SMC05 detailed user manual

Module wiring instructions

Function introduction and operation

Preface

Product introduction

This is a dedicated control module specifically designed for the operation of single-axis stepper motors and servo motors. The module has multiple fixed operating modes built-in, allowing users to quickly choose the appropriate motion trajectory. You can save and set the distance/speed/delay/number of cycles in case of power failure. It can run independently as a module or be used in conjunction with other systems. The firmware can be upgraded through the serial port module using the upper computer, making it easy to modify and customize. Can be used in general industrial control applications.

2. System parameters

Model	**ZK-SMC05**	**Working voltage**	**12-24V**
Output signal	**Output 4, output voltage 0V**	**Input signal**	**4 limit inputs and 3 extended key interfaces**
Use environment	**-5℃-60℃ (No condensation)**	**Motor pulse frequency**	**1HZ - 200000HZ**
Screen	**1.8-inch color screen**	**Motor pulse voltage**	**0V output, collector output form**
Communication	**Modbus protocol, supporting serial port/BT/485**	**Product size**	**83x48x35.5mm**

Catalogue

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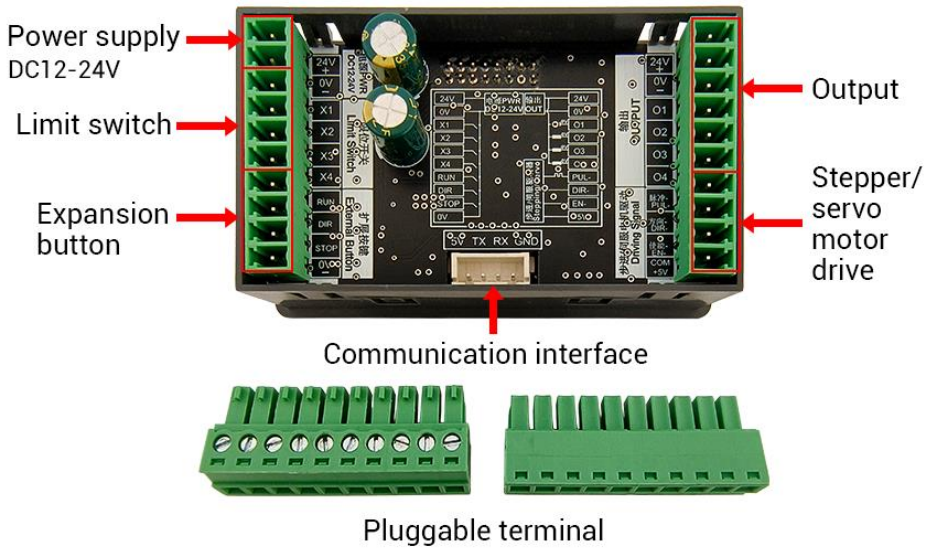
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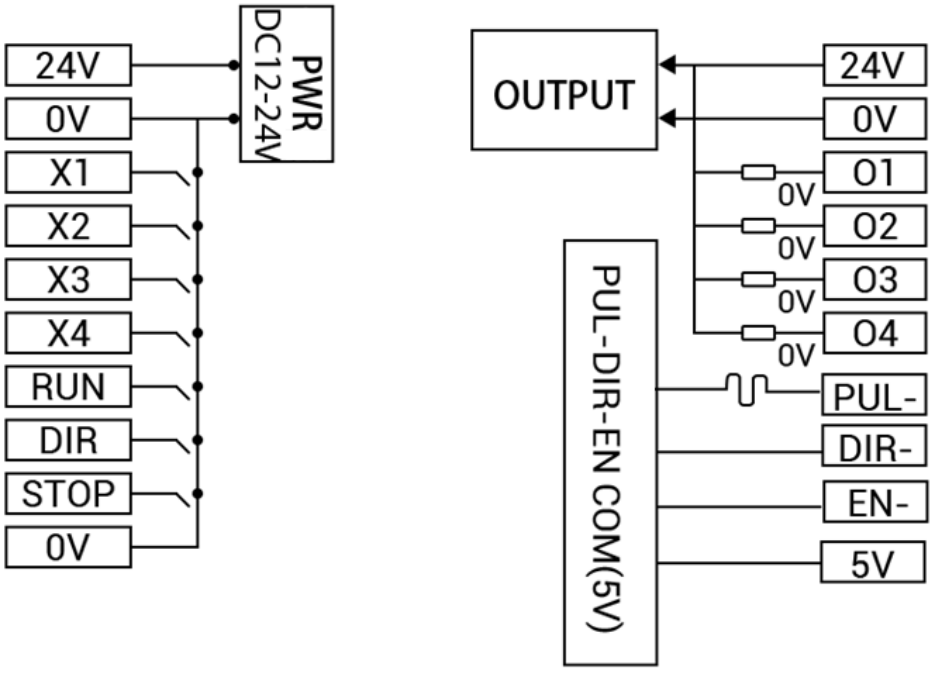
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Chapter 1 Wiring Instructions and Interface Display Introduction

