The value should be is equal or greater than 20MΩ.

The operation of speed control potentiometers should follow above instructions in Figure 6. Fit 10K regulator potentiometer between 5V terminal,IN terminal and 0V terminal.



#### Caution:

The connecting wire of speed control potentiometer should be away from conductors of power input terminal and output in sake for reducing unnecessary interfere of electronic signals. The length of connecting wire should be shorten as far as possible. If the length is over 0.5m, the shielding wire is recommended.

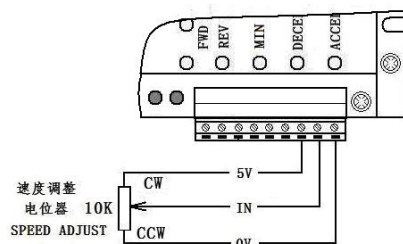


Figure 6

#### 9.Function and connection about control terminal:



#### Caution:

Connecting wires of speed control terminals should be away from conductors of power input terminal and output in sake for reducing unnecessary interfere of electronic signals. The length of connecting wire should be shorten as far as possible. If the length is over 0.5m, the shielding wire is recommended.

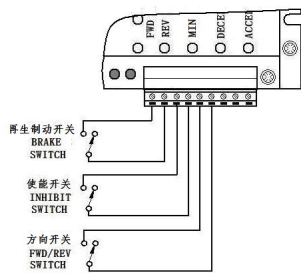


Figure 7

### 1.BRAKE: Regenerative braking control terminal:

Regenerative braking control: When quick stopping of motor is required, this function is suitable. Close brake switch, motor controller rapidly brakes motor's speed by the way of regenerative braking then make motor stop immediately.

### 2.EN: Enable control terminal:

Enable control: Control the start and stop of motor

Open external enable switch, motor controller will automatically lock in internal circuit and make motor stops.

Close external enable switch, motor will start to rotate at the speed value set by potentiometer or input analog signals.

Note: A. When regenerative braking, the motor's stop time is decided by set value of brake current ("REGEN CL" potentiometer set current) or set value of soft stop ("DECEL" potentiometer set soft stop time).

Eg. If the set value of brake current ("REGEN CL" potentiometer set current) is high and the set value of soft stop time ("DECEL" potentiometer set soft stop time) is low, the motor's brake time will be shorten.

B. When close brake switch, rotate speed value after braking is decided by set value of "MIN SP" potentiometer (means Min speed). Eg. If the "MIN SP" potentiometer set the value "0", then after brake, the motor rotate speed will be "0". If the "MIN SP" potentiometer set the value "N", then after brake, the motor rotate speed will be "N".

### 3.DIR: Reversing (Direction) control terminal:

The reversing control of motor: Rotation direction can be easily get through open or close reversing switch.

### 10. Control mode and connection about external analog quantity:

Please see Figure 8.



#### Caution:

Connecting wires of control terminals should be away from conductors of power input terminal and output in sake for reducing unnecessary interfere of electronic signals. The length of connecting wire should be shorten as far as possible. If the length is over 0.5m, the shielding wire is recommended.

### 1. Connection of function control signal's switching analog value

Photocouplers or open collector control:

Please see Figure 8.

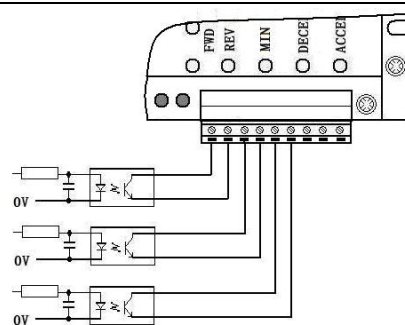
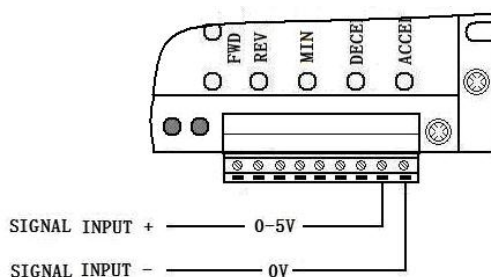


Figure 8

## 2.Connection of speed control's analog quantity

Please see Figure 9.



Figure

## 11.Introduction and setting of adjustable potentiometer:

Please see Figure 10.

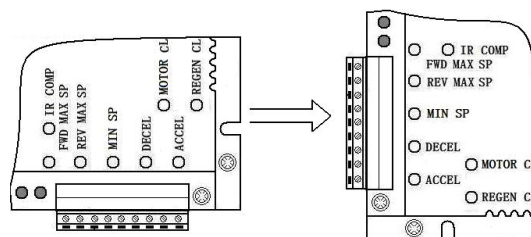


Figure 10

### 11."ACCEL" potentiometer( Set soft start time ):

Adjust "ACCEL" potentiometer to set ramp up from initial speed value to setting speed value(it means acceleration time, the time can be adjusted between 0.2 seconds and 20 seconds).Please see the Figure 11.

Note: Adjust this potentiometer in counter-clockwise to shorten soft start time while adjust this potentiometer in clockwise to prolong soft start time.

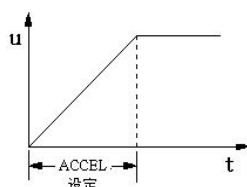


Figure 11

### 2."DECEL" potentiometer( Set soft stop time ):

Adjust "DECEL" potentiometer to set ramp down from Max.speed value to Min.speed value(it means deceleration time, the time can be adjusted between 0.2 seconds and 20 seconds).Please see the Figure



12.

