LK-TECH伺服单元不同系列对比表

LK-TECH SERVO UNIT DIFFERENT SERIES COMPARISON TABLE ENGLISH

电机系列	MS系列	MF系列	MG系列	MH系列
电机图片				
电机优势	低速稳定,过滑环线	高速,高精度	内置减速机，小背隙	大中孔
输入电压	7.4-24V	12-36V	24-48V	12-24V
电流	0-4A	0-9A	0-14A	0-4A
速度范围	0-1000rpm	0-3000rpm	0-2000rpm	0-3000rpm
驱动类型	SVPWM控制	FOC控制	FOC控制	FOC控制
通讯方式	RS-485/CAN BUS	RS-485/CAN BUS	RS-485/CAN BUS	RS-485/CAN BUS
控制模式	速度模式/位置模式	力矩模式/速度模式/位置模式	力矩模式/速度模式/位置模式	力矩模式/速度模式/位置模式
保护类型	温度保护/低压保护	温度保护/低压保护	温度保护/低压保护	温度保护/低压保护
应景场景	云台、吊舱	云台、转盘、电力工业巡检机械臂、激光雷达	足式机器人、外骨骼机器人	云台、吊舱、转盘、激光雷达

MF$_{V2}$ servo motor manual

Statement

Thank you for purchasing the MFv2 series servo motor from Shanghai Lingkong Technology Co., Ltd. Please read this statement carefully before using.It's considered to be the recognition and acceptance of the entire statement once using.Please ensure all the manual,relevant laws,regulations and policies are strictly observed when you run the product.The user take responsibility for his own behavior during the process.We will not be liable for any loss caused by improper use,improper installation and modification by users.

Introduction

MFv2 series brushless motor is supported by DF series drive. Both high-performed 32 bit MCU and optimized FOC control technology together with low internal resistance MOSFET flat structure are specially designed for high-precision, high-response, high-torque applications.The integrated design of motor and drive is convenient for users to integrate system. High-precision absolute value encoder together with an easy-to-use dual closed-loop control highly improved the accuracy of torque,position and speed feedback.

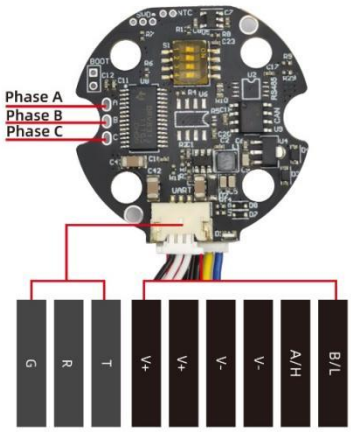
MF Naming Rule

MF 70 25-28T 18bit RS485 ① ② ③ ④ ⑤ ⑥	①	series
	②	motor outer diameter
	③	coil height
	④	turns
	⑤	encoder
	⑥	communication

1.Driver parameter

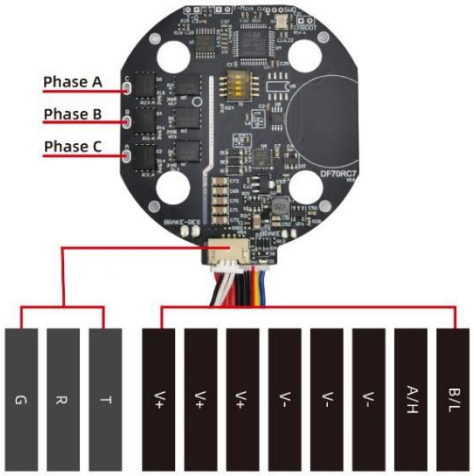
Input Voltage (V)	DF40R/C6	7.4-24V
	DF70R/C6	7.4-32V
Normal Current(A)	DF40R/C6	6A
	DF70R/C6	9A
Max Current(A)	DF40R/C6	8A（duration is 10 seconds）
	DF70R/C7	15A（duration is 10 seconds）
Control Mode	Torque Loop	24KHz
	Speed Loop	8KHz
	Position Loop	8KHz
PWM Frequency	24KHz	
Torque loop control bandwidth	0.4-2.8KHz（determined by different motor and torque）	
Encoder	18 bit	
Communication	RS485 OR CAN	
Baud rate(RS485)(bps)	9600, 19200, 38400,57600, 115200(default),230400,460800,1Mbps,2Mbps,4Mbps	
Baud rate(CAN)(bps)	125Kbps,250Kbps,500Kbps,1Mbps(default)	

