

RMD-X User Manual For Motion Actuator



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1 Product Introduction

RMD-X8 motion actuator is a highly integrated power output module. Integrated with three major functional components of high performance FOC driver, high power density brushless motor and high precision lightweight reducer. Break through the traditional distributed design, make the structure of the terminal product design more concise, product internal wiring more convenient, the performance of the whole machine more stable.

1.1 Naming Rules

RMD Series Motor Naming Rules



1.2 Features

Programmable, integrated servo motor.
 Operating dc voltage 12-48v.

1.2.1 Control Mode

Torque Mode
 Speed Mode
 Position Mode

1.2.2 Communication Control Mode

RS485 Communication Mode Control
 CAN Communication Mode Control

1.2.3 Encoder Feedback

14-bit Magnetic encoder (Absolute Value)

18-bit Magnetic encoder (Absolute Value)

1.2.4 Technical Highlights

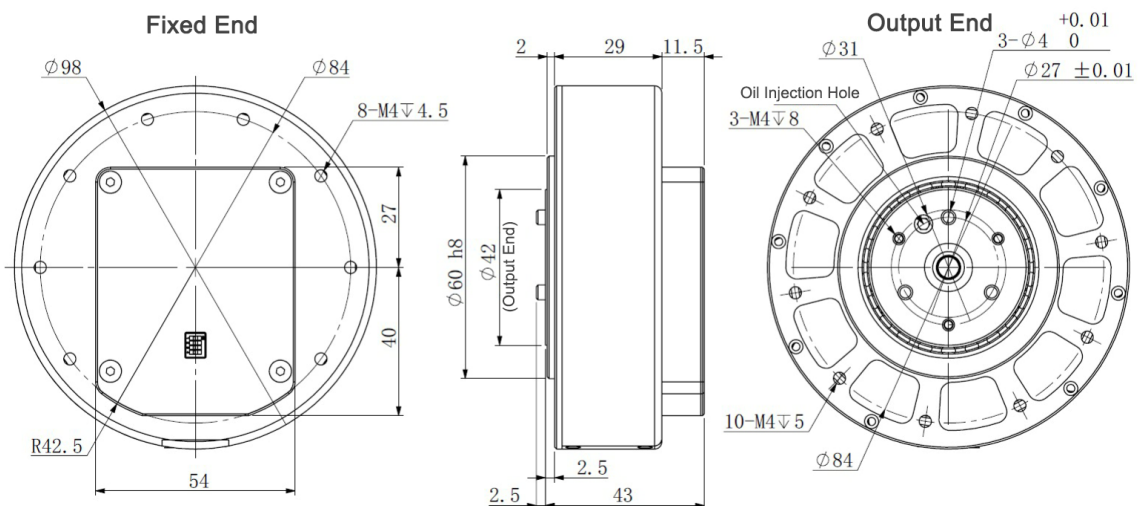
- A. Servo control,
- B. High positioning accuracy,
- C. High speed and high response,
- D. Energy saving and high efficient,
- E. Multi-control mode,
- F. Smooth and low noise,
- G. Compact structure.

1.2.5 IP Level

IP54

2 Installation and Precautions

2.1 Installation Dimensions



Attention

The motor input/output interface needs to keep the connection space, > 20mm is recommended.

The length of mounting screws shall meet the requirements of the drawings. If too long it will damage the internal structure. If too short may become loose.

Due to integrated reducer internal, the lubricating grease of the specified model 5-6ml needs to be refilled every 1000H.

Axial load cannot be greater than 300N, radial load cannot be greater than 1000N.

Warning:

Please carefully read and follow the requirements in this manual, which will help you set up and operate the drive correctly and achieve optimal drive performance.

Please install the equipment in a dry position, and should be non-flammable surroundings

Please put in the place without grinding fluid, oil mist, iron powder, chip, etc.

Please put in well ventilated, dry and dust-free place.

Please put in non-vibration place.

Do not use gasoline, diluents, alcohol, acid and alkaline detergents to avoid discoloration or breakage.

Requirements for the use of motion actuators:

Please ensure that this document is used by design engineers, installers, and those man responsible for debugging the product.

Be sure to comply with the requirements of this document, as well as documentation for other components and modules.

Please consider the legal requirements applicable to the place of using, including

- Regulations and standards
- Test organization and insurance company regulations
- National specification

Transport and storage conditions

Please ensure that products are not subject to more than permitted burdens during transportation and storage, including

- Mechanical load
- Unacceptable temperature
- Moisture
- Corrosive gas

Please use the original packing for storage and transportation. The original packing provides enough protection to avoid regular problems.

