ESTUN ROBOTICS


# OPERATION INSTRUCTIONS

## ESTUN Robot S1E Series Control Cabinet Operation Instructions

ALL MADE BY ESTUN

ESTUN AUTOMATION

# ESTUN Robot S1E Control Cabinet

## Operation Instructions

E-0701EN-02

# Thank you for purchasing ESTUN robots.

Before using the robot, be sure to read the SAFETY PRECAUTION and understand the content.
ESTUN endeavor to prove the products. All specifications and designs are subject to change without notice.
All statements, information, and advice provided in this manual have been carefully processed, but no guarantee is given for their complete accuracy. We shall not be held liable for any direct or indirect losses arising from the use of this manual.
Users are solely responsible for the application of any products and should exercise caution when using this manual and the associated products.
The interpretation of all content in this manual belongs to ESTUN Robotics Engineering Co., Ltd.



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# Revision History

| Revision | Date | Content |
|---|---|---|
| 01 | 2022.09 | Initial issue |
| 02 | 2023.03 | Update the dimensional drawing, delete ER20-1745-PV; add ER20B-1745-PV |

# Safety Precautions

This Chapter describes the content to be observed for the safe use of the robot. Before using, be sure to read and understand the content in this Chapter.

Companies and individuals using Estun Robotics should be familiar with the local and national standards and laws. Appropriate safety facilities shall be provided to protect users. Before use (installation, operation, maintenance and repair), please be sure to read and understand this Manual as well as other ancillary materials thoroughly, and use it after being familiar with all knowledge on equipment, safety and precautions. However, Estun would not guarantee that the user will absolutely not be injured even if he follows completely all the safety information given in the Manual.

## Definition of users

The users of this Manual are defined as follows

1. Operators
   - To perform the power ON/OFF operation of the robot;
   - To start the robot program from the operation panel;
   - To restore system alarm status;
   - **Must not work inside the safety fence.**
2. Programmers
   - To operate the robot;
   - Teach the robot in a safetyarea and others;
   - To work in a safetyarea;
   - **The above-mentioned personnel must receive training on the robot.**
3. Maintenance personnel
   - To operate the robot;
   - To teach the robot in a safetyarea and others;
   - To carry out the robot maintenance (repair, adjustment, replacement);
   - To work in a safetyarea;
   - **The above-mentioned personnel must receive specialist training on the robot.**

## Safety Symbols

If the manual contains instructions marked as follows, users must read them carefully and follow strictly.

| Symbol | Definition |
|---|---|
|  DANGER | **This symbol indicates a high potential for serious danger that could result in death or severe injury if not avoided.** |
|  WARNING | **This symbol indicates a moderate or low potential for danger that could result in minor or moderate injuries if not avoided.** |
|  CAUTION | **This symbol indicates potential risks that, if disregarded, could lead to equipment damage, data loss, decreased device performance, or unpredictable outcomes.** |
|  IMPORTANT | **This symbol indicates mandatory precautions and restrictions to be followed. It may also indicate warnings or precautions that do not pose a risk of equipment damage.** |
|  NOTE | **This symbol provides additional information to the main text, emphasizing and supplementing the content.** |

# Safety Precautions

## 1. General considerations:


CAUTION

DO NOT use the robot in the following situations, as it can have an impact on the robot, peripheral devices, and potentially cause harm to operators:

- In flammable environments
- In potentially explosive environments
- In environments with high levels of radiation
- In water or high humidity environments
- For transporting people or animals
- As a climbing device (climbing onto or suspending beneath the robot)


CAUTION

During robot operation, programming, and maintenance, personnel must prioritize safety. At a minimum, the following items should be worn:

- Appropriate work clothes
- Safety shoes
- Safety helmet


CAUTION

Operations within the safety zone require specialized training on the robot.

For more information regarding training, please consult ESTUN Robotics Engineering Co., Ltd.

## 2. Installation precautions

(1) Follow the specified methods for handling and installing the robot.

When handling and installing the robot, follow the methods specified by Estun Robotics. Using incorrect methods may result in the robot tipping over and causing accidents;

(2) During the initial operation of the robot, start at low speed, gradually increase speed, and check for any abnormalities;

(3) It is strictly prohibited to move the robot's axes, as it may cause personal injury and equipment damage;

(4) Take precautions when wiring and piping between the robot, the cabinet, and peripheral equipment. Put the pipes, wires or cables through a pit or covered with a protective lid, to avoid stepped by personnel or run over by a forklift;

(5) Ensure proper grounding for all peripheral devices;

(6) Draw an area clearly indicates the safety area. Install a fence or hang a warning board to ensure the safety operation of the robot, and keep unauthorized personnel outside the safety area;

(7) Exercise caution when disassembling the robot to avoid injury from falling components;

**3. Precautions for operation**

(1) Unexpected movement may occur on any operating robot, which will cause severe injuries or damages in the working area. Test (safe door, brake, safe indicators, etc.) must be performed on each safety measures before using the robot. Before turn on the system, make sure that no one is in the working space;

(2) Never hang any tools above the robot. Falling of these tools may cause damage to equipment;

(3) Never lean on the cabinet. Never touch any buttons without permission. Unexpected movement of the robot may cause personnel injuries and equipment damage;

(4) Do not wear gloves when using the teach pendant. Operate with gloves may cause an operation error;

(5) Programs, system variables, and other information can be saved on the memory card or USB memories. Be sure to save the data periodically in case that the data is lost;

(6) Turn off the power when adjusting peripheral equipment;

(7) Never set motion range or load condition exceeds the rated range. Incorrect setting may cause personnel injury and equipment damage;

(8) Observe the following precautions when teaching inside the working space of the robot

- Do not enable the system unless the mode is switched to manual, and make sure that all auto-control is cut off;
- Speed must be limited under 250mm/s at manual mode. Only authorized person with fully understand of the risks can adjust the robot to rated speed manually;
- Be careful about rotating joints to prevent hair and clothes involved. Take precautions of injury or damage caused by the manipulator or other auxiliary devices;
- Check the motor brake to avoid personnel injuries caused by unexpected situation;
- Always have an escape plan in mind in case the robot comes towards you unexpectedly;
- Ensure that there is a place to retreat to in case of emergency.


**Under any circumstances, do not stand under any robot arm to prevent abnormal motion of the robot or connection with other people.**


**A carbon dioxide fire extinguisher needs to be placed on site to prevent the robot system from catching fire.**

# Safety Precautions

CAUTION

Operations such as handling, setup, teaching, adjustment, and maintenance must be conducted within a safety area by personnel who have received professional training in robotics.

For more information regarding training, please contact ESTUN Robotics Engineering Co., Ltd.

## Precautions for users

Operators

(1) Before operate the robot, you should press emergency stop button, which is on the teach pendant or the upper right of electric cabinet, in order to check whether the indicator of Servo Ready is not light, and make sure the power of the indicator is turnoff.

(2) In course of operation, never allow the non-work personnel to touch the control cabinet. Otherwise, the robot might bring some unexpected movements, which can cause personal injury or equipment damage.

(3) When you install a device on the robot, the power supplies of the control cabinet and the device must be cut off (OFF), and then hang a caution sign. If you power on in your installation, it might cause the danger of electric shock, or the robot might bring some unexpected movements, which can cause personal injury.

(4) E-stop

- The E-stop is independent of the electrical control of all robots, and it can stop all robot motions;
- E-stop means that all power supplies to the robot are disconnected, but the power to the brake on the servomotor is not disconnected. The robot can work again after releasing E-stop button and re-starting the robot.

**There're several buttons for emergency stopping the robot. On the teach pendant and at the upper right of control cabinet, each of these places has one red button, as shown in the left side. Certainly, users can also set the E-stop button as required.**

**The E-stop button must be installed in an accessible position so that the robot can be stopped in an emergency.**


**Operators shall pay attention to the high-voltage danger of the power line of the servomotor, as well as the power line connecting the fixture and other devices.**


- **E-stop is just used for stopping the robot in the case of an emergency. That is to say, it cannot be used in the normal stop.**

## Programmers

While teaching the robot, and in some cases, the programmer needs to enter the range of the robot's movement, so be sure to keep himself safe.