2.Driver interface



Driver:DF40R/C6

Motor:MF40/MF50 connect ZH1.5-6PIN



Driver:DF70R/C6

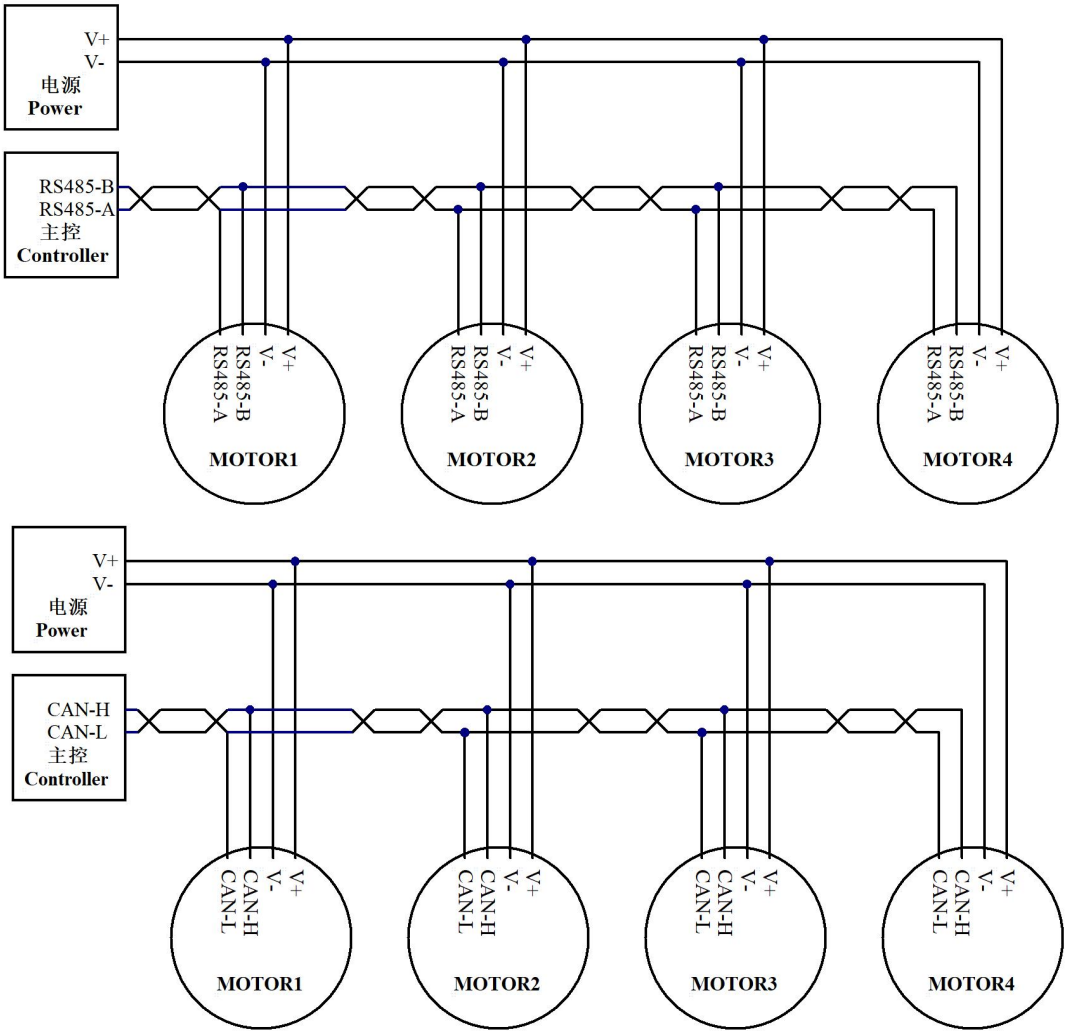
Motor:MF70/MF90 connectZH1.5-8PIN

Interface	Note
B/L	RS485-B OR CAN-L
A/H	RS485-A 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 both ends of the bus.

The control circuit connection is as follows:



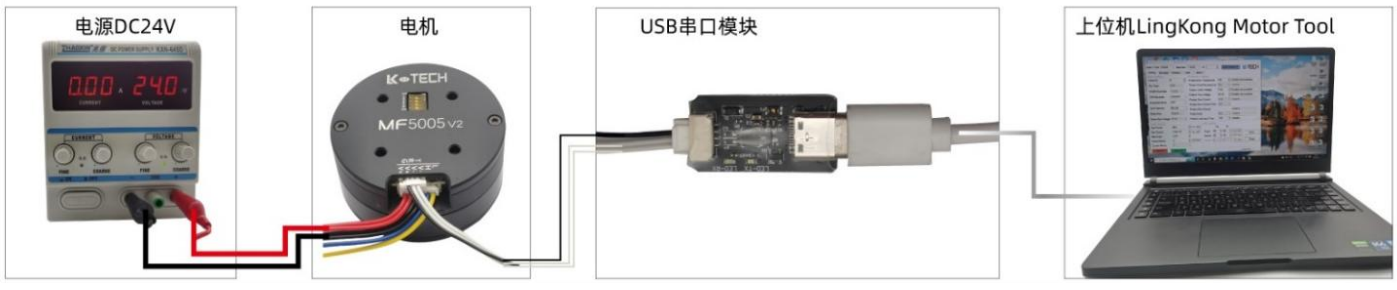
4.MF motor connection

Using ZH1.5-6/8PIN cable to connect power.

