

ZM-6608

High Performance DC Brushless Controller (Driver)



- Read this manual carefully before using this product
- Keep this manual safe for future reference
- The appearance pictures in this book are for reference only. Please take the actual product as the standard. Thank you for purchasing the Times Super Group products.

The ZM-6608 is a high-performance brushless DC controller (driver) developed by our company using the latest BiCD process technology. It features compact size, high reliability, long service life, and user-friendly operation.

Before using this product, we strongly recommend that you read the following safety precautions and fully understand all the contents of the manual before starting to use it.



Safety Notes

- This product is a professional electrical device and should be installed, debugged, operated, and maintained by qualified technicians. Improper use may cause electric shock, fire, explosion, and other hazards.
- This product is powered by a DC power supply. Make sure the **positive and negative poles are correct** before powering it on
- The phase line and Hall line of the brushless motor must be **completely connected to the driver** before being powered on. Otherwise, the driver may be burned out due to high current
- Do not plug or unplug cables while powered on, and avoid cable short circuits during operation, as this may damage the product.
- If the motor needs to change direction during operation, it must first decelerate until the motor stops before changing direction.
- The drive is not sealed. Do not mix screws, metal shavings, or other conductive/corrosive foreign objects inside. Protect against moisture and dust during storage and use.
- The drive is a power device. Keep the working environment well ventilated and cool.

Note! **The motor's phase lines and Hall lines (totaling 8) are clearly defined and must be fully matched with the driver. It is incorrect to use color-based wiring only when the motor's wire definitions are undefined.**

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Product Features

- Highly Integrated and Reliable Brushless DC Motor Controller
- PWM Square Wave Drive Control of Three-phase Full Bridge
- Overcurrent protection measures: immediately shut off the output during overload to protect the motor promptly
- Pure hardware design, high speed, and strong anti-interference capability
- Wide voltage compatibility: DC12-60V
- Low-grade fever, high power

Major Functions

- Under-voltage ($\leq 12V$), over-voltage $60V \pm 8V$
- Turn-off output automatically after 3 seconds of locked rotor
- Hall error protection
- Output 8A, overcurrent shutdown output
- Supports built-in potentiometer, external potentiometer, analog voltage, and PWM speed control
- With enable reversal function, it can flexibly work with normally open and normally closed control systems.
- With a slow-start function, it prevents current overshoot and effectively protects the motor.
- Customize the delay time (0S,1S,3S,10S) to 1S by default

Product Working

Project	Minimum	Specified	Maximum	Unit	
Ambient temperature	-20	-	60	°C	
Input voltage (DC)	12	-	60	V	
Output	-	-	8	A	
Applicable motor speed	0	-	20000	rpm	
Hall signal voltage	4.5	5	5.5	V	
Hall drive current	-	10	-	mA	
External speed control potentiometer	-	10K	-	Ω	
Simulated speed control voltage (Ve)	0	5	24	V	
PWM speed control signal amplitude	4.5	-	24	V	
PWM duty cycle	0	-	100	%	
Control interface voltage	H	4.5	5	24	V
	L	0	0	0.5	V
Control interface identifies internal resistance	0	100	2k	Ω	

Note 1: This maximum voltage is an absolute parameter, and overvoltage and overcurrent use will permanently damage the driver.

Note 2: The effective voltage range for Ve port (analog and PWM) speed control is 0.8V-4.6V. Beyond this range, the motor will not change speed.

Interface D

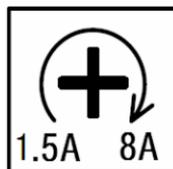
Name	Explain
Positive/negative electrode	DC input, 12-60V
U,V,W	Drive output, connect to the motor phase line
Hu,Hv,Hw	Hall signal, connected to the motor's Hall signal line
H+,H-	Hall power supply, connected to the motor's Hall power supply line (maximum output 100mA)
V+	The external potentiometer's positive terminal for speed control should be left free when not in use. (Internal 5V output, maximum 200mA)
Ve	External speed control signal, potentiometer, analog voltage or PWM can be connected externally ④
V-	External speed control reference ground (COM port)
EN	Enable: When SW2 is off, the high or floating state is normal, and the low state is standby. When SW2 is on, the high or floating state is standby, and the low state is normal.
DR	Direction: Positive rotation occurs when the signal is high, while negative rotation occurs when it is low.
Power light	Power indicator, green, stays on when powered on
RJ1	The rate limiting settings can be configured according to customer requirements.
RJ2	Internal speed control potentiometer. Rotate clockwise to adjust motor speed from 0% to 100%.
SW1 Dial Code	Internal/external speed control switch: ON: Internal, OFF: External
SW2 Dial Code	Enable function switch: ON: High-level idle, OFF: Low-level idle