**ON/OFF enabling is done by operating a Mot button on the teach pendant. When pressing this button, the servomotor is enabled, and disabled when releasing it.**

To ensure the safe use of the teach pendant, the following rules must be observed:

- Ensure that the enable button works at all times.
- Disconnect the enabling timely when temporarily stopping the robot, programming or testing.
- When entering the robot working space, the demonstrator shall bring the teach pendant to avoid other people operating the robot without the programmer is informed.
- The teach pendant must not be placed within the working space of the robot to prevent abnormal actions in case of collision between the robot and the teach pendant.

## Maintenance personnel

(1) Pay attention to the parts in the robot that are prone to become hot

Some parts of the robot in normal operation will become hot, especially the servomotor and reducer, which may cause burns when being approached or touched. When it is inevitable, protective equipment such as heat-resistant gloves should be worn.


**Before touching these parts with your hands, try to feel the temperature of these parts by approaching with your hand, in case you are scalded. Wait for enough time after machine halt, so that the hot parts can be cooled down, and then you can carry out the maintenance work.**

(2) Safety precautions on removing parts

Ensure that the internal parts such as the gears are no longer rotating, and then you can open the lid or the protection device. You shall not open the protection device when the gears and bearings are rotating. If necessary, use the auxiliary device to make the internal unfixed parts remains its original position.

The initial test upon repair, installation and maintenance shall be carried out by following the steps below:

- Clean up the robot and all maintenance and installation tools in the working space of the robot.
- Install all the protective measures.
- Ensure that people are standing outside the safe range of the robot.
- Pay special attention to the working conditions of the parts repaired during testing.

In case of robot repair, do not use the robot as a ladder, and do not climb on the robot to avoid falling.

(3)Safety precautions on pneumatic/hydraulic components

After turning off the air source or hydraulic pump, a few residual gas or liquid exists in the pneumatic system or hydraulic system. Beware these gases or liquid, which have a certain energy; we must take some measures to prevent the residual energy from damaging to the human body and equipment. Therefore, it is necessary to release the residual energy in the system before maintaining the pneumatic or hydraulic components.


**Mount a safety valve to avoid accidents.**

(4)The power supply need be opened in many cases of fault diagnosis, but it must be shut when the maintenance or repair is carried, moreover, you should cut off other power supply connections.

(5)Brake detection.

In general, the brake can be worn in the normal operation. Therefore, the brake detection is necessary by following the steps below.

a)Move each joint to a position, where the joint can bear the maximum load.

b)Shut down the robot and brake.

c)Mark every joint of the robot.

d)Examine whether any joint moves after waiting for a moment.

(6)Safety precautions for adding lubricating oil

When add lubricating oil to the reducer, it might do harm to the person and the equipment. Therefore, you must obey the below safety information before adding lubricating oil:

- Wear the protective measures (e.g. gloves, etc.) when refueling or draining oil to prevent damage to maintenance personnel caused by high-temperature oil or reducer.
- Be cautious when opening the oil chamber cover. Keep away from the opening as there may be pressure in the oil chamber to cause splashing.
- Oil filling shall be made according to the fuel gauge, which shall be not too full. Check the oil indicator port after oil filling.
- Oil of different designations cannot be added to the same reducer, and the remaining oil must be cleaned up before using the oil of different designation.
- Drain the oil completely or check the oil indicator port after oil filling.


**Before emptying the oil in the reducer, you can run the robot for a period of time to heat the oil, to allow easier draining.**

## Safety precautions for robot

In an emergency, any arm of the robot that clips the operator shall be removed. Please ask our technicians for details to ensure the safe removal.

Small robot arms can be removed manually, but for large robots, cranes or other small equipment may be required.

Before releasing the joint brake, the mechanical arm needs to be fixed first to ensure that the mechanical arm will not cause damage again to the person trapped under the action of gravity.

## Ways to stop robot

The stopping of robots has the following three ways.

### Power-Off Stop

Servo power is turned off and the robot stops immediately. Servo power is turned off when the robot is moving, and the motion path of the deceleration is uncontrolled.

The following processing is performed at Power-Off stop:

- An alarm is generated and servo power is turned off, and the robot operation is stopped immediately.
- Execution of the program is paused.

For the robot in motion, frequent power-off operations through E-stop buttons will cause robot failure. The system configuration for daily power-off stop should be avoided.

### Alarm Stop

The motion of the robot is decelerated and stopped through a control command after the robot system issues an alarm (except for the power failure alarm). The following processing is performed at Controlled stop:

- The robot system issues an alarm due to overload, failure, etc. (except for power failure alarms).
- The servo system sends a command “Control Stop” along with a decelerated stop. Execution of the program is paused.
- The servo power is turned off.

### Hold

The robot is decelerated until it stops, and servo power remains on.

The following processing is performed at Hold:

- The robot operation is decelerated until it stops. Execution of the program is paused.

## Safety precautions for tools and peripheral equipment

The external equipment of the robot may still be running after the robot is turned off, so damage to the power cord or power cable of the external equipment may also cause bodily injury.

## Warning and Caution Signs

| Symbol | Description |
|---|---|
|  | **Electric shock**<br>Attention should be paid to the danger of high voltage and electric shock at the place where this sign is affixed. |
|  | **High temperature**<br>Be cautious about a section where this label is affixed, as the section generates heat. If you have to inevitably touch such a section when it is hot, use a protective provision such as heat-resistant gloves. |

| Symbol | Description |
|---|---|
|  | **No stepping**<br>Do not step on or climb the robot as it may adversely affect the equipment, and cause the bodily injury to operators. |
|  | **Wounding by robot**<br>There is a danger of wounding by robot when working within the motion range of robot. |
|  | **No disassembly**<br>Users are prohibited from disassembling the part affixed with this sign. Disassembly shall be carried out by professionals using professional tools. |

# Preface

This document primarily provides instructions for the use of the S1E Control Cabinet. The S1E is a standard vertical cabinet.

The compatible robot types for this control cabinet are as follows:

| Control cabinet | Type |
|---|---|
| S1E | ER8-2000-HW-T |
| | ER8-2000-HW |
| | ER8-2000-CW |
| | ER8-2000-CW-T |
| | ER8-1500-CW |
| | ER8-1450-HW |
| | ER10-2000-CW |
| | ER12B-1510 |
| | ER15-1520-PR |
| | ER20/10-2000-HI |
| | ER20B-1745-PV |
| | ER20-1780 |
| | ER20-1780-F |
| | ER20-1780-HI |
| | ER20B/10-2010-HI |
| | ER20B-1760 |
| | ER30-1880 |
| | ER30-1880-F |
| | ER30B-1810-F |
| | ER35-1880 |
| | ER35B-1810 |
| | ER35B-1810-LI |

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# Chapter 1 Product Information

