

NGM20F0

Integrated Electric Gripper

Instruction 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 electric gripper 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 electric gripper, please use the primary and secondary reinforced insulated DC power supply.	Danger of electric shock.
Please cut off the power supply of the electric gripper during power failure, otherwise the electric gripper will start suddenly after restoring the power supply.	Danger of injury.
When the electric gripper is running, please ensure safety before releasing the holding force of the electric gripper.	Danger of injury.
Do not use the electric gripper 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 electric gripper is strictly prohibited from being impacted: If it is impacted, the electric gripper 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 electric gripper power is OFF: If the motor shaft is turned at more than 400rpm when the electromechanical power is OFF, the electric gripper may cause drive damage due to regenerative current.	Risk of equipment failure.
When using the electric gripper, do not exceed its specification value.	Danger of injury and motor fault.
Do not hold the electric gripper 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 electric gripper.	Danger of injury.
Do not stack obstacles hindering ventilation around the electric gripper to ensure heat dissipation.	Danger of motor fault.
Do not touch the electric gripper 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 electric gripper according to the specified parameters.	Danger of motor fault and fire.
Please install an emergency stop device or emergency stop circuit outside the electric gripper 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 electric gripper 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 electric grippers are used in parallel, the grounding resistance between the ground of each electric gripper 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 electric gripper shell shall be installed on the electric gripper bracket through the installation hole. The bracket shall be reliably connected to the ground, and the grounding resistance shall be less than or equal to 0.1Ω.	Danger of motor fault.
The power supply of the electric gripper 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 electric gripper, otherwise it may cause injury. For inspection or repair, please contact Nimotion, inc.	
When the electric gripper 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 electric gripper 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.	

Summary

Preface

Thank you for using the NGM series integrated electric gripper products of Nimotion, inc. Please read this manual carefully before using!

The NGM series integrated electric gripper products are high-performance, low-power stepper servo solutions. Combining an STM42 integrated stepper servo motor with a finger-clamping mechanism, these devices support MODBUS RTU (RS485) or CANopen bus control, featuring a streamlined design, compact structure, compact size, and simplified wiring. With superior performance, exceptional quality, and outstanding cost-effectiveness, our products are designed to help you achieve your desired motion control objectives.

As our company is committed to the continuous iterative improvement of integrated motors, so the information provided by the company should be changed, please refer to the latest version without prior notice.

About Manuals and Acquire

- Unauthorized reprinting or copying of all or part of the contents of this manual is prohibited.
- Please understand that the performance, specifications and appearance of the product may be changed without prior notice due to improvements.
- We strive to make the content of this manual as correct as possible. If you find any problems or errors or omissions, please contact Nimotion, inc.
- 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.

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1. Product Inspection and Model Description

1.1 Unpacking Inspection

Please check the following items when unpacking:

- Whether it is the ordered product: Please check that the model and specification on the nameplate of the electric gripper is the same as your order.
- Whether the product is damaged: Visually inspect the appearance for damage or scratches.
- Whether the screws are loose: Whether any screws are not locked or fall off.
- Electric gripper without brake check whether the shaft is running smoothly: Rotate the electric gripper shaft by hand, if it can run smoothly, it means that the electric gripper shaft is normal.
- Electric gripper with brake check whether the brake is normal: If the electric gripper shaft is locked, the brake is normal.
- In case of any of the above situations, please contact us for proper solution.

Complete operational product components shall be included as follows:

- Integrated electric gripper.
- Communication cable required.
- Communication interface components required.

1.2 Product Model

1.2.1 Naming Rules

<u>NGM</u> <u>20</u> <u>F0</u> - <u>485</u> - <u>L</u> - <u>4</u>					
①	②	③	④	⑤	⑥
① NGM: Integrated Stepper Gripper	② Stroke: 20-20mm				
③ Force: F0-150N	④ Communication mode: CANopen-CANopen, 485-RS485				
⑤ Fuction Code	⑥ Motor Code				

Figure1-1 Naming Rules for NGM Series

1.2.2 Installation Dimension

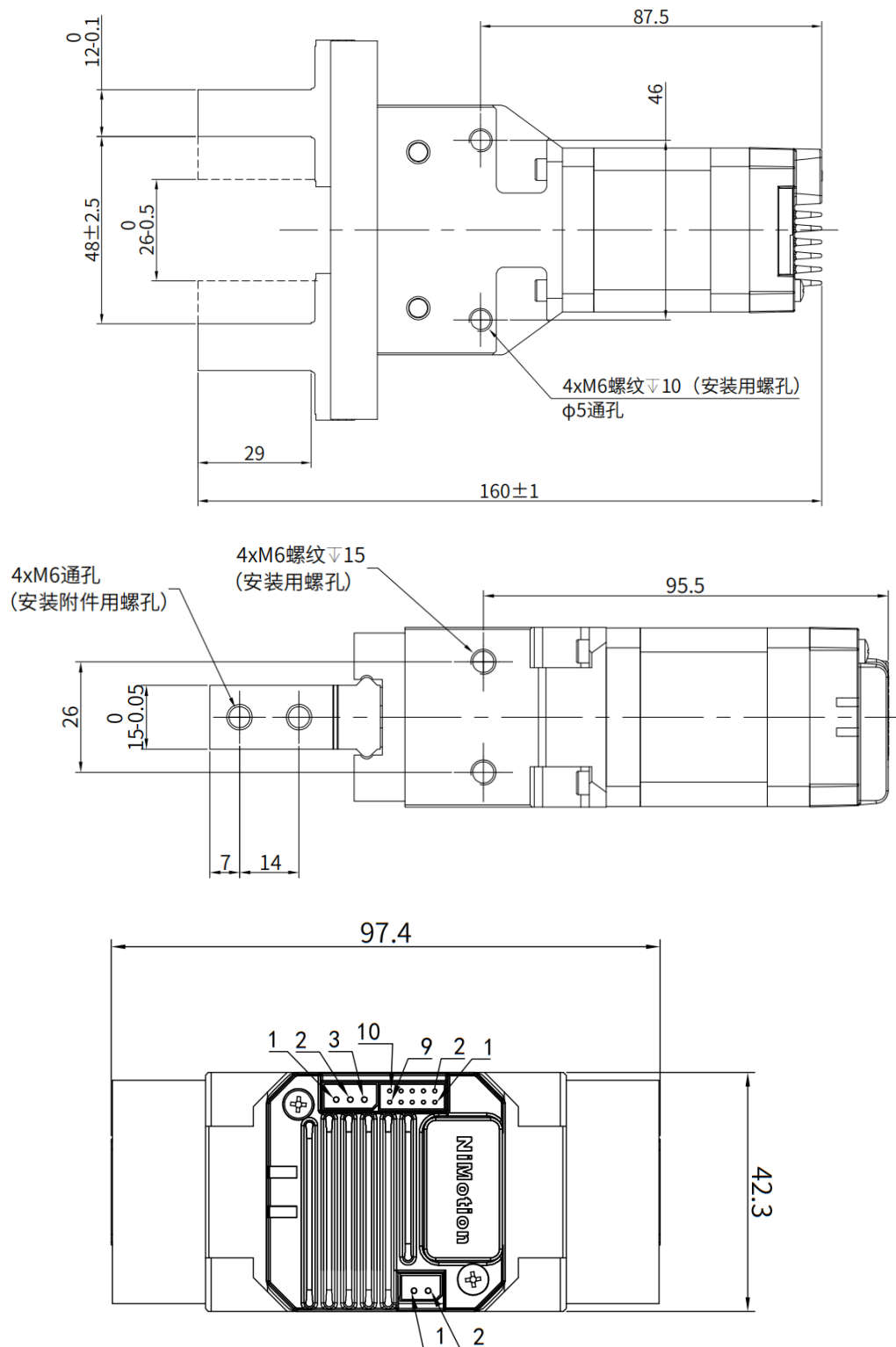


Figure1-2 Installation dimensions of electric gripper

Table 1-1 NGM1240 Product Models and Partial Key Dimensions

Model	Length (X in the diagram) (mm)	Clamping force(N)	Whether a brake is included	Total run(mm)	Weight (kg)
NGM20F0-CANopen-L-4	160	150	No	20	1
NGM20F0-485-L-4	160	150	No	20	1

2.Specifications

2.1Technical Specifications

Table 2-1 Electric gripper Technical Specification

Model		NGM20F0-XXX-L-4
Total run		20mm
Clamping force		150N
Unidirectional stroke action time		0.5s
Driving mode		Screw rod + gripper claw head
Clamping jaws allow load torque		MX:6N.m; MY:3N.m ;MZ:3 N.m
Weight		1000g
Size		160*97.4*42.3mm
Rated current		1A
Rated voltage		DC24V
Insulation grade		B
Levels of protection		IP20
Operating Environment	Temperature	0~40(℃)
	Humidity (RH)	10%~85% RH, non-condensing
	Altitude (m)	<1000
	Installation Environment	No corrosive gases, flammable substances, oil mist, etc., and no strong vibrations.
	Installation Method	Horizontal or vertical
	Storage Temperature	-40~85
	Pollution Level (ppm)	SO ₂ : <0.5; H ₂ S: <0.1
Encoder	Type	Built-in magnetic encoder
	Resolution	17 bits
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

Table2-2 Electric gripper Technical Specification

Model		NGM20F0-XXX-L-4
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: 1channels 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 Control Mode Control Signal	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.

2.2Indicator

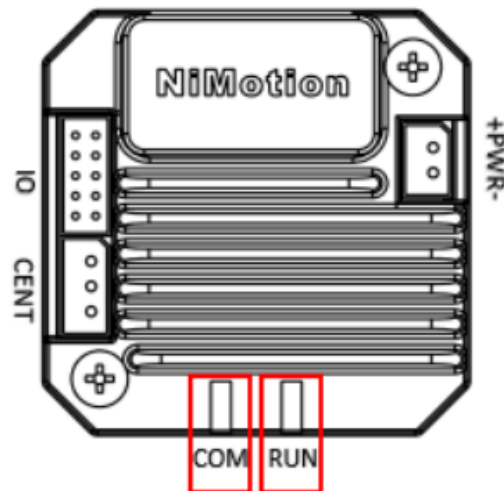


Figure2-1 Indicator

Table2-3 Meaning of Indicator

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

2.3 Definition of Terminal

2.3.1 Power Port

As shown in the figure below. When the motor is placed on its side as shown in the figure below, when looking directly at the interface, the top of the power port is the first pin.