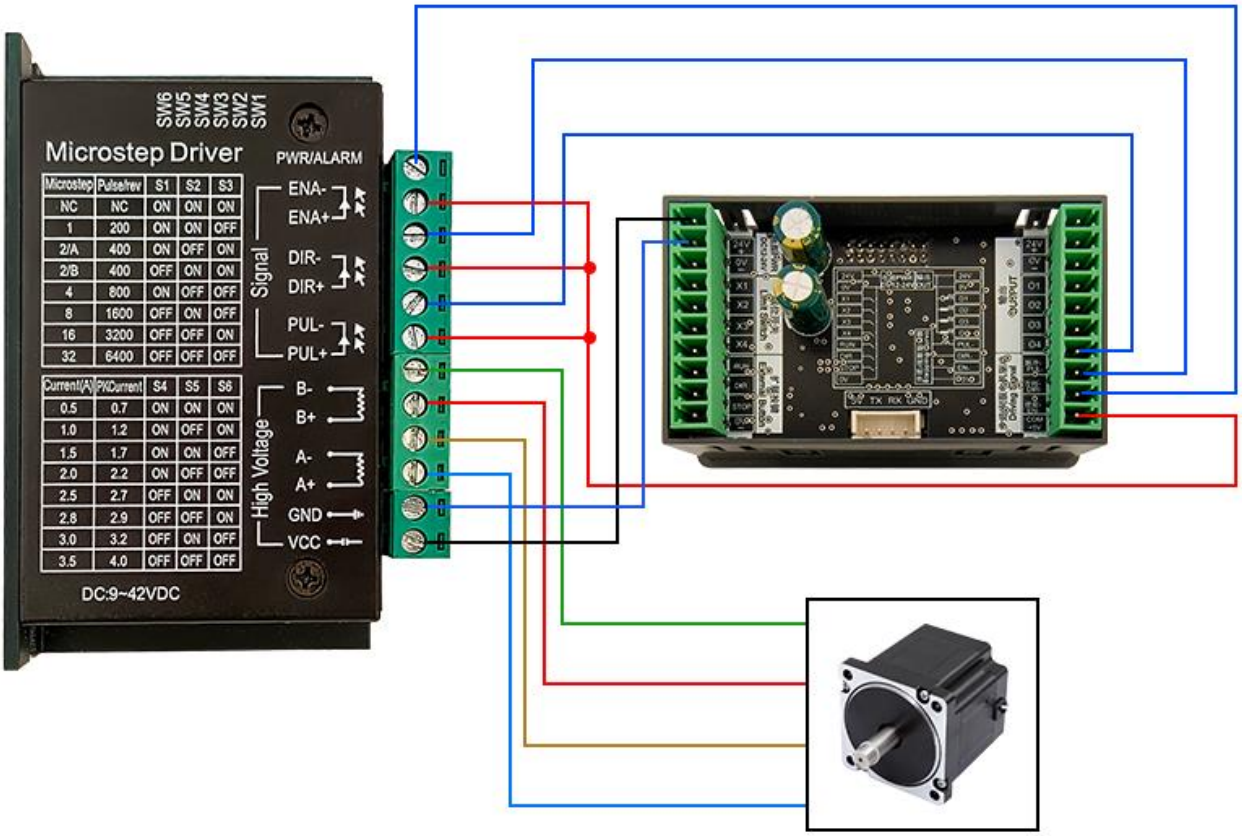
1.1 Back interface schematic diagram



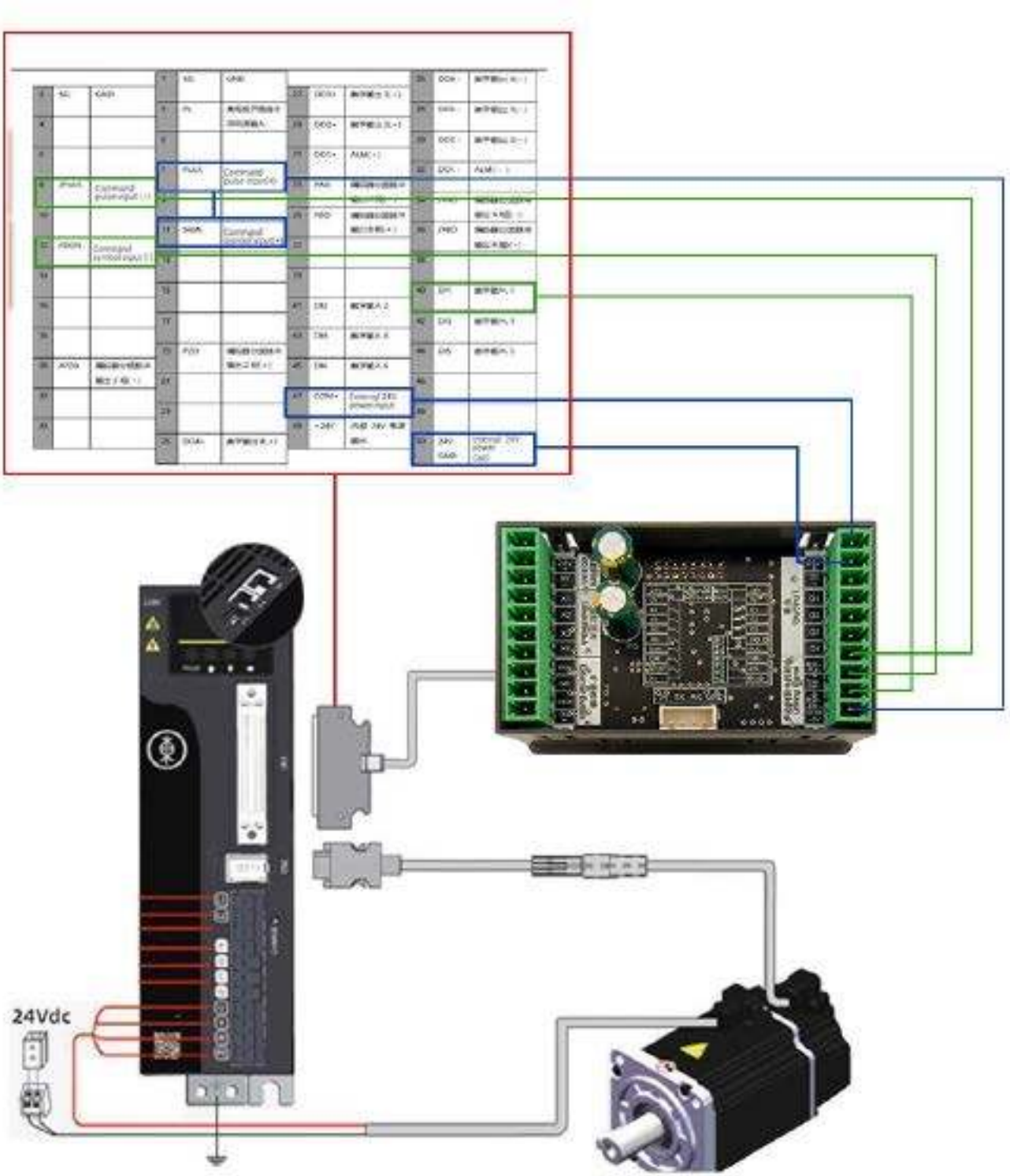


1.2 Wiring Diagram

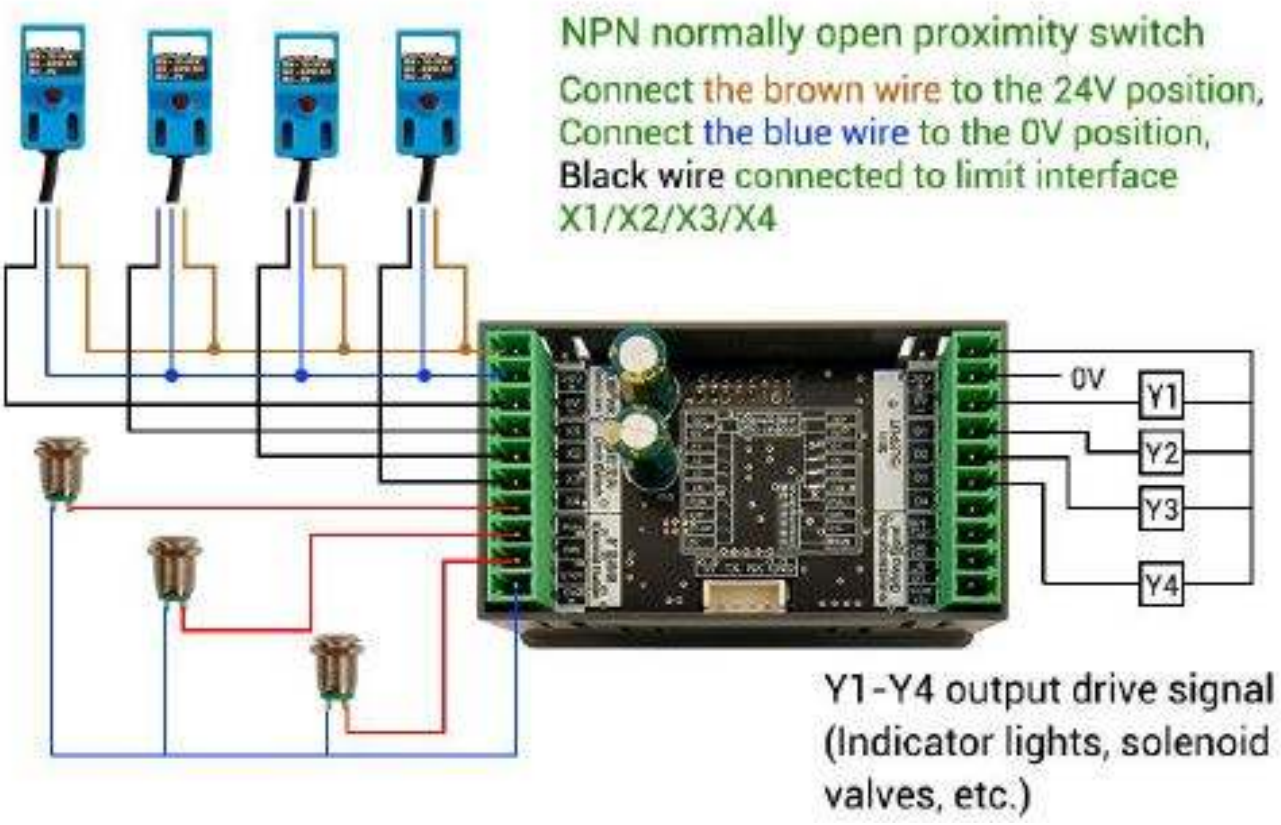
Motor drive wiring diagram



Servo motor wiring diagram (taking Dongling DS2P servo drive as an example)



Expansion interface wiring diagram



Chapter 2 Introduction and setting methods of function buttons

2.1 Main interface display and operation



2.2 Setting interface display and operation

Parameter setting selection main interface





Sports mode - Set the motor control mode, with parameters including forward and reverse pulse count, speed, cycle count,

forward delay, forward position delay, reverse delay, reverse position delay, stop mode, and startup auto start



Motor parameters - Set the electronic gear ratio, the number of pulses per revolution (after confirmation, the rotation angle, distance, and