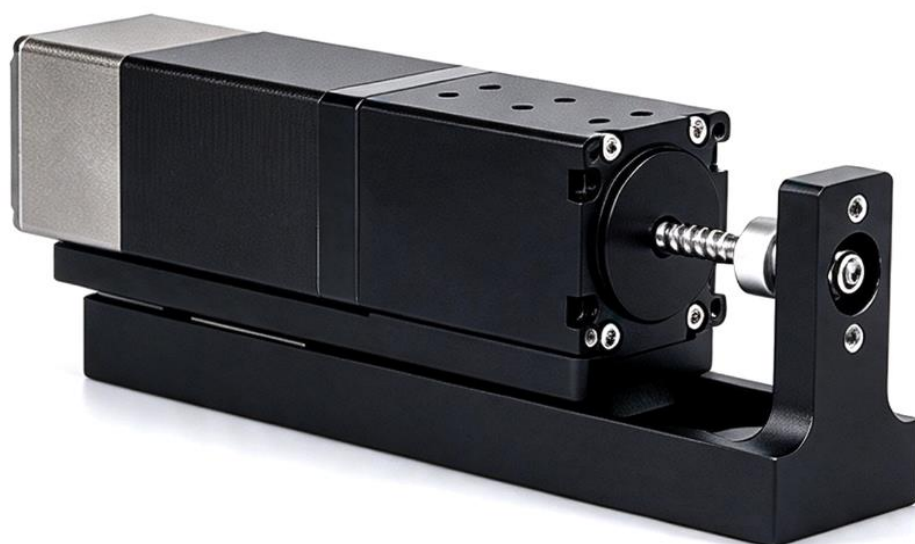


WDG28 SERIES

Mini Electric Cylinder

User Manual



Safety Instructions

 Danger (May cause death or serious injury!)	
Wiring job, be sure to by professional electrical engineer according to the connection diagram installation operation.	Danger of electric shock and fire.
Before wiring , make sure that the power supply is off.	Danger of electric shock and fire.
The ground wire of the Mini Electric Cylinder and the input terminal of the power must be firmly installed.	Danger of electric shock and fire.
Do not bend , pull or clamp the connecting cable forcibly.	Danger of fire.
When using on the lifting device , please take measures to protect the position of the movable part.	Danger of injury.
Please set up circuit breakers and other safety devices to prevent external circuit short circuit and equipment failure can cut off the power supply in time.	Danger of electric shock and fire.
Do not use it in places with severe vibration and impact.	Danger of fire.
After the driver is powered off, the bus voltage will remain for a period of time. Do not touch the power input terminal within two minutes.	Danger of electric shock and fire.
For the power supply of the Mini Electric Cylinder, please use the primary and secondary reinforced insulated DC power supply.	Danger of electric shock.
Please cut off the power supply of the Mini Electric Cylinder during power failure, otherwise the Mini Electric Cylinder will start suddenly after restoring the power supply.	Danger of injury.
When the Mini Electric Cylinder is running, please ensure safety before releasing the holding force of the Mini Electric Cylinder.	Danger of injury.
Do not use the Mini Electric Cylinder near inflammable, explosive, corrosive environment and places easy to touch water.	Danger of electric shock and fire.
 Warning (May result in injury or damage to objects!)	
The Mini Electric Cylinder is strictly prohibited from being impacted: If it is impacted, the Mini Electric Cylinder encoder may be damaged or offset with the magnet position, affecting the accuracy or operation of the motor.	Risk of equipment failure.

Do not turn the motor shaft when the Mini Electric Cylinder power is OFF: If the motor shaft is turned at more than 400rpm when the electromechanical power is OFF, the Mini Electric Cylinder may cause drive damage due to regenerative current.	Risk of equipment failure.
When using the Mini Electric Cylinder, do not exceed its specification value.	Danger of injury and motor fault.
Do not hold the Mini Electric Cylinder output shaft or cable during handling.	Danger of injury and motor fault.
Please install the protective cover on the rotating part (output shaft) of the Mini Electric Cylinder.	Danger of injury.
Do not stack obstacles hindering ventilation around the Mini Electric Cylinder to ensure heat dissipation.	Danger of motor fault.
Do not touch the Mini Electric Cylinder when it is running or within a short time after it stops running. Please post a warning sign in a conspicuous position.	Danger of scalding.
Please use the Mini Electric Cylinder according to the specified parameters.	Danger of motor fault and fire.
Please install an emergency stop device or emergency stop circuit outside the Mini Electric Cylinder to ensure safe shutdown in case of failure or abnormal operation.	Danger of injury.
Please do not touch the shell during insulation resistance measurement or insulation withstand voltage test.	Danger of electric shock.
When the Mini Electric Cylinder is abnormal, please stop running immediately and cut off the power supply to avoid fire or injury.	Danger of injury and fire.
When using, ensure that the grounding resistance of the system is less than 4Ω. When multiple Mini Electric Cylinder are used in parallel, the grounding resistance between the ground of each Mini Electric Cylinder is less than or equal to 0.1Ω. The interface of the master controller and the slave station of the integrated servo motor should be in common ground, and the grounding resistance should be less than or equal to 0.1Ω. The Mini Electric Cylinder shell shall be installed on the Mini Electric Cylinder bracket through the installation hole. The bracket shall be reliably	Danger of motor fault.

connected to the ground, and the grounding resistance shall be less than or equal to 0.1Ω.	
The power supply of the Mini Electric Cylinder needs to be connected with a capacitor above 4700uF, which is used to absorb the regenerative current generated by the external force and excessive deceleration of the motor and reduce the peak starting current of the high speed response of the large inertia load. Otherwise, it will cause serious damage of the motor.	Danger of motor fault.
 Caution	
Do not disassemble or modify the Mini Electric Cylinder, otherwise it may cause injury. For inspection or repair, please contact Nimotion, inc.	
When the Mini Electric Cylinder is scrapped, please disassemble it as far as possible and treat it as industrial waste.	
Before use, please read and fully understand the "Safety Instructions" to use the Mini Electric Cylinder correctly.	
This product is designed and manufactured for use in general industrial equipment. Don't use it for any other purpose. We hereby state that we will not be liable for any damages caused by ignoring this advice.	

1. Summary

1.1 Preface

Thank you for using the NiMotion WDG28 Mini Electric Cylinder Series! Please read this guide carefully before use.

This is a high-performance, low-power motion module independently developed by our company. It adopts high-precision linear guides and ball screws in its design. With no coupling or other connecting components in the structure, it integrates a hollow-shaft motor and ball nut into one unit. This reduces transitional parts and assembly errors to achieve high-precision positioning. It implements FOC (Field-Oriented Control) and SVPWM (Space Vector Pulse Width Modulation) technologies, and supports control via CANopen and Modbus (RS485) communication buses. Equipped with Limai-S integrated stepper-servo drive, it features a compact structure to facilitate equipment miniaturization and simplify product selection. It is applicable to a wide range of industries, such as driving units for dispensers, terminal pressing, CCD camera focusing, liquid-transfer handling, positioning correction, and more.

This manual serves as the instruction manual for the WDG28 Mini Electric Cylinder Series, covering motor selection, technical specifications, terminal definitions, cable selection, wiring, and other contents. For detailed information on motor functions and communication protocols of the mini electric cylinder, please refer to the communication manual or contact the technical support team of NiMotion.

As our company is committed to the continuous iteration and improvement of Mini Electric Cylinder, the information provided in this document is subject to change without prior notice. Please refer to the latest version for accuracy.

1.2 About Manuals and Acquire

- No part of this manual may be reprinted or copied without prior authorization.
- Product performance, specifications and appearance are subject to change without prior notice as a result of product improvements. We appreciate your understanding.
- Every effort has been made to ensure the accuracy of the contents in this manual. If you find any problems, errors or omissions, please contact NiMotion.
- This manual is not shipped with the product. To obtain the electronic PDF file, you can obtain it in the following ways:
 - Log in to the official website of NiMotion, inc. (<https://www.nimotion.com>), "Member Center - Data download", log in to search keywords and download.
 - Scan the QR code on the product to obtain product related information.

Contents

1.	Summary	IV
1.1	Preface	IV
1.2	About Manuals and Acquire	V
2.	Product Inspection and Model Description	1
2.1	Unpacking Inspection	1
2.2	Product Model	1
2.2.1	Naming Rules	1
2.2.2	Mounting Dimensions	2
3.	Specifications	5
3.1	Technical Specifications	5
3.2	Indicator	8
3.3	Definition of Terminal	9
3.3.1	Power Port	9
3.3.2	Communication Port	10
3.3.3	Digital Input and Output Port (I/O)	11
3.3.4	I/O Terminal Wiring Diagram	12
4.	Host-PC Debugging Software Solution	14
4.1	Installation Contents	14
4.2	Basic Usage	14
4.2.1	Communication Connection	14
4.2.2	Curve Display	15
4.2.3	Homing Control	15
4.2.4	Position Control	17
5.	Install and Connect	19
5.1	Installation Precautions	19
5.1.1	Installation Location	19
5.1.2	Installation Requirements	19
5.1.3	Installation Precautions	20
5.2	Cable Wiring and grounding Requirement	21
5.2.1	Wiring Requirements	21
5.2.2	Grounding Requirements	21
5.3	Communication Distance	23
5.3.1	RS485 Communication	23
5.3.2	CAN Communication	24
5.4	Other Cable Wiring	25
5.4.1	Communication Wiring	25
5.4.2	Debugging Wiring	26
5.4.3	External Control Wiring	26
5.4.4	Communication Network Wiring	28
5.4.5	Network Wiring Requirements	28
6.	Product Selection	30
6.1	Cable Selection	30
7.	Alarm Function	33
8.	Daily Inspection and Maintenance	35

8.1 Inspection Items and Intervals	35
8.2 Grease Replenishment	36
Warranty Statement	37
Warranty Period	37
Warranty Coverage	37
Version Change Record	39

2. Product Inspection and Model Description

2.1 Unpacking Inspection

Upon unpacking, please carefully inspect the items listed below:

Verify that the product is the one ordered: Check that the model/specification on the nameplate matches your order requirements.

Check for product damage: Visually inspect the exterior for any damage or scratches.

Check for loose screws: Ensure no screws are loose or missing.

For motors without a brake: Check that the shaft rotates smoothly. Rotate the motor shaft by hand; smooth rotation indicates the shaft is normal.

For motors with a brake: Check that the brake functions properly. Rotate the motor shaft by hand; if the shaft is locked, the brake is normal.

If any of the above conditions occur, please contact our company for proper resolution.

The complete operational product assembly shall include:

Integrated Mini Electric Cylinder.

Required communication cables.

Required communication interface components.