Note: Adjust this potentiometer in counter-clockwise to shorten soft stop time while adjust this potentiometer in clockwise to prolong soft stop time.

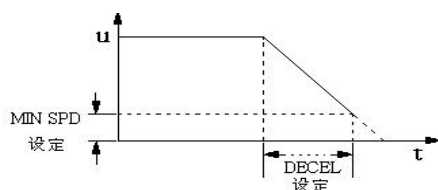


Figure 12

### 3. "FWD MAX SP" potentiometer(set Max. forward speed value):

Adjust this **"FWD MAX SP"** potentiometer to set motor's Max. forward speed value(it is also be used to limit motor's Max. forward speed value). When adjust this potentiometer in clockwise, forward speed value is increased.

10

### 4. "REV MAX SP" potentiometer(set Max. reverse speed value):

Adjust this **"REV MAX SP"** potentiometer to set motor's Max. reverse speed value(it is also be used to limit motor's Max. reverse speed value). When adjust this potentiometer in clockwise, reverse speed value is increased.

10

### 5. "REGEN CL" potentiometer(set regenerative braking current value):

Adjust "REGEN CL" potentiometer to limit Max. braking armature current value(it also means brake/stop time). The braking current value affect brake/stop time. When adjust this potentiometer in clockwise, the braking current value will be increased.

### 6. "IR COMP" potentiometer(set torque compensation):

Adjust "IR COMP" potentiometer to make motor have constant speed value in different load conditions(Before the motor controller is delivered out of factory, the torque compensation generally set "0"). When adjust potentiometer in clockwise, torque compensation value is increased.

The following procedures can be adopted to collate torque compensation again.

A. Set the "IR COMP" potentiometer at Min.value(adjust this potentiometer at end in counter-clockwise).

B. Adjust the external speed control potentiometer until motor speed is up to medium speed value( eg. Motor speed should be at 900rpm if its rated speed value is 1800rpm), measure motor's speed value with the help of handheld tachometer.

C. Apply load until it is up to rated current value of armature, motor speed will be distressed at the moment.

D. Hold motor's rated current load, at the same time adjust "IR COMP" potentiometer until the motor's speed value is up to 900 rpm in no load condition.

E. Release load from motor

Note: If motor's rotation speed is constant in no load condition while rotation speed is increased or motor shakes after loaded, it means adjustment of "IR COMP" potentiometer is overbig(we also say torque compensation is overbig).

If motor's rotation speed is decreased after load, it means adjustment of "IR COMP" potentiometer is oversmall(we also say torque compensation is over small).

### 7. "MIN SP" potentiometer(set Min speed value):

When external given signal is "0V"(or adjust external signal setting potentiometer at end in counter-clockwise), adjust "MIN SP" potentiometer to set motor's Min speed value(Generally this potentiometer is set "0", before the motor controller is delivered out of factory).

## 8. "MOTOR CL" potentiometer(set motor's rated current):

Adjust "MOTOR CL" potentiometer to limit motor controller's Max.output current(we also says motor's setting current value).The setting of this current should be based on motor's rated current value.Current value should be moderate.If not,torque is not enough or overcurrent protection is failure. Adjust this potentiometer in clockwise to increase motor controller's output current.

Note: Motor controller's output current value should be twice as much as motor's rated current value in general.However,motor controller can't operate at setting value which is greater than motor's rated current value for a long time, or the motor will be burnt out.

Collation procedure of motor's current:

- A.In power off condition, series one ampere meter between motor controller's output end and motor's armature.
- B.Adjust motor controller's "MOTOR CL" potentiometer to "0"(adjust this potentiometer at end in counter-clockwise).
- C.Adjust external speed setting potentiometers to Max.value(potentiometers contacted with"S1,S2 and S3" in Figure 3).
- D.Apply enough load on motor
- E.In power on condition, adjust "MOTOR CL"potentiometer(adjust in clockwise) at the same time look at ampere meter.The current value will increased until it is twice as much as motor's rated current value.
- F.Cut off power supply, remove ampere meter and renew wires between motor controller and motor.
- G. Adjust back speed control potentiometer and collation is finished.

## 12. Inspection procedure before powered on motor controller:

- 1.Ensure power supply(or Battery) are connected motor controller's positive pole and negative pole correctly and tightly. Input power source should meet motor controller's requirement.
- 2.Ensure uncovered part of motor controller's PCB is clean. Conductive metals, humidification,water and sundries is not permitted.
- 3.Ensure motor controller's external connecting wires are correctly wired. Short circuit or GND is not permitted(About correct connection, please see Figure 2).
- 4.Ensure external speed control potentiometers is Min value(we also say given signal is "0").

## 7.LED Status Light

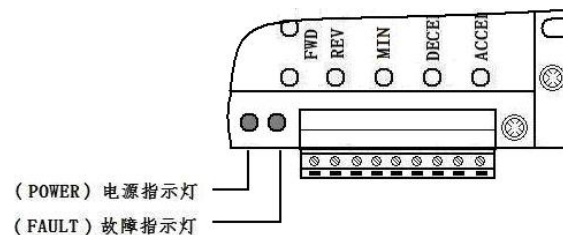


Figure 13

"Power" high

Continuously flash t(Green): Indicate power

"FAULT" light(Red): Indicate various fault warning.Please see the following chart.

Red light	Abnormalities
Constantlight	Motor controller automatically limit current and protect.

Continuously flash twice	Motor controller automatically protect in low voltage.
Continuously flash thrice	Motor controller automatically protect in high voltage.
Continuously flash four times	Motor controller automatically protect when short circuit.
Continuously flash five times	Motor controller automatically protect when overheat value is up to 75°C, then motor stops.