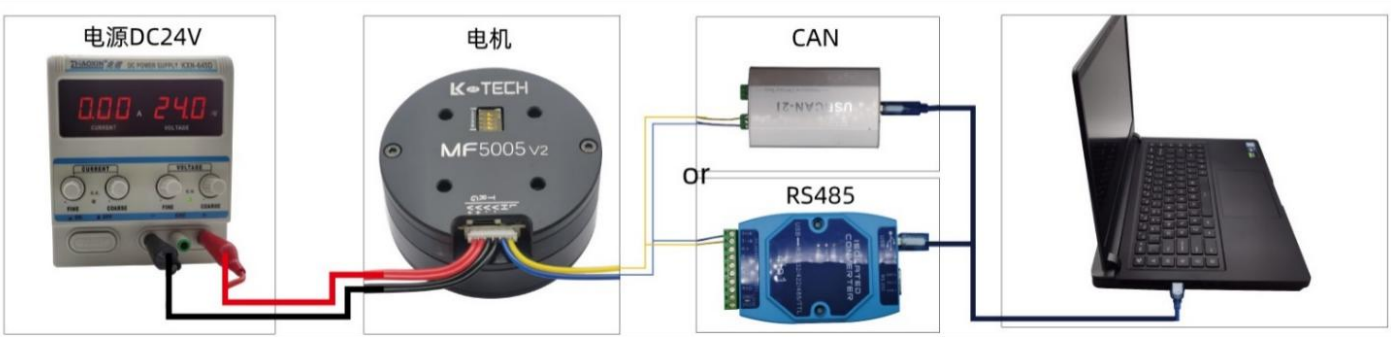
Using USB UART to connect PC for parameter adjustment.

Note: Please ensure the positive and negative poles are correctly connect.Please select appropriate power supply voltage range and output power.

Port connection:



Communication connection:



5.Setting

- Accessories for connection:

  Connect motor drive and PC with USB UART(optional) and matching cable(customized length)

USB UART

USB type C

MX1.25-3PIN cable

ZH1.5-6/8PIN cable

- LingKong Motor Tool V2.35 introduction

  LingKong Motor Tool is a PC-side debugging tool software developed by LK-TECH,which is suitable for WIN7 and above system.Version 2.35.

- Software installation

  1.Download CP210x_VCP_Windows.zip,install the drive and check the below:

CP210x_VCP_Windows.zip

Windows link address:https://pan.baidu.com/s/1Bsi9vpOPZ5LhOhMxRjuUfQ password:1111

CP210x_Mac.zip

Mac OS link address:https://pan.baidu.com/s/1NyE2CkslqFb7WDzRYjm-Iw password:2222

Linux_3.x.x_4.x.x_VCP_Driver_Source.zip

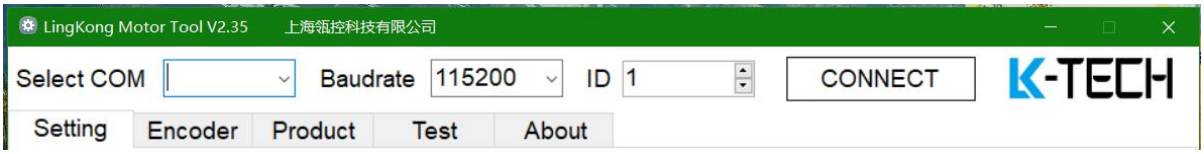
Linux link address: https://pan.baidu.com/s/1JmLHZhVm_m_Sebx-DeLT1Q password:3333

2.Download LingKong Motor Tool V2.35,do not need to install here,double click LK Motor Tool V2.35.exe for operating.