2.2 Product Model

2.2.1 Naming Rules

WDG28M - 485 - 2 - 30 - M				
①	②	③	④	⑤
①	WDG28M : 28 Integrated Mini Electric Cylinder			
②	Communication method : CANopen-CANopen; 485-RS485			
③	Lead: Ball screw lead 2 mm			
④	Effective Stroke: 30-30mm; 50-50mm			
⑤	Hardware Function Feature Code			

Figure 2-1 Product Naming Rules

2.2.2 Mounting Dimensions

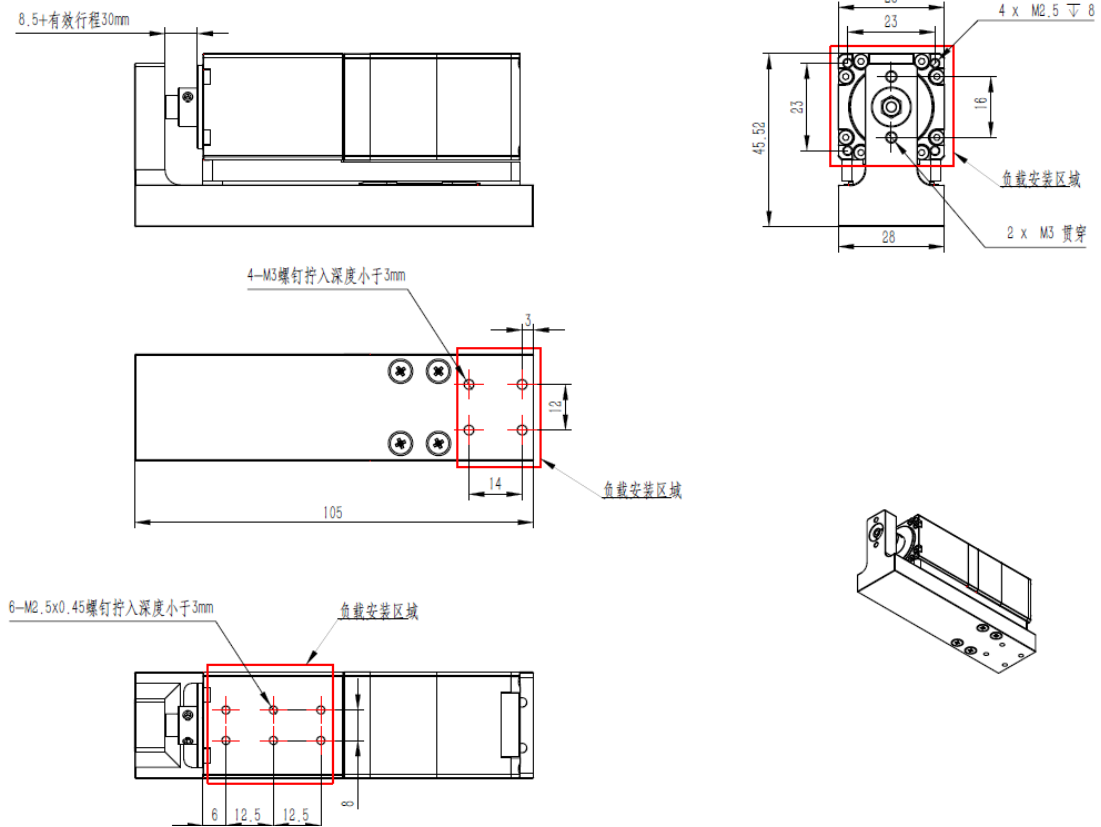


Figure 2-2 WDG-2832-30-00-A Structure Diagram

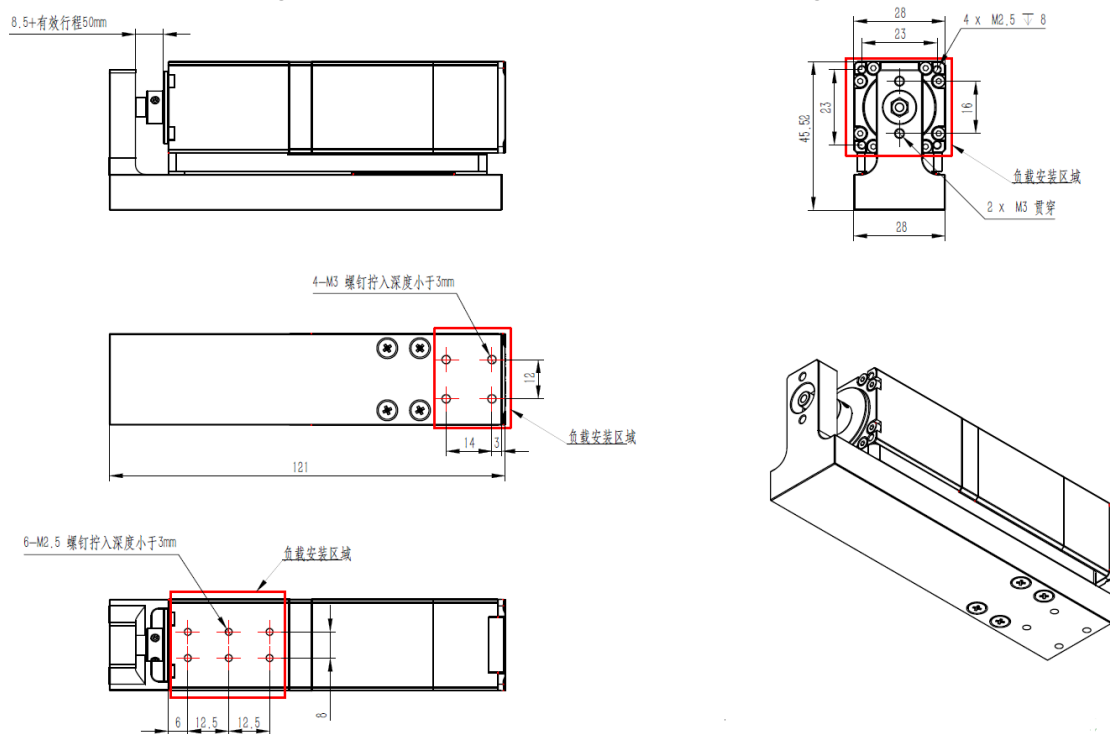


Figure 2-3 WDG-2851-30-00-A Structure Diagram

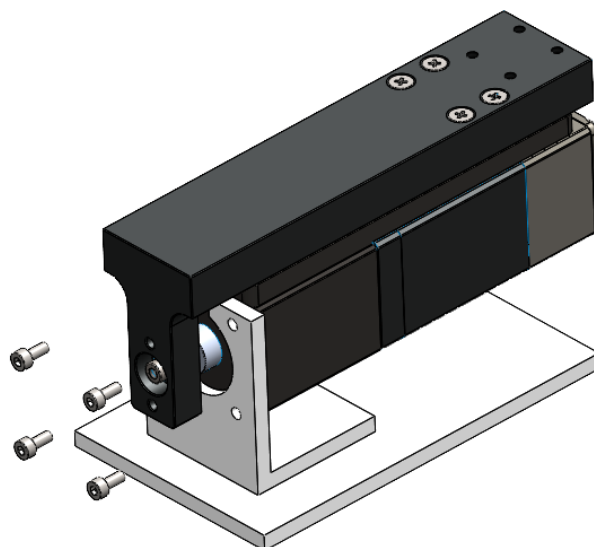


Figure 2-4 Front-face Mounting

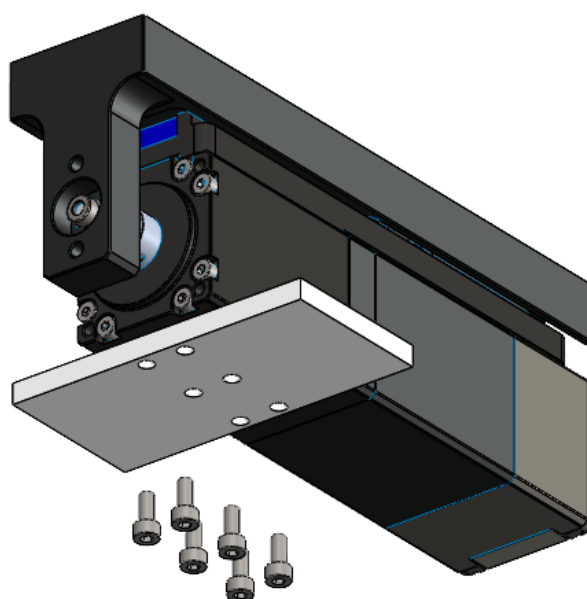


Figure 2-5 Bottom-face Mounting

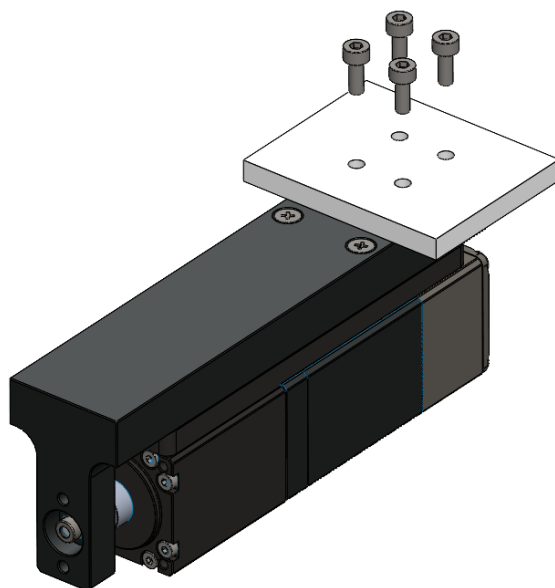


Figure 2-6 Load Mounting

3. Specifications

3.1 Technical Specifications

Table 3-1 Technical Specifications

Mini Electric Cylinder Model		WDG28M-xxx-2-30-M	WDG28M-xxx-2-50-M
Cylinder Stroke (mm)		30	50
Ball Screw Diameter (mm)		4	4
Screw Lead (mm)		2	2
Max. Speed (mm/s)		80	80
Max. Acceleration (mm/s ²)		500	500
Max. Thrust Force (N)		25	25
Max. Load Mass (kg)	Horizontal	3	3
	Vertical	1	1
Repeat Positioning Accuracy (mm)	Rolled-thread Screw	±0.01	±0.01
	Ground-thread Screw	±0.005	±0.005
Mass (kg)		0.4	0.5
Compatible Motor		STM2832B	STM2851B
Operating Environment		Temperature: 0°C~40°C, Humidity: 10%-85%RH	
Ingress Protection Rating		IP40	
Input Power Voltage Range (VDC)		12-30	
Rated Voltage (VDC)		24	

