

MF servo motor manual v2.3

Disclaimer

Thank you for purchasing LK-TECH MF series servo motor system. Please read this statement carefully before use. Once used, it is considered as acceptance and acceptance of the entire contents of this statement. Please strictly follow the manual, product description and related laws, regulations, policies and guidelines to install and use the product. In the process of using the product, the user is committed to being responsible for his or her actions and all consequences arising therefrom. LK-TECH will not be liable for any loss caused by improper use, installation or modification by the user.

LK-TECH is a trademark of Shanghai lingkong technology Co., Ltd. and its affiliates. Product names, brands, etc. appearing in this document are trademarks or registered trademarks of their respective companies.

This product and manual are copyrighted by LK-TECH. Reproduction may not be allowed in any form without permission. The final interpretation of the disclaimer is owned by LK-TECH .

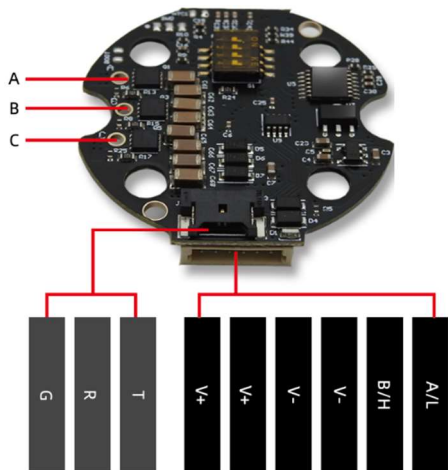
Introduction

The MF servo motor system used a 32-bit high-performance MCU 、 High bandwidth op amp 、 Low internal resistance flat MOSFET and combined with an optimized version of the FOC control technology, equipped with a high-performance brushless motor of the DF series, designed for high-precision, high-response, high-torque applications. The integrated design of the motor and the driver facilitates ,easily apply for system integration. The driver integrates a high-precision absolute encoder with an easy-to-use closed-loop control algorithm that greatly improves the accuracy of position ,speed feedback and torque output.

1. Driver parameter

Input voltage	DF40R7	7.4V~24V
	DF60R7	7.4V~36V
Normal current	DF40R7	6A
	DF60R7	10A
Maxium current	DF40R7	8A （10s）
	DF60R7	15A （10s）
Control frequency	Torque loop	24KHz
	Speed loop	8KHz
	Position loop	8KHz
PWM frequency	24KHz	
Encoder	14 bit	
Bus type	RS485 OR CAN	
Baudrate （RS485）	9600, 19200, 38400,57600,115200,230400,460800, 1Mbps,2Mbps	
Baudrate （CAN）	1Mbps	