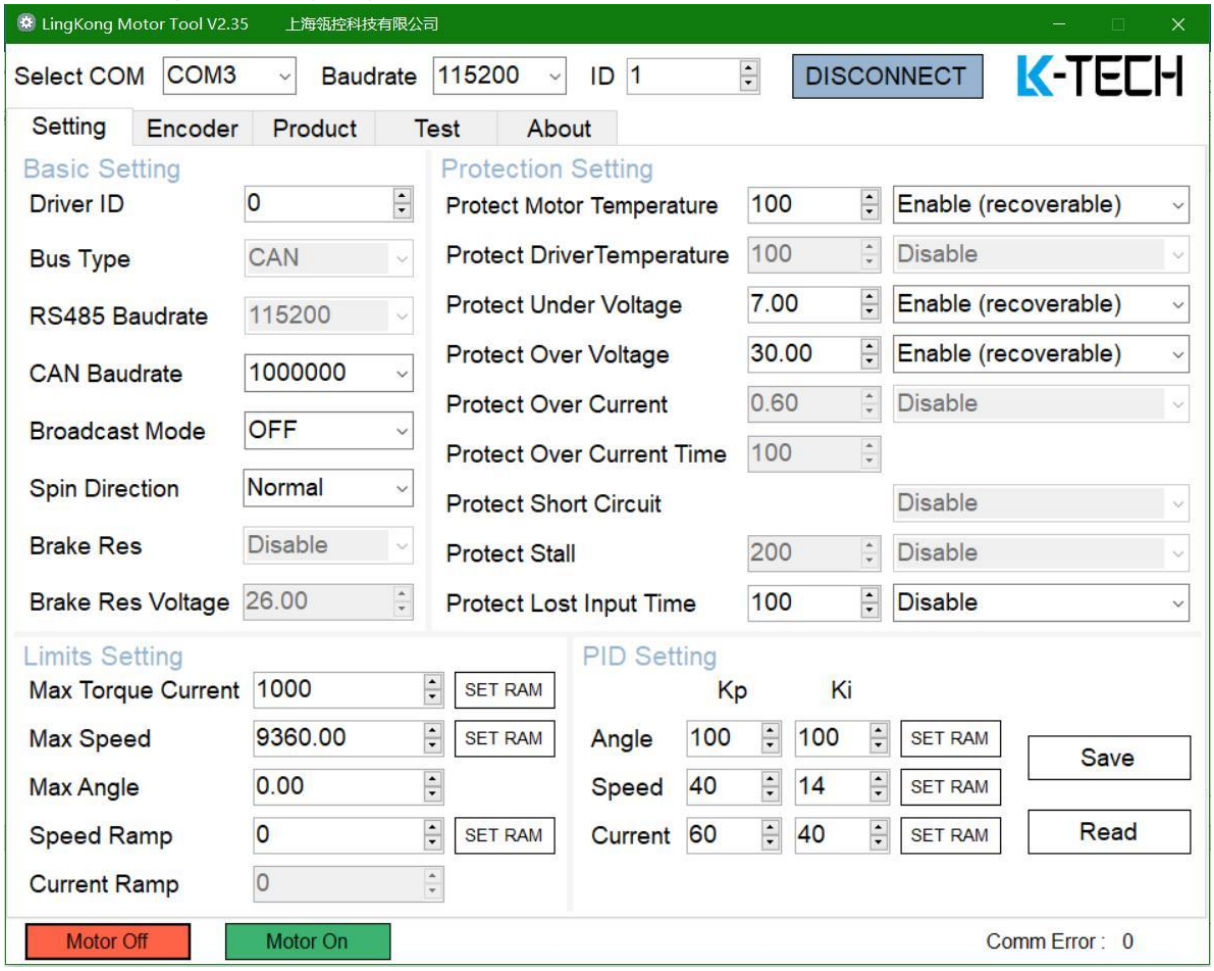
Link address:https://pan.baidu.com/s/1tdxck272FPNRYWF4PVHCKQW password:v235

- LingKong Motor Tool V2.35 setting

Select COM(based on demand),Baud rate 115200(default),default ID for 1(set by the DIP switch), click **connect** button to complete connection. LED(green)always lit.



- **Basic setting**,on setting page, click **read** button to read motor and encoder.



1.Basic Setting

Driver ID: Sets the ID number.

When set to **0**, the ID is selected by the DIP Switch,the correspondence is as follows:

ID	switch3	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

When set to 1~32, the ID is determined by the setting item.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 only when it's saved and the power is on again.

Bus Type:

RS485 Baud rate:9600K, 19200K, 38400K,57600,115200(default),230400,460800,1Mbps,2Mbps.

CAN Baud rate:100K, 125K, 250K,500K, 1Mbps(default).

Note:The Baud rate will be valid only when it's saved and the power is on again.

Broadcast Mode:can be controlled by 4 motors at the same time.ID need to be set as 1-4#,baud rate need to set as 1M or 2M bps, CAN need to be set as 500K and 1 Mbps. It can only be controlled by Torque Loop.

Note: Will be valid only when it's saved and the power is on again.

Spin Direction:

Normal:counter clockwise rotation is positive

Reverse:clockwise rotation is positive

Note:click save button,power is on again,click Align button.

Brake Res:Set brake res

Brake Res Voltage:Will be valid only when it's saved and the power is on again.