Technical requirements

General conditions for correct and safe use of products must be complied with:

The technical requirements for the connection and environment conditions specified in the product technical data and for all other connected components. Only if the product meets the requirements of motor specification, it is allowed to operate the product in accordance with the relevant safety procedures.

Please follow the instructions and warnings in this document.

Operator requirements

This product can only be operated by engineers who are familiar with the following rules:

- Familiar with installation and operation of electrical control system.
- Familiar with applicable provisions for operational safety engineering systems.
- Familiar with applicable provisions for accident protection and occupational safety.
- Familiar with product document on provisions.

2.2 Environmental Conditions

Environment temperature $-20^{\circ}\text{C} \sim 50^{\circ}\text{C}$ (Not freeze) .

Environmental humidity $5 \sim 95\% \text{RH}$ (Without condensation) .

Storage temperature $10^{\circ}\text{C} \sim 70^{\circ}\text{C}$ (Not freeze) .

Storage humidity $5 \sim 95\% \text{RH}$ (Without condensation) .

Installation requirements no insolation, corrosive gas and fuel dust.

Altitude below 1000m.

The vibration is $10 \sim 60\text{Hz}$ below 5.9 m/s^2 .

Attention

Motor fixing screws must be locked;

Cables must not be overstretched;

Motor shaft and equipment shaft must be installed in good alignment;

Avoid any foreign bodies entering the servo drive. Conductive or combustible foreign bodies such as screws and metal chips entering the servo drive may cause fire and electric shock.

GYEMS

3 Electrical Parameters

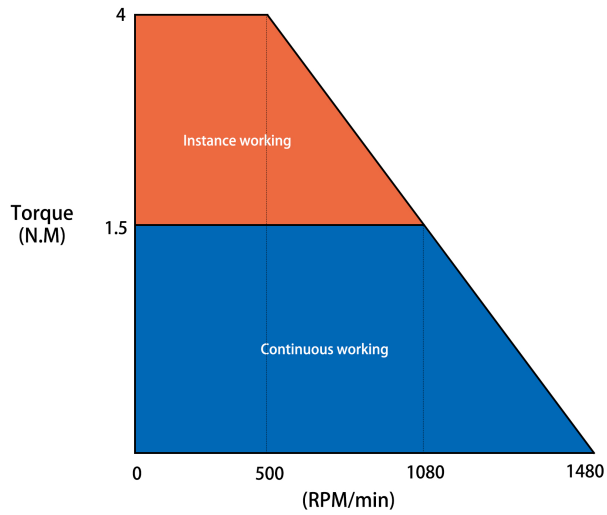
3.1 Detailed Parameters

Item number		RMD-X8	
Nominal voltage	V	48	
No-load Speed	rpm	1480	
No-load current	A	0.30	
Nominal Speed	rpm	1080	
Nominal torque	N.M	1.50	
Nominal current	A	4.90	
Rated power	W	235.20	
Stall torque1	N.M	1.38	(Blocking current1.03A, 60°C Temperature rise@5MIN)
Stall torque2	N.M	2	(Blocking current1.9A, 60°C Temperature rise@90S)
Stall torque3	N.M	3	(Blocking current5.1A, 60°C Temperature rise@23S)
Stall torque4	N.M	3.50	(Blocking current6.8A, 60°C Temperature rise@13S)
Wire resistance	Ω	0.94	
Wire connect		Y	
Wire inductance	mH	0.73	
Rotor inertia	gc m ²	805	
Number of pole pairs		20	

The motor data measured based on the ambient temperature of 30 ° C, the gearbox data is as follows:

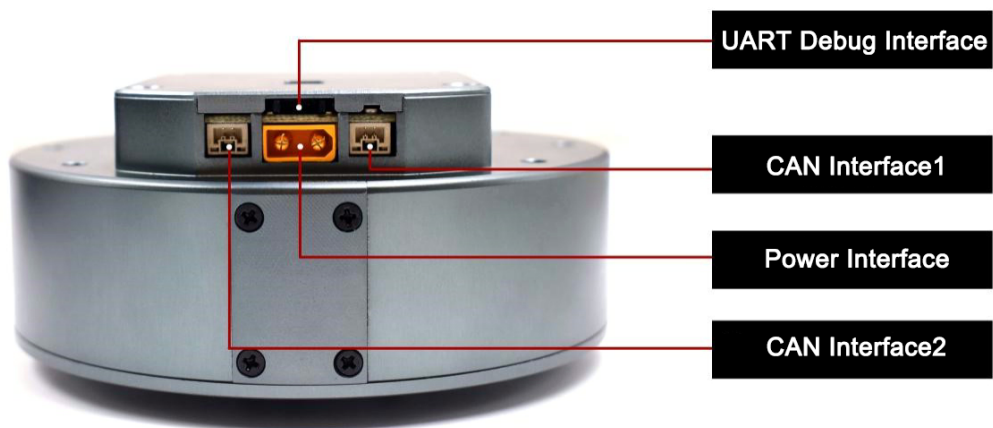
Backlash	Arc min	5
Reducer ratio		6:1
Peak torque	N.M	24
Weight	g	610
Temperature range	°C	-20-80
Noise	dB	< 70