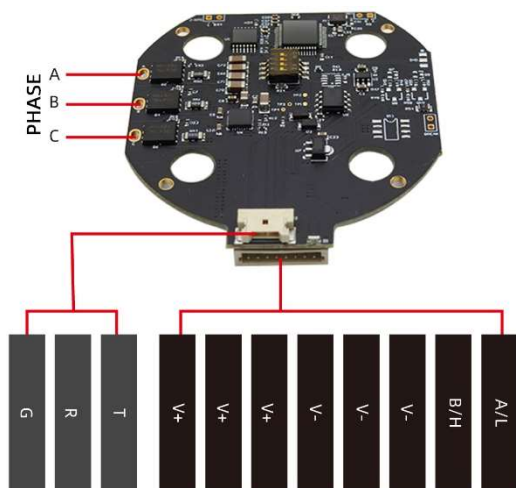
2. Driver interface



Driver:DF40R/C6



Motor:MF40/MF50



Driver:DF70R/C6



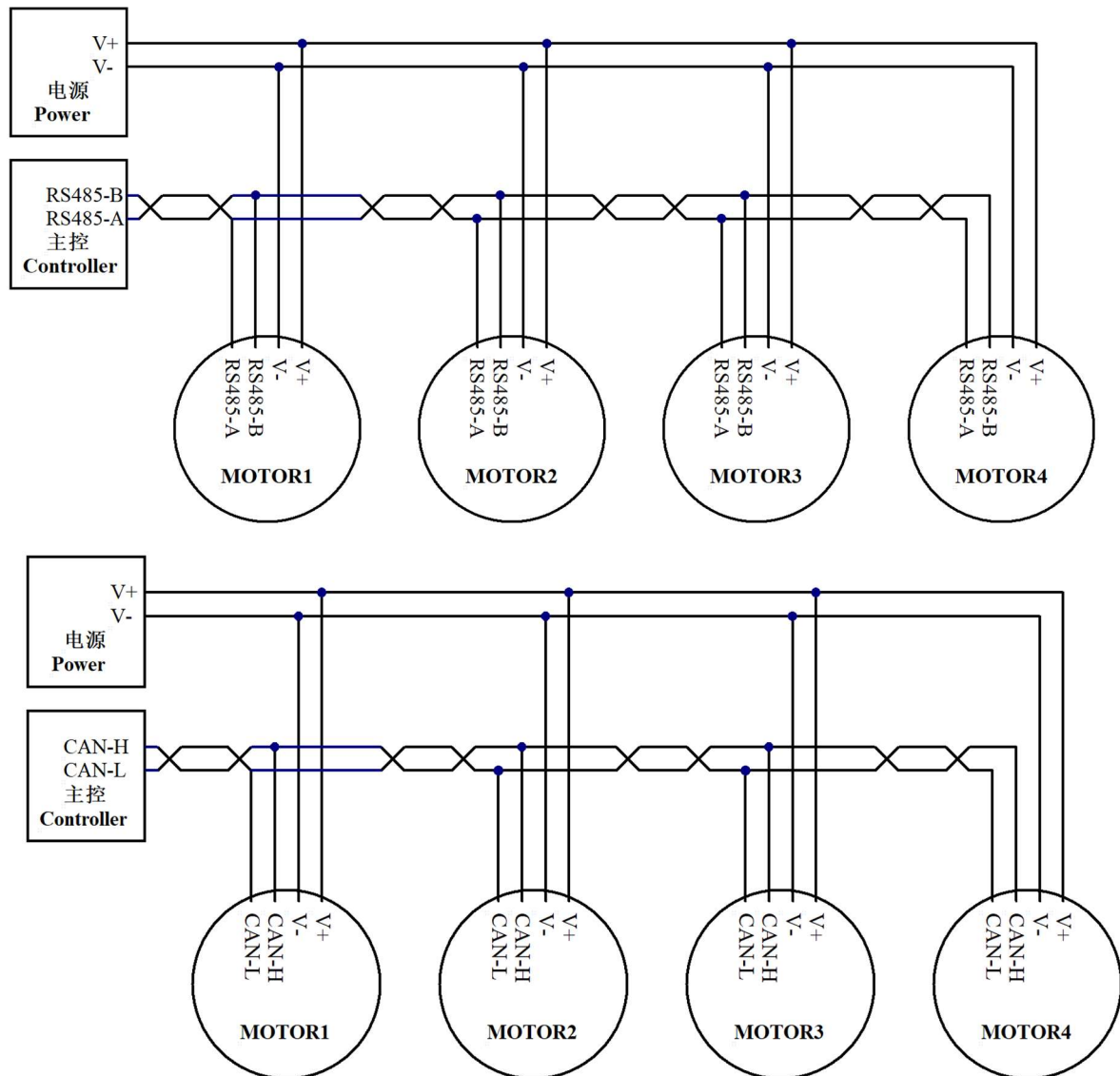
Motor:MF70/MF90

Interface	Note
A/L	RS485-A OR CAN-L
B/H	RS485-B OR CAM-H
V-	Negative Power Supply
V-	Negative Power Supply
V-	Negative Power Supply
V+	Positive Power Supply
V+	Positive Power Supply
V+	Positive Power Supply
T	UART Transmitter
R	UART Receiver
G	Signal GND

3. Line connection

The 120Ω resistor is connected at bothends of the bus.