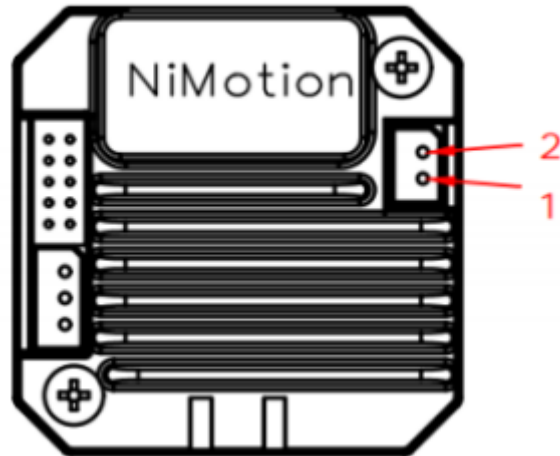


Figure2-2 Power Cable

Table2-4 Definition of Power Cable Ports

Pin	Function	Note
1	GND	-
2	VCC	12-36VDC

Note: The positive and negative poles of the power cord cannot be connected in reverse, otherwise the motor may be damaged. And the original manufacturer cannot provide warranty service for such damage.

2.3.2 Communication Port

The communication port CNET is used for the connection of RS485/CANopen communication. When the motor is placed on its side as shown in the figure below, when looking directly at the interface, the top of the CNET terminal is the first pin.

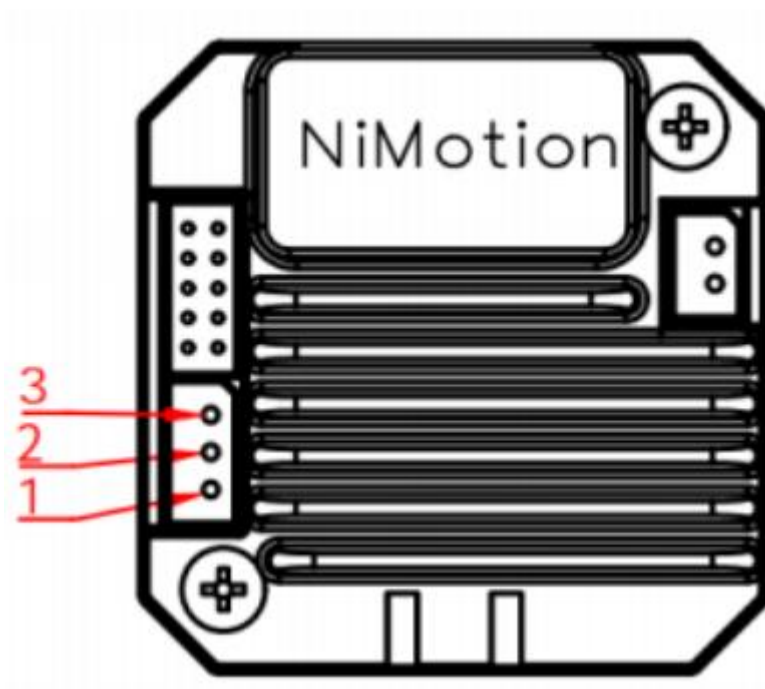


Figure2-3 Pins of Communication Cable

Table2-5 Definition of Communication Cable Ports

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

2.3.3 Digital Input and Digital Output(I/O)

Digital input and output connection port.

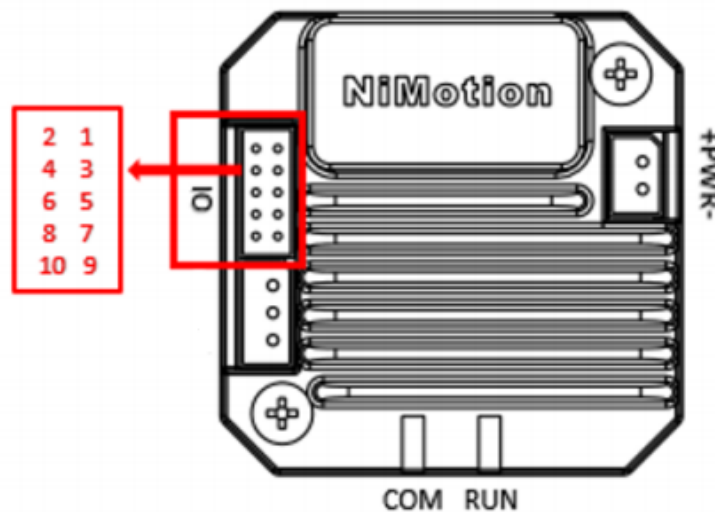


Figure2-4 Pins of I/O Cable

Table2-6 Definition of I/O Cable Ports

Pin	PIN bits	Function
1	DI1	Support for 5V and 24V level inputAll adopt high-speed bidirectional optical coupler, support PWM
2	+5V_COM	+ 5V input common terminal
3	DI2	Support for 5V and 24V level inputAll adopt high-speed bidirectional optical coupler, support PWM
4	+24V_COM	+ 24V input common terminal
5	DI3	Support for 5V and 24V level inputAll adopt high-speed bidirectional optical coupler, support PWM
6	-	-
7	DO1	Output method: Support MOS open-drain outputCurrent: 0.5A@36V
8	GND	Ground
9	DO2	Output method: Support MOS open-drain outputCurrent: 1.0A@36VNote: For the motor with brake, the DO is not available.
10	/	/

2.3.4 Wiring Diagram of I/O

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

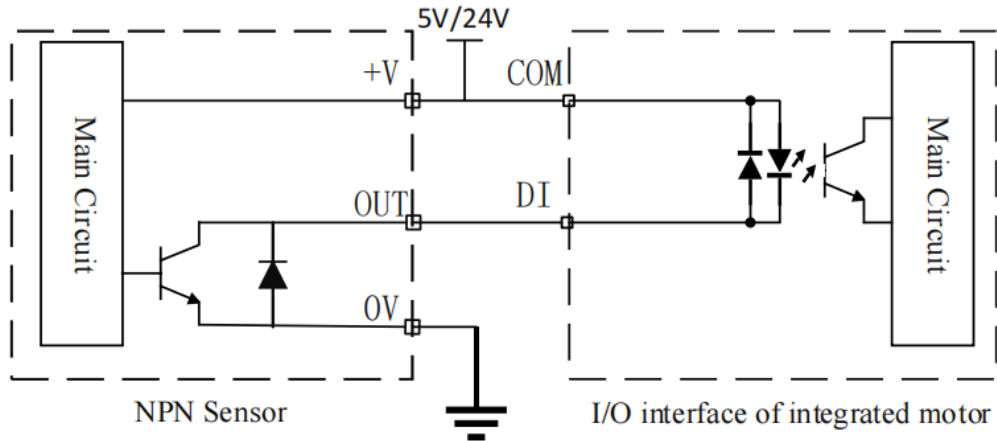


Figure 2-9 Schematic diagram of DI input port is connected to NPN sensor

+V terminal of the sensor and the COM terminal of the I / O interface are connected to the positive 5V / 24V power supply, 0V terminal of the sensor is connected to the negative power supply, and DI terminal of the I / O interface is connected to OUT terminal of the sensor..

DI1, DI2, DI3 (input terminals) are connected to the PNP sensor.

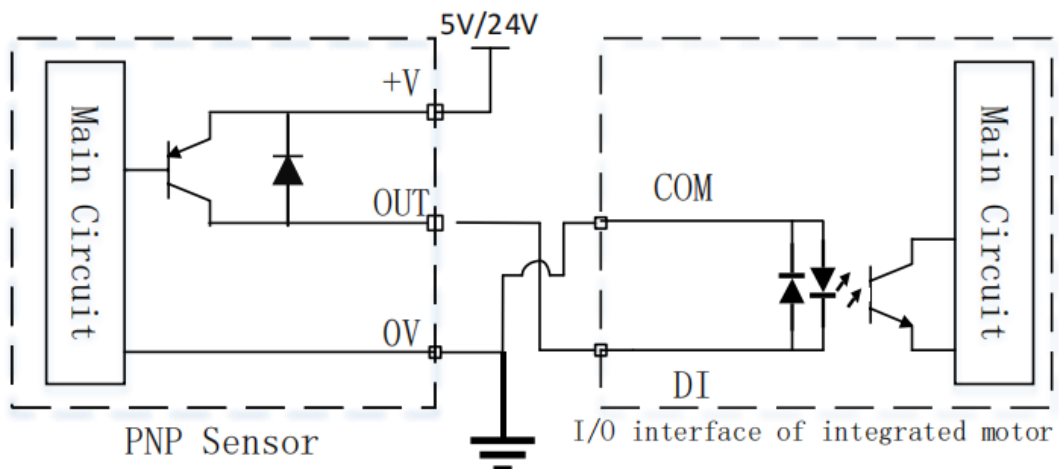


Figure2-10 Schematic diagram of DI input port is connected to PNP sensor

The 5V / 24V positive pole of the power supply is connected to +V terminal of the sensor, 0V terminal of the sensor is connected to the negative pole of the COM terminal of the I / O interface, and OUT terminal of the sensor is connected to DI terminal of the I / O interface.

DI1, DI2, DI3 (input terminals) are connected to the switch (Common-anode).

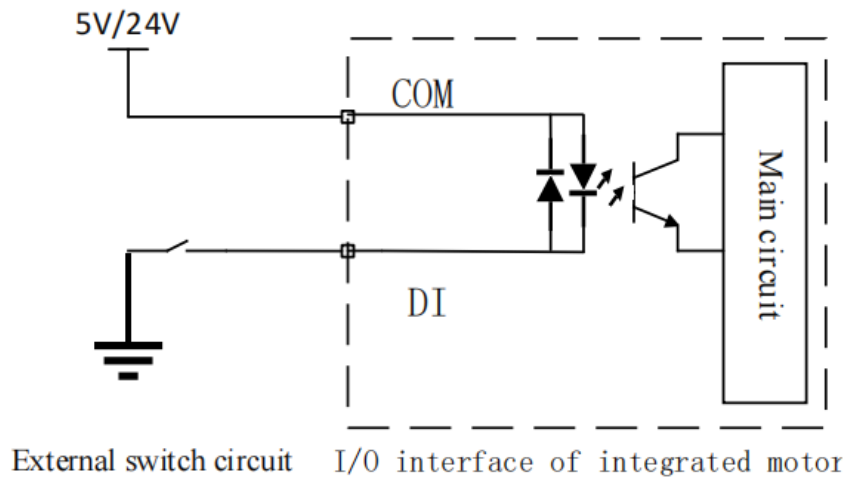


Figure2-11 Schematic diagram of DI input port is connected to switch

The 5V / 24V positive pole of the power supply is connected to COM terminal of the I / O interface, one end of the switch is connected to DI terminal of the I / O interface, and the other end of the switch is connected to the negative pole of the power supply.