## 1.1 Information on nameplate

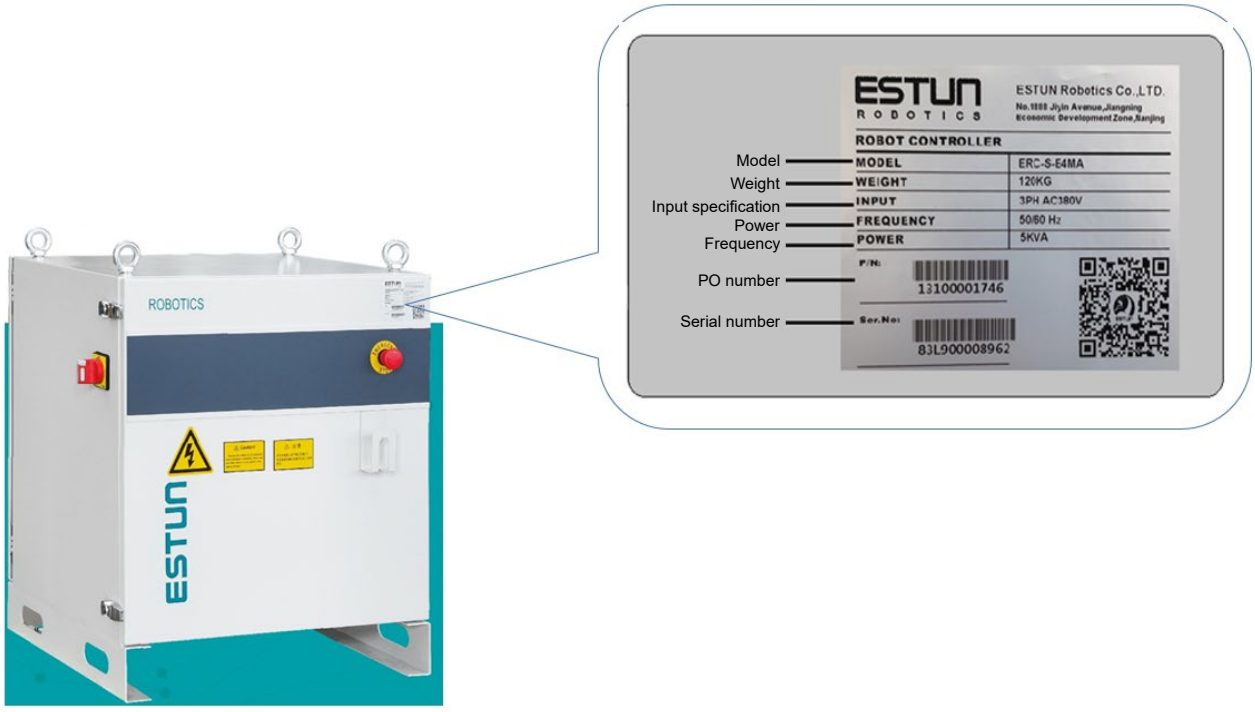



Figure 1.1 Information on nameplate of electric cabinet

## 1.2 Designation

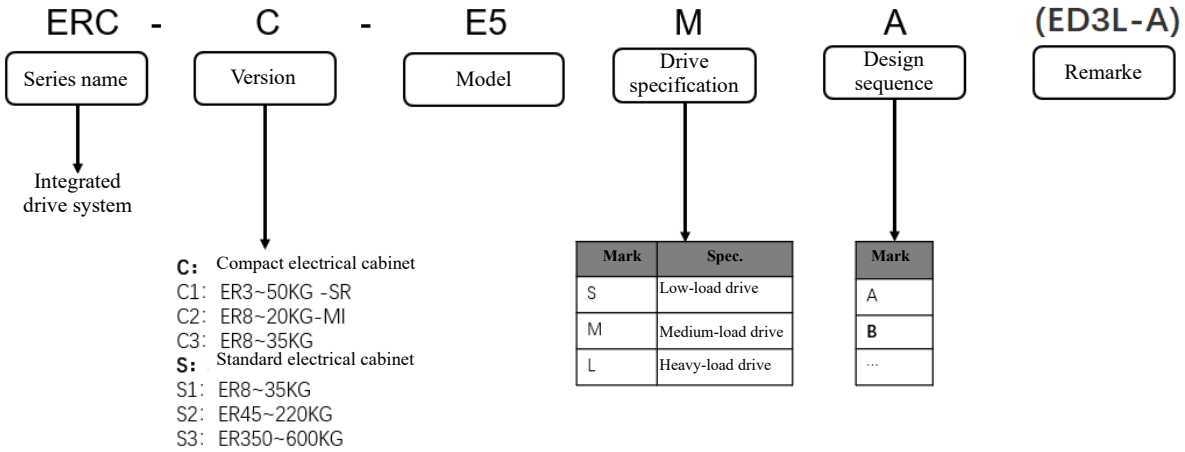



Figure 1.2 Designation

## 1.3 Components

### Description of appearance

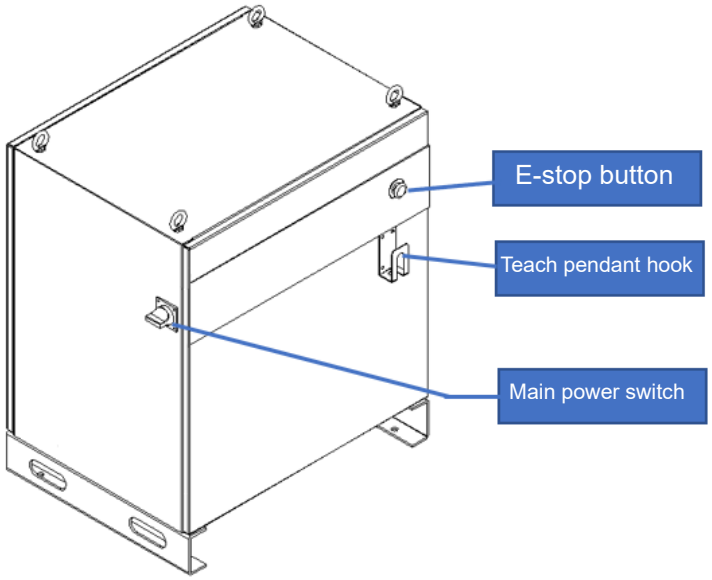
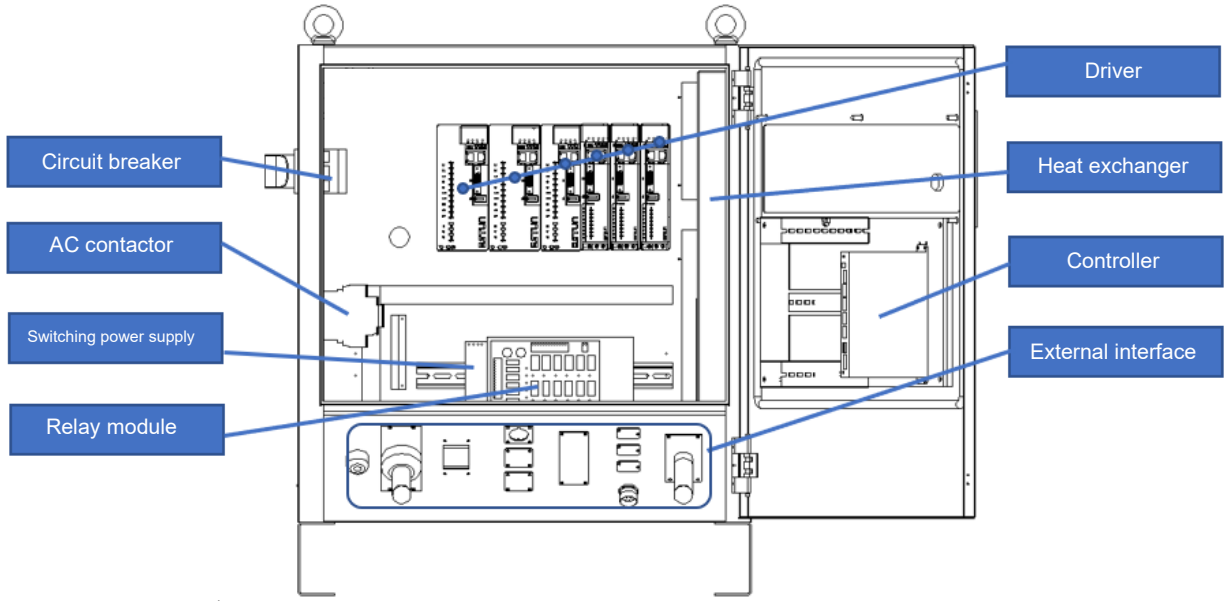



Figure 1.3 Description of appearance

### Internal structure

NOTE Inside the control cabinet, multi-core cables should be used for wiring. Avoid leaving excessively long wiring and check for any cable entanglement.