Note 1:When using this function, make sure the "SW1" dial on the side of the drive is OFF

Traffic Lin

This controller uses output current limiting to prevent abnormal operation caused by excessive current during startup or heavy load. Set the output current limiting value according to the motor parameters. The adjustment diagram is shown in the figure on the right.

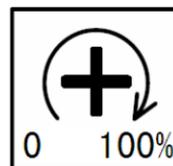
pour : This feature is optional. The default product has a fixed maximum current value.



Speed Control M

1. Internal Speed Regulation

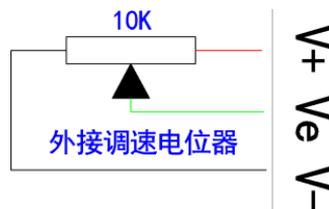
To activate internal speed control, switch the rotary switch SW 1 to ON. Rotate the internal speed control potentiometer clockwise from low to high, adjusting the motor speed from 0% to 100%. The adjustment diagram is shown in the figure on the right.



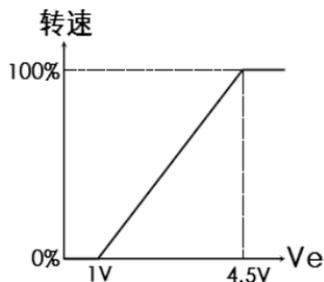
2. External Speed Regulation

To use external speed control, switch the rotary switch SW1 to OFF.

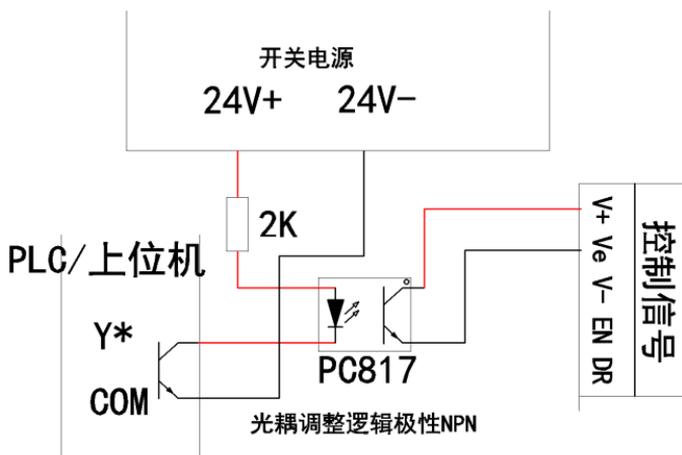
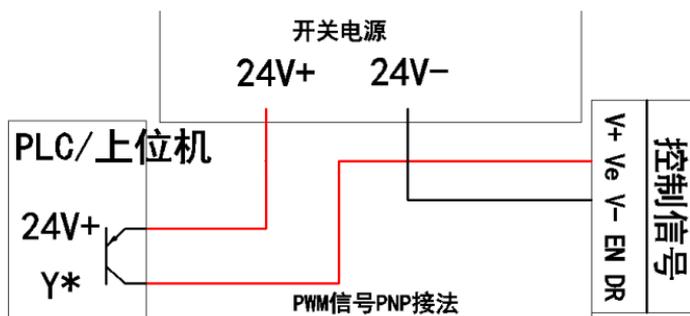
2.1 For external 10K potentiometer speed control, connect the potentiometer to the V+,Ve,V-interfaces of the driver. Adjust the motor speed by rotating the potentiometer (Ve connected to the middle pin of the potentiometer), as shown in the wiring diagram on the right:



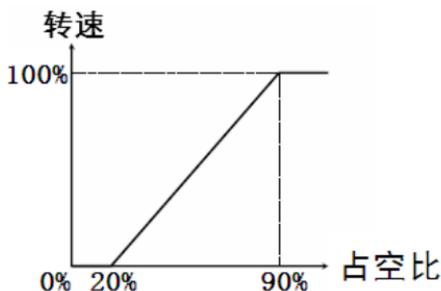
2.2 External analog voltage speed control, V- (COM) is the reference ground, Ve is connected to 0-5V voltage signal, in which the motor speed changes at 1-4.6V, the wiring diagram and *voltage-speed* correspondence diagram are as follows:



2.3 External PWM signal speed control, V- is the reference ground, Ve is connected to the PWM signal, the PWM voltage amplitude is 5V, the frequency is 1-10KHz, the wiring diagram and the corresponding duty cycle-output diagram are as follows:



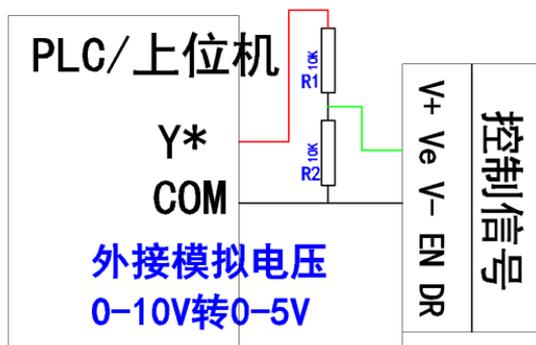
Important: The internal/external switching code SW1 only affects speed control signals. Whether the motor speed is regulated through an internal potentiometer or an external speed signal, both the control signal direction and enable signals are controlled. The Ve speed control signal operates at a maximum voltage of 24V with a speed range of 0.8V-4.6V, designed to accommodate PLC users who do not require current-limiting resistors.



2.4 How to convert 0-10V (24V, etc.) analog quantity to 0-5V analog quantity for some PLC users and host computer users. The reference wiring is as follows:

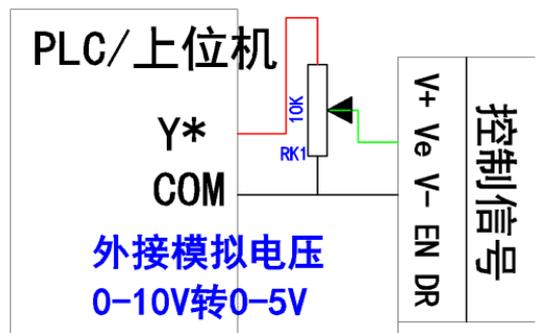
➤ Reference 1

If the output voltage of Y* is 0-10V, the voltage is divided by R1 and R2 in series, and the voltage of R2 is 0-5V.



➤ Reference 2

If the output voltage of Y* is 0-10V, the voltage is divided by potentiometer RK1, and the voltage of Ve is 0-5V. This method has the advantages of simple circuit wiring, convenient voltage adjustment, and flexible voltage adjustment.



➤ According to the voltage divider formula, the calculation is as follows:

$$Ve = VY^* \times R2 / (R1 + R2)$$

Direction and Enab

1.1 Enable control

Set the enable signal to high level (EN high).

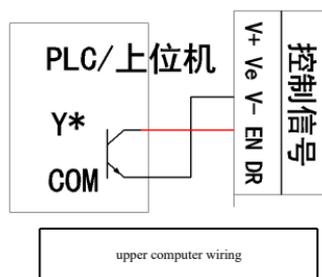
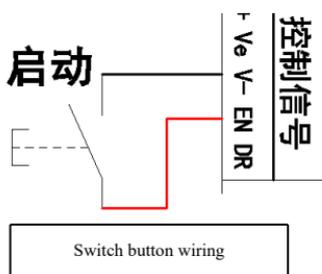
SW2 ON, the driver enters standby mode and the motor stops rotating.

SW2 is turned off, the driver activates, and the motor resumes operation.

When the enable signal is low (EN short-circuited to V-),

SW2 activates the driver, and the motor resumes operation.

SW2 is off, the drive is in standby mode, and the motor stops rotating.