DI1, DI2, DI3 (input terminals) are connected to the switch(Common cathode)

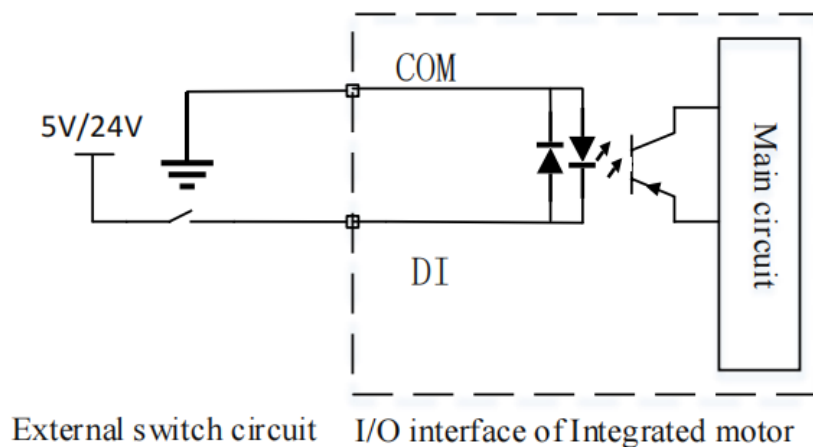


Figure2-11 Schematic diagram of DI input port is connected to switch

The 5V / 24V positive pole of the power supply is connected to one end of the switch, the other end of the switch is connected to DI terminal of the I / O interface, and COM terminal of the I / O interface is connected to the negative pole of the power supply.

DO1 (output terminal) is connected to the LED.

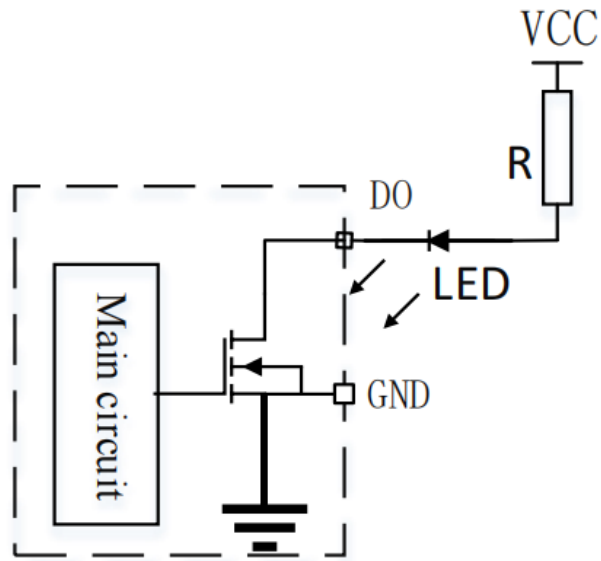


Figure2-12 Schematic diagram of DO Port is connected to the LED

The positive terminal of the power supply VCC is connected to the positive electrode of the LED lamp after the current limiting resistor, DO terminal of the I / O interface is connected to the negative electrode of the LED lamp, and GND terminal of the I / O interface is connected to the negative electrode of the power supply.

3. Install and Connect

3.1 Installation Precautions

3.1.1 Installation Places

- ① Please install it in the control cabinet without direct sunlight, and do not place flammable materials around it.
- ② Do not use this product in a corrosive environment such as hydrogen sulfide, sulfite, chlorine, ammonia, chlorinated gas, acid, alkali, salt, or in an inflammable gas environment or combustible materials.
- ③ No cutting fluid, oil mist, iron powder, iron filings and other places.
- ④ Well-ventilated, dry and dust-free place.
- ⑤ A place without vibration.
- ⑥ Do not use gasoline, diluent, alcohol, acid and alkaline cleaning agent, so as to avoid the shell discoloring or damage.

3.1.2 Installation Requirements

- ① The installation direction of the integrated electric gripper should be consistent with the direction of the heat sink and the heat dissipation duct of the system to ensure good heat dissipation effect.
- ② The wiring end face of the integrated electric gripper shall reserve at least 30mm space for easy maintenance and operation.
- ③ The integrated electric gripper wiring should be tied at a distance of 30 ~ 40mm from the electric gripper to prevent the loosening of the plug for a long time.
- ④ Before powering the integrated motor, make sure that the communication cables and power cables are connected correctly. If you need to use the IO function, you should connect the corresponding IO cables (Recommend using our company's standard cable).
- ⑤ According to the company's selected communication cable to correctly select the installation network, optional terminal matching head installed in the network terminal position, to achieve signal terminal matching.

3.1.3 Installation Cautions

- ① Do not make the wire "bend" or exert "tension" on it;
- ② When connecting the connectors, make sure that there are no foreign objects such as garbage or metal sheets in the connectors.
- ③ When carrying out the operation under the condition of keeping the cable connected, please be sure to hold the main body of the integrated motor. If only catch cables carrying, could damage the connector or cut cables.
- ④ If the use of curved cable, should be fully paid attention in the wiring operation, do not apply stress to the connector part. If stress is applied to the connector portion, it may cause connector damage.
- ⑤ During product installation, be sure to confirm the screw type and length required in the product structure diagrams (Figure 1-2 and Figure 1-3). The locking depth of the assembled screws must not exceed the depth of the mounting threaded holes shown in the diagrams. Using excessively long screws will cause damage to the motor.

3.2 Cable Wiring and grounding Requirement

3.2.1 Wiring Requirements

Alternating electromagnetic fields around AC cables, especially in the power supply and integrated electric gripper cables, may interfere with the integrated electric gripper and other equipment. Please note the following requirements:

- ① The integrated electric gripper power cord adopts 16AWG ~ 24AWG twisted-pair copper wire, and the temperature resistance should be greater than or equal to 105°C (the value is the recommended value, please select according to the actual

working conditions).

② The communication cable adopts the characteristic impedance of 120Ω, 22AWG ~ 24AWG twisted-pair shielded line, and the temperature resistance should be greater than or equal to 105°C (the value is the recommended value, please select according to the actual working conditions).

③ The length of the IO channel signal cable does not exceed 1m, the use of 24AWG copper wire, the temperature resistance should be greater than or equal to 105 °C (the value is the recommended value, please select according to the actual working conditions), greater than 1m signal to choose a shielded cable.

④ All kinds of cable wiring should be divided into bundles and slots. Different types of cables should be crossed, and cables should be at right angles to each other. The I/O signal cable and communication cable are more than 0.2m away from the system power cable.

3.2.2 Grounding Requirements

The product adopts common ground design internally, and the power supply, communication cable and IO port are common ground design. In order to make the product correctly grounding, please observe the following precautions:

① In order to prevent electric shock, please be sure to ground the ground terminal. For the method of grounding, please follow the relevant national or regional electrical regulations.

② In order to prevent electric shock, please confirm that the protective grounding conductor conforms to the technical specifications and local safety standards, and minimize the length of the grounding wire.

③ When using multiple devices, follow the instructions for grounding all devices. Improper grounding of the device may cause maloperation of the equipment.

④ The grounding terminal must be reliably grounded, otherwise it will lead to abnormal work or even damage of the equipment.

⑤ Do not share the ground terminal with the neutral wire (N-terminal) of the power supply.

⑥ Protective grounding conductor must use yellow-green copper conductor cable, and cannot be connected with circuit breakers and other switchgear.

⑦ Recommended installation on the conductive metal surface, to ensure that the entire conductive bottom of the equipment and the installation surface is good lap.

Common Power Supply Ground

In the communication networking of multiple integrated motors, 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 integrated electric gripper shall be isolated by electrical isolation technology, and the ground of the communication ground (RS485_GND, CAN_GND) and the communication interface of the integrated electric gripper shall be common (common GND, namely communication interface GND).

Protective Grounding

The integrated electric gripper shell should be installed to the electric gripper bracket through the mounting hole, and the bracket should be reliably connected to the ground. The resistance between the integrated electric gripper shell, the accessible grounding metal shell and the grounding terminal should not exceed 0.1Ω.

3.3 Communication Distance

3.3.1 RS485 Communication

RS485 communication transmission medium can choose type A and type B two kinds of wire, A is shielded twisted pair, B is ordinary twisted pair. However, Type A wire is specified in the EN50170 standard, and Type A has a larger extension length than type B, as shown in Table 12.

Table3-1 Communication Transmission Medium of RS485

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	—
Wire core diameter (mm)	0.64	>0.53
Wire core cross-sectional area (mm^2)	>0.34	>0.22

Table3-2 Communication Distance and Baud Rate of RS485

Baud rate (bps)	Bus length (m) (Type A)	Bus length (m) (Type B)	Note
1.5M	100	Not Recommended	This parameter is the estimation in the ideal state and is for reference only. The actual application is affected by many factors. Please refer to the actual application
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 the ideal environment (the load RS485 bus device is one, the baud rate is 9600bps, the use of high-quality communication wire) the longest communication distance of RS485 bus theory is about 1200m.

RS485 bus communication distance reduction factors: there are a number of loads RS485 equipment, wire characteristic impedance does not meet the standard, the wire diameter is small, non-quality converter, equipment lightning protection complex and baud rate is too high factor, will shorten the RS485 communication distance.

For how to reduce interference and the impact of communication distance reduction: Both to increase the transmission distance, but also to ensure the stability of the transmission signal. It is usually necessary to stay away from interference sources (large mechanical equipment) as far as possible, increase shielding measures, increase repeaters, reduce the transmission rate (baud rate), and use high-quality communication cables and converters and so on.