3.2 Working Range



3.3 Hardware Connection

3.3.1 Interface Specification



Debugging interface: Connector type 51146-1.25mm-2p (Brand: molex)

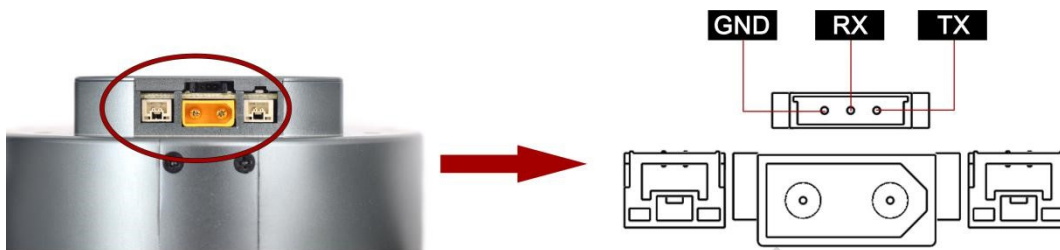
Level range:0-3.3v

Can interface: Connector type SM02-GHS-TB (Brand: JST)

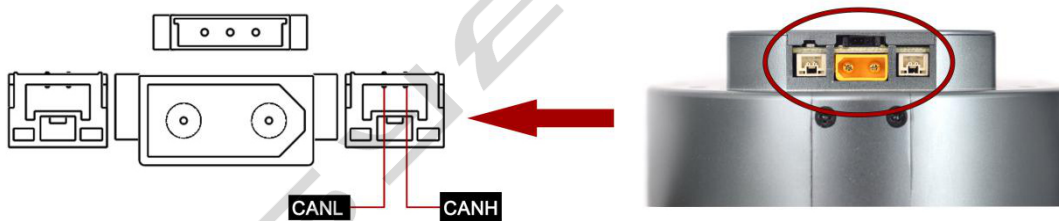
Level range:0-5v

Power interface: Connector type XT30-U (Brand: 艾迈斯)

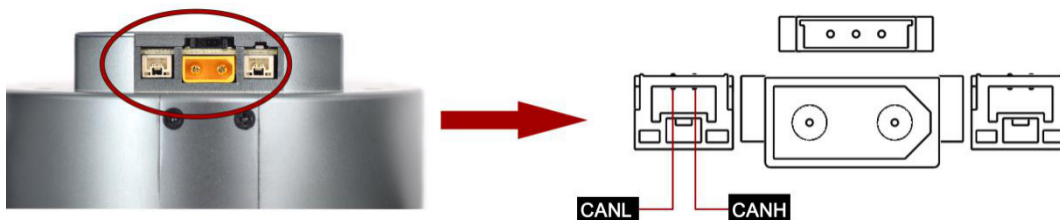
3.3.2 Interface Debugging



3.3.3 Can interface 1



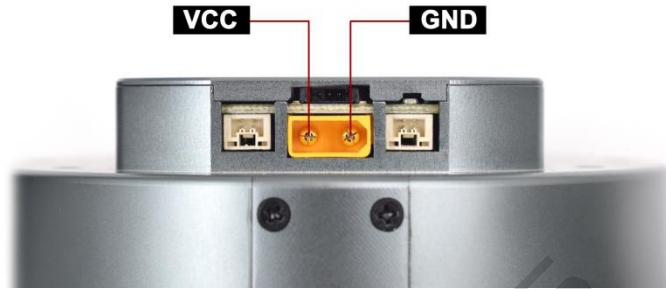
3.3.4 Can interface 2



Note:

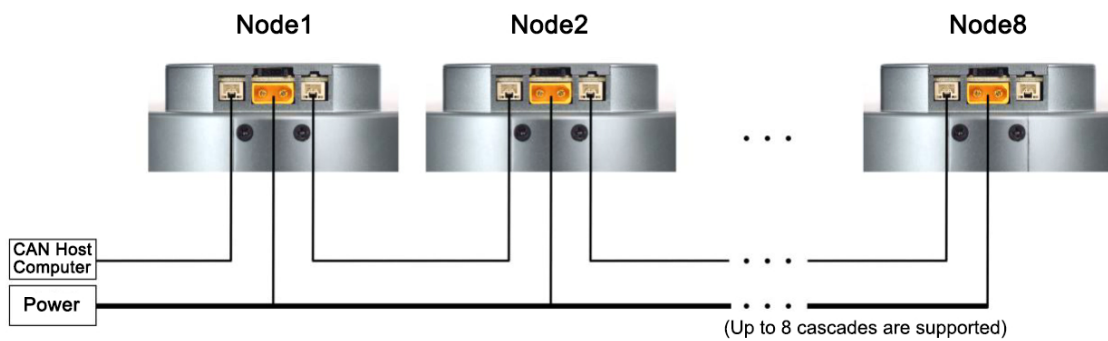
The CAN1 interface and CAN2 interface are connected in parallel and have the same functions.

3.3.5 Power interface



- *Pay attention to the power supply voltage range and power supply output.
- *Pay attention to the anode and cathode of the power supply.

3.4 Multilevel connection line



3.5 Dial code switch Settings

3.5.1 Can bus device address Settings (Dial code switch 1st-3rd)

Switch1	Switch2	Switch3	ID
OFF	OFF	OFF	#1
ON	OFF	OFF	#2
OFF	ON	OFF	#3
ON	ON	OFF	#4
OFF	OFF	ON	#5
ON	OFF	ON	#6
OFF	ON	ON	#7
ON	ON	ON	#8

3.5.2 Bus terminal resistance setting (Dial code switch 4th)

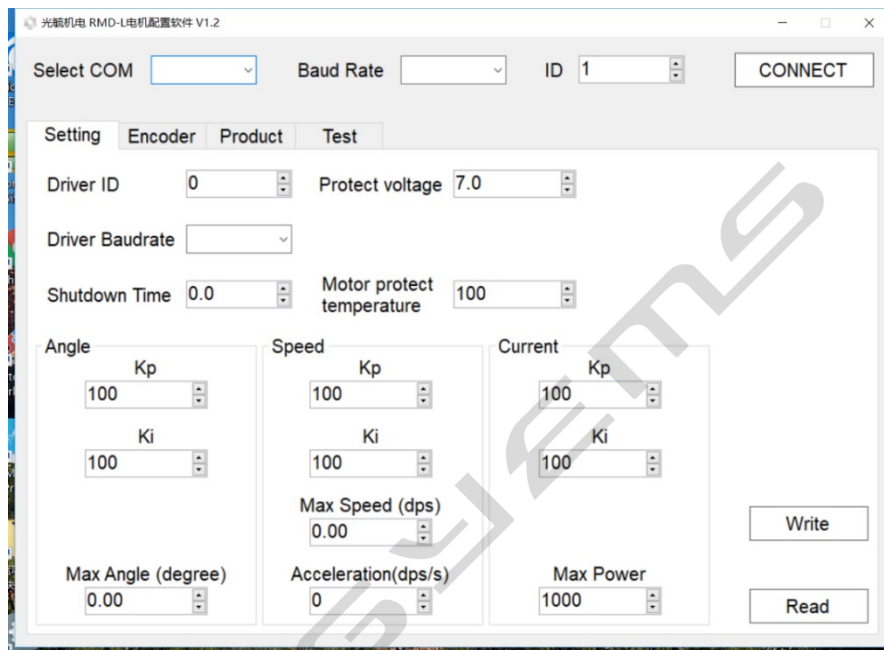
*Dial code switch 4th ON mean bus terminal resistance (120 Ω) get through;

*In general, devices in the last stage of the can bus need terminal resistance (Dial code switch 4th turns On)


4 RMD-L config Installation And Parameter Setting

4.1 RMD-L config Brief Introduction

RMD-L config is a PC debugging tool software developed by GYEMS, which can be used on computers above win7. The operation interface is as follows:



4.1.1 RMD-L config Installation

RMD-L config installation is the same as the Windows universal application, just double-click the icon  RMD-L config Setup.msi and choose the default installation path.