Table 3-2 Technical Specifications

Mini Electric Cylinder Model		WDG28M-xxx-2-30-M	WDG28M-xxx-2-50-M
Communication Protocol	CANopen	• CAN interface; 3-wire non-isolated; 3.3 V • CAN2.0A • Application layer: CANopen protocol • Communication baud : 1 Mbps, 800 kbps, 500 kbps, 250 kbps, 125 kbps, 100 kbps, 50 kbps, 20 kbps, 10 kbps; default: 1 Mbps	
	RS485	• RS485 interface; 3-wire non-isolated • Modbus-RTU protocol • Communication baud rates: 1 Mbps, 500 kbps, 256 kbps, 115.2 kbps, 57.6 kbps, 38.4 kbps, 19.2 kbps, 9.6 kbps; default: 115.2 kbps	
Control Mode	CiA402 Mode	Profile Position mode (PP)、Profile Velocity mode (PV)、Profile Torque mode (PT) • Velocity mode (VM) • Interpolation mode (IP) • Homing mode (HM) (Home search by switch, Home search by stall) • Cyclic Synchronous Position mode (CSP)、Cyclic Synchronous Velocity mode (CSV)、Cyclic Synchronous Torque mode (CST)	
	NiMotion Mode	• Position mode: Pulse control, multi-segment position control, digital setpoint control • Velocity mode: Digital setpoint control • Torque mode: Digital setpoint control	
Control Signal	DI (Digital Input)	• Quantity: 3 channels • Supports PWM pulse input, maximum pulse frequency 1.2 MHz • Logic 1 signal: 5–24 V • Logic 0 signal: 0–2 V Configurable functions: 1. Enable 2. Positive/Negative Limit 3. Home Switch 4. Alarm Reset 5. Pause 6. Multi-segment operation command switching	

	DO (Digital Output)	• Quantity: 2 channels • Output type: MOS open-drain output • DO load: Maximum current 100 mA, maximum voltage 30 V • Configurable functions: 1. General DO; 2. Motor run/stop; 3. Target reached; 4. Alarm output • Note: When connecting inductive loads, a diode must be connected in parallel across the load.
Special Functions	Fault Diagnosis	Overvoltage \ Undervoltage \ Over-temperature \ Hardware fault \ Stall / Locked rotor \ Overload \ Overspeed \ Initialization fault \ Memory fault \ Over-limit detection \ Homing timeout \ Following error \ Target position overflow fault \ Fault caused by too small trajectory planning parameters
	Fault Reset	Alarms are auto-reset, while faults are manual-reset.
	Soft Limit	Set the position range via software; if the range is exceeded, the motor will lock and trigger an alarm.
	Parameter Identification	It features parameter identification and automatic PI parameter tuning.
	Configurable Parameters	Acceleration, deceleration, jerk, acceleration/deceleration, velocity feedforward, position feedforward, operating current, electronic gear ratio, three-loop PI parameters, following error, etc.
	Gain Switching	Two sets of gain parameters can be preset, and automatic switching between the two sets will be performed according to different motor operating states.
	Resonance Suppression	Effectively suppresses vibration frequencies in the range of ≥ 300 Hz.

Notes:

1. Loading Process: Gradually increase load from 1 kg to 3 kg. Do not apply excessive load, otherwise structural damage may occur.

2851-50: Max. thrust force < 25 N

2832-30: Max. thrust force < 25 N

2. During operation, restrict speed and acceleration via drive parameters to prevent overload-induced structural damage.

2851-50 Mini Electric Cylinder: Max. acceleration < 500 mm/s²

2832-30 Mini Electric Cylinder: Max. acceleration < 200 mm/s²

3.2 Indicator

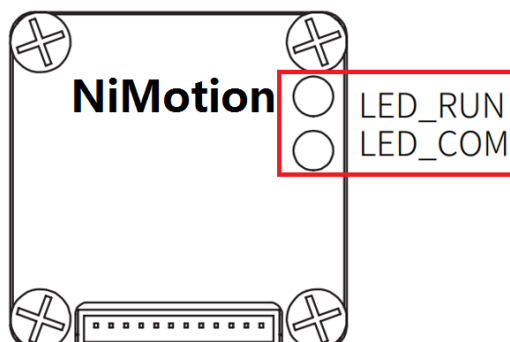


Figure 3-1 Indicator

Table 3-3 Indicator Meaning

Meaning	Green LED (RUN)	Yellow LED (COM)
Communication normal, no alarm.	Steady light	Slow flashing (1 s flash frequency)
Communication normal with warning.	Steady light	Flashing (0.5s flash frequency)
Communication normal, fault present.	Steady light	Flashing (0.25 s flash frequency)
Communication normal, hardware fault.	Steady light	Light off
Communication normal with warning.	Flashing (0.5s flash frequency)	Flashing (0.5s flash frequency)
Communication normal, fault present.	Flashing (0.5s flash frequency)	Flashing (0.25 s flash frequency)
Power supply abnormal or serious fault occurred.	Light off	Light off

3.3 Definition of Terminal

3.3.1 Power Port

As shown in the figure below, when facing the interface directly, the left side of the power port is Pin12.

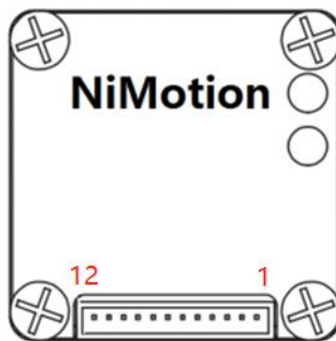


Figure 3-2 Power Port

Table 3-4 Power Port Definition

Pin	Function	Remark
6	GND	Power Ground
10		
11	VCC	12-30VDC
12		

Note: The positive and negative poles of the power cable must not be reversed, as this may cause product damage. Such damage is not covered by the manufacturer's warranty.

3.3.2 Communication Port

The communication port CNET is used for CANopen/RS485 communication connection. As shown in the figure below, when facing the interface directly, the rightmost pin of the port is Pin 1.

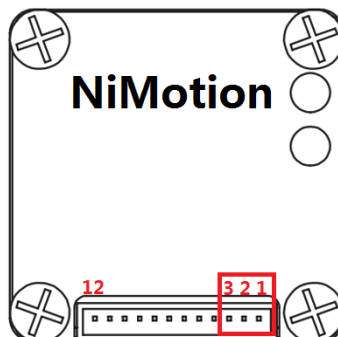


Figure 3-3 Communication Port

Table 3-5 Communication Port Definition

Pin	RS485	CAN
1	485+(A)	CAN_L
2	485- (B)	CAN_H
3	GND	GND

3.3.3 Digital Input and Output Port (I/O)

Digital input and output connection port.

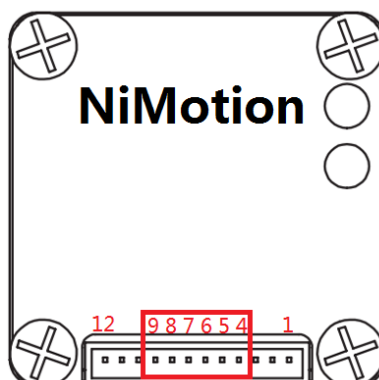


Figure 3-4 I/O Port

Table 3-6 I/O Port Definition

Pin	PIN bits	Function
4	DO2	•Open-drain output •Maximum current: 100 mA •Maximum voltage: 30 VDC
5	DO1	
7	DI3	•Logic signal 1: Input 5–24 VDC •Logic signal 0: Input 0–2 VDC •Non-isolated
8	DI2	
9	DI1	

3.3.4 I/O Terminal Wiring Diagram

DI1, DI2, DI3 (input terminals) are connected to NPN sensors.

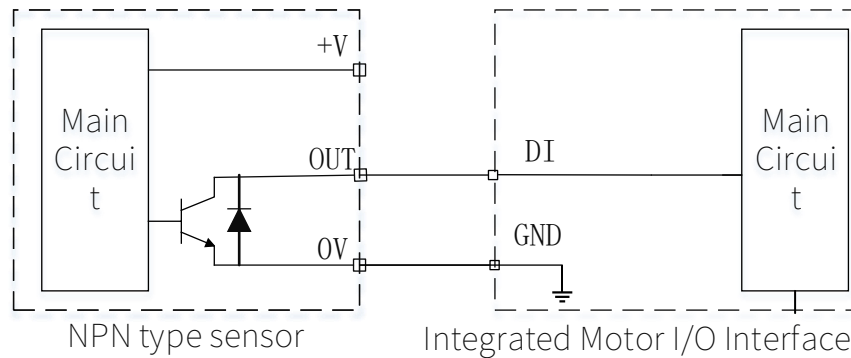


Figure 3-5 Schematic diagram of DI input port connected to NPN type sensor

Connect the sensor +V to the positive power supply, sensor 0V to the negative power supply and common ground with the motor GND, and the sensor OUT terminal to the DI of the motor.

DI1, DI2, DI3 (input terminals) are connected to switches

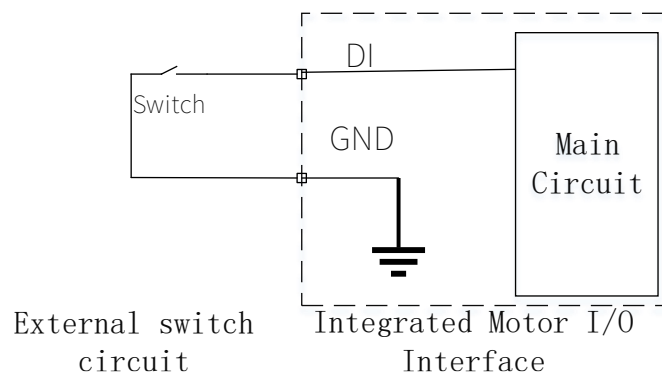


Figure 3-6 Schematic diagram of DI input port connected to a switch

The DI terminal of the motor is connected to one end of the switch, and the other end of the switch is connected to the motor GND.

DI1, DI2, DI3 (input terminals) are connected to pulse inputs.

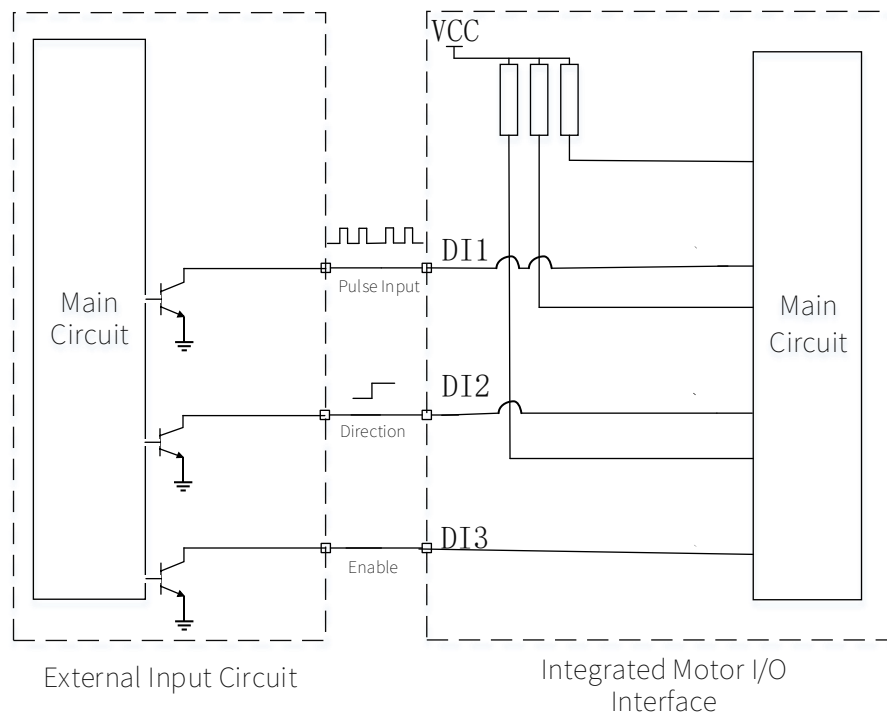


Figure 3-7 Schematic diagram of DI input port connected to pulse input

DO1, DO2 (output terminals) are connected to LED.