3.3.2 CAN Communication

Table3-3 Communication Distance and Baud Rate of CAN

Baud rate (bit/s)	Bus length (m)	Nominal bit time(μ s)	Sampling point location	Sampling point range	Note
1M	25	1	87.5% (875 ns)	75%~90%	This parameter is the estimation in the ideal state and is for reference only. The actual application is affected by many factors. Please refer to the actual application
800k	50	1.25	87.5% (1.09375 μ s)	75%~90%	
500k	100	2	87.5% (1.75 μ s)	85%~90%	
250k	250	4	87.5% (3.5 μ s)	85%~90%	
125k	500	8	87.5% (7 μ s)	85%~90%	
50k	1000	20	87.5% (17.5 μ s)	85%~90%	
20k	2500	50	87.5% (43.75 μ s)	85%~90%	
10k	5000	100	87.5% (87.5 μ s)	85%~90%	

The above tabulated data are the parameters in the ideal state. In practical application, when the distance of the wire to transmit the signal is too long, the signal will be distorted due to environmental problems (such as electromagnetic, electric field interference) and the characteristic impedance of the wire itself.

How to optimize the communication distance of the CAN bus: reduce the length of the branch, add appropriate matching resistance to the long branch, use shielded cables and correct grounding, reduce the number of CAN bus nodes, reduce the transmission rate (baud rate), increase the CAN repeater or hub, etc.

3.4 Other Cable Wiring

3.4.1 Wiring Diagram of Communication

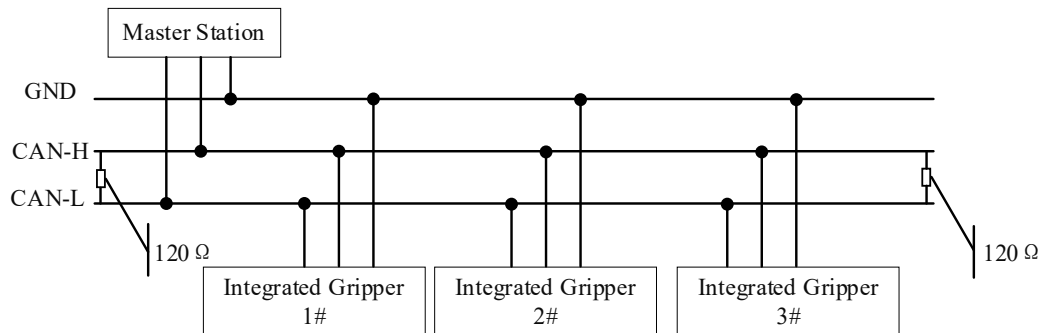


Figure3-1 Wiring Diagram of CANopen Communication

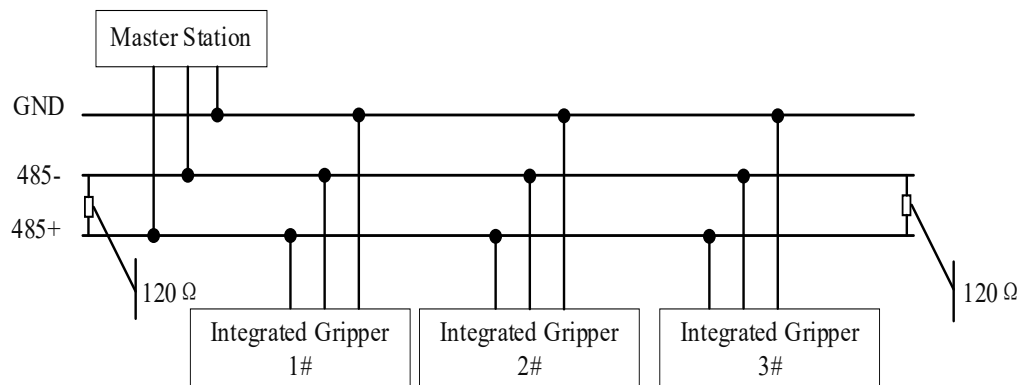


Figure3-2 Wiring Diagram of RS485 Communication

3.4.2 Network wiring requirements

a. RS485 networking requirements

- ① RS485 can use a variety of types of media for transmission, but should use in accordance with the "GBT 19582.2-2008 Modbus protocol implementation guide on serial links" standard cable.
- ② RS485 bus please be sure to use Daisy chain connection, all nodes RS485 signal reference connected together.
- ③ The terminal matching resistor must be configured at the end of the cable to prevent RS485 signal from reflection.
- ④ The node branch should be as short as possible: long branches cause obvious characteristic impedance mismatch, and then cause signal reflection, so the branch should be ensured as short as possible, generally not more than 30cm.
- ⑤ The number of bus nodes: depends on the actual application conditions and transmission media hardware characteristics.

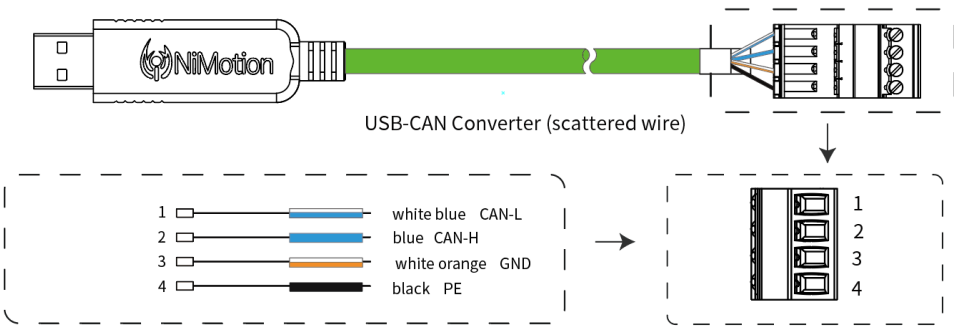
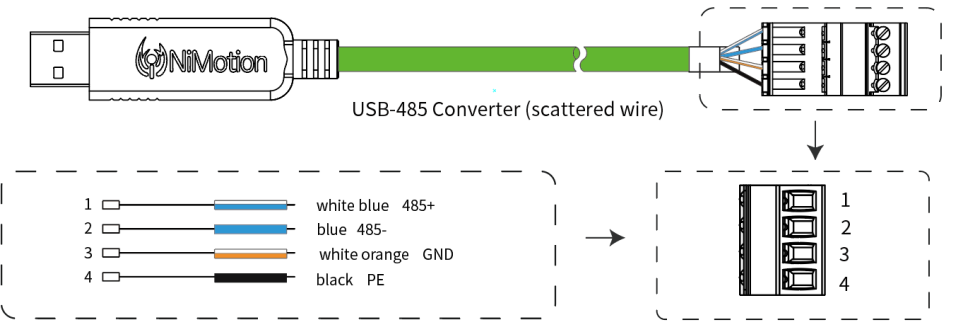
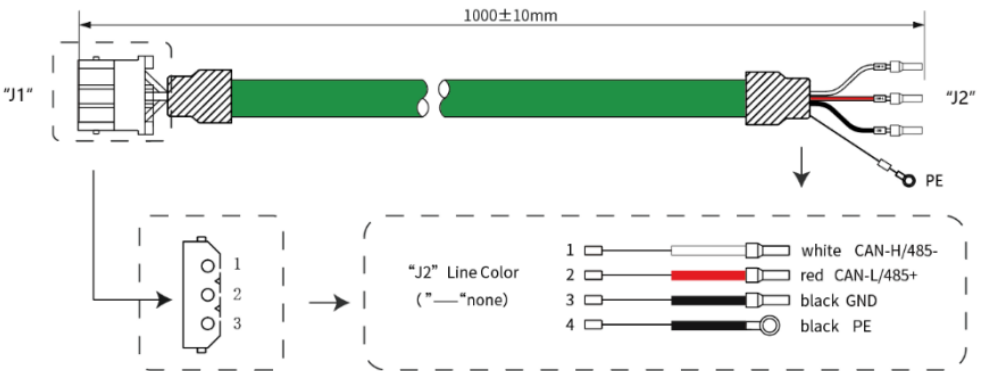
b. CAN networking requirements

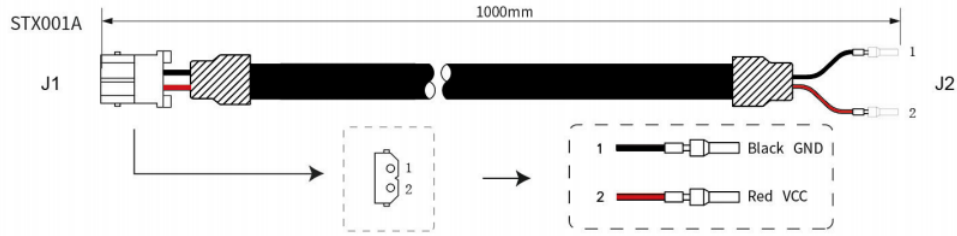
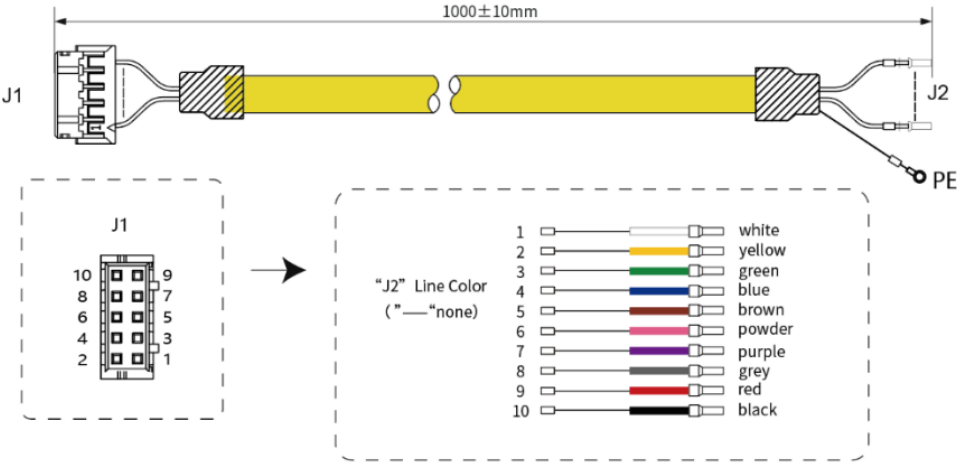
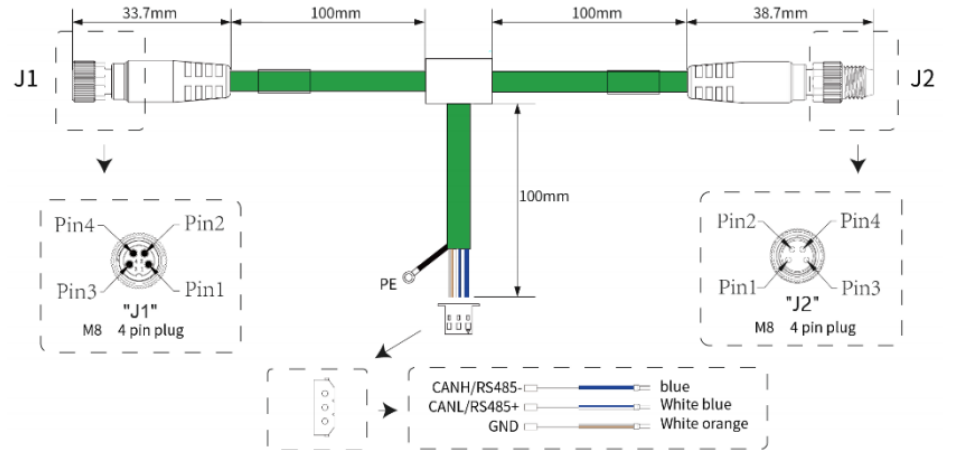
- ① Cables shall be connected in accordance with GBT 41588.3-2022 Road Vehicle Controller LAN (CAN) Part 3: Low-Speed Fault-tolerant, media-related Interfaces.
- ② The CAN bus please be sure to use Daisy chain connection, and the reference ground of CAN signal of all nodes is connected together.
- ③ The terminal matching resistor must be configured at the end of the cable to prevent CAN signal reflection.
- ④ The length of the branch node should not be too long, generally not more than 30cm.
- ⑤ The number of bus nodes: depends on the actual application conditions and transmission media hardware characteristics.