number of revolutions can be set through the number of pulses), display the main interface style, set the motor direction, motor self-locking switch, and acceleration/deceleration level settings



System parameters - Set display brightness level, buzzer switch, MODBUS communication address baud rate, interface display language supports both Chinese and English display, restore factory settings button

Chapter 3: Introduction to 【Sports Modes】

3.1. Parameter settings related to action mode

Menu	Function explanation	Range	Default value
1	Action mode selection (Below is a detailed introduction)	0-20	3
2	Number of forward pulses The setting of the number of forward rotation pulses also indicates the angle of rotation under this pulse	0-9999999	1600
3	Forward rotation speed (unit	0-999.9	60.0

	revolutions per minute) Forward rotation speed setting		
4	Reverse pulse count The setting of the number of reverse pulses also indicates the angle of rotation under this pulse	0-9999999	1600
5	Reverse speed (unit revolutions per minute) Reverse speed setting	0-999.9	60.0
6	number of cycles Set to ----=continuous loop	9999	1
7	Forward rotation delay The corresponding forward rotation time in the action mode	0.0-999.9	4.0
8	Forward rotation delay Stop time after the corresponding forward rotation ends in the action mode	0.0-999.9	2.0
9	Reverse delay The corresponding reversal in action mode	0.0-999.9	4.0
10	Reverse in place delay Stop time after the corresponding reversal in the action mode ends	0.0-999.9	2.0
11	Stop mode (button pause action) 0-Slow motor deceleration stop 1-Immediate motor stop (emergency stop with impact)	0-1	0
12	Start on boot Set to the corresponding action mode and power on to start movement	0-1	0

3.2. Action mode selection

Sports Mode [Settings] - [Sports Mode] - [Mode]