2.Protection Setting

- ✓ Protect Motor Temperature:YES
- ✓ Protect Driver Temperature:not yet available
- ✓ Protect Under Voltage:YES
- ✓ Protect Over Voltage:YES
- ✓ Protect Over Current::not yet available
- ✓ Protect Over Current Time:not yet available
- ✓ Protect Short Circuit:not yet available
- ✓ Protect Stall:not yet available
- ✓ Protect Lost Input Time:YES

Note: Disable (unprotected);Enable(recoverable); Enable(not recoverable,need to restart)

3.Limits Setting

- ✓ Max Torque Current:Effective adjustment range 0-2000 (ratio)
- ✓ Max Speed:Effective adjustment range 0-72000dps (degrees per second)
- ✓ Max Angle
- ✓ Speed Ramp:the actual acceleration of the motor depends on the PI parameters, motor load and drive voltage, etc.
- ✓ Current Ramp:not yet available

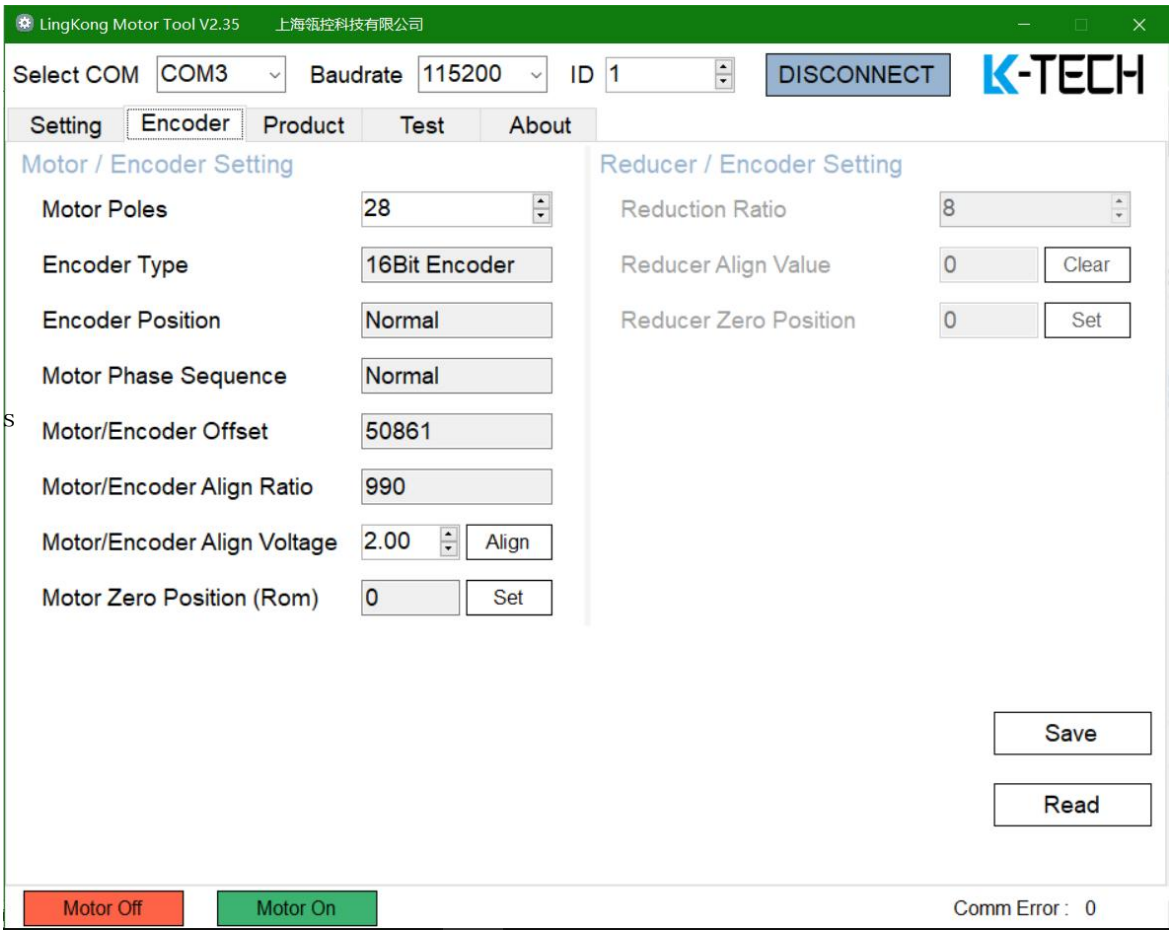
Note: Write to RAM,the parameter will be lost once power off.Write to ROM,the parameter can permanently stored.Ensure **save** the parameter and the power need to be on again.