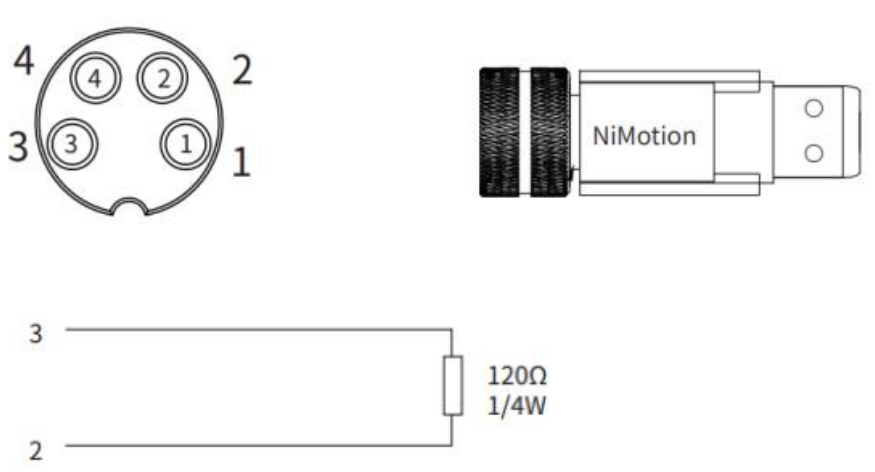
4. Product Selection

4.1 Cable Selection

Table 4-1 Cable Selection

NGM20 Series Integrated Servo Gripper	
Cable Name	Cable Wiring Diagram
SCM-USBCANI-L Converter	 USB-CAN Converter (scattered wire)
SCM-USB485A-L Converter	 USB-485 Converter (scattered wire)
STX002A Communication Cable	 1000±10mm "J1" "J2" PE "J2" Line Color ("—" "none") 1 white CAN-H/485+ 2 red CAN-L/485- 3 black GND 4 black PE

NGM20 Series Integrated Servo Gripper	
Cable Name	Cable Wiring Diagram
STX001A Power Cable	 Diagram of the STX001A Power Cable. The cable length is 1000mm. It features a J1 connector on the left and a J2 connector on the right. The J2 connector has two pins: 1 (Black GND) and 2 (Red VCC).
STX003 IO Cable	 Diagram of the STX003 IO Cable. The cable length is 1000±10mm. It features a J1 connector on the left and a J2 connector on the right. The J2 connector has 10 pins with the following line colors: 1 (white), 2 (yellow), 3 (green), 4 (blue), 5 (brown), 6 (powder), 7 (purple), 8 (grey), 9 (red), and 10 (black). The J1 connector has 10 pins numbered 1 to 10.
Communication Cable	 Diagram of the Communication Cable. The cable has a total length of 33.7mm + 100mm + 100mm + 38.7mm = 272.4mm. It features a J1 connector on the left and a J2 connector on the right. The J1 connector is an M8 4 pin plug with pins labeled Pin1, Pin2, Pin3, and Pin4. The J2 connector is an M8 4 pin plug with pins labeled Pin1, Pin2, Pin3, and Pin4. The cable has a central 100mm section with a PE (Protective Earth) connection. The wiring is as follows: CANH/RS485- (blue), CANL/RS485+ (White blue), and GND (White orange).

NGM20 Series Integrated Servo Gripper	
Cable Name	Cable Wiring Diagram
STRX001-120	
1. Communication cable: Used for communication with the integrated motor, connecting the integrated electric gripper to a computer for parameter setting and debugging. 2. Power cable: Used to supply power to the integrated motor. 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.	

5. NimSuite Debugging Software Platform Usage

5.1 Introduction to Claw Clamp Software Usage

5.1.1 Communication Connection

Double-click to launch the software and navigate to the login page as shown below. Select either CANopen or MODBUS as the communication protocol, then click 'Login' to access the main software interface.



Figure 5-1 Software login interface

After entering the software main page, click the "Communication Connection" button in the upper left corner to access the communication settings page. Select the converter type, communication baud rate, and device address range. Click OK to let the software automatically search for devices. As shown in the figure below.

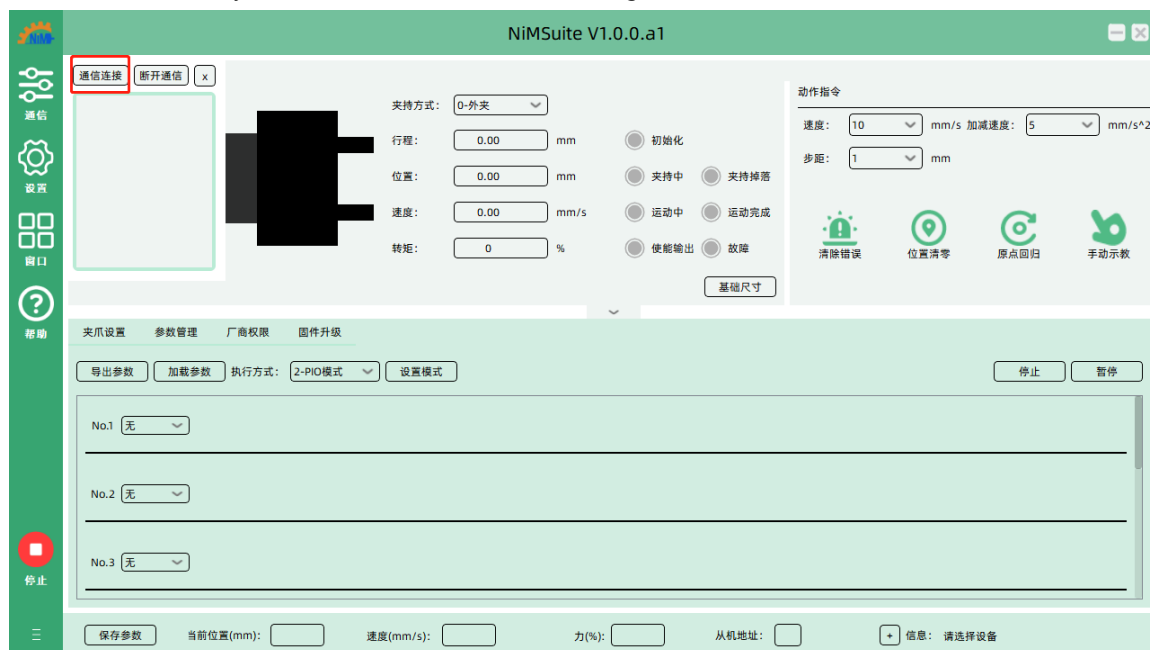


Figure 5-2 Software communication connection



Figure 5-3

The device is found as shown below.



Figure 5-4

3.1.2 Introduction to Basic Interface

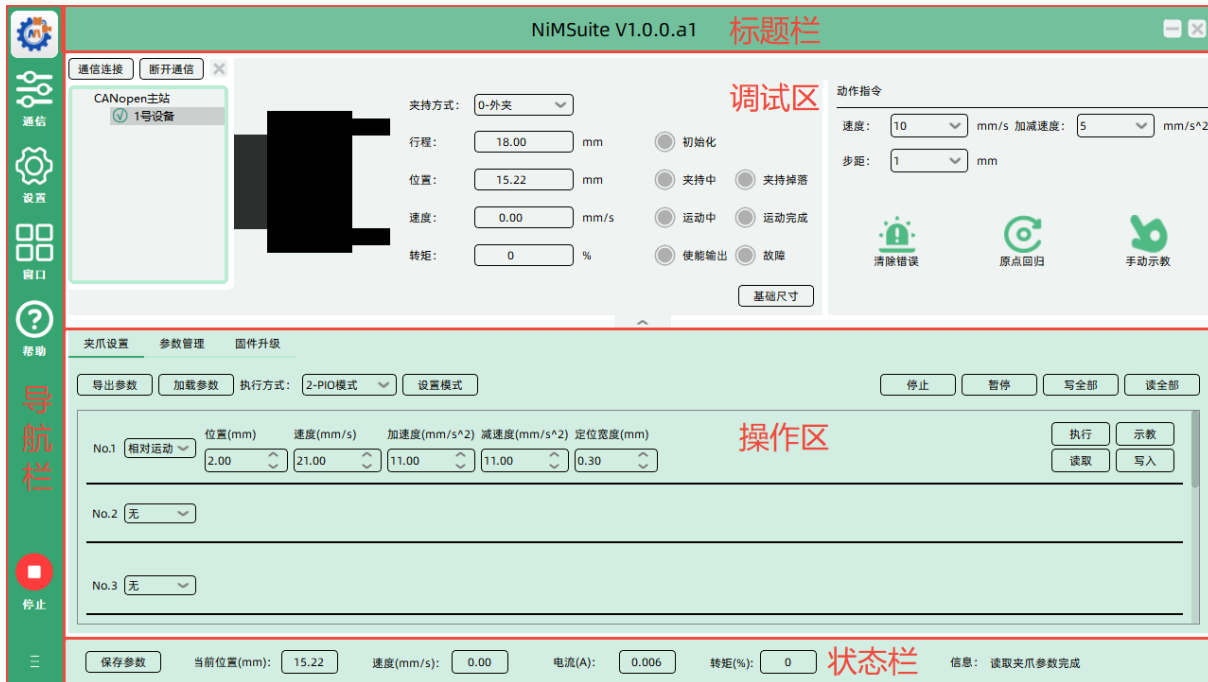


Figure 5-5

Set your desired motion parameters in the operation area, as shown in the figure below.