Number	Action description
01	The motor works following the knob.
02	Press and hold the button while rotating, release to stop
03	Press the button and keep rotating, then press it again to stop
04	After pressing the button, follow the set distance (number of pulses) to rotate forward with a delay in position or reverse with a delay in position, in a loop
05	After pressing the button, rotate forward or backward according to the set distance (number of pulses) - delay, cycle, and return to zero at the end of the cycle.
06	After pressing the button, rotate forward and backward according to the set distance (number of pulses) in a loop
07	Cycle forward and reverse between two limit positions abbreviation: forward rotation - stop at limit position - delay - reverse rotation - stop at limit position - delay
08	After pressing the button, rotate forward or backward according to the set time - delay in place. loop
09	After pressing the button, rotate forward or backward according to the set time - delay, cycle, and return to zero at the end of the cycle.
10	After pressing the button, rotate forward and backward according to the set time, looping
11	Press and hold the button to rotate the motor forward or reverse permanently, release the button, - delay - return to zero.
12	Press the [FWD] button and the motor will continue to rotate forward to stop at limit 1. Press the [REV] button and the motor will continue to rotate in reverse until it stops at limit 2
13	Press and hold the FWD button until the motor rotates forward to the limit and stops; (Not reaching the limit. Release and reverse directly) Release the motor and continue to reverse until the limit stops

14	Power on and run automatically, or press the start button to rotate forward at the set distance, and then press the start button to rotate backward at the set distance
15	Power on and run automatically, or press the【 Start 】button to rotate forward for the set distance, and then press the 【 Start 】 button to reverse and return to zero
16	Automatically run when powered on or press the start button to cycle forward and backward at a fixed distance. Abbreviation: Forward Delay (F-07) - Reverse Delay (F-08)
17	Power on and run automatically, or press the [start button] for forward and reverse rotation between two limit positions - delay cycle
18	Press and hold the FWD key to rotate forward. When encountering limit 1, stop and delay. When encountering limit 2, automatically reverse and stop and delay
19	Press and hold the forward and reverse adjustment positions, press the 【 Start 】 button to set the distance for forward rotation - delay cycle, and then press the 【 Start 】 button to reverse the set distance - delay cycle
20	Four limit signals control the movement to four positions respectively

3.3 Detailed Introduction to Sports Modes

3.3.1 【01】The motor follows the action of the knob.

1.Action Introduction:

Rotate the knob, the motor follows the knob action, and the rotation angle and speed are consistent with the knob (high-speed following is not supported)

2.Workflow

Rotate the knob forward → Motor forward → 01 output turned on, forward rotation stopped → 01 output turned off

Rotary knob reverse → Motor reverse → 03 output on, reverse stop → 03

output off

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	No effect
DIR	No effect
STOP	No effect

3.3.2 【02】Press and hold the button, the motor keeps rotating, release to stop

1. Action Introduction

Press and hold the 【FWD】button to rotate forward continuously, and press and hold the 【REV】button to rotate backward continuously

2. Workflow

Press and hold [FWD] → Motor rotates forward → O1 output is turned on, release [FWD] → Motor stops → O1 output is turned off.

Press and hold [REV] ->motor reverse ->O2 output turned on, release [REV] ->motor stop ->O2 output turned off.

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	No effect
DIR	No effect
STOP	No effect

3.3.3 【03】Press the button, the motor keeps rotating, press it again to stop

1. Action introduction

Keep rotating after pressing the button, press 【 RUN/STOP 】 to stop or restart

2. Workflow

Press the button to rotate in both forward and reverse directions, press it again to stop, press 【 RUN/STOP 】 to stop or restart. Stop after encountering the limit

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Start/Stop
DIR	Switch direction
STOP	Emergency stop

3.3.4【04】After startup, rotate according to the set distance (number of pulses) - delay in position

1.Action introduction

After pressing the button, rotate according to the set distance (number of pulses) - stop in place after the end delay time

2. Workflow

Click on [FWD] Forward - Delay, click on [REV] Reverse - Delay

3.Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Stop
DIR	No effect
STOP	Emergency stop

3.3.5 【05】After starting, rotate forward or backward according to the set distance - delay in place, and return to zero at the end of the cycle

1.Action introduction

After pressing the button, rotate according to the set distance - delay in position, cycle, return to zero after the cycle ends

2. Workflow

Click on [FWD] Forward Rotation - Position Delay, click on [REV] Reverse Rotation - Position Delay, cycle, return to zero after the cycle ends

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Stop
DIR	No effect
STOP	Emergency stop

3.3.6 【06】After starting, rotate forward and backward according to the set distance, and cycle

1. Action introduction

After pressing the button, rotate forward and backward according to the set distance, loop.

2. Workflow

Click on [FWD] Forward - Delay, click on [REV] Reverse - Delay, loop

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Stop
DIR	No effect
STOP	Emergency stop

3.3.7 【07】Cycle forward and reverse between two limits

1. Action introduction

Forward and reverse rotation between two limits - cycle

2. Workflow

Click on [FWD] Forward Rotation - Stop at Limit 1- Delay in Arrival Time - Reverse Rotation - Stop at Limit 2- Delay in Arrival Time, loop continuously

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Start/Stop
DIR	Switch direction
STOP	Emergency stop

3.3.8 【08】After startup, rotate forward or reverse according to the set time - delay. loop

1. Action introduction

After pressing the button, rotate forward or backward according to the set time delay. Loop

2. Workflow

Press【 FWD 】or【 Reverse 】to start, and rotate forward or reverse according to the set time delay. Loop

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Stop
DIR	No effect
STOP	Emergency stop

3.3.9 【09】After pressing the button, rotate forward or reverse according to the set time - delay, cycle, and end to return to zero.