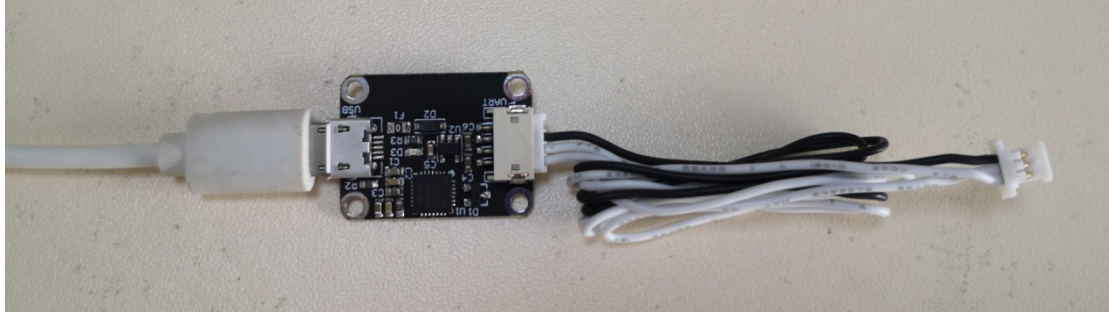
RMD-L config Installation file download address: <http://www.gyems.cn/support/download>

 RMD-L config V1.2.zip


4.1.2 Connection Tools and Driver Installation

RMD-X8 is designed with a debugging interface (UART port), which usually requires a USB to UART tool (as shown in the figure below) to connect. The driver of this tool is installed

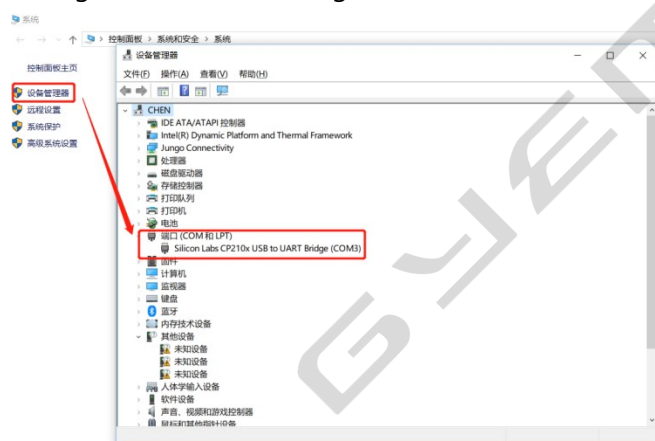
before use.



Driver download address: <http://www.gyems.cn/support/download>

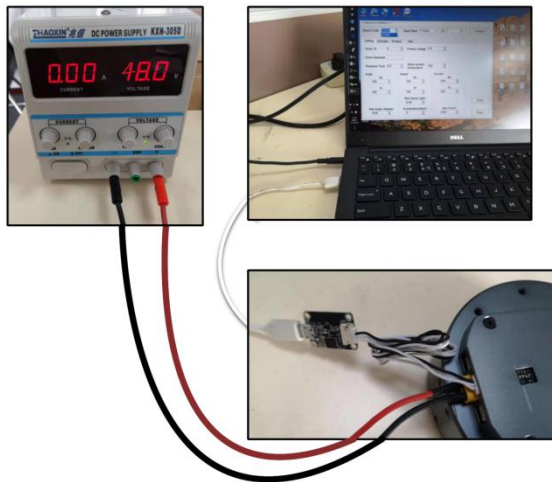
 CP210x_Windows_Drivers

After the download is complete, unzip it and double-click to start the installation until it is complete. Then insert the USB data cable, you can see whether the installation is successful in the Windows device manager. The corresponding COM port can be found in the figure below, indicating the installation is successful.



4.2 Hardware Connection

Power supply voltage adjust to 48v (the power supply with fixed 48v output is better). Turn off the power button before connecting the motor, as shown in the following figure:

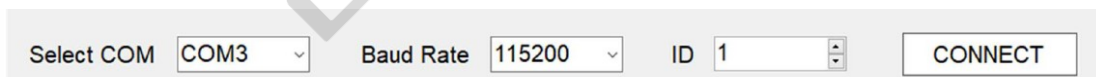


Note:
Switch on the power supply after the connection. Do not plug the terminals with power.