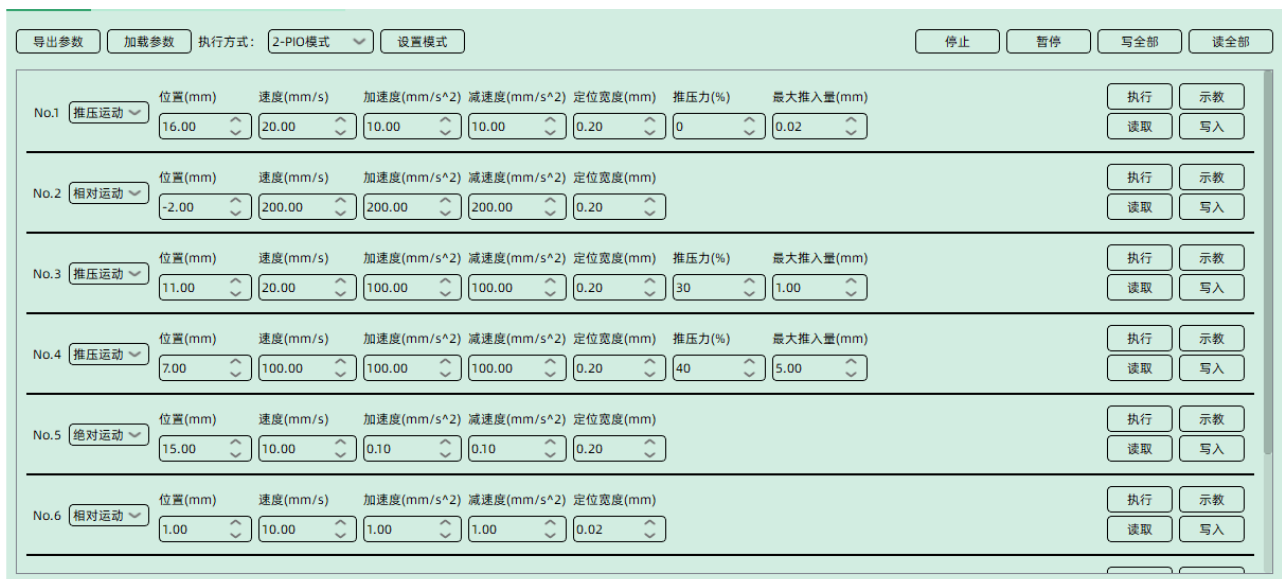


Figure 5-6

After completing parameter configuration, click the "Save Parameters" button in the status bar to automatically save the settings. Clicking the "Execute" button will activate the corresponding gripper action (default motion parameters are preconfigured). For instruction explanations in the operation area, refer to the appendix. Additional software operations should be consulted in the user manual and configuration examples.

5.2 Clamping Claw Motion Command Settings

5.2.1 Rapid positioning movement

(commonly used for quick positioning of gripper to an open position or target position)

Case 1: [Absolute Motion]

Example: Given the dimensions of the object to be gripped, use an electric clamp to quickly secure it, as shown in the figure below.

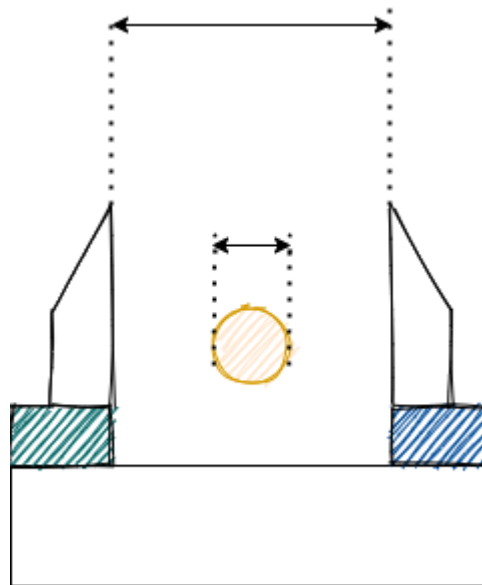


Figure 5-7

The specific implementation steps are as follows:

- ① Through absolute motion, the gripper reaches the open position as shown in the figure below.
- ② Through absolute motion, the gripper can rapidly reach the clamping position;

No.1	绝对运动	位置(mm)	速度(mm/s)	加速度(mm/s ²)	减速度(mm/s ²)	定位宽度(mm)	等待时间(s)
		18.00	10.00	10.00	10.00	0.20	0.000
No.2	绝对运动	位置(mm)	速度(mm/s)	加速度(mm/s ²)	减速度(mm/s ²)	定位宽度(mm)	等待时间(s)
		5.00	10.00	10.00	10.00	0.20	0.000

Figure 5-8

Case 2: [Relative Motion]

Relative motion involves movement based on the current position of the gripper, as shown in the figure below.

No.	运动模式	位置(mm)	速度(mm/s)	加速度(mm/s ²)	减速度(mm/s ²)	定位宽度(mm)	等待时间(s)
No.1	相对运动	1.00	10.00	10.00	10.00	0.20	0.000
No.2	相对运动	-2.00	10.00	10.00	10.00	0.20	0.000

Figure 5-9

5.2.2 Rapid Flexible Pushing

(commonly used for quick flexible clamping or external support of workpieces by gripper)

For instance, use approximately 30% of the clamping force from the electric jaw to internally grip a workpiece with an outer diameter of about 5 mm. As shown in the figure below, the specific operational steps are as follows:

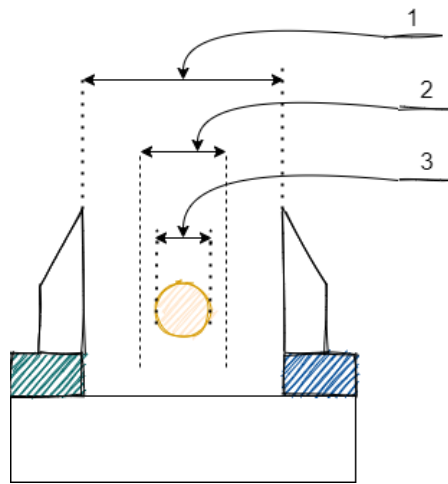


Figure 5-10

Through absolute motion, the gripper reach the open position, as shown in Figure 1 above.

No.	运动模式	位置(mm)	速度(mm/s)	加速度(mm/s ²)	减速度(mm/s ²)	定位宽度(mm)	等待时间(s)
No.1	绝对运动	18.00	10.00	10.00	10.00	0.20	0.000

Figure 5-11

To achieve faster approach to the workpiece to be clamped, the clamping motion in the workpiece direction consists of two phases: the rapid positioning phase from Position 1 to Position 2, and the pushing phase from Position 2 to Position 3. The rapid positioning phase employs position control, enabling quick position attainment with customizable positioning distance and speed. The pushing phase utilizes torque control, designed for slower approach speeds. Upon reaching the target object, the clamping success is determined by the clamping torque magnitude, with adjustable parameters including pushing torque, pushing speed, and pushing force stability thresholds.

Set the pushing speed, pushing stabilization time, and pushing error for the pushing phase (Note: These parameters are global variables applicable to all pushing motions within the 8-segment motion parameters).

夹爪设置	参数管理	厂商权限	固件升级
点位设置	执行方式: 2-PIO模式		
PID调节	推压时间: 1.000 s	推压速度: 1.00 mm/s	
单位换算	推压误差: 5.00 %		
原点回归	加减速模式: 0-线性		
出厂参数	起始点位: 1	循环次数: 0	
限制参数	结束点位: 2		
设置参数			

Figure 5-12

Set the motion parameters as shown in the figure below. The second phase parameters include a rapid positioning stage and a pushing stage. After the gripper opens, when executing the second phase parameters: First, the gripper rapidly moves to a 6mm position at 10mm/s. Then it switches to pushing mode, applying inward clamping force at 1mm/s with a maximum insertion depth of 6mm. During the clamping process, the system detects object engagement when the gripping torque reaches 30%, indicating successful capture. If the maximum insertion depth is achieved without reaching the target torque, the task is deemed a gripping failure (see appendix for detailed instruction usage).

No.1	绝对运动	位置(mm)	速度(mm/s)	加速度(mm/s ²)	减速度(mm/s ²)	定位宽度(mm)	等待时间(s)
		18.00	10.00	10.00	10.00	0.20	0.000

No.2	推压运动	位置(mm)	速度(mm/s)	加速度(mm/s ²)	减速度(mm/s ²)	定位宽度(mm)	等待时间(s)	推压力(%)	最大推入量(mm)
		6.00	10.00	10.00	10.00	0.20	0.000	30	6.00