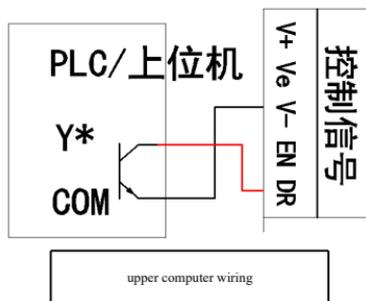
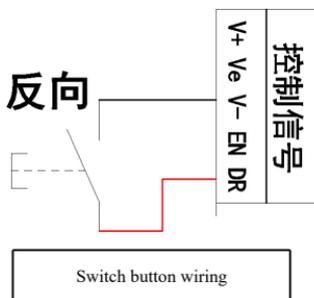


1.2 Directional control

When the DR input is high (in floating state), the motor rotates forward.

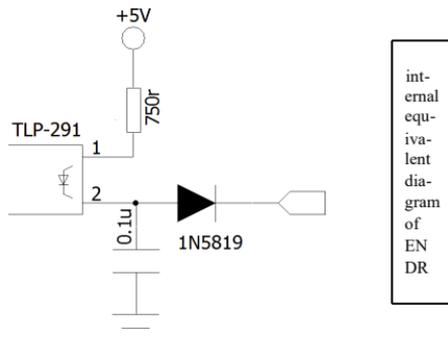
When the DR input is low (DR is shorted to V), the motor rotates in reverse.

When the DR state changes, the driver will automatically execute the energy consumption braking for 0.5S.



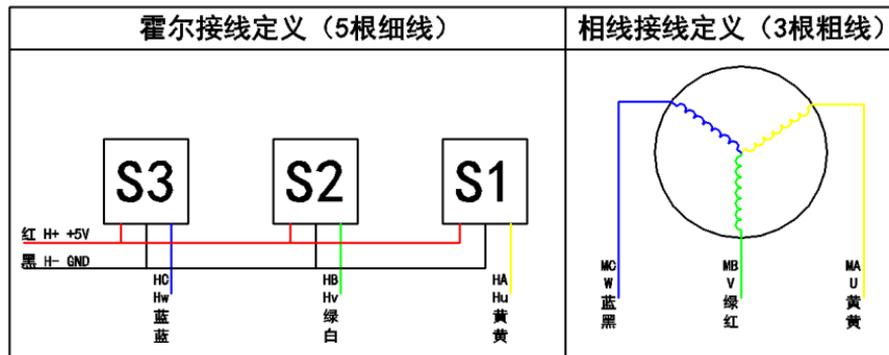
Note! The DR state can only be changed when the motor is low speed or stopped. Otherwise, the controller and motor may be damaged.