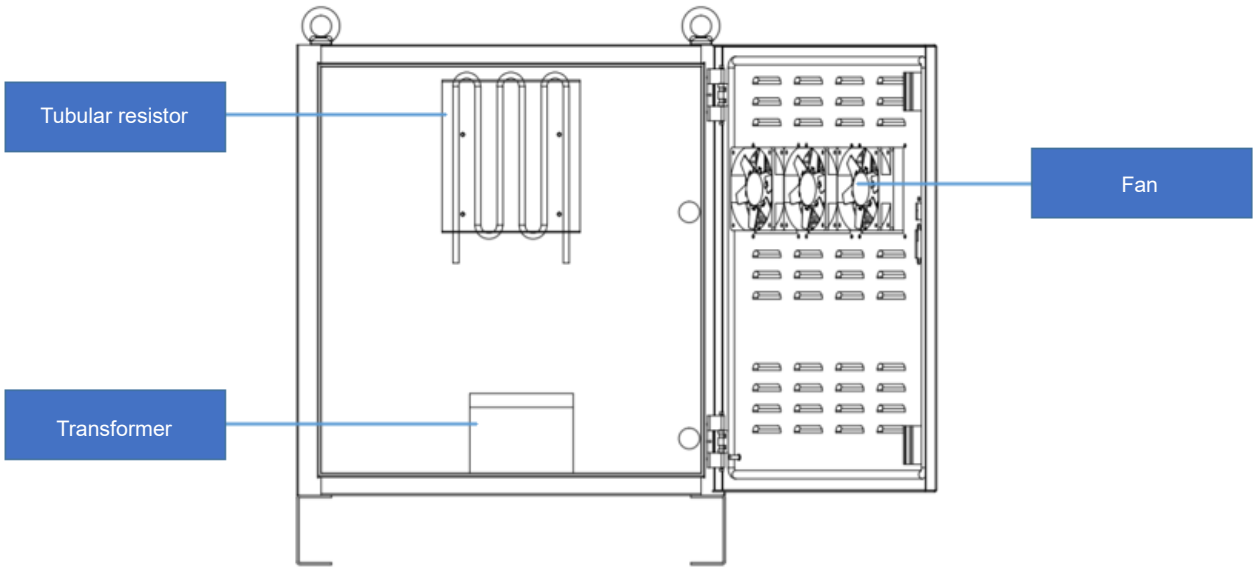



Figure 1.4 Internal structure

External interface

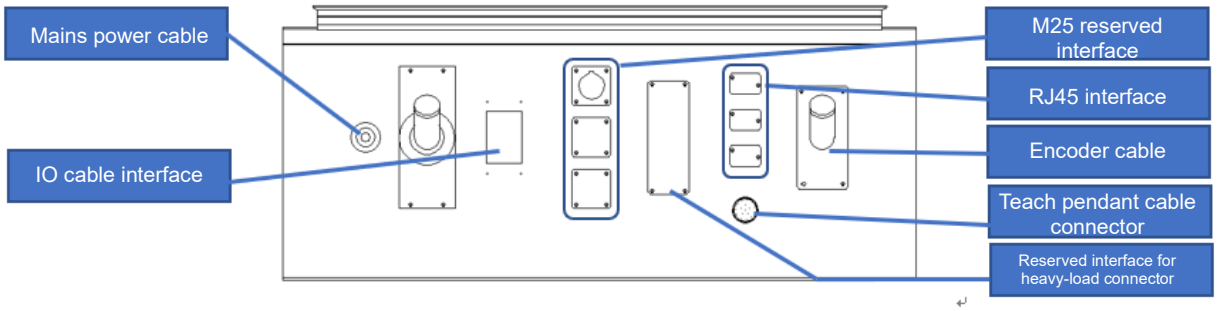



Figure 1.5 External interface

## 1.4 Basic parameters

Table 1-1 Basic parameters list of control cabinet

| Model | Dimensions (mm) (L*W*H) | Self-weight (kg) | Rated power (kW) | Reference energy consumption (Kw/h) | Applicable model |
|---|---|---|---|---|---|
| ERC-S1-□□S□(ED3L) | 620*550*750 Vertical electrical cabinet | 120 | 4 | 1.07 | ER8-1450-HW |
| | | | | 1.07 | ER8-1500-CW |
| | | | | 0.45 | ER8-2000-HW-T |
| | | | | 0.45 | ER8-2000-HW |
| | | | | 1.07 | ER12B-1510 |
| | | | | 1.64 | ER15-1520-PR |
| | | | 4.9 | 1.3 | ER20/10-2000-HI |
| | | | | 1.3 | ER20B/10-2010-HI |

| | | | | | |
|---|---|---|---|---|---|
| | | | | 2.76 | ER20-1780 |
| | | | | 1.61 | ER20-1780-HI |
| | | | | 1.09 | ER20B-1745-PV |
| | | | | 1.17 | ER20B-1760 |
| | | | | 1.25 | ER20-1780-F |
| | | | | 0.91 | ER30B-1810-F |
| | | | | 1.38 | ER30-1840-F |
| | | | | 1.33 | ER30-1880 |
| | | | | 1.12 | ER35-1880 |
| | | | | 1.34 | ER35B-1810 |
| | | | | 1.34 | ER35B-1810-LI |
| | | | 5.5 | 0.44 | ER8-2000-CW |
| | | | | 0.44 | ER8-2000-CW-T |
| | | | | 0.73 | ER10-2000-CW |

Table 1-2 Control cabinet installation parameters

| | |
|---|---|
| Control cabinet installation environment | Ventilated, not airtight |
| Minimum installation range | 2500*2500*1200 (mm, L*W*H) |
| Ambient working temperature | Temperature ：0°~45℃<br>Humidity：20%~80%RH |
| Communication interface with peripherals (additional module required) | Standard: EtherCAT, Modbus TCP, TCP/IP;<br>Optional: Profinet, Profibus, CCLINK, EtherNet IP |
| Total cable length to robot | Standard: 8m<br>Options: 10m, 15m, 20m, 10m (flexible), 15m (flexible), 20m (flexible) |
| Noise level | 50-75dB |

Table 1-3 Control cabinet specifications

| Item | Spec. |
|---|---|
| Mains power supply for electrical cabinet | Three-phase, AC 380V, -15% to +10%, 50/60Hz |
| Number of control axes | 4～6 |
| Storage environment | Temperature: -25℃～55℃<br>Humidity: 95% RH or less (no condensation, no freezing) |
| Insulation resistance | 100mΩ or more |
| Vibration strength | 4.9m/s² |
| Shock resistance | 19.6m/s² |
| Altitude | Below 1,000m |
| EMC test standards | IEC 61800-3:2017 |
| IP grade | IP54 |