Figure 5-13

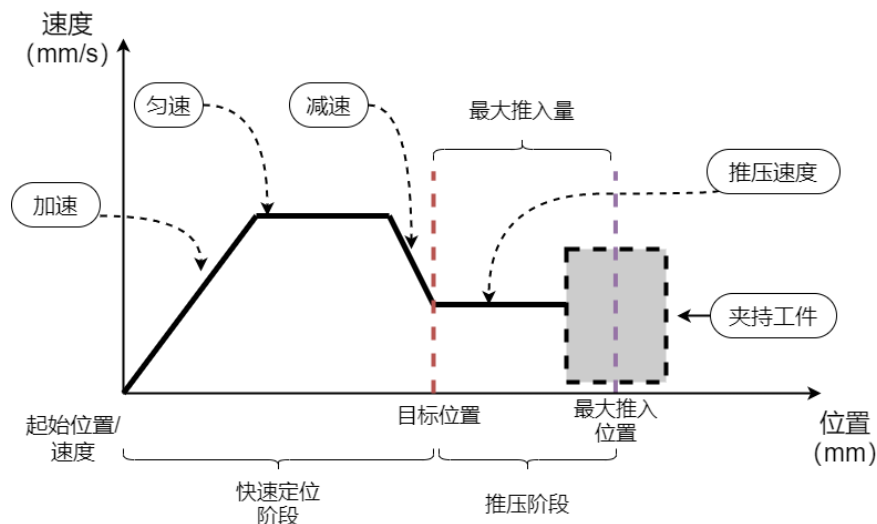


Figure 5-14

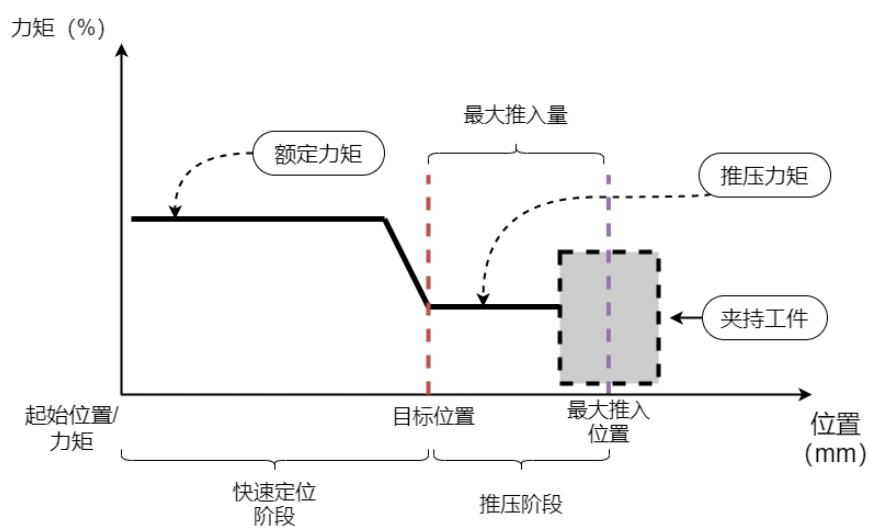


Figure 5-15

5.2.3 Basic Dimension Function Example (Using Special Clamps for Gripper Application)

Using basic size parameters facilitates users in utilizing the actual size dimensions of the gripper.

Case 1: [External Clamp Claw]

If a customer designs an external clamp-type gripper and connects it to the actuator end of our electric gripper as shown in the figure below, when the actuator reaches its minimum engagement distance, if the user-installed gripper fails to achieve full clamping and maintains a certain clearance, the actual gripper movement distance can be configured using basic parameters.

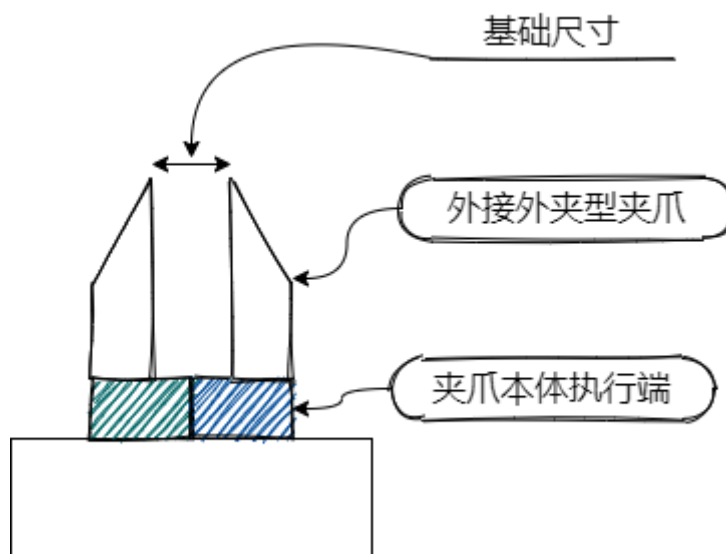


Figure 5-16

For instance, when the customer-installed gripper reaches its minimum distance at our company's electric gripper execution end, there remains a 10mm gap between the user's gripper. If the customer wishes to use the actual opening distance of the external gripper as the control parameter, the following steps can be followed:

Open the clamp configuration software, select external clamping as the holding method, and set the base dimension to 10mm, as shown in the figure below.

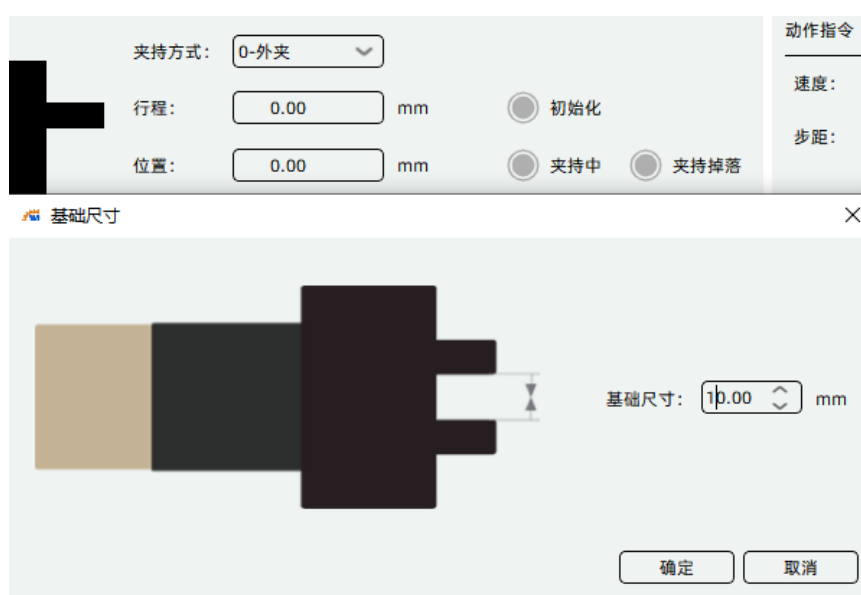


Figure 5-17

If the actual opening distance of the external gripper is set to 15mm, the motion parameters can be configured as shown in the figure below (Note: After setting the base dimensions, the gripper position range becomes 10~28mm).

No.1	绝对运动	位置(mm)	速度(mm/s)	加速度(mm/s ²)	减速度(mm/s ²)	定位宽度(mm)	等待时间(s)
		15.00	10.00	10.00	10.00	0.20	0.000
No.2	相对运动	位置(mm)	速度(mm/s)	加速度(mm/s ²)	减速度(mm/s ²)	定位宽度(mm)	等待时间(s)
		1.00	10.00	10.00	10.00	0.20	0.000

Figure 5-18

Case 2: [Internal Support Clamping Claw]

If the customer designs an internal support-type gripper and connects it to the actuator end of our electric gripper, as shown in the figure below, when the actuator end of our electric gripper reaches the minimum distance (i.e., during clamping), the user's internal support allows the actual gripper movement distance to be set using basic parameters.

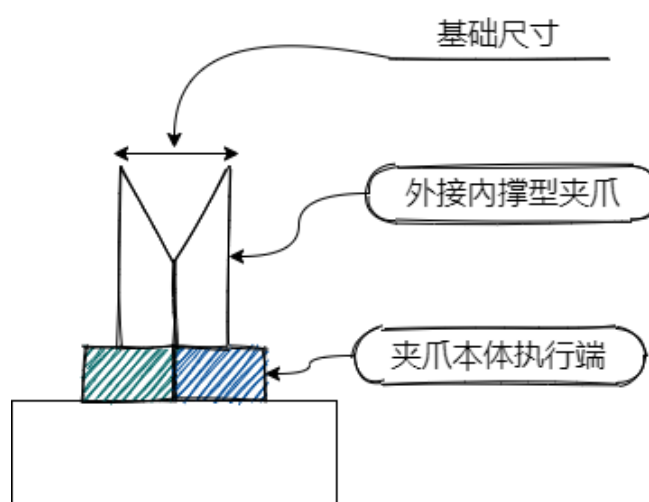


Figure 5-19



Figure 5-20

5.3 Introduction to Claw Communication Control and IO Control Usage

This example demonstrates the communication control and IO control of electric gripper.

5.3.1 Line Connection

(1) Wiring schematic diagram of the gripper and motion controller under IO control mode

Schematic diagram of wiring between motion controller and gripper (refer to the user manual of the motion controller for specific DI/DO terminals)

Wiring schematic diagram of gripper and motion controller under communication control mode

Schematic diagram of wiring between motion controller and gripper (refer to the user manual of the motion controller for specific terminals of CAN/485 communication)

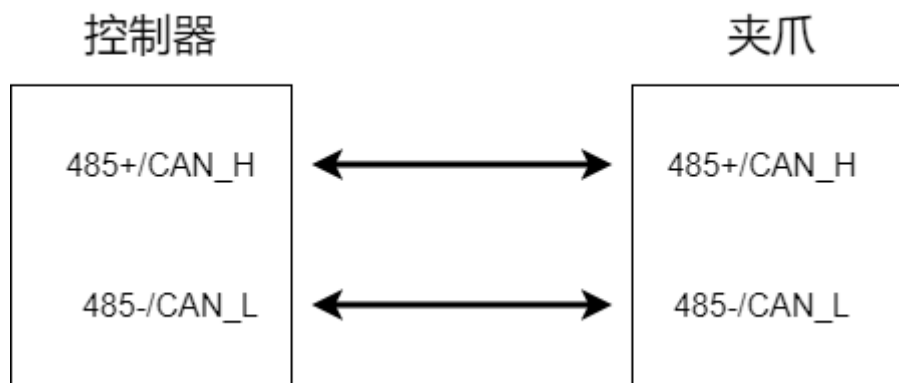


Figure 5-22

5.3.2 Claw Operation under Communication Control

Compared to IO control, communication-based control offers greater scalability, flexibility, and a larger volume of data acquisition. When using communication control, in addition to obtaining gripper status information, it can also acquire position feedback, torque feedback, and error code information. Electric gripper support two communication control bus methods: CANopen and MODBUS RTU (485). Communication-based electric gripper control operates through virtual VDI control. For virtual VDI configuration details, refer to Appendix 8.1. By default, gripper are configured for VDI control upon factory delivery. When using communication control, no modifications are required—only parameter settings for each section need to be configured.

5.3.2.1 Claw Operation under CANopen Communication Protocol

The gripper supports standard CANopen communication, which can be implemented through SDO and PDO communication protocols.

The PDO method is primarily designed for real-time data transmission, ideal for applications requiring rapid data transfer. Its data transmission operates on an event-triggered mechanism, where data is transmitted immediately upon event occurrence without additional requests or responses. In contrast, the SDO method facilitates node parameter configuration and management through a request-response architecture for data read/write operations. This approach is particularly suitable for scenarios such as node parameter setup, device status monitoring, and fault diagnosis.