4.PID Setting

- ✓ Angle:Angle loop control parameters. Kp and Ki modify the PI parameter of the angle ring.
- ✓ Speed:Speed loop control parameters. Kp and Ki modify the PI parameter of the speed loop.
- ✓ Current:Torque loop control parameters, Kp and Ki modify the PI parameter of torque loop.

Note: Write to RAM,the parameter will be lost once power off.Write to ROM,the parameter can permanently stored.Ensure **save** the parameter and the power need to be on again.

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

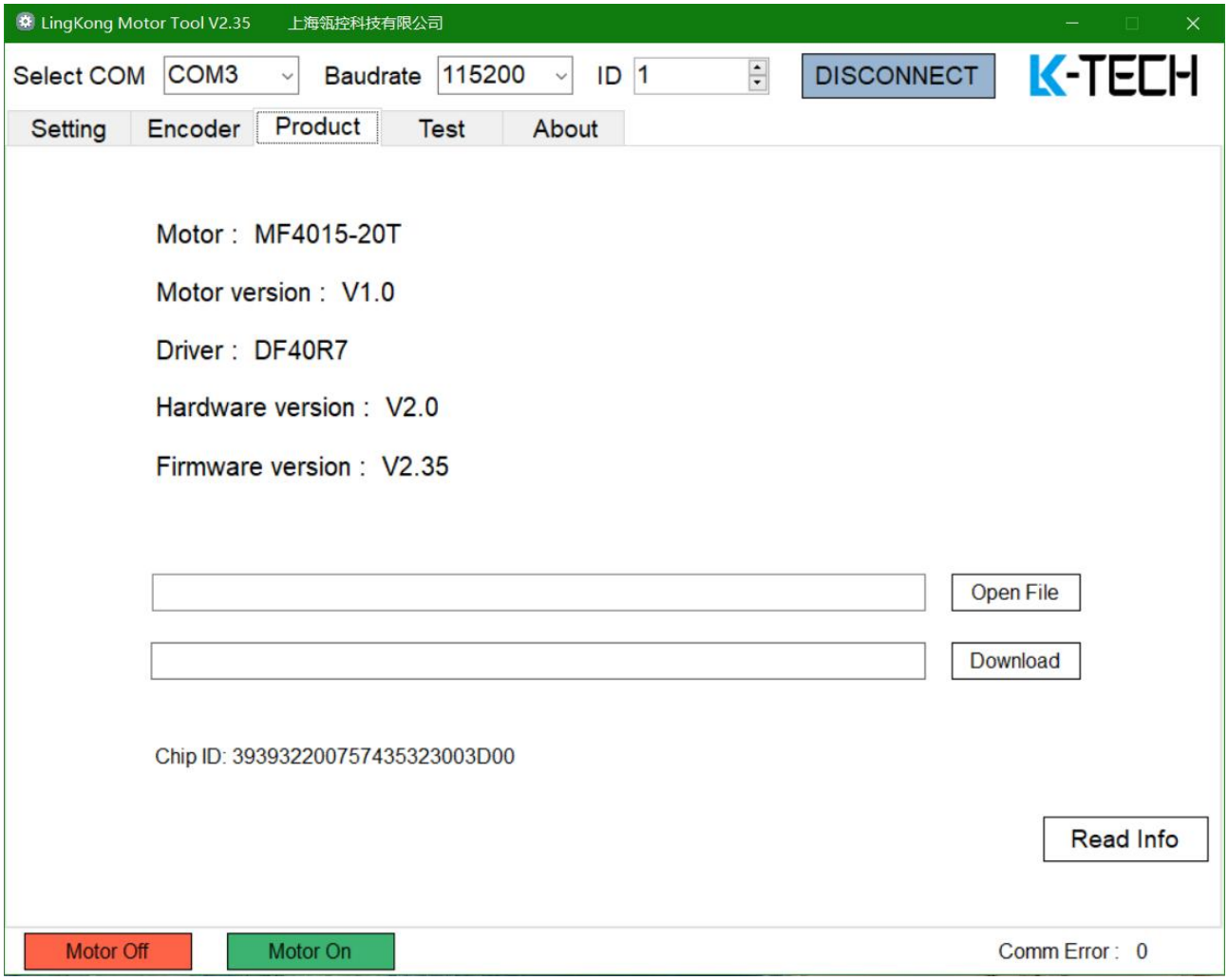


- ✓ Motor Poles:Set the number of magnetic poles in the motor,normally default parameters work.
- ✓ Encoder Type:Encoder type and resolution, which is read-only.
- ✓ Encoder Position:Read encoder location information, which is read-only.
- ✓ Motor Phase Sequence
- ✓ Motor/Encoder Offset:Read-only parameter
- ✓ Motor/Encoder Align Ratio:The ratio of motor and encoder align, which is read-only, generally around 1000, the closer to 1000, the better the align effect.
- ✓ Motor/Encoder Direction:The direction of motor and encoder align, which is read-only
- ✓ Motor/Encoder Align Voltage:Generally use the default parameters, when the load is heavy, you can increase it to improve the align effect.
- ✓ Align button:Start align 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 align power. After clicking the Align button, the motor will rotate back and forth to perform align. After the align 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.The deviation value the encoder read cannot be modified.