1. Action introduction

After pressing the button, rotate forward or backward according to the set time delay. Loop, end and return to zero

2. Workflow

Press the 【Forward】 or 【Reverse】 button to start, rotate forward or reverse according to the set time - delay, cycle, return to zero

after the cycle ends

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Stop
DIR	No effect
STOP	Emergency stop

3.3.10 【10】After pressing the button, rotate forward and backward according to the set time in a loop.

1. Action introduction

After pressing the button, rotate forward and backward according to the set time

2. Workflow

Press the 【Forward】 or 【Reverse】button to start, and delay t

he forward rotation according to the set time. Reverse the delay cycle

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Stop
DIR	No effect
STOP	Emergency stop

3.3.11 【11】After starting, the motor will rotate in either forward or reverse direction permanently. Release the button, then delay and return to zero

1. Action introduction

Press and hold the button to rotate the motor forward or backward, and release the button to delay the arrival time and return to zero

2. Workflow

Long press the FWD button to rotate forward, delay the forward rotation time, release the button, reverse, and return to zero

Long press [REV] to reverse - delay the reverse in place time - release button - forward - return to zero

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Stop
DIR	No effect
STOP	Emergency stop

3.3.12 【12】Press the forward button and continue to rotate to limit 1 to stop, press the reverse button and continue to rotate until limit 2 stops

1. Action introduction

After pressing the button to start, it starts rotating and stops when it reaches the limit position

2. Workflow

Press [FWD] to start forward rotation, stop when encountering displacement limit, press reverse rotation to start, stop when encountering limit

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Stop
DIR	No effect
STOP	Emergency stop

3.3.13 【13】Press the forward rotation button until it reaches limit 1 to stop; Release halfway and reverse until limit 2 stops

1. Action introduction

Press and hold the button to start, then rotate continuously. Release the button halfway and reverse to limit 2 to stop

2. Workflow

Press and hold the FWD button to start the forward rotation, release it and then reverse it. Stop when encountering limit 2

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Stop
DIR	No effect
STOP	Emergency stop

3.2.14 【14】After starting, rotate forward according to the set distance, and then press the [Start] button to reverse according to the set distance

1. Action introduction

Press 【 START 】 or start the machine, start the forward rotation according to the set distance, stop, and then press the start button to start the reverse

rotation

2. Workflow

Press the 【 START 】 button to start, start forward rotation according to the set distance, stop when the forward rotation is in place, and then press the 【 START 】 button to start reverse rotation. Stop when the reverse rotation is in place

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Start/Stop
DIR	No effect
STOP	Emergency stop

3.3.15 【15】After starting, rotate forward according to the set distance, and then press the [start button] to reverse and return to zero

1. Action introduction

After pressing the start button or turning on the device, rotate forward according to the set distance, stop after completing the forward rotation, and then reverse to zero after pressing the start button again

2. Workflow

Press 【 START 】 to start, rotate forward according to the set distance, and then press 【 START 】 to reverse and return to zero

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Start/Stop
DIR	No effect
STOP	Emergency stop

3.3.16 【16】After startup, cycle forward and backward according to the set distance

1. Action introduction

After pressing the start button or turning on the device, cycle forward and backward according to the set distance

2. Workflow

Press 【 START 】 to start, and start the cycle of forward rotation, forward rotation time, reverse rotation time, and reverse rotation time according to the set distance (number of pulses)

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Stop
DIR	No effect
STOP	Emergency stop

3.3.17 【17】 Forward and reverse rotation between two limit positions after startup

1. Action introduction

After the start button or startup, cycle forward and backward between two limit positions

2. Workflow

Press 【 START 】 to start, rotate, stop when limit 1 is reached - in place delay time, automatically reverse to limit 2- stop in place delay time - cycle

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Start/Stop
DIR	No effect
STOP	Emergency stop

3.3.18 【18】Start forward rotation, stop at limit 1- delay, automatic reverse rotation stops at limit 2- delay

1. Action introduction

After pressing the forward rotation start button, the rotation begins and stops when it reaches limit one. The delay time for the forward rotation to reach the correct position is - when the reverse rotation begins, it encounters limit

two

2. Workflow

Press [FWD] to start forward rotation, stop after limit 1, delay forward rotation to the right time, rotate backward, stop when limit 2