4.3 Parameter setting

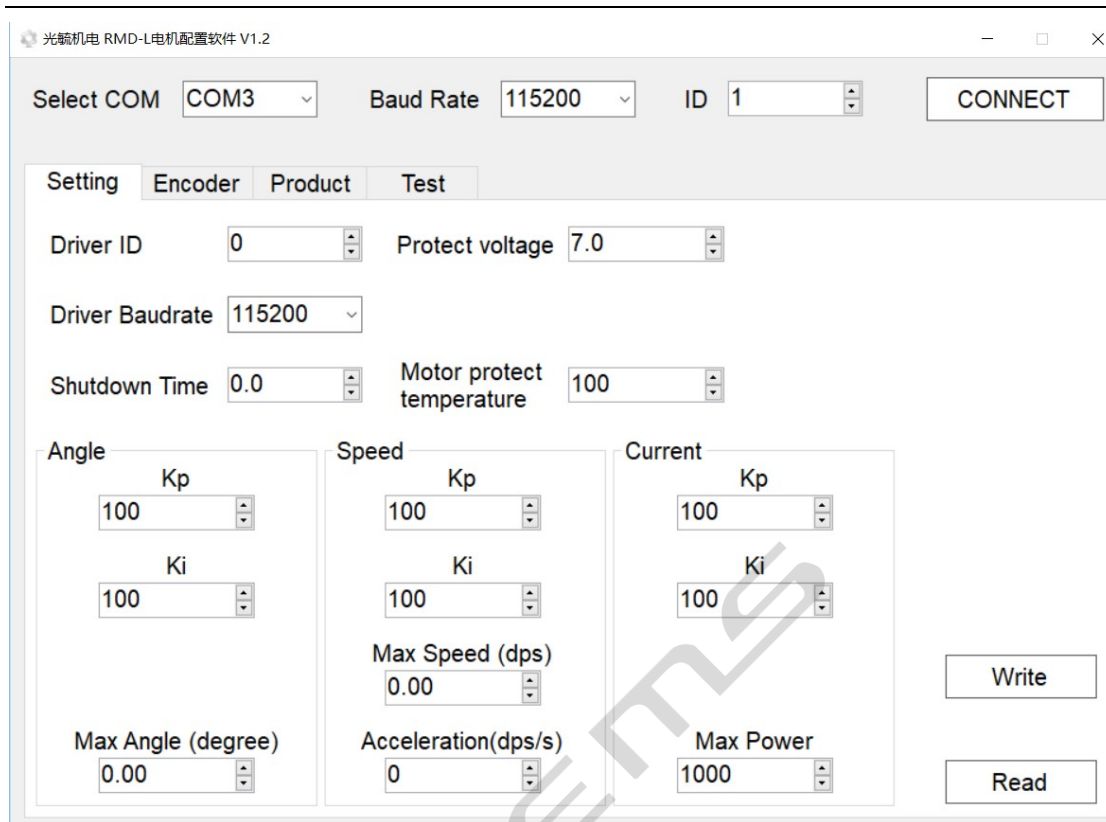
4.3.1 Software Connection

The motor driver and the software can be connected by USB to UART module.
The default baud rate is 115200 when the motor is driven out of the factory, and the default ID is set by the dial-code switch, generally 1. Therefore, the Settings before the connection of the software are as follows (COM is selected according to the actual situation). Click the CONNECT button to CONNECT the device.



4.3.2 Basis Setting

In the Setting page, click the Read button to get the motor information.



Driver Baudrate: Set the baud rate of the driver.

Shutdown Time: Set the shutdown time of the motor. If no control order is received during this time, the power will be shut down; When set to 0, the motor will never be turned off.

Angle: Angle loop control parameters. Kp and Ki modify the PI parameters of the Angle loop, and Max Angle is used to limit the maximum rotation angle of the motor. For example, when set to 3600, the maximum rotation angle of the motor is $\pm 3600^\circ$, namely positive and negative 10 turns.

Speed: Speed loop control parameter. Kp and Ki modify the PI parameters of the Speed loop. Max Speed is used to limit the maximum rotation speed of the motor. For example, when set to 720, the maximum angular speed of the motor is $\pm 720^\circ /s$, that is 2 cycles per second.