The gripper supports both PDO and SDO communication protocols. PDO requires integration with a motion controller (PLC); for detailed implementation steps, please consult our technical team. This example demonstrates gripper operation under CANopen communication using SDO protocol.

The electric gripper is controlled via SDO mode, where CAN converters can be used to transmit SDO messages for

operation:

1. Read the gripper status from register address 2400-01. Refer to Chapter 4 for the communication object dictionary.

(1) Send message: 40 00 24 01 00 00 00 00

(2) Received message: 43 00 24 01 01 00 00 00

(3) Message frame transmission explanation:

- ① 40 represents the SDO read register instruction;
- ② The value 00 24 indicates the address index for the SDO read register, specifically 2400h.
- ③ 01 represents the sub-index value of the SDO read register, specifically 2400-01h;
- ④ The value 00 00 00 00 represents the data bit of SDO. When reading, this value should be set to 0 during register operations.

(4) Message frame reception interpretation:

- ① 43 indicates successful SDO read of 4 bytes
- ② The value 00 24 indicates the address index for the SDO read register, specifically 2400h.
- ③ 01 represents the sub-index value of the SDO read register, specifically 2400-01h;
- ④ 01 00 00 00 represents the register content read by SDO. A value of 1 indicates successful initial clamp operation.

For details on data reading, refer to Chapter 4.

2. Configure the gripper motion execution with register address 2031-01. Refer to Chapter 4 for the Communication Object Dictionary.

(1) Send message: 2B 31 20 01 01 00 00 00

(2) Received message: 60 31 20 01 00 00 00 00

(3) Message frame transmission explanation:

- ① 2B stands for the SDO register instruction that writes two-byte values.
- ② The value 31 20 indicates the address index for SDO write registers, specifically 2031h.
- ③ 01 represents the sub-index value written by SDO to the register, specifically 2031-01h;
- ④ 01 00 00 00 represents the data bits for SDO write operations. A value of 1 enables write functionality. For details on write data content, refer to Chapter 4.

(4) Message frame reception interpretation:

- ① 60 indicates successful SDO write operation
- ② The value 31 20 indicates the address index for SDO write registers, specifically 2031h.
- ③ 01 represents the sub-index value written by SDO to the register, specifically 2031-01h;
- ④ The value 00 00 00 00 represents the data bits of SDO, and it is set to 0 when writing to the register.

5.3.2.2 Claw Operation under MODBUS Communication Protocol

The clamp gripper supports the standard MODBUS RTU protocol. For protocol details, please refer to the relevant website or our company's communication manual.

(1) Read the gripper status feedback value

① Send message: 01 04 04 FA 00 02 50 CA

② Received message: 01 04 04 00 00 00 00 FA 74

(2) Read the feedback value of gripper position

① Send message: 01 03 05 07 00 02 75 06

② Received message: 01 03 04 00 00 00 00 FA 33

Configure virtual VDI for clamp

① Enable setting of gripper: 01 10 03 73 00 02 04 00 01 CRC_H CRC_L

② Set the clamping point positions as the first segment: 01 10 03 73 00 02 04 00 02 CRC_H CRC_L

③ Set gripper point execution: 01 10 03 73 00 02 04 00 23 CRC_H CRC_L

5.3.3 Claw Operation under IO Control

When using IO control, configure the gripper's IO status to physical DI and DO.

(1) After launching the gripper software, select [Window] -> [Status Monitoring] to access the status monitoring interface. Check the automatic monitoring option in the upper-left corner as shown in the figure below.



Figure 5-23

(2) The gripper are factory-configured with VDI control. Click the "DI Default Settings" button in the upper-right corner to automatically configure physical DI and DO functions through software, or modify them as needed. (For demonstration purposes, this example configures D1 as enabled, D12 as multi-stage operation command switch 1, and D13 as position trigger signal, all with low-level logic validity; DO1 as alarm output and DO2 as position completion signal, both with high-level logic validity) See the diagram below.



Figure 5-24

Table 5-1: Claw-related Object Dictionary

DI2 configuration	Input high level	Input low level
6-Multi-stage operation command switching 1	Execute paraGraph 2	Execute ParaGraph 1
7-Multi-stage Operation Command Switching 2	Execute paraGraph 3	Execute ParaGraph 1

(3) Clamp claw DI input test

The claw software's IO status page displays whether the claw DI has detected input signals, as shown in the figure below. Once the claw DI_1 detects the correct signal input, it confirms normal wiring. Subsequently, DI_2 and DI_3 can be tested sequentially using this method.

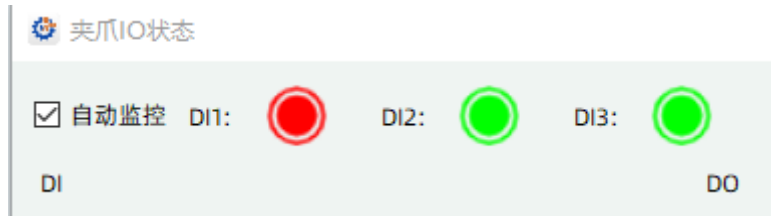


Figure 5-25

6.communication object dictionary

6.1 Common objects for gripper applications

Table 6-1: Claw-related Object Dictionary

CANopen index of matrix	CANopen sub-index	MODBUS index of matrix	parameter name	data type	Factory setting	data area	accessibility	unit	Parameter Explanation
2400h	01h	H04FA	Clamping claw state	UInt32	-	0~4294967295	R	-	
			Detailed description: bit0 initialization status 1-initialized 0-un initialized Detailed description: bit0 initialization status 1-initialized 0-un initialized Detailed description: bit0 initialization status 1-initialized 0-un initialized bit1 Motion status 1-Running 0-Not running bit1 Motion status 1-Running 0-Not running bit1 Motion status 1-Running 0-Not running bit1 Motion status 1-Running 0-Not running bit1 Motion status 1-Running 0-Not running Bit2 control mode: 1-Multi-stage force control; 0-Multi-stage position control Bit2 control mode: 1-Multi-stage force control; 0-Multi-stage position control Bit2 control mode: 1-Multi-stage force control; 0-Multi-stage position control Bit2 control mode: 1-Multi-stage force control; 0-Multi-stage position control bit3 Clamping state 1: Clamped state 0: Not clamped bit3 Clamping state 1: Clamped state 0: Not clamped bit3 Clamping state 1: Clamped state 0: Not clamped bit3 Clamping state 1: Clamped state 0: Not clamped bit3 Clamping state 1: Clamped state 0: Not clamped bit4 Clamping Drop Status 1-Clamped and dropped 0-Not dropped bit4 Clamping Drop Status 1-Clamped and dropped 0-Not dropped bit4 Clamping Drop Status 1-Clamped and dropped 0-Not dropped bit4 Clamping Drop Status 1-Clamped and dropped 0-Not dropped bit4 Clamping Drop Status 1-Clamped and dropped 0-Not dropped Bit5 position completed: push completed at point 1; push completed at point 0; not completed Bit5 position completed: push completed at point 1; push completed at point 0; not completed Bit5 position completed: push completed at point 1; push completed at point 0; not completed Bit5 position completed: push completed at point 1; push completed at point 0; not completed bit6 Alarm output: 1-Alarm present; 0-Alarm absent bit6 Alarm output: 1-Alarm present; 0-Alarm absent bit6 Alarm output: 1-Alarm present; 0-Alarm absent bit6 Alarm output: 1-Alarm present; 0-Alarm absent bit6 Alarm output: 1-Alarm present; 0-Alarm absent bit7 Enable output 1-Enable 0-Disable bit7 Enable output 1-Enable 0-Disable bit7 Enable output 1-Enable 0-Disable bit7 Enable output 1-Enable 0-Disable bit7 Enable output 1-Enable 0-Disable						
2031h	01h	H0373	Virtual Device	UInt16	0	0~65535	RW	-	

			Interface for Communication						
			Detailed description: For 2031h:01h, a bit (n) value of 1 indicates that VDI(n+1) is at high level, while a bit (n) value of 0 indicates that VDI(n+1) is at low level (refer to Section 3.2.5). Default configuration: bit0 enabled bit1 Trigger point execution signal bit2 trigger origin regression signal bit4 Multi-stage instruction switching 1 Bit5 Multi-Phase Instruction Switching 2 Bit6 Multi-Phase Instruction Switching 3						
603Fh	00h	H037F	Clamping claw error code	Uint16	0	0~65535	R	-	
2400h	0Ah	H0507	Clamping Claw User Position Feedback	Int32	-	-2147483648~2147483647	R	0.01mm	
6077h	00h	H03E3	Clutch torque feedback value	Int16	-	-32768~32767	R	0.1%	

7.Alarm Function

Table7-1 Alarm Function

Alarm Code	Alarm Contents	Default Alarm Type	Self reset or not
0x2300	Motor overcurrent alarm	Fault	No
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	No
0x5543	No parameters in flash user area	Fault	No
0x6000	Hardware initialization failure	Fault	No
0x16320	Parameter setting error	Fault	Yes
0x6321	Registration failure	Fault	No
0x7305	Z pulse fault	Fault	No
0x4017307	Encoder warning	Alarm	Yes
0x17310	Overspeed	Fault	Yes
0x3017501	Communication failure	Alarm	Yes
0x4017502	Illegal address	Alarm	Yes
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

Table5-2 Alarm Function

Alarm Code	Alarm Contents	Default Alarm Type	Self reset or not
0x401750E	The address of the packet node is incorrect	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

Table8-1 Daily Inspection and Maintenance

Inspection Items	Inspection Time	Key points of inspection and maintenance	Note
Vibration and sound examination	q.d	Visual inspection and auditory assessment.	——
Fixation and Connection	At least once a week	Regularly inspect the installation position of the gripper and check whether the screws connecting the gripper to the machinery are loose.	——
appearance inspection	once a week	Wipe with cloth or clean with air gun.	——
Insulation resistance test	At least once a year	Disconnect the power supply and mechanical connections of the clamp jaws, then measure the insulation resistance using a 500V megohmmeter (between the power lines VCC and GND and the housing). A resistance value greater than 1M Ω indicates normal operation.	If the insulation resistance is less than 1 m Ω , stop using it.
Oil seal replacement (if applicable)	at least every 5000 hours/each time	Remove the clamping claw mechanically, then replace the oil seal.	Only applicable to motors with oil seals.
Comprehensive examination	At least 20,000 hours per cycle or once every 5 years	——	——

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	Description of Revised Content	Date
A	Establish	2026-8-28



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