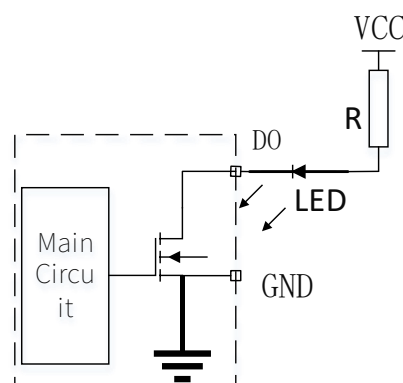


Figure 3-8 Schematic diagram of DO output port connected to LED indicator

Connect the positive pole of the power supply VCC to the current-limiting resistor, then to the positive pole of the LED. Connect the DO terminal of the I/O interface to the negative pole of the LED, and the GND terminal of the I/O interface to the negative pole of the power supply.

4. Host-PC Debugging Software Solution

4.1 Installation Contents

Use NiMStudio, software developed by Limaisheng. It runs on Windows operating systems. Connect the mini electric cylinder to the host PC via an RS-485 / CANopen communication converter.

Required installation components:

- Power supply complying with manual specifications
- WDG-28 Mini Electric Cylinder
- Required communication cables
- Host PC and NiMStudio V1.2.4.a6.exe or later versions released by Limaisheng
- RS-485 / CAN listener or analyzer

4.2 Basic Usage

4.2.1 Communication Connection

Take the Modbus-based electric cylinder as an example. Click Communication at the top-left corner of the software, configure communication parameters, then click OK, as shown in the figure below.



After successful communication connection, the Modbus master station scans and detects the corresponding device. Switch to the Console - Cylinder Debugging page.



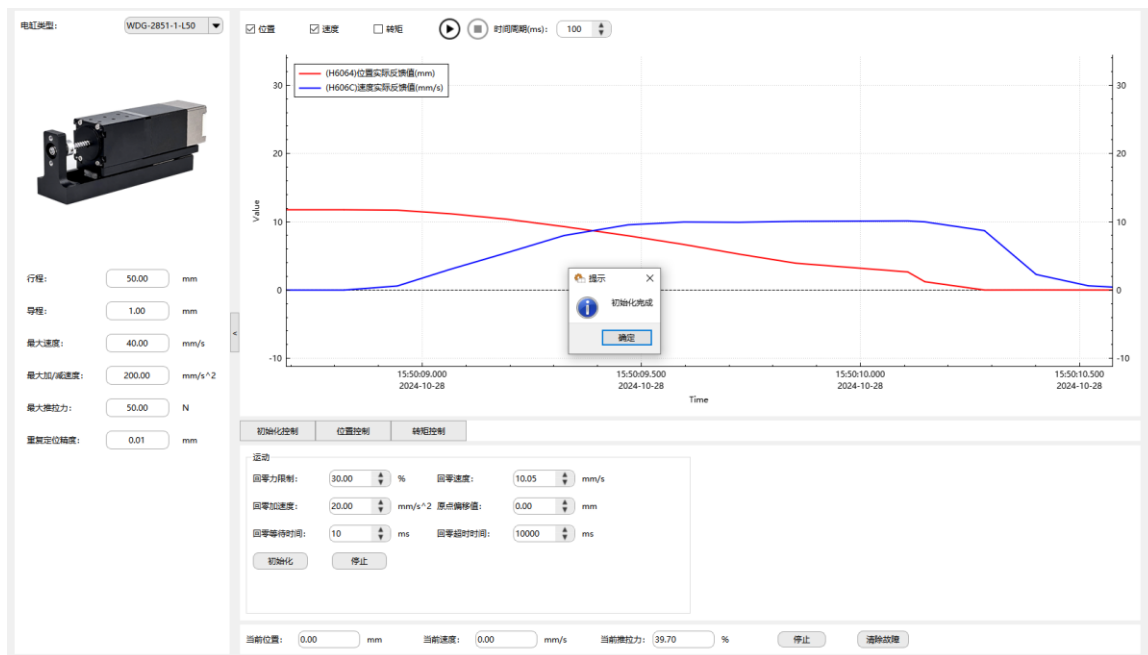
4.2.2 Curve Display

This function monitors cylinder position, velocity and torque. Configure the time cycle to modify the refresh interval of curve data.

4.2.3 Homing Control

① GUI Operation Click Homing Control to open the homing-control interface.

Configure homing-related parameters and click Initialize. A prompt will pop up upon completion of homing, as shown in the figure below.



② Message Examples

Set Operation Mode

CANopen:

SDO write to 2002h: 01h=0 (Operation Mode), 6060h=0x06 (Operating Mode), to activate homing mode.

Send: 601 2B 02 20 01 00 00 00 00 (Set to CiA402 mode)

Send: 601 2F 60 60 00 06 00 00 00 (Set to Homing Mode)

Modbus:

Write register 00B1h=0 (Operation Mode), 03C2h=0x06 (Operating Mode), to activate homing mode.

Send: 01 10 00 B1 00 01 02 00 00 + CRC (Set to CiA402 mode)

Send: 01 10 03 C2 00 01 02 00 06 + CRC (Set to Homing Mode)

Set Homing Method

CANopen:

SDO write to 6098h = 37/38 (Homing Method)

Send: 601 2F 98 60 00 25 00 00 00 (Set stall-detection homing)

Modbus:

Write register 0416h = 37/38 (Homing Method)

Send: 01 10 04 16 00 01 02 00 25 + CRC (Set stall-detection homing)

Set Homing Force Limit and Homing Waiting Time

CANopen:

SDO write to 2007h:13h = 300 (Homing Force Limit), 2007h:15h = 50 (Homing Waiting Time)

Send: 601 2B 07 20 13 2C 01 00 00 (Set stall-detection torque to 30%)

Send: 601 2B 07 20 15 32 00 00 00 (Set stall-detection time to 5 ms)

Modbus:

Write register 0170h = 300, 0172h = 50

Send: 01 10 01 70 00 01 02 01 2C + CRC (Set homing force limit to 30%)

Send: 01 10 01 72 00 01 02 00 32 + CRC (Set homing waiting time to 5 ms)

Set Homing Velocity and Homing Acceleration

CANopen:

SDO write to 6099h:02h = 1000 (Homing Velocity), 609Ah = 200000 (Homing Acceleration)

Send: 601 23 99 60 02 E8 03 00 00 (Set homing velocity to 1000)

Send: 601 23 9A 60 00 40 0D 03 00 (Set homing acceleration to 200000)

Modbus:

Write register 0419h = 1000 (Homing Velocity), 041Bh = 200000 (Homing Acceleration)

Send: 01 10 04 19 00 02 04 00 00 03 E8 + CRC (Set homing velocity to 1000)

Send: 01 10 04 1B 00 02 04 00 03 0D 40 + CRC (Set homing acceleration to 200000)

Set Homing Timeout

CANopen:

SDO write to 2005h:1Ch = 10000 (Homing Timeout)

Send: 601 2B 05 20 1C 10 27 00 00 (Set homing timeout to 10000 ms)

Modbus:

Write register 012Eh = 10000 (Homing Timeout)

Send: 01 10 01 2E 00 02 04 00 00 27 10 + CRC (Set homing timeout to 10000 ms)

4.2.4 Position Control

① GUI Operation

Click Position Control to open the position-control interface. Position control consists of Motion and Debugging sections. Motion execution refers to absolute movement under profile position mode. Two motion modes are available: Single Control and Cycle Control, selectable via dropdown menu, as shown in the figure below.



② Message Examples

Set Operation Mode

CANopen:

SDO write to 2002h:01h = 0 (Operation Mode), 6060h = 0x01 (Operating Mode), to activate profile-position mode.

Send: 601 2B 02 20 01 00 00 00 00 (Set to CiA402 mode)

Send: 601 2F 60 60 00 01 00 00 00 (Set to Profile Position Mode)

Modbus:

Write register 00B1h=0 (Operation Mode), 03C2h = 0x01 (Operating Mode), to activate profile-position mode.

Send: 01 10 00 B1 00 01 02 00 00 + CRC (Set to CiA402 mode)

Send: 01 10 03 C2 00 01 02 00 01 + CRC (Set to Profile Position Mode)

Note: The motor shall be disabled when switching modes.

Parameter Configuration

CANopen:

SDO write to 607Ah (Target Position), 6083h (Acceleration), 6084h (Deceleration), 6081h (Target Velocity)

Send: 601 23 7A 60 00 10 27 00 00 (Set target position 607Ah to 10000)

Send: 601 23 81 60 00 10 27 00 00 (Set target velocity 6081h to 10000)

Send: 601 23 83 60 00 40 9C 00 00 (Set acceleration 6083h to 40000)

Send: 601 23 84 60 00 40 9C 00 00 (Set deceleration 6084h to 40000)

Modbus:

Write register 03E7h (Target Position), 03F8h (Target Velocity), 03FCh (Acceleration), 03FEh (Deceleration)

Send: 01 10 03 E7 00 02 04 00 00 27 10 + CRC (Set target position 03E7h to 10000)

Send: 01 10 03 F8 00 02 04 00 00 27 10 + CRC (Set target velocity 03F8h to 10000)

Send: 01 10 03 FC 00 02 04 00 00 9C 40 + CRC (Set acceleration 03FCh to 40000)

Send: 01 10 03 FE 00 02 04 00 00 9C 40 + CRC (Set deceleration 03FEh to 40000)

Note: Both Point A and Point B represent target positions. Cycle count and waiting time are implemented by host-PC logic, no corresponding physical drive parameters.