## 1.5 Overall dimensions

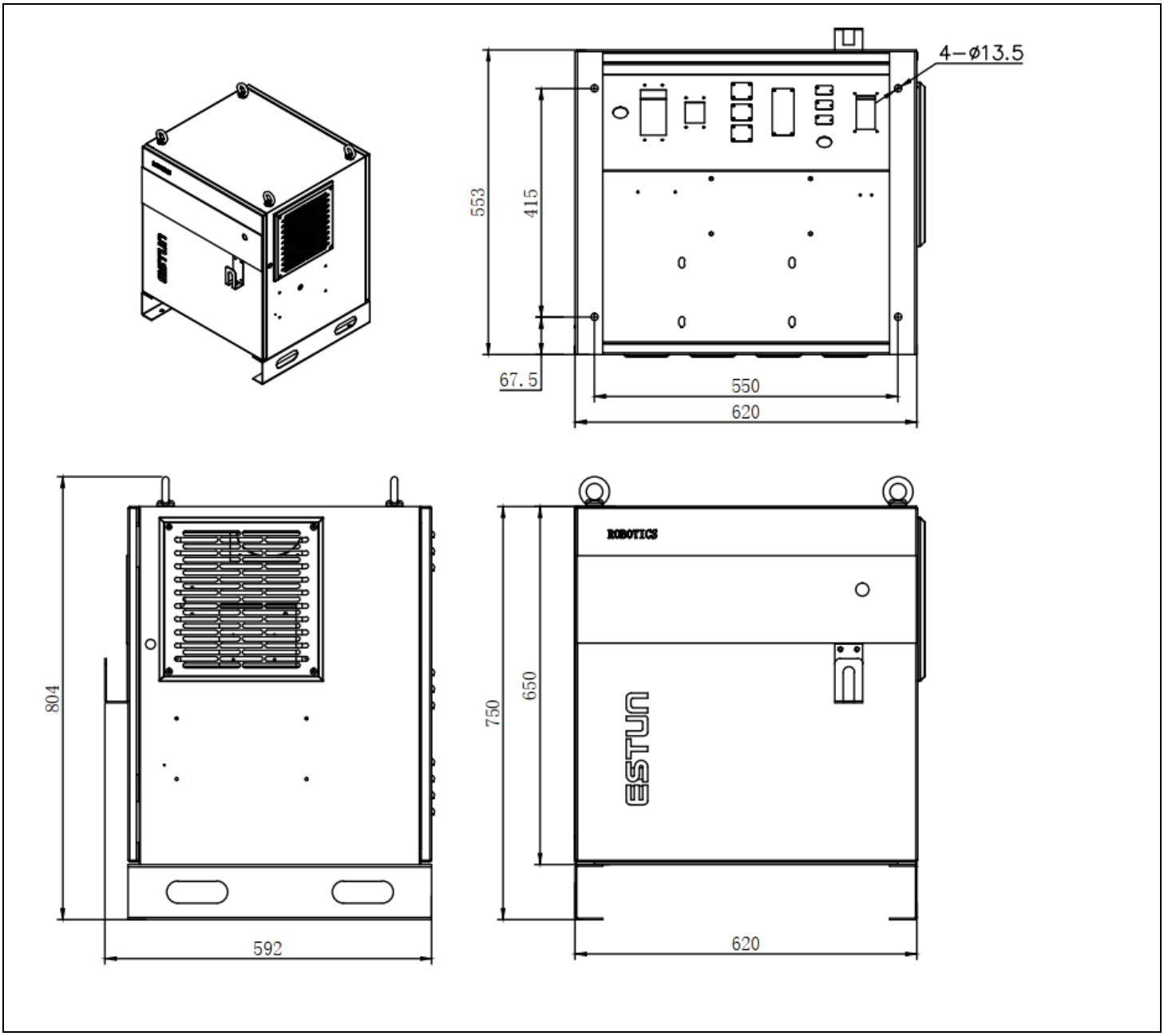



Figure 1.6 Overall dimensions

# Chapter 2 Transportation & Installation

## 2.1 Transportation

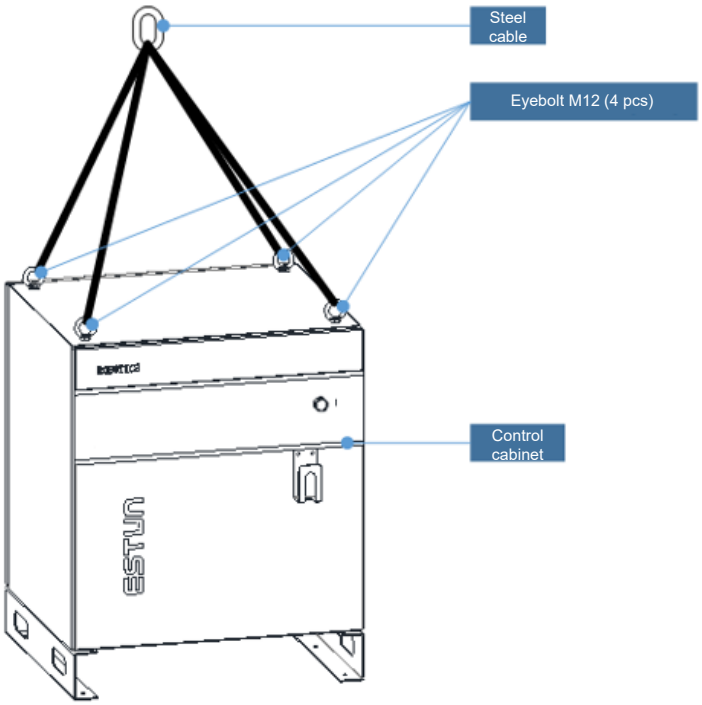
CAUTION

- Handle horizontal control cabinets on pallets during transportation.
- The operation of cranes, hoists, and forklifts must be carried out by authorized personnel to prevent personal injury and equipment damage.
- During transportation, avoid vibration, dropping, or impacting the control cabinet. Excessive vibration or impact can have harmful effects on its performance. Moisture protection measures should also be taken.

### 2.1.1 Transport by a forklift

Before moving the control cabinet, the following items should be checked:

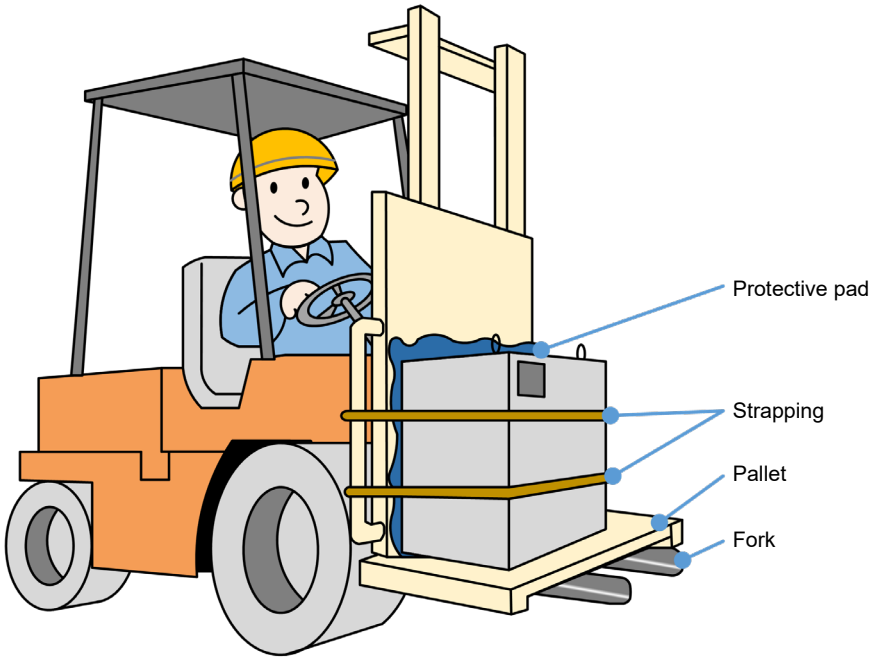
- Confirm the weight of the control cabinet and use a wire rope with a load capacity greater than the weight of the control cabinet for lifting.
- Install the lifting eye bolts securely before lifting.
- The lifting eye bolts should not be removed.



### 2.1.2 Transport by a forklift

When using a forklift to transport the control cabinet, the following precautionary measures should be followed:

- Ensure a safe working environment for the control cabinet to be safely transported to the installation site.
- Notify personnel working in the forklift's path to be aware of the ongoing movement of the control cabinet.
- Avoid shifting or tilting of the control cabinet during transportation.
- Keep the height of the control cabinet as low as possible during the movement.
- Avoid vibration, dropping, or impacting the control cabinet during transportation.