1.6 Internal port equivalent diagram

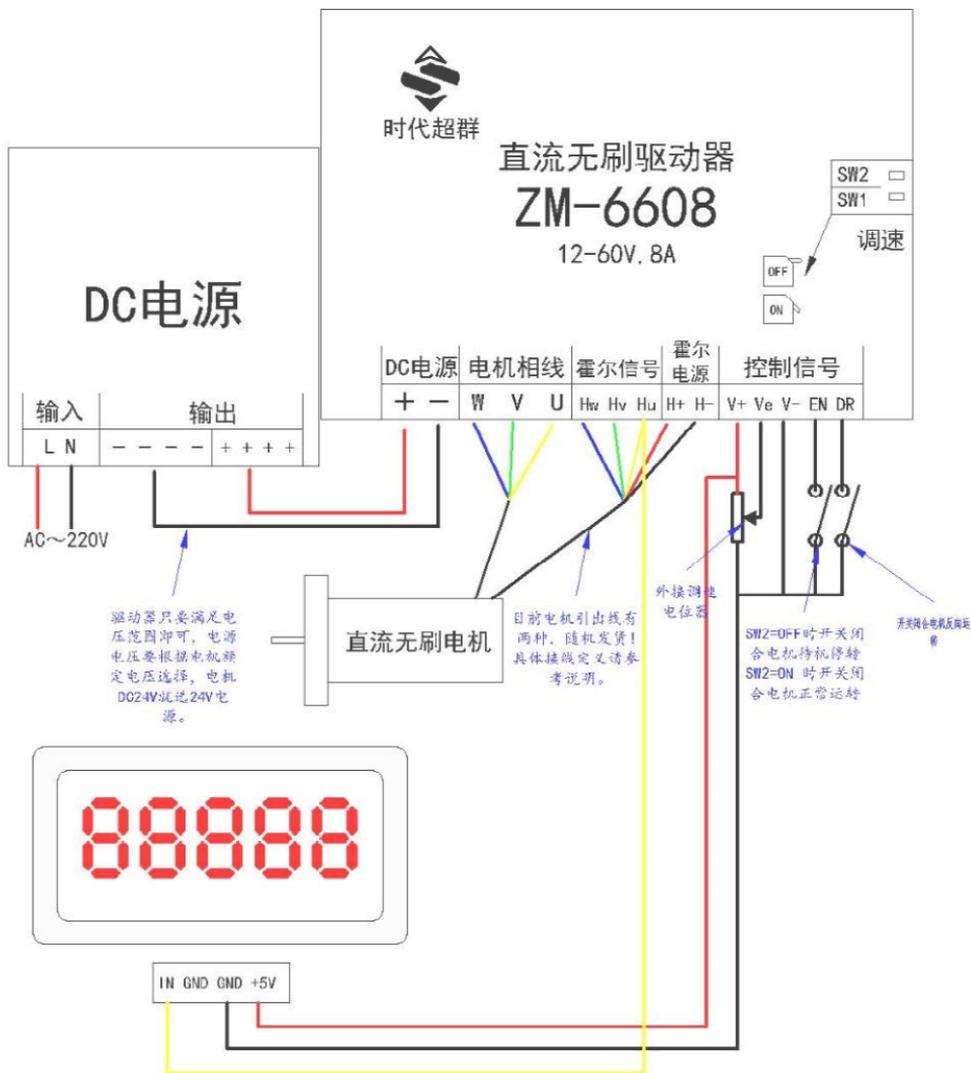


System Refer

1. Brushless Series Product Line Sequence Reference Diagram



2. Basic System Reference Diagram



Restore Prc

The control has multiple protection functions, and the correct method can be used to remove the protection after the protection function is activated.

1. Undervoltage protection: The driver enters protection mode when the supply voltage drops below 11V. To disable this protection, first power off, then increase the voltage to 12V before powering on again.

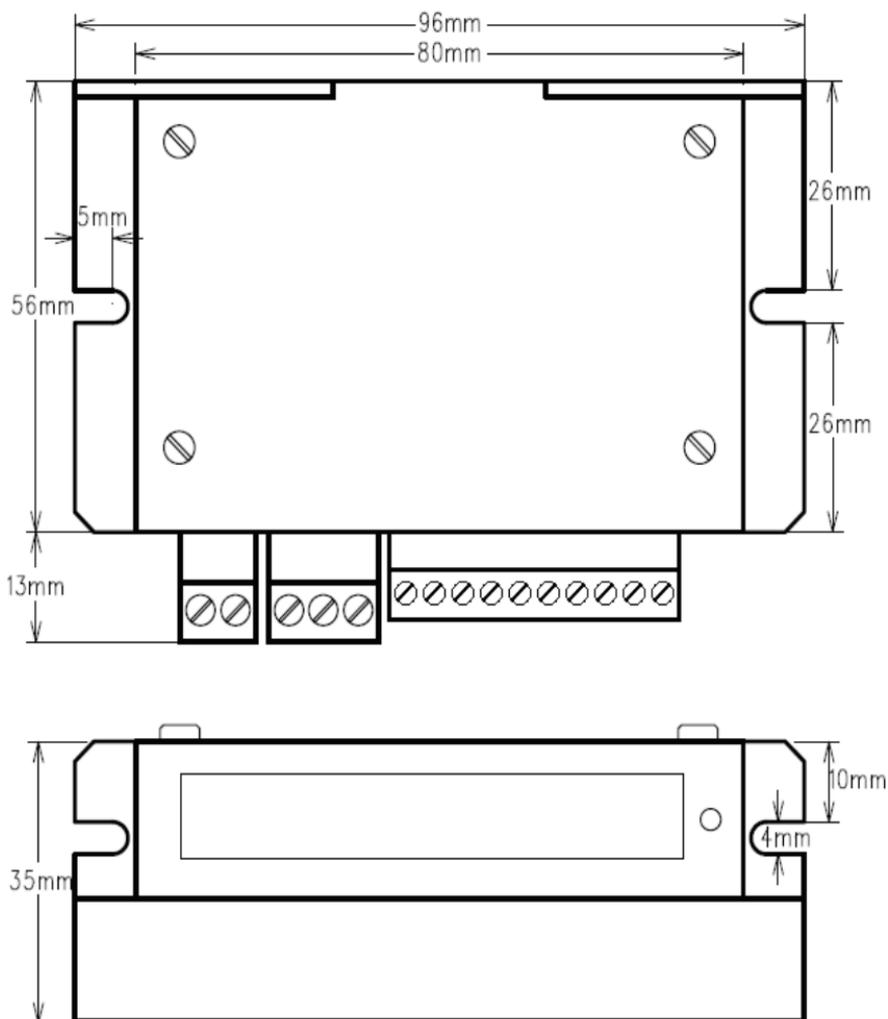
2. Overvoltage protection: The driver enters protection mode when the supply voltage exceeds 60V. To disable this protection, first power off, then reduce the voltage to 60V before powering on again.