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Start/Stop
DIR	No effect
STOP	Emergency stop

3.3.19【19】Forward and reverse adjustment position, forward setting distance, reverse setting distance - loop

1. Action introduction

Adjust the position in both forward and reverse directions, press the start button to set the distance for forward rotation, and then press the start button to reverse the set distance

2. Workflow

Press 【 START 】 to start, stop when limit 1 is reached

3. Input port

Limit switch	
X1	Forward rotation limit
X2	Reverse limit
X3	No effect
X4	No effect

Expansion	
RUN	Start/Stop
DIR	No effect
STOP	Emergency stop

3.3.20 【20】Four limit signals, each controlling rotation to different positions

1. Action introduction

Four limit signals represent four coordinate positions respectively. The motor moves forward to different positions with a delay time for stopping forward rotation, and moves backward to different positions with a delay time for stopping reverse rotation

2. Workflow

Press [FWD] to start the forward rotation, stop when limit 1 is reached - delay the forward rotation to the desired time, continue the forward rotation after the desired time is over, stop when limit 2 is reached - delay the forward rotation to the desired time, continue the forward rotation after the desired time is over, stop when limit 3 is reached - delay the forward rotation to the desired time. Continue to rotate forward after the delay ends, and stop when encountering limit 4.

Press [REV] to start the reversal, stop when limit 3 is reached - delay the reversal to the desired time, continue the reversal after the desired time is over, stop when limit 2 is reached - delay the reversal to the desired time. After the delay ends, continue to reverse and stop when encountering limit 1. Press the start button to stop

3. Input port

Limit switch	
X1	Position 1
X2	Position 2
X3	Position 3
X4	Position 4

Expansion	
RUN	Start/Stop
DIR	No effect
STOP	Emergency stop

Chapter 4 [Motor] introduction

4.1. Motor setting overview

Menu	Function explanation	Range	Default value
1	**Molecular-Gear ratio** （Setting of electronic gear ratio） It only applies to whether the display of the system is consistent with the actual coordinates. Other things are not affected. The following text provides a detailed explanation	1-65535	8

2	**Denominator - Gear ratio** （Setting of electronic gear ratio） It only applies to whether the display of the system is consistent with the actual coordinates. Other things are not affected. The following text provides a detailed explanation	1-65535	5
3	**Number of pulses per revolution** （Pulse number display） Set the number of pulses required for the motor to rotate once	99999	1600
4	**ain interface display style** Set the display style of the main interface: 0-pulse number display 1-coordinate display	0-1	0
5	**Self-locking switch** Used to set whether the motor is self-locking	0-1	0
6	**Motor direction change** Used to change the rotation direction of existing motors	0-1	0
7	**Acceleration level** Used for setting acceleration levels for motor rotation	1-100	50
8	**Deceleration level** Used for setting the deceleration level of motor rotation	1-100	50

4.2. Introduction to Electronic Gear Ratio

Function introduction: Ensure that the system display value is consistent with

the actual motor motion value

$$\frac{\text{The value of the controller} \times 1000 \times \text{Numerator}}{\text{Denominator}} = \text{Number of pulses emitted}$$

For example:

Numerator=8, denominator=5. Now the controller input distance value is 23.450. Then the number of pulses is 23.450 x 1000 x 8 ÷ 5=37520

Explanation and illustration

Electronic gear ratio-Molecular——

The number of pulses per revolution of the motor, i.e. the setting of the number of pulses

Electronic gear ratio-Denominator——

How much um does one revolution of the motor equal. 1mm = 1000um;

4.3. Introduction to the number of pulses per revolution

Function introduction: Determine how many pulses the driver sends in one cycle

For example：

The inherent step angle of the motor is 1.8 °, and 200 pulses are required for one revolution. At this time, the subdivision of the driver is set to 8, so the number of pulses required for each revolution of the motor is 200X8=1600; Set the number of pulses per revolution to 1600

Explanation and illustration： The number of pulses required for the driver to control the motor to rotate once

4.4. Common problems and solutions for motor malfunctions

Phenomenon	Possible issues	Solution measures
The motor does not rotate	The screen is not lit	Check the power supply circuit to see if it is connected in reverse or supplying power normally
	The motor shaft is powerless	The pulse signal is weak, it is recommended to increase the voltage or choose a larger current
	Driver chip protection	Power on again
	The motor does not rotate and keeps vibrating	Check the motor wiring for any issues
Motor rotation error	Wrong connection of motor wire	Swap two wires of the same phase for any motor For example, A+A - exchange positions
The position is not accurate	Signal interference	Eliminate distractions
	The motor wire has a broken circuit	Check and connect correctly
	Subdivision error	Set up subdivision
	The current is too small	Increase the current
Motor stalling	Short acceleration time	Extend acceleration time

vibration	The motor torque is small	Choose a high torque motor
	Low voltage or low current	Appropriately increase the voltage or current