Set Control Word to Enable the Cylinder

CANopen:

SDO write to 6040h = 0x06 → 0x07 → 0x(n)F for motor enable:

Send: 601 2B 40 60 00 06 00 00 00 (Set 6040h to 0x06, motor ready)

Send: 601 2B 40 60 00 07 00 00 00 (Set 6040h to 0x07, motor disable)

Send: 601 2B 40 60 00 0F 00 00 00 (Set 6040h to 0x0F, motor enable)

Modbus:

Write register 0380h = 0x06 → 0x07 → 0x(n)F for motor enable:

Send: 01 10 03 80 00 01 02 00 06 + CRC (Set 0380h to 0x06, motor ready)

Send: 01 10 03 80 00 01 02 00 07 + CRC (Set 0380h to 0x07, motor disable)

Send: 01 10 03 80 00 01 02 00 0F + CRC (Set 0380h to 0x0F, motor enable)

Trigger Cylinder Motion (after cylinder is enabled)

CANopen:

SDO write to 6040h = 0x(n)F → 0x(n+1)F to start motor motion:

Send: 601 2B 40 60 00 1F 00 00 00 (Set 6040h to 0x1F, absolute-position movement, non-immediate update)

Send: 601 2B 40 60 00 3F 00 00 00 (Set 6040h to 0x3F, absolute-position movement, immediate update)

Send: 601 2B 40 60 00 5F 00 00 00 (Set 6040h to 0x5F, relative-position movement, non-immediate update)

Send: 601 2B 40 60 00 7F 00 00 00 (Set 6040h to 0x7F, relative-position movement, immediate update)

Modbus:

Write register 0380h = 0x(n)F → 0x(n+1)F to start motor motion:

Send: 01 10 03 80 00 01 02 00 1F + CRC (Set 0380h to 0x1F, absolute-position movement, non-immediate update)

Send: 01 10 03 80 00 01 02 00 3F + CRC (Set 0380h to 0x3F, absolute-position movement, immediate update)

Send: 01 10 03 80 00 01 02 00 5F + CRC (Set 0380h to 0x5F, relative-position movement, non-immediate update)

Send: 01 10 03 80 00 01 02 00 7F + CRC (Set 0380h to 0x7F, relative-position movement, immediate update)

5. Install and Connect

5.1 Installation Precautions

5.1.1 Installation Location

- ① Install the product in an indoor control cabinet free from direct sunlight, and do not place flammable materials nearby.
- ② Do not use this product in corrosive environments containing hydrogen sulfide, sulfurous acid, chlorine, ammonia, oxidizing gases, acids, alkalis, salts, etc., or in flammable gas environments or near combustible materials.
- ③ Use only in locations free of cutting fluid, oil mist, iron powder, iron chips, etc.
- ④ Use in a well-ventilated, dry and dust-free location.
- ⑤ Use in a vibration-free location.
- ⑥ Do not use gasoline, thinners, alcohol, acidic or alkaline cleaning agents, as this may cause discoloration or damage to the housing.

5.1.2 Installation Requirements

- ① The mounting orientation of the Mini Electric Cylinder shall be such that the heat sink aligns with the systems cooling air duct, ensuring optimal heat dissipation.
- ② A clearance of at least 30 mm shall be reserved at the wiring end face of the Mini Electric Cylinder for maintenance and operation.
- ③ The wiring of the Mini Electric Cylinder shall be secured with a rigid support at a position 30–40 mm away from the motor to prevent connector loosening caused by long-term vibration.
- ④ Before powering on the Mini Electric Cylinder, confirm that the communication cables and power cables are connected correctly. If I/O functions are required, connect the corresponding I/O cables (standard cables from our company are recommended).
- ⑤ Select and install the communication cables according to the optional types provided by our company for proper networking. An optional terminal matching resistor may be installed at the network end to achieve signal termination.

5.1.3 Installation Precautions

- ① When connecting to machinery, use a coupling and ensure the motor shaft is aligned with the mechanical shaft.
- ② Do not bend or apply tension to the cables.
- ③ When connecting the connector, make sure there are no foreign objects such as dust or metal fragments inside the connector.
- ④ When carrying the unit with cables connected, always hold the main body of the Mini Electric Cylinder. Lifting by the cables alone may damage the connector or break the cables.
- ⑤ If using bent cables, exercise sufficient care during wiring to avoid applying stress to the connector. Stress on the connector may result in damage.

5.2 Cable Wiring and grounding Requirement

5.2.1 Wiring Requirements

It is recommended to use the matching cables. If extension is required, extend as needed while ensuring signal quality.

5.2.2 Grounding Requirements

The product adopts a common ground design internally. The power supply, communication lines and IO ports share the same ground. To ensure proper grounding of the product, please strictly observe the following precautions.

- ① To prevent electric shock, be sure to ground the grounding terminal. For the grounding method, comply with the relevant electrical regulations of each country or region.
- ② To prevent electric shock, confirm that the protective grounding conductor meets the technical specifications and local safety standards, and keep the grounding wire as short as possible.
- ③ When using multiple devices, follow the instructions to ground all devices. Improper grounding may cause malfunction of the equipment.
- ④ The grounding terminal must be reliably grounded; otherwise, the equipment may operate abnormally or even be damaged.
- ⑤ Do not share the grounding terminal with the neutral N terminal of the power supply.
- ⑥ It is recommended to install on a conductive metal surface to ensure a good connection between the entire conductive base of the equipment and the mounting surface.

Common power ground

In the communication networking of multiple Mini Electric Cylinder, if there are multiple power supplies in the system, the power supply should be common ground (common GND, that is, the negative pole of the power supply). The ground resistance of the electrical system involved in Unicom's communication bus is $< 4\Omega$.

Common Signal Ground

The main controller, communication bus master station and communication converter communication port connected to the communication bus of the Mini Electric Cylinder shall be isolated by electrical isolation technology, and the ground of the communication ground (RS485_GND, CAN_GND) and the communication interface of the Mini Electric Cylinder shall be common (common GND, namely communication interface GND).

Protective Grounding

The Mini Electric Cylinder shell should be installed to the motor bracket through the mounting hole, and the bracket should be reliably connected to the ground. The resistance between the Mini Electric Cylinder shell, the accessible grounding metal shell and the grounding terminal should not exceed 0.1Ω.

5.3 Communication Distance

5.3.1 RS485 Communication

RS485 communication can use two types of transmission media: Type A and Type B. Type A is shielded twisted-pair cable, and Type B is unshielded twisted-pair cable. According to the EN 50170 standard, Type A cable is specified. Type A allows a longer extension distance than Type B, as shown in Table 4-1 below.

Table 4-1 Communication Transmission Medium Description

Parameters	Type A	Type B
Characteristic Impedance (Ω)	135~165	100~130
Capacitance per unit length (pF/m)	<30	<60
Loop resistance (Ω /km)	110	-
Core Diameter (mm)	0.64	>0.53
Core cross-sectional area (mm ²)	>0.34	>0.22

Table 4-2 RS485 Communication Distance vs. Baud Rate Comparison Table

Baud Rate (bps)	Bus Length (m) (Type A)	Bus Length (m) (Type B)	Remarks
1M	200	100	
500k	400	200	
256k	800	600	
115.2k	1000	1000	
57.6k	1200	1200	
38.4k	1200	1200	
19.2k	1200	1200	
9.6k	1200	1200	

Under ideal conditions (one load device on the RS485 bus, baud rate 9600 bps, high-quality and compliant communication cables), the theoretical maximum communication distance of the RS485 bus is approximately 1200 meters.

Factors that reduce the communication distance of the RS485 bus: multiple RS485 load devices, non-standard characteristic impedance of the cable, small wire diameter, low-quality converters, complex lightning protection in the equipment, and excessively high baud rate will all shorten the RS485 communication distance.

To reduce the impact of interference and shortened communication distance:

To extend the transmission distance while ensuring stable signal transmission, it is generally required to keep away from interference sources (large mechanical equipment) as much as possible, adopt enhanced shielding measures, install repeaters, reduce the transmission rate (baud rate), and use high-quality and compliant communication cables and converters.

5.3.2 CAN Communication

Table 4-3 CAN Communication Distance vs. Baud Rate Comparison Table

Baud Rate (bit/s)	Bus Length (m)	Nominal Bit Time (μs)	Sample Point Position	Sample Point Range	Remarks
1M	25	1	87.5% (875 ns)	75%~90%	These parameters are estimated values under ideal conditions and are for reference only. In actual application, as they are affected by multiple factors, please refer to actual field conditions.
800k	50	1.25	87.5% (1.09375 μs)	75%~90%	
500k	100	2	87.5% (1.75 μs)	85%~90%	
250k	250	4	87.5% (3.5 μs)	85%~90%	
125k	500	8	87.5% (7 μs)	85%~90%	
50k	1000	20	87.5% (17.5 μs)	85%~90%	
20k	2500	50	87.5% (43.75 μs)	85%~90%	
10k	5000	100	87.5% (87.5 μs)	85%~90%	

The data in the above table are parameters under ideal conditions. In practical applications, if the signal transmission distance over the cable is excessively long, signal distortion may occur due to environmental interference (such as electromagnetic and electric field interference) as well as the characteristic impedance of the cable itself.

Measures for optimizing the communication distance of the CAN bus:

Reduce the length of branches, install appropriate matching resistors on long branches, use shielded cables with proper grounding, reduce the number of CAN bus nodes, lower the transmission rate (baud rate), and add CAN repeaters or hubs.