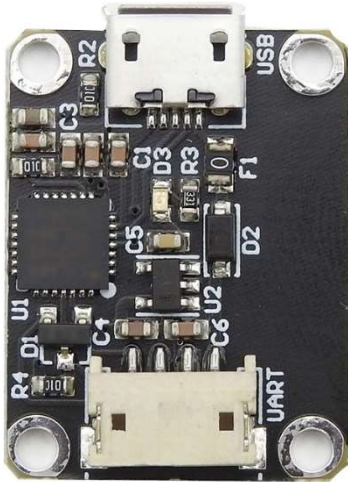
The control circuit connection is shown in the following image:



4. Setting

- **Connect with accessories**

The motor drive and the upper unit can be connected via the USB serial module (optional) and the companion connection cable (customizable length).



USB serial module



USB serial cable



ZH1.5-6/8PIN

- **Introduction to the LingKong Motor Tool V2.3**

LingKong Motor Tool is a PC-side debug tool software developed by SCI for systems above win7, version number V2.3.

- **Software installation**

Download the Ling Kong Motor Tool V2.3 package without installation, double-click the LK Motor Tool V2.3.exe application to get to the operator interface.

- **MF motor connection**

MF motor with matching ZH1.5-6/8PIN wire to power up, via USB serial module connected to the PC side for upper machine parameters, refer to the figure below.

Power 12V

MF Series Motor

USB serial module

LingKong Motor Tool V2.3



V- V+

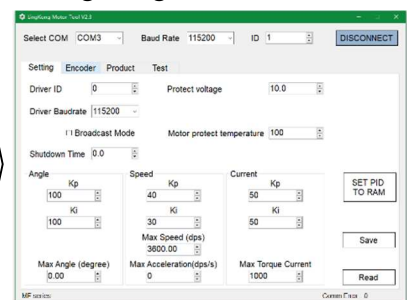


ZH1.5-6/8PIN



TRG

USB serial cable



Note: Power supply positive and negative avoid backswing, select the appropriate supply voltage range and power output power.