Chapter 5 [System] Introduction

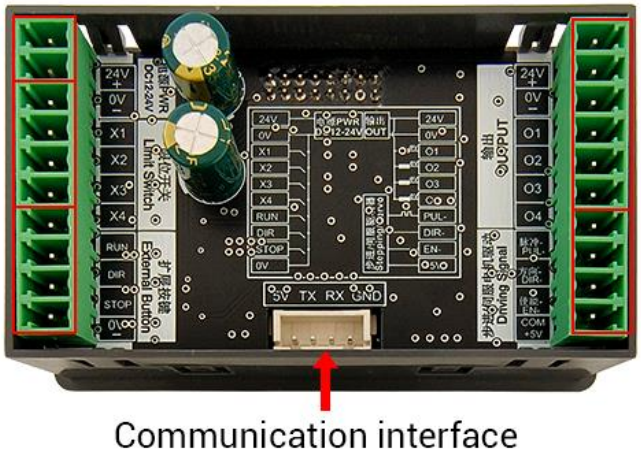
5.1. System settings overview

Menu	Function explanation	Range	Default value
Brightness level	Set backlight brightness level	0-4	4
Buzzer switch	Buzzer switch	0-1	1
Mailing Address	As the address of the slave during communication	1-255	1
Baud rate	Baud rate during communication	9600-115200	115200
Language	System language settings	0 Chinese – 1 English	0 Chinese
Restore factory settings	Clear existing data settings, restore factory settings (restart)		

Chapter 6 [Communication] Introduction

6.1 Communication introduction

Built in MOSBUS protocol, supports serial communication



6.4 Communication protocol

Adopting TTL serial port transmission interface, the communication protocol is MODBUS-RTU protocol, and this product only supports function code 0x03、0x06、0x10.

Name	Instructions	Byte count	Read and write	Register address
System parameters, Writing will store				
F-01	Action process mode selection	2	R/W	0000H
F-02-LOW	The number of forward pulses is low by 16 bits	2	R/W	0001H
F-02-HIGH	The number of forward pulses is 16 bits high	2	R/W	0002H
F-03	Forward rotation speed	2	R/W	0003H

F-04-LOW	Reverse pulse count low 16 bits	2	R/W	0004H
F-04-HIGH	The number of inverted pulses is 16 bits high	2	R/W	0005H
F-05	Reversal speed	2	R/W	0006H
F-06	Number of cycles of work	2	R/W	0007H
F-07	Forward rotation delay	2	R/W	0008H
F-08	Forward rotation delay	2	R/W	0009H
F-09	Reverse delay	2	R/W	000AH
F-10	Reverse in place delay	2	R/W	000BH
F-11	Stop mode	2	R/W	000CH
F-12	Start on boot	2	R/W	000DH
F-13	Electronic Gear - Molecular	2	R/W	000EH
F-14	Electronic gear - Denominator	2	R/W	000FH
F-15	Number of pulses per revolution	2	R/W	0010H
F-16	Main interface display style	2	R/W	0011H
F-17	Self-locking switch	2	R/W	0012H
F-18	Motor direction change	2	R/W	0013H
F-19	Acceleration level	2	R/W	0014H
F-20	Deceleration level	2	R/W	0015H
F-21	Brightness level	2	R/W	0016H
F-22	Buzzer switch	2	R/W	0017H
F-23	Mailing Address	2	R/W	0018H
F-24	Baud rate	2	R/W	0019H
Read device information				
STATUS	Current motor operating status: 00- stop 01- acceleration status	2	R	001AH

	02- deceleration status 03- uniform speed status			
DIR	Current direction of motor rotation: 00- Forward rotation 01- Reverse	2	R	001BH
MODEL	Product Model 2505	2	R	001CH
VERSION	Firmware version number	2	R	001DH
Current operational information				
	The total number of pulses is low by 16 bits	2	R	001EH
	The total number of pulses is 16 digits high	2	R	001FH
	The movement distance is 16 places lower	2	R	0020H
	Sports distance is 16 digits higher	2	R	0022H
	Number of actions	2	R	0023H
	Limit switch	2	R	0024H
	Output switch	2	R	0025H
System operation				
RESTORE	Restore factory settings	2	W	0027H
FIRMWARE	Firmware Update	2	W	0028H
LANGUAGE	Language	2	W/R	0029H
Control equipment operation				
Control the operation command	Serial port control operation mode 00- forward rotation 01- reverse rotation 03- stop start	2	W	0030H