3. Stall protection: If the motor stalls for 3 seconds, the driver will shut off the output and enter protection mode. In this case, you should immediately disable the enable setting or cut off the power supply. Reconnect the power after the motor stalls issue is resolved.

4. Hall error protection: When the driver detects a Hall error, it will turn off the output and enter a protection state. In this case, you should quickly set the enable to low or turn off the power supply, resolve the Hall error, and then power it up again.

Note! To prevent unprotected operation, set the enable to low or reduce the speed to minimum when the motor is not needed (turn the potentiometer to the lowest, reduce the analog voltage to 0V, and reduce the PWM to 0%).

Outline Dir



FAQ

1. Q: How can I get started with this controller quickly?

Answer: After properly connecting the power cord, motor phase wire, and Hall line, ensure the motor is unloaded with all other interfaces disconnected. Use the internal speed control to gradually accelerate. Once the motor rotates correctly, sequentially test the enable, direction, and external speed control functions. If unfamiliar with this product, perform thorough testing before installation in actual use.

2. Q: What happens if the power supply is connected in reverse? A: It will immediately burn out the drive.

3. Q: What is the maximum voltage for the upper control signal?

A: The maximum voltage of the speed control signal is $5+0.2V$, and the maximum voltage of the enable and direction control interface is $24+2V$. Exceeding this voltage will cause the driver to burn out.

4. Q: Is it normal for the casing to get hot after the actuator has been working for a long time?

A: Normal, at room temperature, long-term working shell reaches 90 degrees will not affect performance.

5. Q: The power indicator is on, but the motor is not rotating and is shaking. What could be the cause?

Answer: It may be that the phase line and the Hall line are wrong, so the motor manual is correct wiring and power on the test.

6. Q: Can this controller set my motor speed to 6000?

A: The maximum speed of a brushless motor is determined by its technical specifications, while the controller regulates its operation within a range from zero to the maximum speed.

7. Q: I already have a motor. How should I connect it after purchasing this driver?

Answer: The phase line and Hall line of the motor must be defined before wiring. If the definition is uncertain, ask the motor manufacturer. Otherwise, incorrect wiring will damage the driver.

8. Q: Can we add features or develop new products for this drive? A: Yes, please contact our company.

Warranty Regulations

This Product Offers a Free Warranty for up to 15 Months, Followed by 2 Years of Cost-Reimbursement Repairs. The Details Are as Follows:

- No reason for returns or exchanges within 7 days after receiving the product-ensure the product is in good condition with no signs of use.
- Free replacement of major components (excluding the casing) within six months, starting from the purchase date or three months after the factory date (based on the warranty signature).
- Free repairs for one year — from the date of purchase or three months after the factory date (as per the warranty certificate).
- Free warranty is valid for 2 years after the warranty period.

The above warranty shall not apply under any of the following circumstances:

1. Use without following the "Safety Precautions" or "Product Operating Conditions", resulting in product damage;
2. The warranty is void if the fragile label is damaged or if there are signs of disassembly.
3. Product damage caused by irresistible factors such as lightning, earthquake, tsunami, or war;
4. Other human-caused damage.

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