## 2.2 Installation

### 2.2.1 Installation guidelines

Environmental requirements:

- The operating environment temperature should be between 0°C and 45°C. During transportation and maintenance, the temperature range should be -25°C to 55°C.
- The relative humidity should not exceed 95%RH, and there should be no condensation.
- The installation site should have minimal dust, powder, oil fumes, and water.
- Flammable substances, corrosive liquids, and gases are not allowed in the operating area.
- The control cabinet should be installed in a low vibration or low impact energy environment (vibration below 0.5G).
- There should be no nearby electrical interference sources (e.g. gas shielded welding TIG equipment).
- There should be no potential hazards of collision with moving equipment (e.g. forklifts).

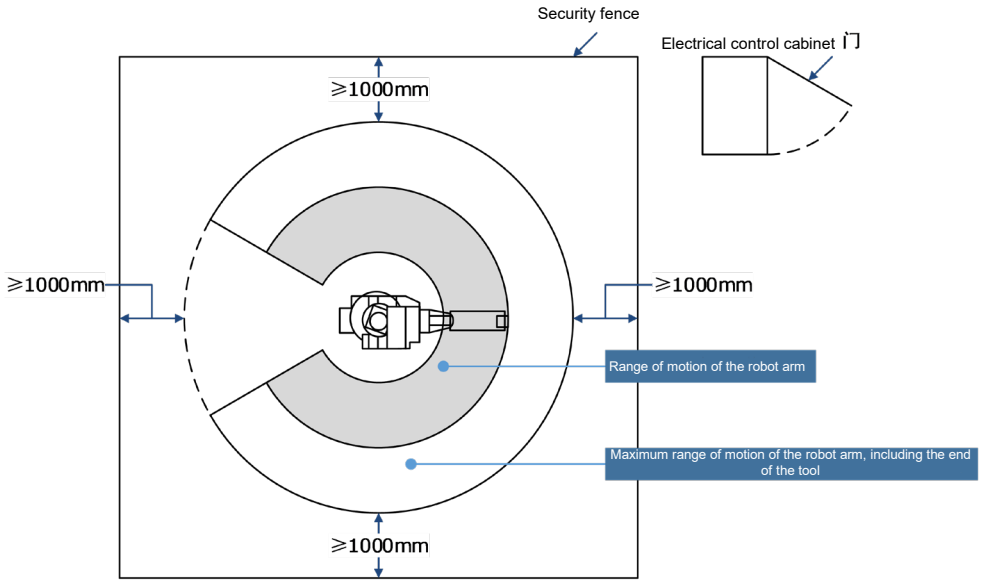
- There should be no ion or non-ion interference.

Instructions for users:

Please refer to the Instructions for Users and standardize your work.

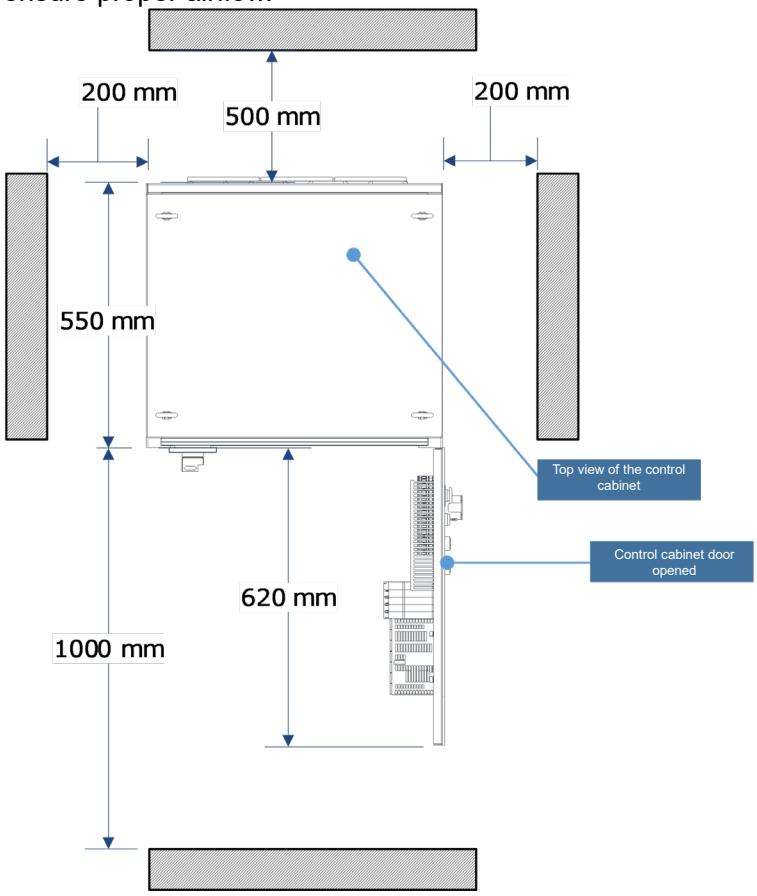
### 2.2.2 Installation location

- The control cabinet should be installed outside the range of robot movement (within a safety fence)




- The control cabinet should be installed in a position where the robot's actions can be clearly observed.
- The control cabinet should be installed in a location that allows easy access for door inspection, with a minimum distance of 500 mm from front and rear walls to maintain clear maintenance pathways.

- - There should be a distance of at least 200 mm on both sides of the control cabinet to ensure proper airflow.




- The control cabinet should be installed at a height between 0.6 meters and 1.72 meters from the ground.

# Chapter 3 Wiring & Connection

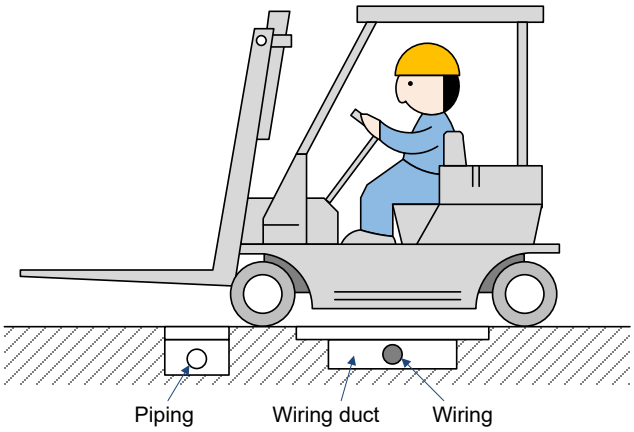

- The system must be electrically grounded to avoid fire, electric shock and bodily injury.
- Turn off the main power switch prior to wiring and inspection to avoid electric shock and bodily injury.
- Be sure to turn off the main power supply for at least 5 minutes prior wiring and inspection. There may be residual high-voltage inside the control cabinet even if power off. Therefore, never touch the power terminals.
- The main power supply cannot be powered on when the cabinet door is not closed, this is because the safety interlock so mounted would prevent the main power supply from powering on.
- The electric control cabinet is in E-stop mode when wiring, and any matters incurred shall be under the responsibility of users. Operation inspection shall be performed once the wiring is done.
- The robot's electrical cabinet is a dedicated control device designed with power capacity considerations for only a minimal amount of external I/O requirements. Therefore, it is not allowed for users to connect external power sources, including but not limited to additional axes, and definitely not to connect power strips. Doing so may result in fault alarms or even cause a fire in the electrical cabinet.
- Avoid frequently turning the main power on and off for the electrical cabinet, and ensure that the time interval between each power cycle is at least 1 minute.


- Perform the wiring or inspection only by professional technicians.
- Perform the wiring according to the rated capacity provided in the Manual.
- Make sure that all circuit connections are securely fixed.
- Do not touch the circuit boards directly with your hands.
- Integrated circuit boards may experience malfunctions due to electrostatic discharge.
- The robot's electrical cabinet should not be opened or accessed by users.
- If the customer's power supply is unstable, it is recommended for the customer to purchase additional equipment such as an UPS and connect it to the robot. This will protect the controller and ensure stable operation, avoiding the loss of system files.