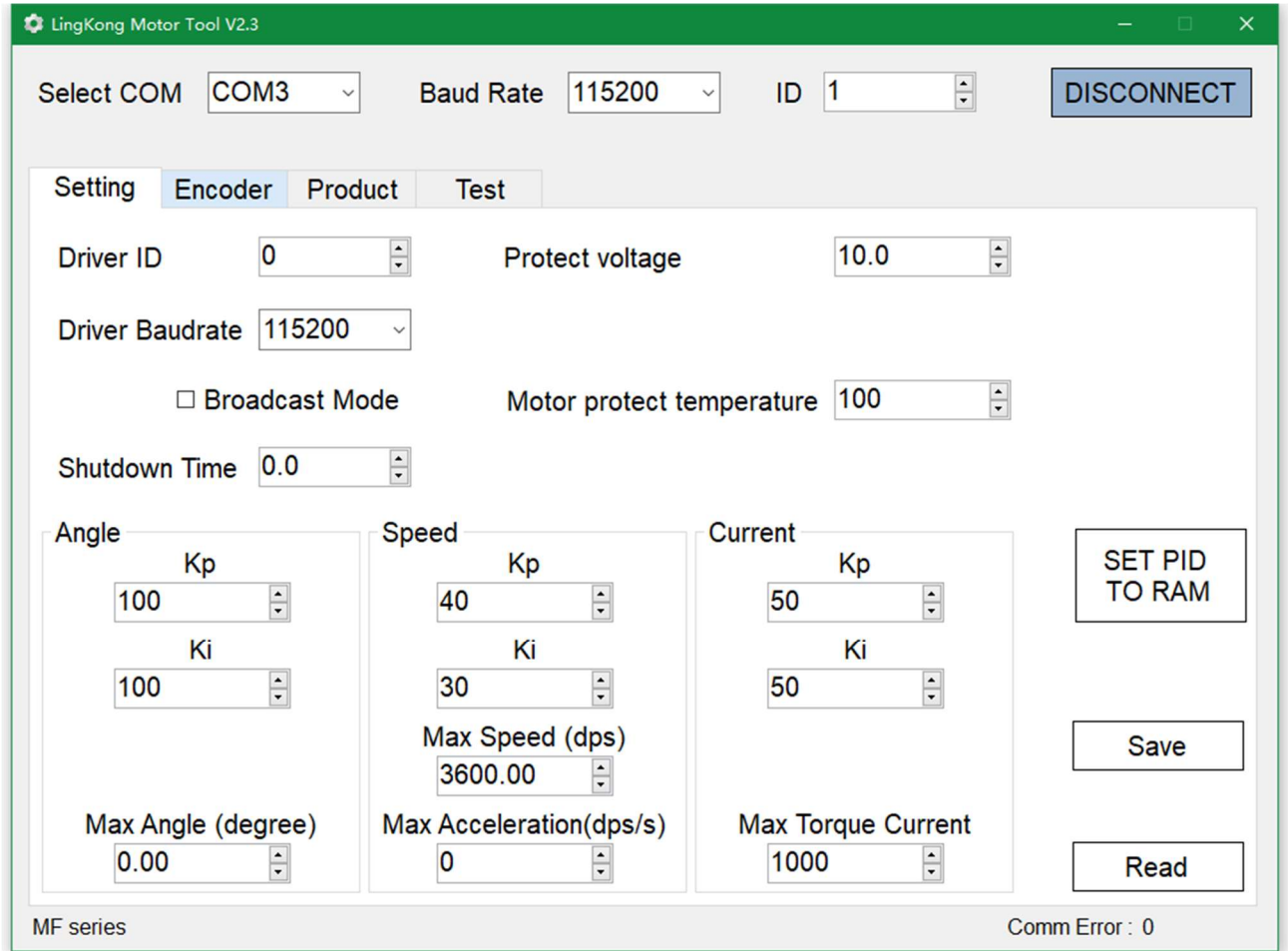
- **The Ling Kong Motor Tool V2.3 setting**

The Motor Tool V2.3 connection setting, select **COM** (...CP210x USB to UART bridge), Baud rate is 115200(default), default ID For 1(set by the DIP Switch), click the **CONNECT** button to complete the connection, led always lit.



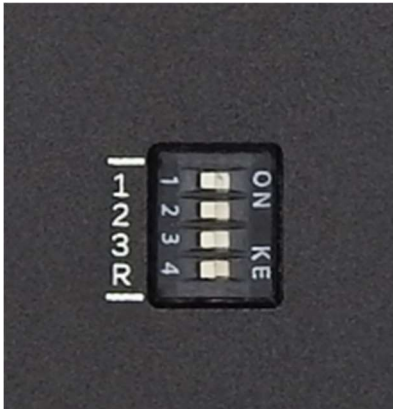
The screenshot shows the 'LingKong Motor Tool V2.3' window. At the top, there are three dropdown menus: 'Select COM' set to 'COM3', 'Baud Rate' set to '115200', and 'ID' set to '1'. To the right of these is a 'CONNECT' button. The window has a green title bar and standard Windows window controls.