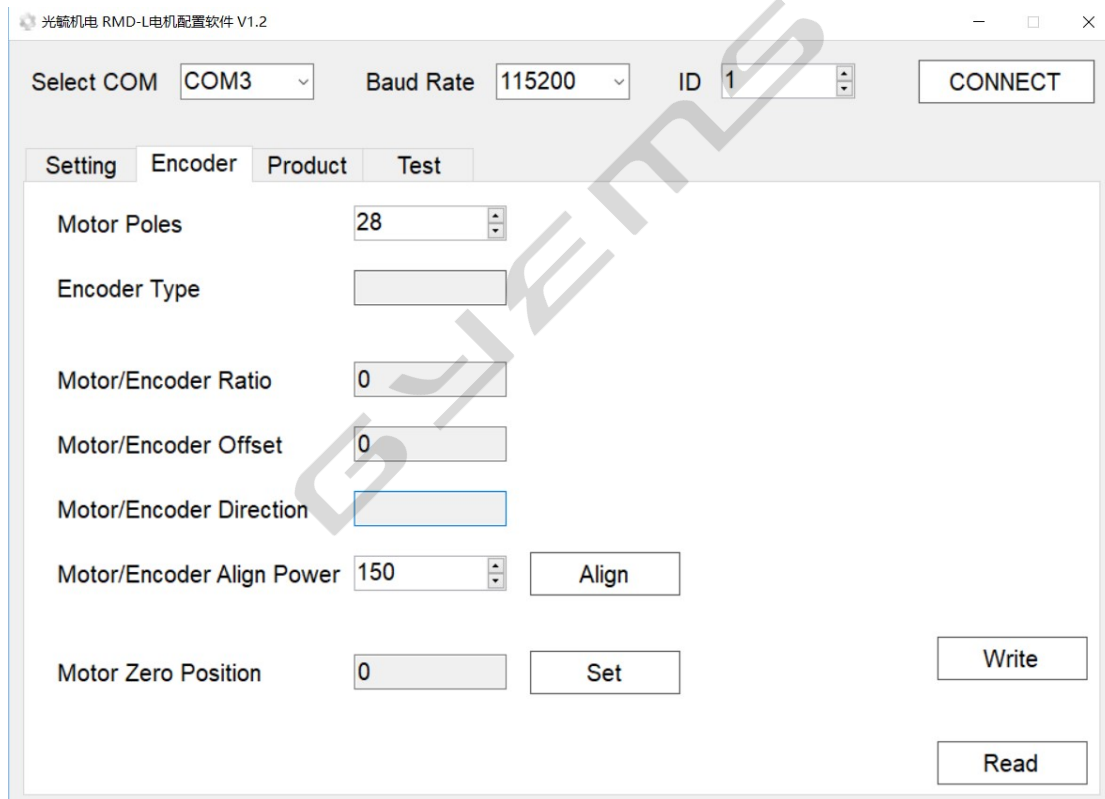
Current: torque loop control parameters. Kp and Ki modify the PI parameters of the torque loop, and Max Power limits the final output to the motor.

Note:

1. Acceleration option does not take effect in the current version of the drive, and the actual Acceleration of the motor depends on the PI parameters, motor load and drive voltage, etc.
2. After the parameters are modified, click the Write button to save the parameters to the driver.
3. After setting, the new parameters need to be recharged to take effect.

4.3.3 Encoder Setting

In the Encoder page, click the Read button to get the motor and encoder information.



The screenshot shows the 'Encoder' tab in the configuration software. At the top, there are fields for 'Select COM' (COM3), 'Baud Rate' (115200), and 'ID' (1), along with a 'CONNECT' button. Below this, there are tabs for 'Setting', 'Encoder', 'Product', and 'Test'. The 'Encoder' tab is active, showing several parameters: 'Motor Poles' (28), 'Encoder Type' (empty), 'Motor/Encoder Ratio' (0), 'Motor/Encoder Offset' (0), 'Motor/Encoder Direction' (empty), 'Motor/Encoder Align Power' (150) with an 'Align' button, and 'Motor Zero Position' (0) with a 'Set' button. At the bottom right, there are 'Write' and 'Read' buttons.

Motor Poles: Set the number of magnetic poles of the motor, generally it will be set before out of the factory.

Encoder Type: this parameter is read-only.

Motor/Encoder Ratio: The ratio of motor and encoder calibration, which is a read-only parameter, is generally around 1000. The closer it is to 1000, the better the calibration effect will be.

Motor/Encoder Offset: The 0 offset of motor and encoder calibration, which is a read-only parameter, generally has no effect on motor drive performance.

Motor/Encoder Direction: The direction of motor and encoder calibration, which is a read-only parameter, generally has no effect on motor drive performance.

Motor/Encoder Align Power: Motor and encoder calibration power, generally use the default parameters. When the load is large, it can be increased appropriately to improve the calibration effect.

Align button: Start motor and encoder calibration. Before this step, it is necessary to ensure that the number of magnetic poles of the motor is set correctly and that the appropriate calibrated power is selected. After clicking the Align button, the motor will rotate back and forth to perform the calibration, and the parameters will be automatically saved to the driver after the calibration completed.

Motor Zero Position: Motor starting position. After clicking the Set button, the driver will save the current position as the motor starting position.

Note:

1. The calibration of the motor and encoder should be carried out at the condition of no load of the motor. If the motor does not rotate smoothly during the process of calibration, please check whether there is any fault of the motor or excessive mechanical friction.
2. After the parameters modified, click the Write button to save the parameters to the driver.

4.4 Product Information

In the Product page, click the Read button to get the driver model, motor type, hardware and software versions of the driver.