Note:

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

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

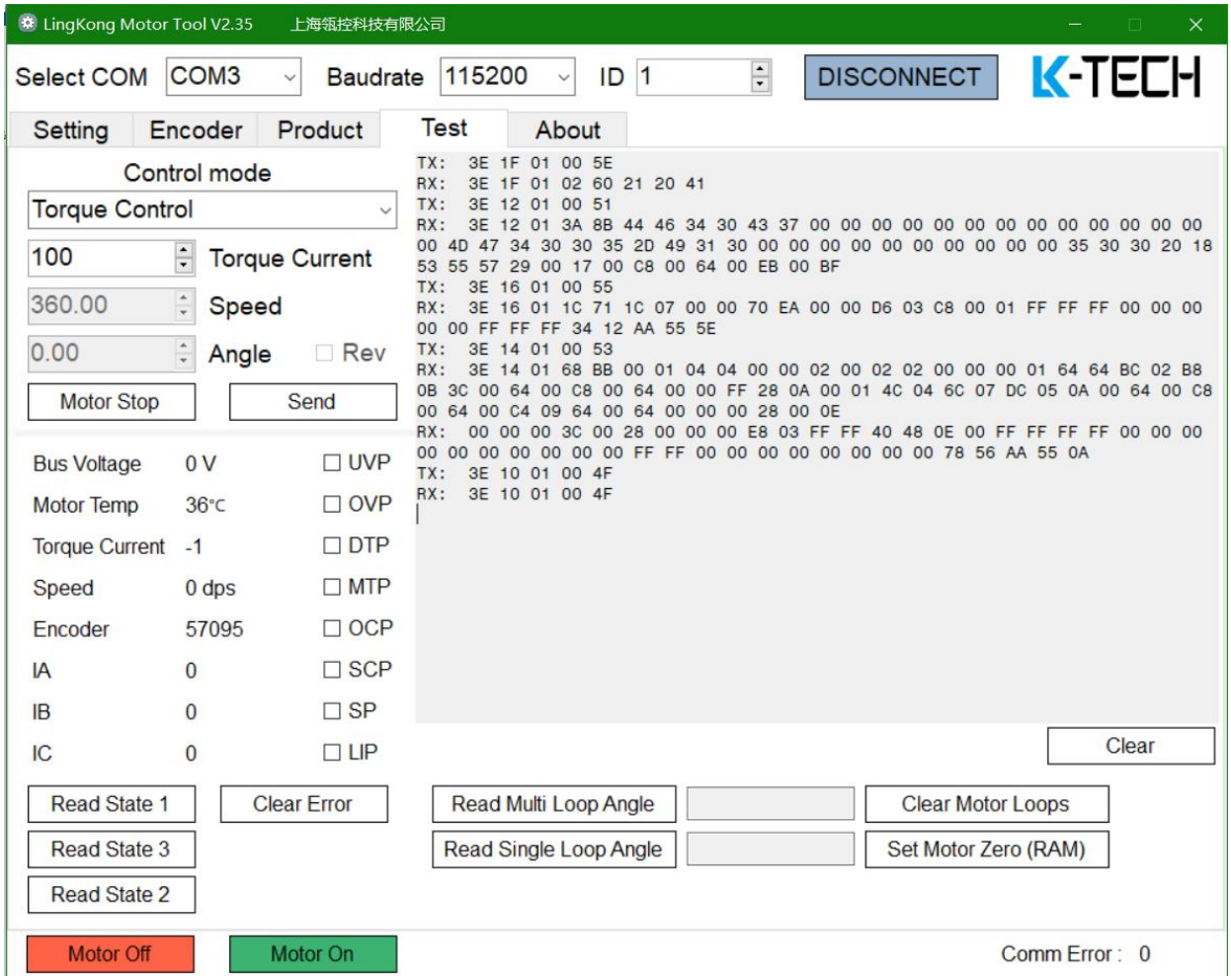


Firmware Upgrade:

- ✓ Open File:Find and open the firmware storage location and make sure that the firmware and motor models are consistent.It works only in LingKong Motor Tool.
- ✓ Download:Download and upgrade the firmware until write finish.

Note: When the firmware upgrade is complete, the motor will calibrate automatically.

- **Test information**, on the Test page,there are various control modes to meet the different needs of users.