5.4 Other Cable Wiring

5.4.1 Communication Wiring

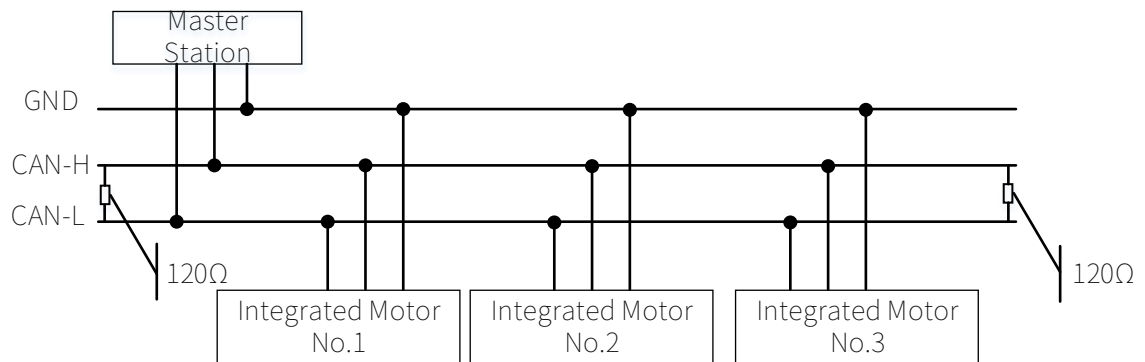


Figure 5-1 CANopen Communication Wiring Topology

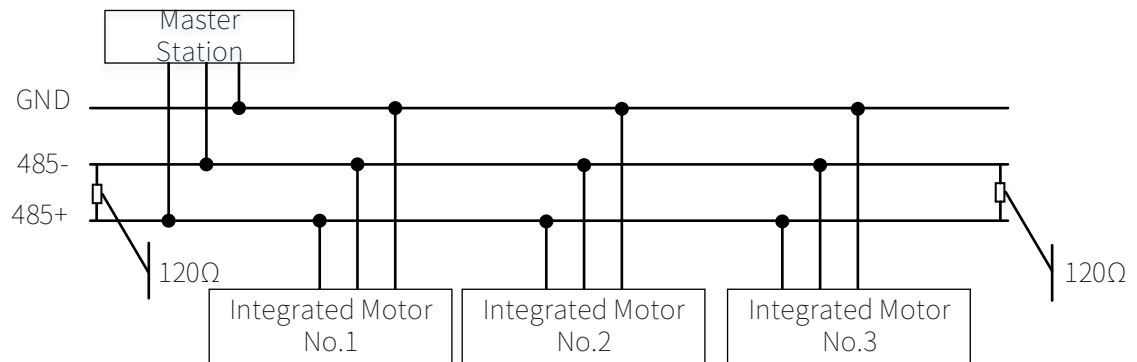


Figure 5-2 RS485 Communication Wiring Topology Diagram

5.4.2 Debugging Wiring

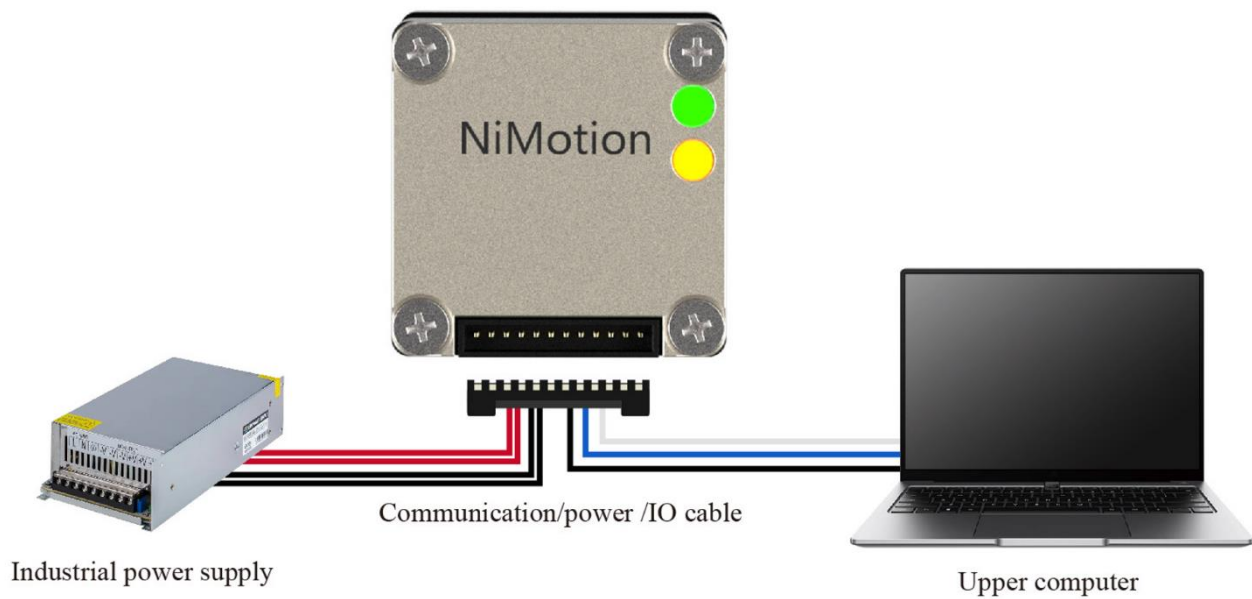


Figure 5-3 Wiring Diagram for Mini Electric Cylinder Debugging

5.4.3 External Control Wiring

① Controlled via communication bus

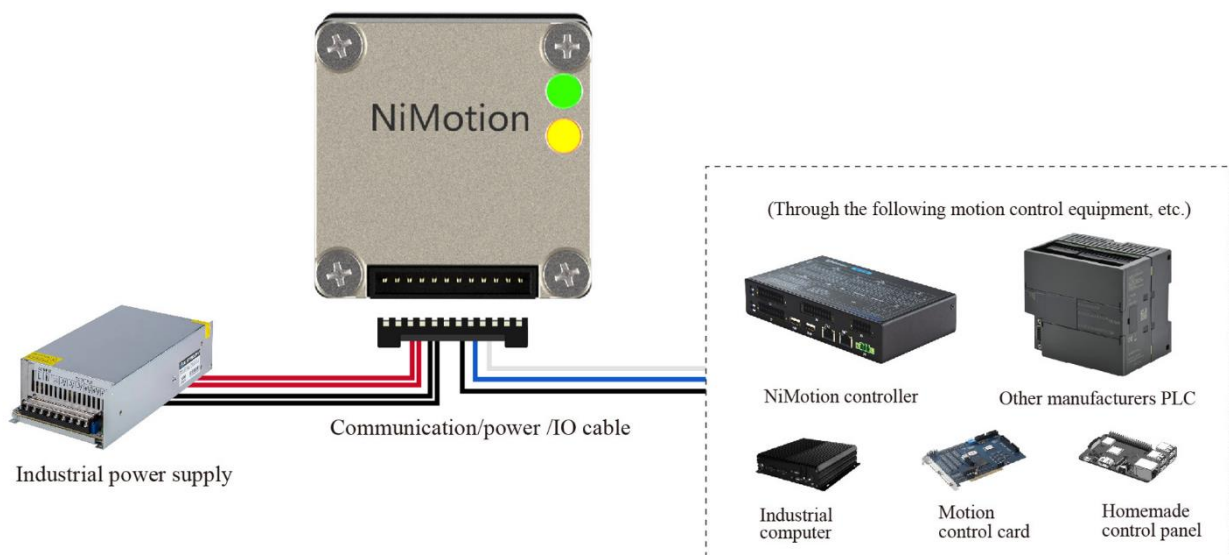


Figure 5-4 External Control Wiring Diagram (Controlled via Communication Bus)

② Controlled via IO Port (Controller)

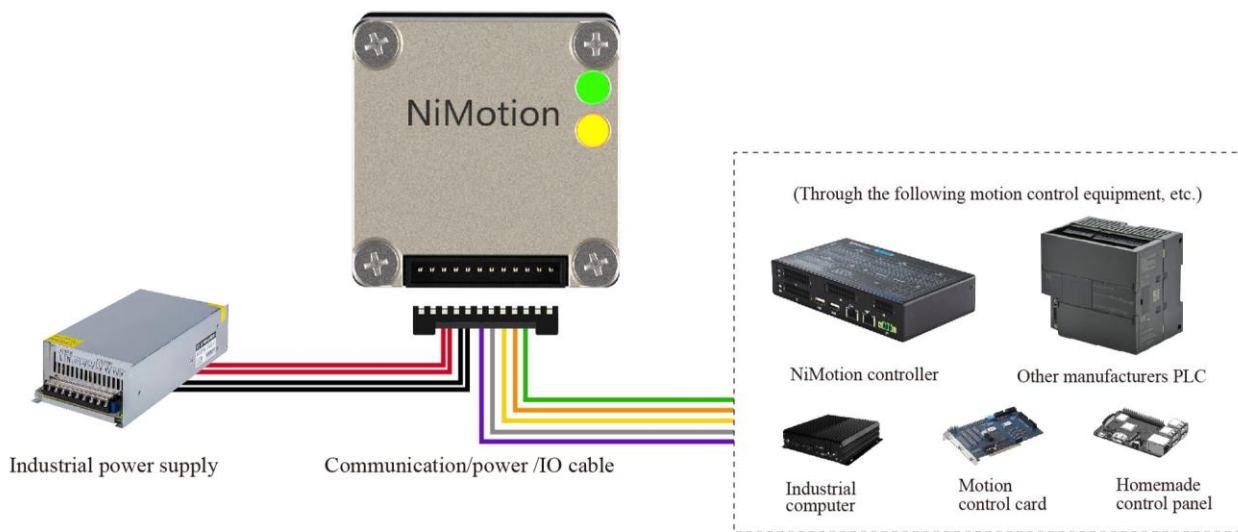


Figure 4-5 External Control Wiring Diagram

③ Controlled via IO Port (Sensor)