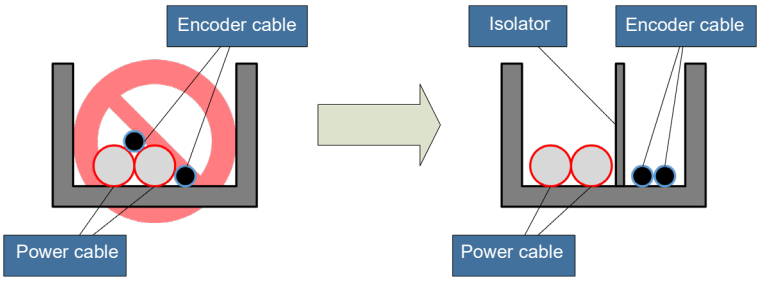
## 3.1 Precautions for cable connection

- LV cables shall be used to connect between control cabinet and peripheral equipment.
- The signal cables of the control cabinet shall be laid in a distance far away from the main power supply circuit, while the HV power supply line shall not be parallel to the signal cables of the control cabinet. Where unavoidable, metal tube or metal slot shall be used to prevent the interference of electric signal. If the cables must be arranged in a cross way, the power cables and signal cables shall be laid in a perpendicular way.
- Confirm the socket and cable number to prevent equipment damage arising from incorrect connection.

- All non-workers shall be evacuated from the site when connecting cables. Be sure to put all cables in underground cable trench with cover.




- The wiring and routing of encoder cables must be separated from power cables. If they are placed in the same cable conduit, isolators must be used to keep them separated.




## 3.2 Residual-current circuit breaker

The power supply of the robot control device may have high-frequency leakage currents, which can sometimes cause the unintended operation of the residual current devices or residual current protection relays installed on the upper-level robot control device.

When selecting a leakage protector, the following conditions should be met to avoid unintended operation:

1. The leakage protector should be a Type B residual current device;
2. The sensitivity current of the leakage protector should be ⩾300mA.

## 3.3 External interface definition

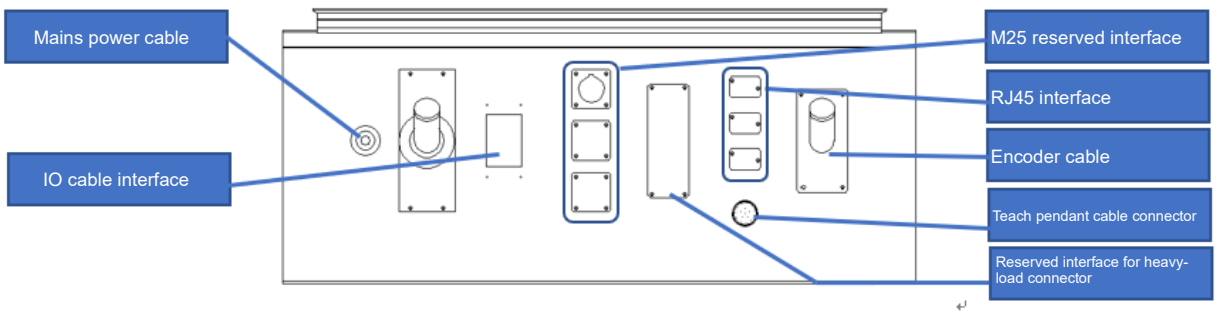



Figure 3.1 External interface

| S/N | Name | Description |
|---|---|---|
| 1 | Mains power cable | |
| 2 | IO cable interface | Undefined input and output signal interfaces (24-pin) |
| 3 | RJ45 interface | Communication interface to the vision module |
| 4 | Encoder cable | Motor encoder cable interface for each axis of the robot to collect the robot position signal and connect to the robot body using a special cable. |
| 5 | Demonstrator cable interface | Cable interface for the robot demonstrator. |
| 6 | M25 reserved interface | — |
| 7 | Reserved interface for heavy-duty connectors | — |
| 8 | IO cable interface | **IO modules are optional for the user.**<br>System interface: 9DI/8DO:<br>System interface: 16DI/16DO, user interface: 7DI/8DO;<br>System interface: 32DI/32DO, user interface: 23DI/24DO;<br>System interface: 48DI/48DO, user interface: 39DI/40DO. |

## 3.4 Basic diagram

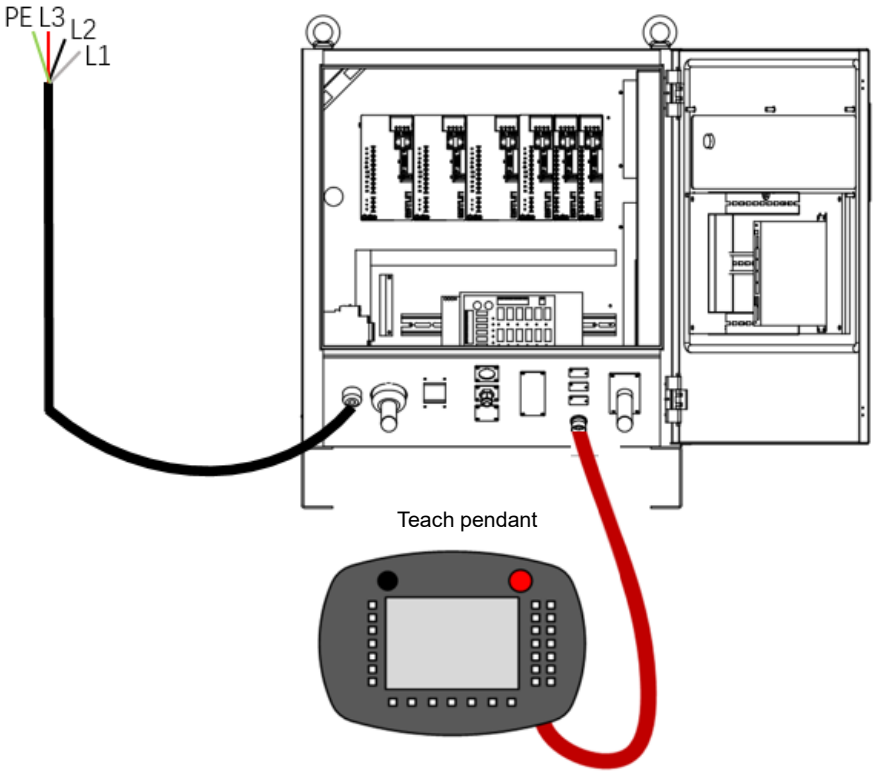


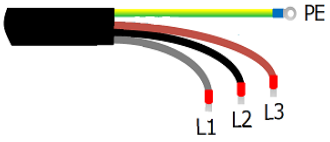

Figure 3.2 Basic diagram

## 3.5 Power supply wiring

### Description

When using a three-phase AC 380V power supply for the control cabinet, please follow the schematic diagram provided below for the fabrication and correct wiring of the power lines. During the wiring process, please pay attention to the following:

Three-phase: L1, L2, L3, PE (If there is a transformer inside the cabinet or an external transformer box is provided)

| Diagram | Pin | Description |
|---|---|---|
|  | L1 | Three-phase power supply wiring |
| | L2 | |
| | L3 | |
| | PE | Protective earth |

The input power cable for ESTUN control cabinets is not included and should be wired by the user or purchased from ESTUN (ER12-ER35 still come with input power cables as standard). When selecting your own cable, it must comply with the relevant safety regulations. The following cable specifications are recommended based on different control cabinet models.

| Model | Wire gauge | | Rated current (A) |
|---|---|---|---|
| | AWG | Cross-sectional area ($mm^2$) | |
| ERC-S1-□□S□(ED3L) | 13 | 4 | 10.4 |