光毓机电 RMD-L电机配置软件 V1.2

Select COM Baud Rate ID 1

Setting Encoder Product Test

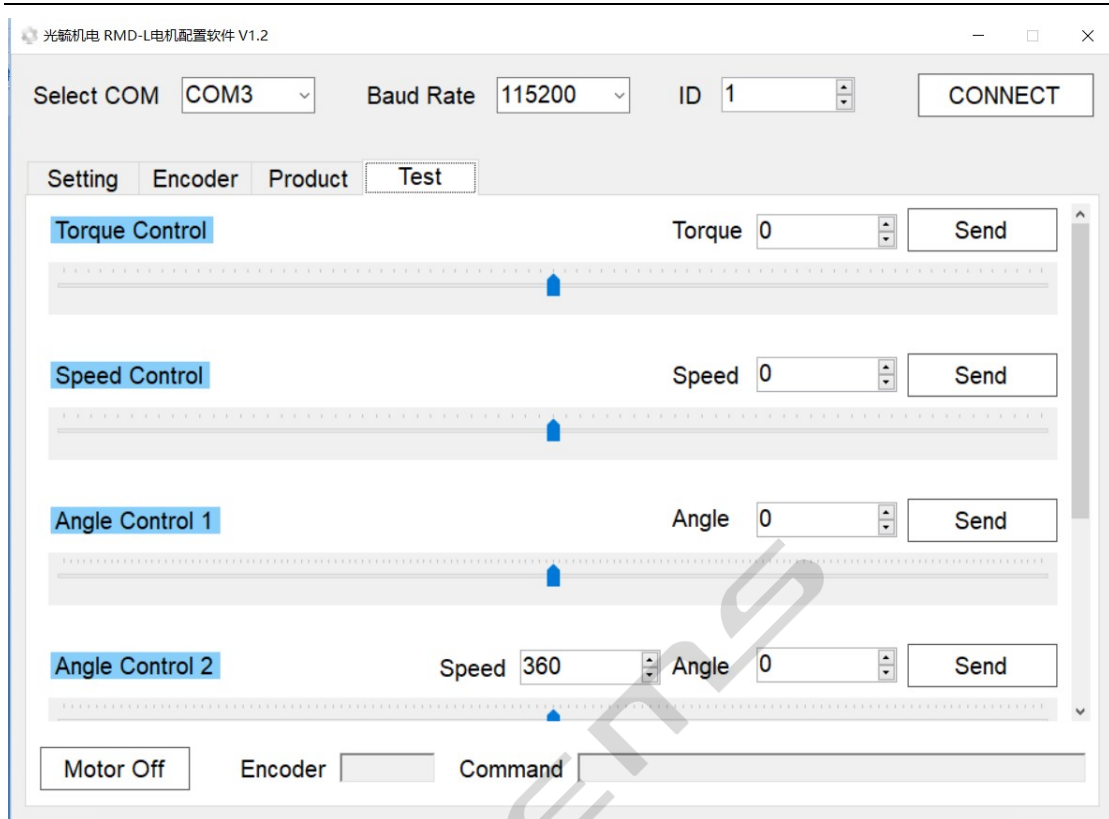
Driver ID Protect voltage

Driver Baudrate

Shutdown Time Motor protect temperature

Angle	Speed	Current
Kp <input type="text" value="100"/>	Kp <input type="text" value="100"/>	Kp <input type="text" value="100"/>
Ki <input type="text" value="100"/>	Ki <input type="text" value="100"/>	Ki <input type="text" value="100"/>
Max Angle (degree) <input type="text" value="0.00"/>	Max Speed (dps) <input type="text" value="0.00"/>	Max Power <input type="text" value="1000"/>
	Acceleration(dps/s) <input type="text" value="0"/>	

4.5 TEST function



Test function used for simple debugging of single machine.

Torque control Adjust the torque, the symbol represents the rotation direction.

Speed control At this mode, run at the specified speed, the symbol represents the rotation direction.

Angle control1 At this mode, rotate to the specified angle at the default speed, and the symbol represents the direction of rotation.

Angle control2 At this mode, to rotate to a specified angle at a specified speed, the symbol represents the direction of rotation.

5. Communication Protocol

5.1 Communication Protocol

Please reference protocol document.

5.2 RS485 Communication Protocol

Please reference protocol document.

Disclaimer

Thank you for using the RMD series motor drive system. Before use, please read this statement carefully. Once used, it will be regarded as acceptance of all contents of this statement.

Please use the motor which strictly abide by the manual, product description and relevant laws, regulations, policies, installation guidelines.

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