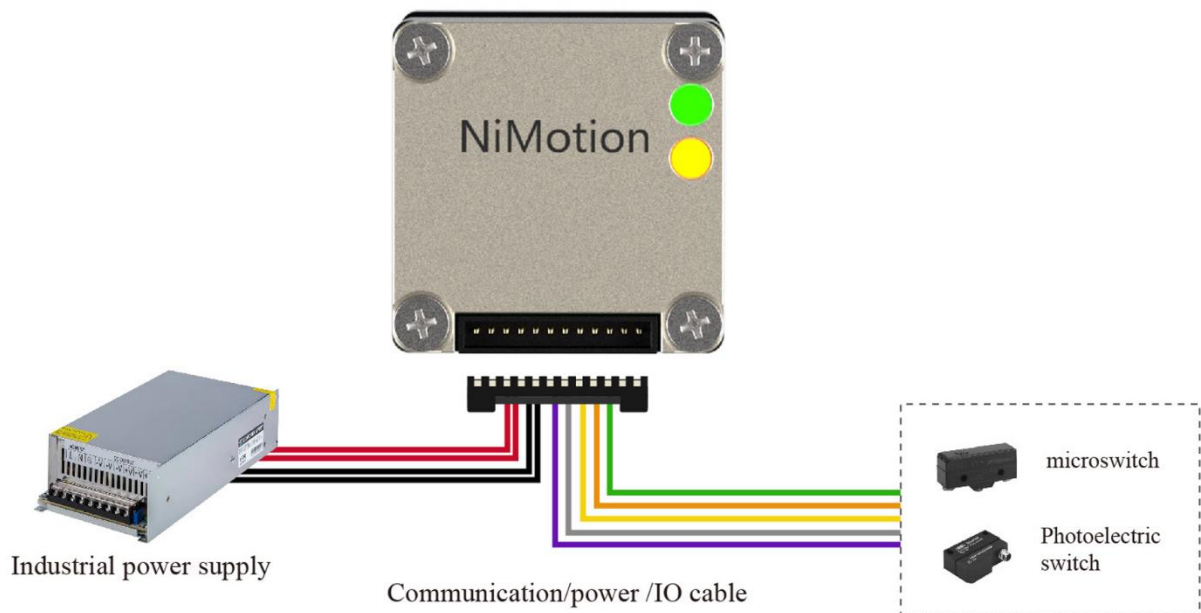


Figure 4-6 External Control Wiring Diagram

5.4.4 Communication Network Wiring

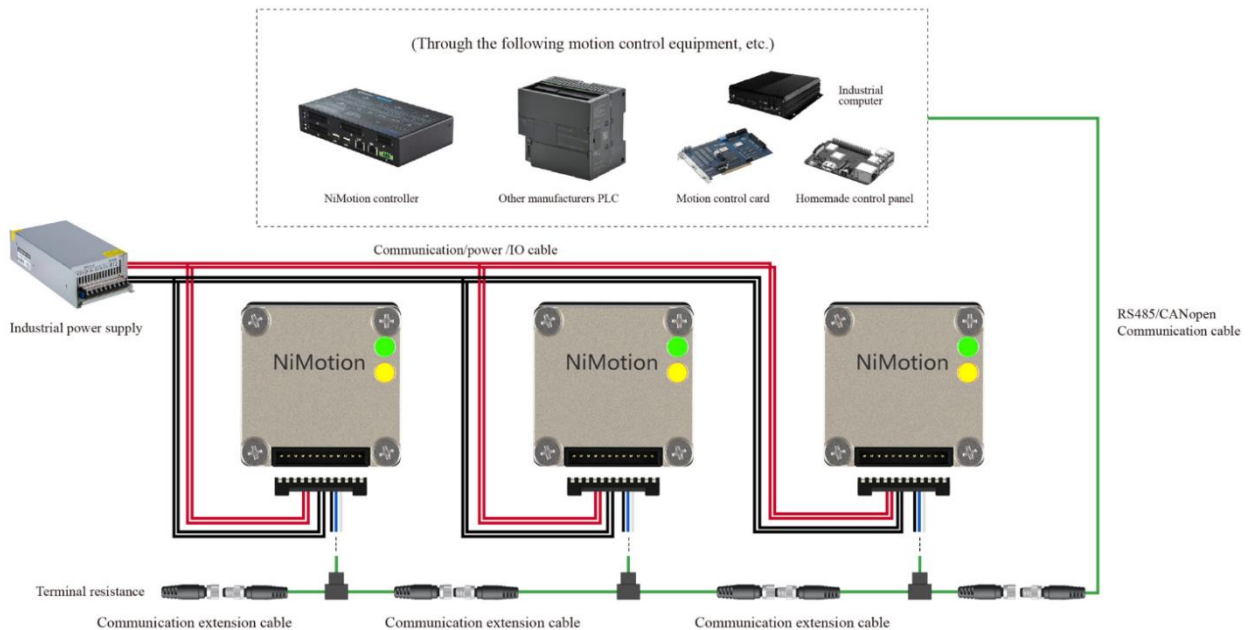


Figure 5-7 RS485&CANopen Communication Network Wiring Diagram

5.4.5 Network Wiring Requirements

a. RS485 Network Requirements

① RS485 can use various types of transmission media, but cables complying with the standard GB/T 19582.2-2008 Modbus Application Guide for Serial Links shall be used.

② The RS485 bus must adopt a daisy-chain connection. The reference grounds of the 485 signals for all nodes shall be connected together.

③ A terminal matching resistor must be installed at the farthest end of the cable to prevent RS485 signal reflection.

④ Node branches should be as short as possible: long branches cause significant characteristic impedance mismatch, which in turn leads to signal reflection. Therefore, branches shall be kept extremely short, generally no more than 30 cm.

⑤ The number of bus nodes depends on the actual application conditions and the hardware characteristics of the transmission media.

b. CAN Network Requirements

① Cables complying with the standard GB/T 41588.3-2022 Road vehicles — Controller area network (CAN) — Part 3: Low-speed fault-tolerant, medium-dependent interface shall be used for wiring.

② The CAN bus must adopt a daisy-chain connection. The reference grounds of the CAN signals for all nodes shall be connected together.

- ③ A terminal matching resistor must be installed at the farthest end of the cable to prevent CAN signal reflection.
- ④ The length of node stub cables shall not be excessive, generally no more than 30 cm.
- ⑤ The number of bus nodes depends on the actual application conditions and the hardware characteristics of the transmission media.

6. Product Selection

6.1 Cable Selection

Table 6-1 Cable Selection Table

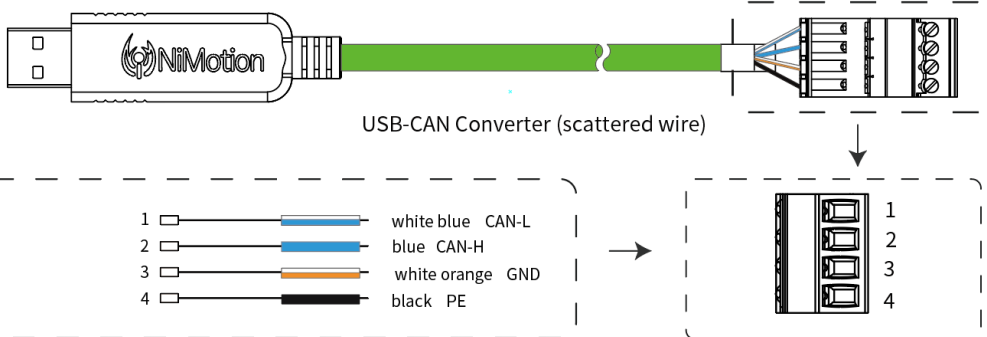
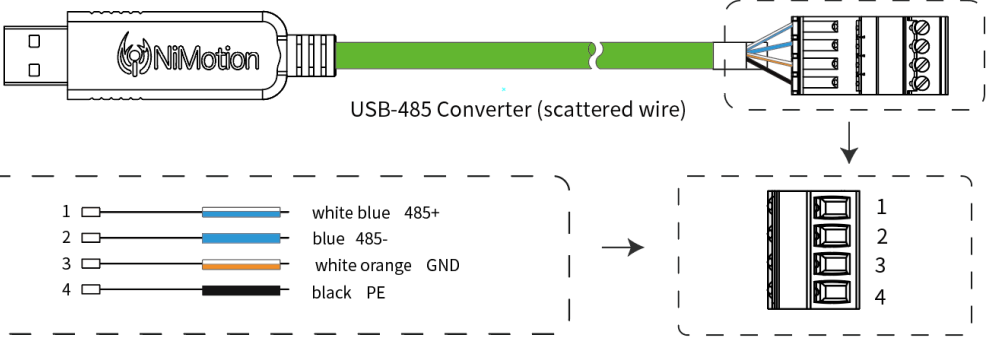
STM28MC Series Integrated Stepper Servo Motor Cable Selection Table	
Cable Name	Cable Wiring Diagram
SCM-USBCA NI-L Converter	 USB-CAN Converter (scattered wire) 1 white/blue CAN-L 2 blue CAN-H 3 white/orange GND 4 black PE
SCM- USB485A-L Converter	 USB-485 Converter (scattered wire) 1 white/blue 485+ 2 blue 485- 3 white/orange GND 4 black PE

Table 5-2 Cable Selection Table

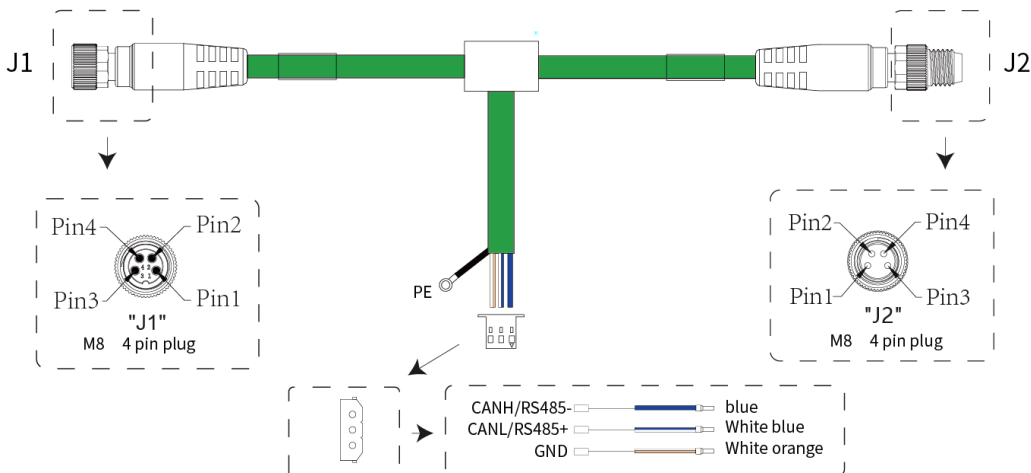
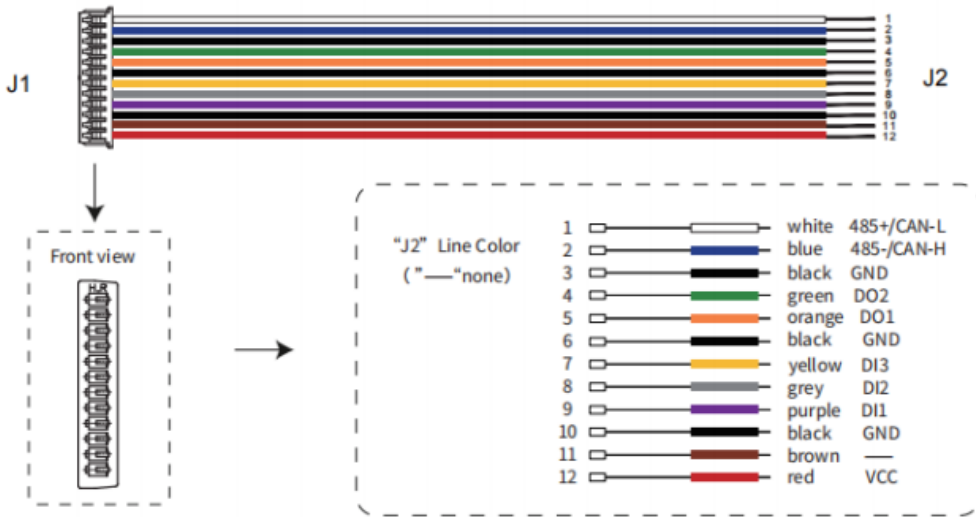
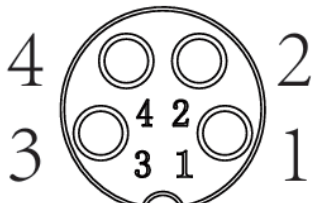
STM28MC Series Integrated Stepper Servo Motor Cable Selection Table																																								
Cable Name	Cable Wiring Diagram																																							
SDCX001-KZ-B CAN&RS485 Communication T-Node Extension Cable	 J1 Pin4 Pin2 Pin3 Pin1 "J1" M8 4 pin plug J2 Pin2 Pin4 Pin1 Pin3 "J2" M8 4 pin plug PE CANH/RS485- blue CANL/RS485+ White blue GND White orange																																							
STX019 Motor Communication / Power / IO Cable	 J1 Front view J2 <table><tr><th>"J2" Line Color</th><th>Pin</th><th>Signal</th></tr><tr><td>white</td><td>1</td><td>485+/CAN-L</td></tr><tr><td>blue</td><td>2</td><td>485-/CAN-H</td></tr><tr><td>black</td><td>3</td><td>GND</td></tr><tr><td>green</td><td>4</td><td>DO2</td></tr><tr><td>orange</td><td>5</td><td>DO1</td></tr><tr><td>black</td><td>6</td><td>GND</td></tr><tr><td>yellow</td><td>7</td><td>DI3</td></tr><tr><td>grey</td><td>8</td><td>DI2</td></tr><tr><td>purple</td><td>9</td><td>DI1</td></tr><tr><td>black</td><td>10</td><td>GND</td></tr><tr><td>brown</td><td>11</td><td>—</td></tr><tr><td>red</td><td>12</td><td>VCC</td></tr></table>	"J2" Line Color	Pin	Signal	white	1	485+/CAN-L	blue	2	485-/CAN-H	black	3	GND	green	4	DO2	orange	5	DO1	black	6	GND	yellow	7	DI3	grey	8	DI2	purple	9	DI1	black	10	GND	brown	11	—	red	12	VCC
"J2" Line Color	Pin	Signal																																						
white	1	485+/CAN-L																																						
blue	2	485-/CAN-H																																						
black	3	GND																																						
green	4	DO2																																						
orange	5	DO1																																						
black	6	GND																																						
yellow	7	DI3																																						
grey	8	DI2																																						
purple	9	DI1																																						
black	10	GND																																						
brown	11	—																																						
red	12	VCC																																						