1.Control mode:

- ✓ Torque Control:Control motor output torque current and rotation direction. The counterclockwise rotation is "+", the clockwise rotation is "-", and the effective adjustment range is ± 2000 (ratio). After setting the value, click the Send button to rotate the motor in the same torque mode.
- ✓ Speed Control:Control the speed and direction of motor rotation. It is "+" when it is turned counterclockwise and "-" when it is turned clockwise. The effective adjustment range is ± 24000.00 (dps).
- ✓ Multi Loop Angle Control 1:The counterclockwise rotation is "+", the clockwise rotation is "-",effective adjustment range ± 359999.99 °.For example, if it is set to 3600, click the Send button, and the motor rotates 3600 ° at the maximum speed, that is, 10 turns counterclockwise.
- ✓ Multi Loop Angle Control 2:The mode adds the speed(dps) limit function.
- ✓ Single Loop Angle Control 1:After inputting the position parameters, click the Send button to turn counterclockwise to the set position, and the effective adjustment range is 0-359.99 °.For example, if the input value is 90 °, click the Send button, the motor will rotate counterclockwise from the zero point position to 90 °, and check Rev to rotate reversely to the

set position.

- ✓ Single Loop Angle Control 2:The mode adds the speed(dps) limit function.

Note:

1. When the power is kept on, the motor returns to the zero point position according to the original path direction.

2. When the power is turned on again, the motor returns to the zero point position according to the shortest path direction.

- ✓ Increment Angle Control 1:The counterclockwise rotation is "+", the clockwise rotation is "-",effective adjustment range ± 359999.99 °.After setting the value, click Send button continuously to increase by the same angle value.
- ✓ Increment Angle Control 2:The mode adds the speed(dps) limit function

2.Motor state and error

- ✓ Bus Voltage:Read Bus Voltage(V)
- ✓ Motor Temp:Read Motor Temp(℃)
- ✓ Torque Current:Read Torque Current(A)
- ✓ Speed:Read Speed(dps)
- ✓ Encoder:Read Encoder position,it is related to the encoder resolution, and the encoder value is within 360 degrees
- ✓ IA/IB/IC :Read motor phase current (ratio)
- ✓ UVP:Under Voltage Protection
- ✓ OVP:Over Voltage Protection
- ✓ DTP:Driver Temperature Protection
- ✓ MTP:Motor Temperature Protection
- ✓ OCP:Over Current Protection
- ✓ SCP:Short Circuit Protection
- ✓ SP:Stall Protection
- ✓ LIP:Lose Input Protection
- ✓ Read State1:Read the current motor temperature,voltage and error state
- ✓ Read State2:Read the current motor temperature and torque current
- ✓ Read State3:Read the current motor temperature and phase current
- ✓ Clear Error:Clear motor error status
- ✓ Read Multi Loop Angle
- ✓ Read Single Loop Angle
- ✓ Clear Motor Loops
- ✓ Set Motor Zero(RAM)
- ✓ Motor Off:LED flashing slowly (2S/time)
- ✓ Motor ON

Note: When the motor is in error state, the LED flashes quickly(0.3s/time).When the motor is off,the led flashes slowly(2S/time),click Motor ON.

3.Motor operation instruction and recovery

```
TX:  3E 1F 01 00 5E
RX:  3E 1F 01 02 60 21 20 41
TX:  3E 12 01 00 51
RX:  3E 12 01 3A 8B 44 46 34 30 43 37 00 00 00 00 00 00 00 00 00 00 00 00
00 4D 47 34 30 30 35 2D 49 31 30 00 00 00 00 00 00 00 00 00 00 35 30 30 20 18
53 55 57 29 00 17 00 C8 00 64 00 EB 00 BF
TX:  3E 16 01 00 55
RX:  3E 16 01 1C 71 1C 07 00 00 70 EA 00 00 D6 03 C8 00 01 FF FF FF 00 00 00
00 00 FF FF FF 34 12 AA 55 5E
TX:  3E 14 01 00 53
RX:  3E 14 01 68 BB 00 01 04 04 00 00 02 00 02 02 00 00 00 01 64 64 BC 02 B8
0B 3C 00 64 00 C8 00 64 00 00 FF 28 0A 00 01 4C 04 6C 07 DC 05 0A 00 64 00 C8
00 64 00 C4 09 64 00 64 00 00 00 28 00 0E
RX:  00 00 00 3C 00 28 00 00 00 E8 03 FF FF 40 48 0E 00 FF FF FF FF 00 00 00
00 00 00 00 00 00 00 FF FF 00 00 00 00 00 00 00 00 00 78 56 AA 55 0A
TX:  3E 10 01 00 4F
RX:  3E 10 01 00 4F
```

TX:Send instruction

RX:Reply instruction

Clear

Note:Refer to RS485 communication protocol for instructions.

- Application