- **Basic settings**, on the Settings page, click the **Read** button to read the motor and encoder informatio



The screenshot shows the 'LingKong Motor Tool V2.3' window with the 'Encoder' tab selected. At the top, there are three dropdown menus: 'Select COM' set to 'COM3', 'Baud Rate' set to '115200', and 'ID' set to '1'. To the right is a 'DISCONNECT' button. Below these are four tabs: 'Setting', 'Encoder' (selected), 'Product', and 'Test'. The 'Encoder' tab contains several settings: 'Driver ID' (0), 'Protect voltage' (10.0), 'Driver Baudrate' (115200), 'Broadcast Mode' (unchecked), 'Motor protect temperature' (100), 'Shutdown Time' (0.0), and three columns of PID settings for 'Angle', 'Speed', and 'Current'. Each column has 'Kp' and 'Ki' values. To the right of these settings are three buttons: 'SET PID TO RAM', 'Save', and 'Read'. At the bottom left, it says 'MF series', and at the bottom right, it says 'Comm Error : 0'.

- ✓ **Driver ID:** Sets the ID number. When set to **0**, the ID is selected by the DIP Switch, and when set to **1 ~ 32**, the ID is determined by the setting item, and the corresponding relationship between the two is as follows:



ID	Switch 3	Switch 2	Switch 1
#1	OFF	OFF	OFF
#2	OFF	OFF	ON
#3	OFF	ON	OFF
#4	OFF	ON	ON
#5	ON	OFF	OFF
#6	ON	OFF	ON
#7	ON	ON	OFF
#8	ON	ON	ON

The fourth **R** of the DIP Switch is on, indicating that the 120 Ω resistance in the bus is on.

Note: The new ID will be valid when power on again.

- ✓ **Protect voltage:** Sets the protection voltage and turn off the motor when the voltage is lower than this value.
- ✓ **Driver Baudrate:** Set the driven Baud Rate.
Note: After setting, new parameters will be valid when power on again.
- ✓ **Motor protection temperature:** Set the motor protection temperature, When the set temperature is reached, the motor turns off.
- ✓ **ShutdownTime:** Set the shutdown time(ms) for the motor. No control command was received during that time and the electrical opportunity was turned off, when set to 0, the motor will never turn off.
Note: After setting, new parameters will be valid when power on again.
- ✓ **Angle:** Angle loop control parameters. Kp and Ki modify the PI parameter of the angle ring. 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 $\pm 3600^\circ$, 10 turns.
- ✓ **Speed:** Speed loop control parameters. Kp and Ki modify the PI parameter 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 velocity of the motor is $\pm 720^\circ/\text{S}$, which is 2 turns per second.
Max Acceleration option does not take effect in the current version of the drive, the actual acceleration of the motor depends on the PI parameters, motor load and drive voltage.
- ✓ **Current:** Torque loop control parameters. Kp and Ki modify the PI parameter of the torque loop, Max Power is used to limit the output power to motor.
Note: After the parameters have been modified, click the **Save** button to save the parameters to the driver and need to be re-energized to survive effect.

- **Encoder settings**, on the Encoder page, click the **Read** button to read the motor and encoder information.