Table 5-3 Cable Selection Table

STM28MC Series Integrated Stepper Servo Motor Cable Selection Table	
Cable Name	Cable Wiring Diagram
STRX001-120 Terminal Resistor	 
1. Communication cable: Used for communication with the Mini Electric Cylinder, connecting the Mini Electric Cylinder to a computer for parameter setting and debugging. 2. Power cable: Used to supply power to the Mini Electric Cylinder. 3. IO cable: IO pins – for connecting IO ports to the control terminal; Communication pins – for connecting communication ports to the debugging terminal. 4. Terminal resistor: Installed at the end of the communication bus line to improve anti-interference capability.	

7. Alarm Function

Table 7-1 Alarm Function List

Alarm Code	Alarm Contents	Default Alarm Type	Self reset or not
0x2300	Motor overcurrent alarm	Fault	No
0x4012310	Limited power alarm	Alarm	Yes
0x4012311	Motor overload alarm	Alarm	Yes
0x3002312	Motor stalled alarm	Pause and lock the shaft	No
0x1013210	Power supply overvoltage alarm	Fault	Yes
0x1013220	Power undervoltage alarm	Fault	Yes
0x14210	Overtemperature alarm	Fault	Yes
0x14220	Low temperature alarm	Fault	Yes
0x5080	Drive failure	Fault	No
0x5540	Flash operation failure	Fault	No
0x5541	Flash initialization failure	Fault	No
0x4005542	Flash validation error warning	Alarm	Yes
0x5543	No parameters in flash user area	Fault	No
0x4005544	The power off location is incorrectly stored	Alarm	No
0x4005545	Data saved in a power failure is not stored	Alarm	No
0x6000	Hardware initialization failure	Fault	No
0x16320	Parameter setting error	Fault	Yes
0x6321	Registration failure	Fault	No
0x7305	Z pulse fault	Fault	No
0x7306	Encoder failure	Fault	No
0x4017307	Encoder warning	Alarm	Yes
0x4017308	Encoder calibration failure	Alarm	Yes
0x17310	Overspeed	Fault	Yes
0x3017501	Communication failure	Alarm	Yes
0x4017502	Illegal address	Alarm	Yes

Alarm Code	Alarm Contents	Default Alarm Type	Self reset or not
0x4017503	Illegal data value	Alarm	Yes
0x4017505	Confirmation in communication	Alarm	Yes
0x4017506	Slave in communication	Alarm	Yes
0x401750C	Request data is larger than mapping data	Alarm	Yes
0x401750D	The number of request data is not equal to the number of mapping data	Alarm	Yes
0x401750E	The address of the packet node is incorrect	Alarm	Yes
0x408311	Torque-limiting protection	Alarm	Yes
0x8610	The origin regression timeout	Fault	No
0x8611	Out of position	Fault	No
0x3018613	Software limit error	Pause and lock the shaft	No
0x3018614	The limit switch is incorrect	Pause and lock the shaft	No
0x4018615	Curve planning calculation error	Alarm	Yes
0x18616	Target location overflow	Fault	No
0x5018617	Curve planning parameters are too small	ignore	Yes
0xFF01	Motor parameter identification failure	Fault	No
0x0401FF02	Parameter saving fault	Alarm	Yes
Note: Please refer to the corresponding communication manual for more details of alarm failure.			

8. Daily Inspection and Maintenance

8.1 Inspection Items and Intervals

If the transmission system runs 8 hours per day, arrange maintenance intervals according to the table below. For equipment operating non-stop around-the-clock or under high-frequency usage, shorten the maintenance cycle appropriately according to actual working conditions.

Maintenance Timing	External Check	External Cleaning	Internal Check
Initial Start-up	○	○	-
After 1-week Operation	○	○	○
Monthly Thereafter	○	○	○

● External Check

Inspection Object	Check Content	Countermeasure
Transmission Device	• Check whether screws for mounting the transmission device are loose. • Check whether screws for mounting the load are loose.	Tighten the screws.
Cables & Connectors	• Check cables for damage or stress. • Check whether connections to motor, driver and other components are loose.	• Replace damaged cables. • Re-connect the connectors.
Operating Condition	Check for abnormal noise or vibration from bearings and other parts.	Verify load mounting status and operating speed.

● External Cleaning

Keep the outer surface of the product clean at all times. ① Wipe off dirt with a soft cloth. ② Do not blow with compressed air, otherwise dust may enter through gaps and cause malfunctions. ③ For

heavy dirt, wipe with a soft cloth dampened with neutral detergent. ④ Do not use petroleum-based solvents, as they may damage the painted surface.

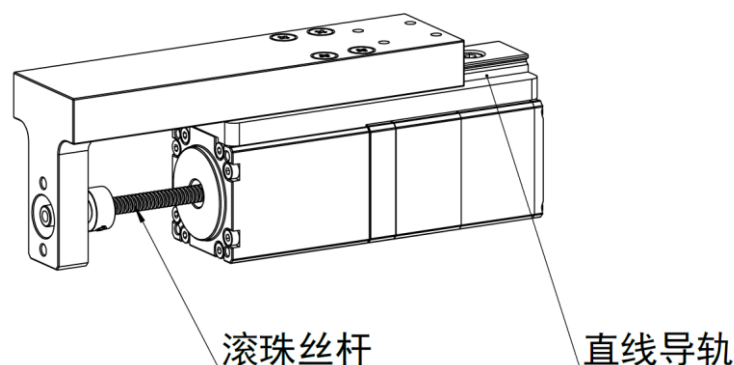
- **Internal Check**

Perform visual inspection for items listed in the table. Even if the grease is discolored, the lubrication condition remains acceptable if the sliding surface still retains luster. For grease replenishment procedures, refer to 8-2 Grease Replenishment.

Inspection Object	Check Content	Countermeasure
Ball Screw Shaft	Check for foreign contaminants such as dust. Check whether grease has lost luster or its quantity has decreased.	Remove foreign contaminants. Wipe the ball screw clean with a soft cloth, then apply grease to the ball-screw grooves.
Linear Guide	Check for foreign contaminants such as dust. Check whether grease has lost luster or its quantity has decreased.	Remove foreign contaminants. Wipe the grooves on both sides of the linear guide with a soft cloth, then apply grease into the guide grooves.

8.2 Grease Replenishment

Wipe off old grease and dirt with a soft cloth, then apply new grease. Use AFC grease.



Warranty Statement

Warranty Period

The product quality warranty period is 1 year from purchase. However, for motors equipped with a brake, the warranty is subject to the axis acceleration/deceleration cycles not exceeding the service life. (Within the allowable angular acceleration and deceleration, the service life is 5,000,000 cycles, referring to the number of acceleration/deceleration cycles before a sharp change in brake backlash occurs.)

Warranty Coverage

If the product is used properly in strict accordance with this manual and a fault is confirmed within the warranty period, free repair service will be provided.

Non-warranty repair cases within the warranty period:

- ① Damage caused by improper use, inappropriate repair or modification;
- ② Damage caused by dropping, impact or other transportation factors after delivery;
- ③ Damage caused by use beyond the designed specifications of the equipment;
- ④ Damage caused by fire, earthquake, lightning strike, wind disaster, chloride corrosion, abnormal voltage or other natural disasters;
- ⑤ Damage caused by intrusion of water, oil, metal or other foreign substances;
- ⑥ Damage caused by parts with standard mechanical life exceeding their respective service life.

The warranty is limited to the main body of the purchased product.

Other associated damages caused by product failure are not covered by our repair and compensation.

Important Usage Instructions

● This product is developed, designed and manufactured in accordance with standards applicable to general industrial applications. It has not been developed or tested in compliance with technical specifications for equipment and systems in special fields involving personal safety, medical treatment, national defense, military industry, etc.

● Installation, commissioning, wiring, operation, maintenance and inspection of this product must be performed by qualified personnel with relevant professional knowledge and skills.

● The tightening torque of fasteners for product installation shall be set properly according to the strength grade of screws and material of the mounting surface to prevent loosening or breakage.

● If a failure of this product integrated into equipment may cause major accidents or losses, special safety design and corresponding safety devices shall be configured before installation.

● If you plan to use this product in special applications such as nuclear power control equipment, aerospace equipment, medical equipment, high-purity equipment or other safety-related devices, you must confirm pre-sales technical details with our company fully.

● This product has passed quality control according to standard procedures to ensure stable operation. However, it may still malfunction due to unexpected external factors (such as noise interference, electrostatic shock, power fluctuation, circuit abnormality or sudden component failure). Users must implement fault protection design and ensure that the operating environment and procedures comply with safety regulations.

● If the motor shaft operates without electrical grounding, the motor bearings may suffer from electric corrosion due to the product structure and installation environment, which may lead to increased bearing noise.

● If the product is used in an environment with high concentrations of sulfur or sulfide gases (such as H_2S , SO_2 , NO_2 , Cl_2 , etc.), chip resistor open circuits or poor contact may occur due to sulfuration. Please take corresponding measures during the system design stage.

● The input voltage of this product must strictly comply with the rated parameters. If the input voltage significantly exceeds the rated range, it will cause irreversible damage to internal core components, with safety risks such as smoking and fire. Please inspect and confirm the input voltage before use.

Version Change Record

Version Number	Brief Description of Revisions	Date
A	Create	2026-08-28
B	Revised Pin Definition	2026-10-08



Email: nimotion-al@nimotion.com

Beijing NiMotion Control Technology Co.,Ltd.