LingKong Motor Tool V2.3

Select COM: COM3 Baud Rate: 115200 ID: 1 DISCONNECT

Setting Encoder Product Test

Motor Poles: 28

Encoder Type: 14Bit Encoder

Encoder Position: Normal

Motor/Encoder Ratio: 1002

Motor/Encoder Offset: 14931

Motor/Encoder Direction: Normal

Motor/Encoder Align Power: 90 Align

Motor Zero Position: 0 Set

Save

Read

MF series Comm Error : 0

- ✓ **Motor Poles:** Set the number of magnetic poles in the motor, usually before the factory.
 - ✓ **Encoder Type:** Encoder type and resolution, which is read-only.
 - ✓ **Encoder Position:** Read encoder location information, which is read-only.
 - ✓ **Motor/Encoder Ratio:** The ratio of motor and encoder calibration, which is read-only, generally around 1000, the closer to 1000, the better the calibration effect.
 - ✓ **Motor/Encoder Offset:** Read-only parameter.
 - ✓ **Motor/Encoder Direction:** The direction of motor and encoder calibration, which is read-only and generally has no effect on motor drive performance.
 - ✓ **Motor/Encoder Align Power:** Generally use the default parameters, when the load is large, you can increase the calibration to improve the calibration effect.
- Align button:** Start calibration of the motor and encoder. Before this step, you need to ensure that the number of poles of the motor is set correctly and select the appropriate calibration power. After clicking the **Align** button, the motor will rotate back and forth to perform calibration. After the calibration is completed, the parameters will be automatically saved to the drive.
- ✓ **Motor Zero Position:** After clicking the **Set** button, the drive will save the current position as the starting position of the motor.

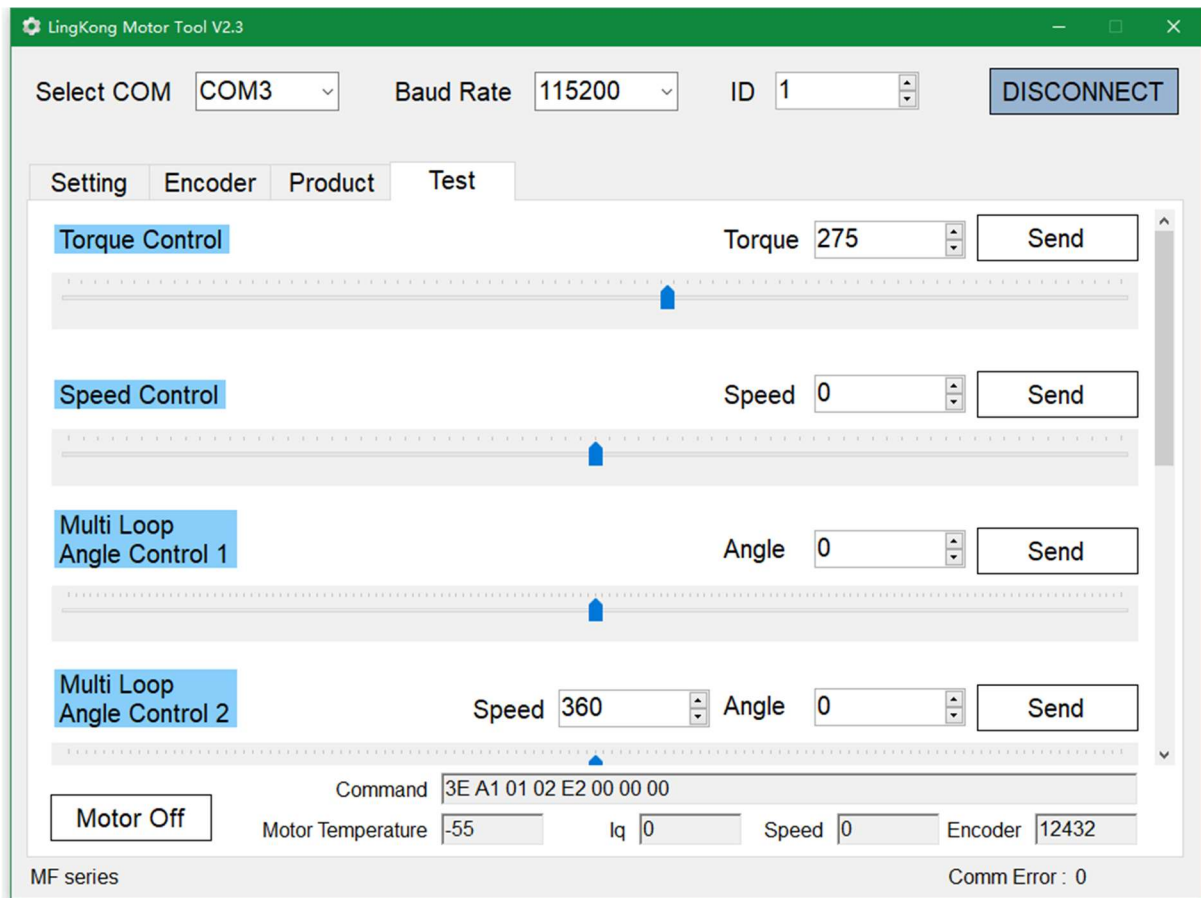
Note:

1. Suggest calibrating the motor and encoder under no-load conditions. If the motor does not rotate smoothly during the calibration rotation, check the motor fault or mechanical friction.
2. After the parameters are modified, click the **Save** button to save the parameters to the driver

- **Product information:** in the Product page, click the **Read** button to read the hardware and software version of the product.

The screenshot shows the 'LingKong Motor Tool V2.3' window. At the top, there are fields for 'Select COM' (set to COM3), 'Baud Rate' (set to 115200), and 'ID' (set to 1), along with a 'DISCONNECT' button. Below these are four tabs: 'Setting', 'Encoder', 'Product' (which is selected), and 'Test'. The 'Product' tab displays the following information: Motor : MF7015-23T, Motor version : V1.0, Driver : DF70C6, Hardware version : V1.0, and Firmware version : V2.30. There are two empty text input fields below this information. To the right of the first input field is an 'Open File' button, and to the right of the second is a 'Download' button. At the bottom left, the 'Chip ID: 333134200C53525021002800' is displayed. At the bottom right, there is a 'Read' button. The status bar at the very bottom shows 'MF series' on the left and 'Comm Error : 0' on the right.

- **Test information**, on the Test page, is available in a variety of control modes to meet the different needs of users.



- ✓ **Torque Control:** Torque Loop mode. Counterclockwise rotation is positive, clockwise rotation is negative, and the effective adjustment range is ± 2000 . After setting, the motor sends a command with the **Send** button.
- ✓ **Speed Control:** Speed Loop mode. Counterclockwise rotation is positive, clockwise rotation is negative, and the effective adjustment range is ± 18000 (dps). After setting, the motor sends a command with the **Send** button.
- ✓ **Multi Loop Angle Control 1:** Counterclockwise rotation is positive, clockwise rotation is negative.
For example, when set to 3600, the motor rotates counterclockwise to 3600° at the maximum speed, 10 turns.
- ✓ **Multi Loop Angle Control 2:** The mode adds the speed limit function.
For example, when the Speed set to 360, the maximum angular velocity of the motor is $360^\circ/\text{S}$, which is 1 turns per second.
- ✓ **Single Loop Angle Control 1:** Rotate counterclockwise to the specified position, effective range $0-359^\circ$, **Reverse** rotation.
For example, when the angle input value is 90° , click the **Send** button, the motor rotates counterclockwise to 90° at the maximum speed.
- ✓ **Single Loop Angle Control 2:** The mode adds the speed(dps) limit function.

Note:

1. In position mode, the motor needs to return to zero first.
 2. When the power is maintained, the motor returns to the zero point position according to the original path direction.
 3. When re powered on, the motor returns to the zero point position in the direction of the shortest path.
- ✓ **Increment Angle Control 1:** Counterclockwise rotation is positive, clockwise rotation is negative, and the effective adjustment range is ± 360 . After setting the parameters, continuously click the **Send** button to increase with the same angle value.
 - ✓ **Increment Angle Control 2:** The mode adds the speed(dps) limit function.
 - ✓ **Motor Off:** Turn off the motor.
 - ✓ **Command:** Click the **Send** button to read the current state command.
 - ✓ **Temperature Motor:** Click the **Send** button to read the current motor temperature.
 - ✓ **Iq:** Motor quadrature-axis current (torque current).
 - ✓ **Speed:** Click the **Send** button to read the current motor speed (dps).
 - ✓ **Encoder:** Read the current encoder single turn position value in real time (repeatedly click the **Send** button to read).

- **Products application:**