### Power harness assembly

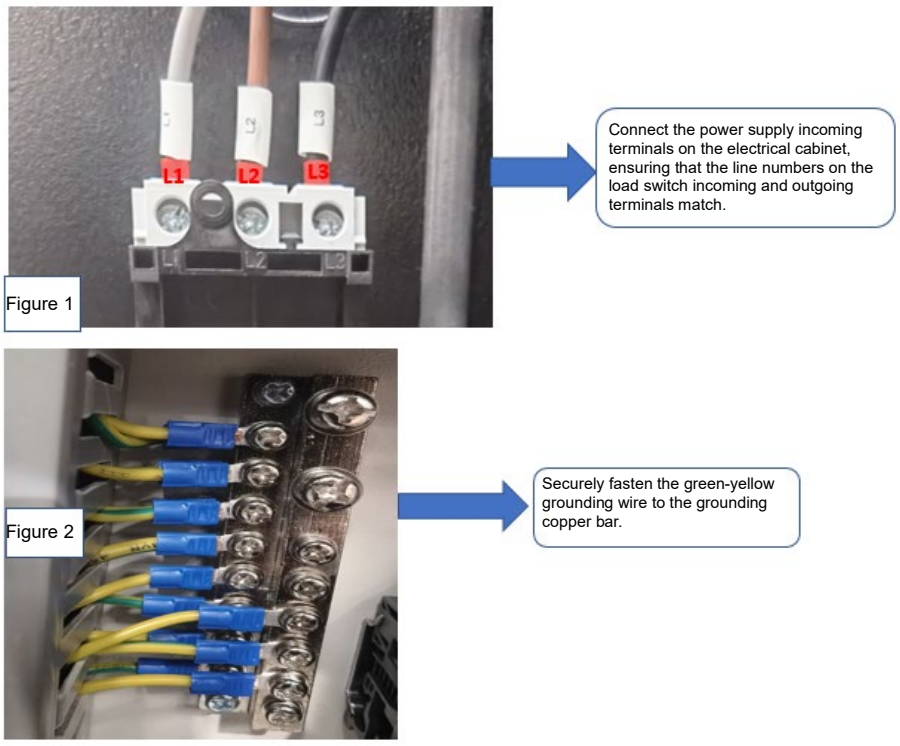



Figure 3.3 Power harness assembly illustration (3-phase 1)

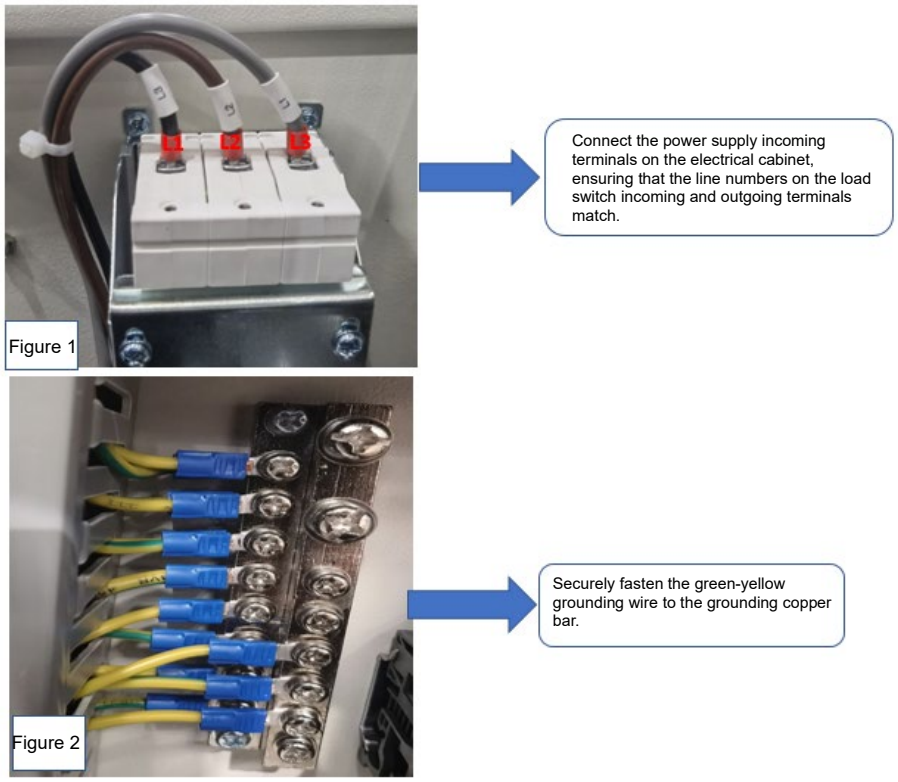



Figure 3.4 Power harness assembly illustration (3-phase 2)

## Electrical principle

After the three-phase AC is filtered, the three-phase AC 380V voltage is changed to three-phase AC 200V through the transformer (for the electric control cabinet powered by the servo drive with 200V power supply). When there is a temporary power supply frequency interruption or voltage drop, or there is any alarm from the driver, the servo power will be cut off and power will be shut down.

### Power distribution

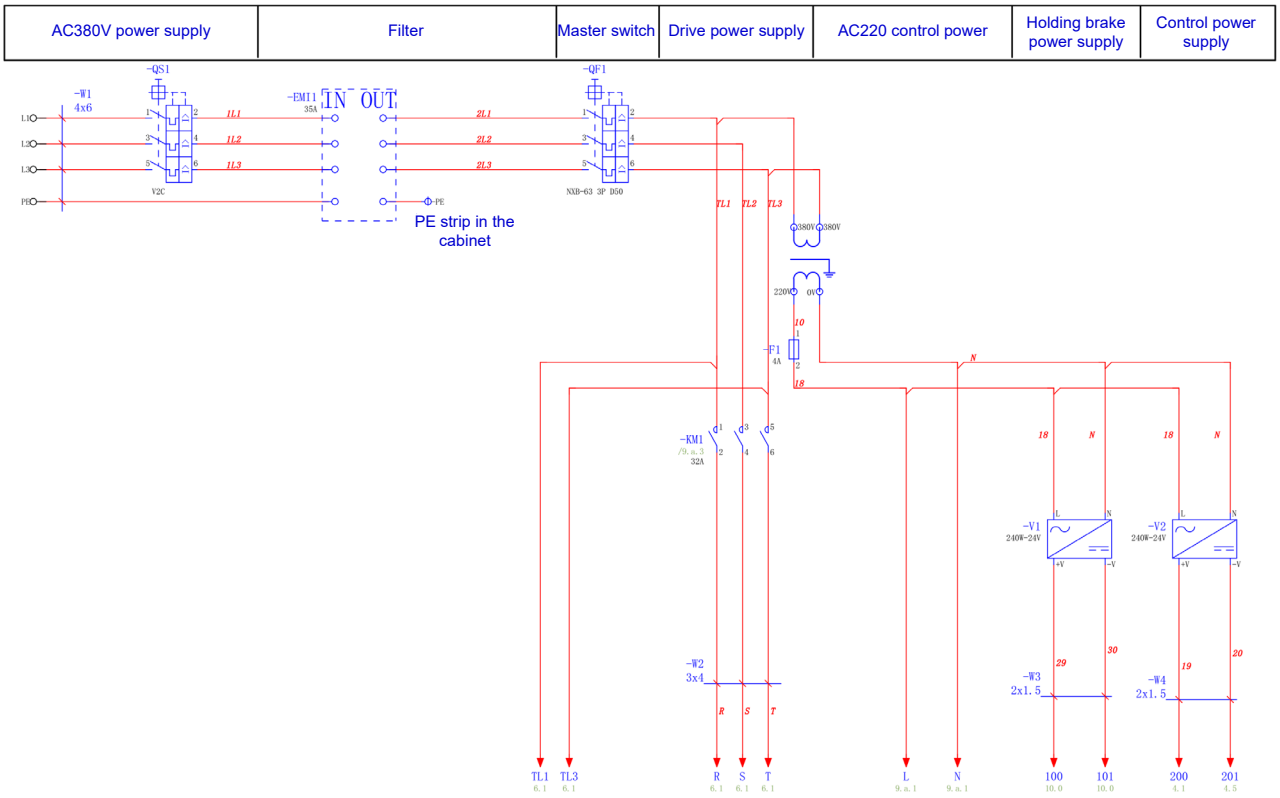



Figure 3.5 Three-phase power distribution

Control power supply 24V

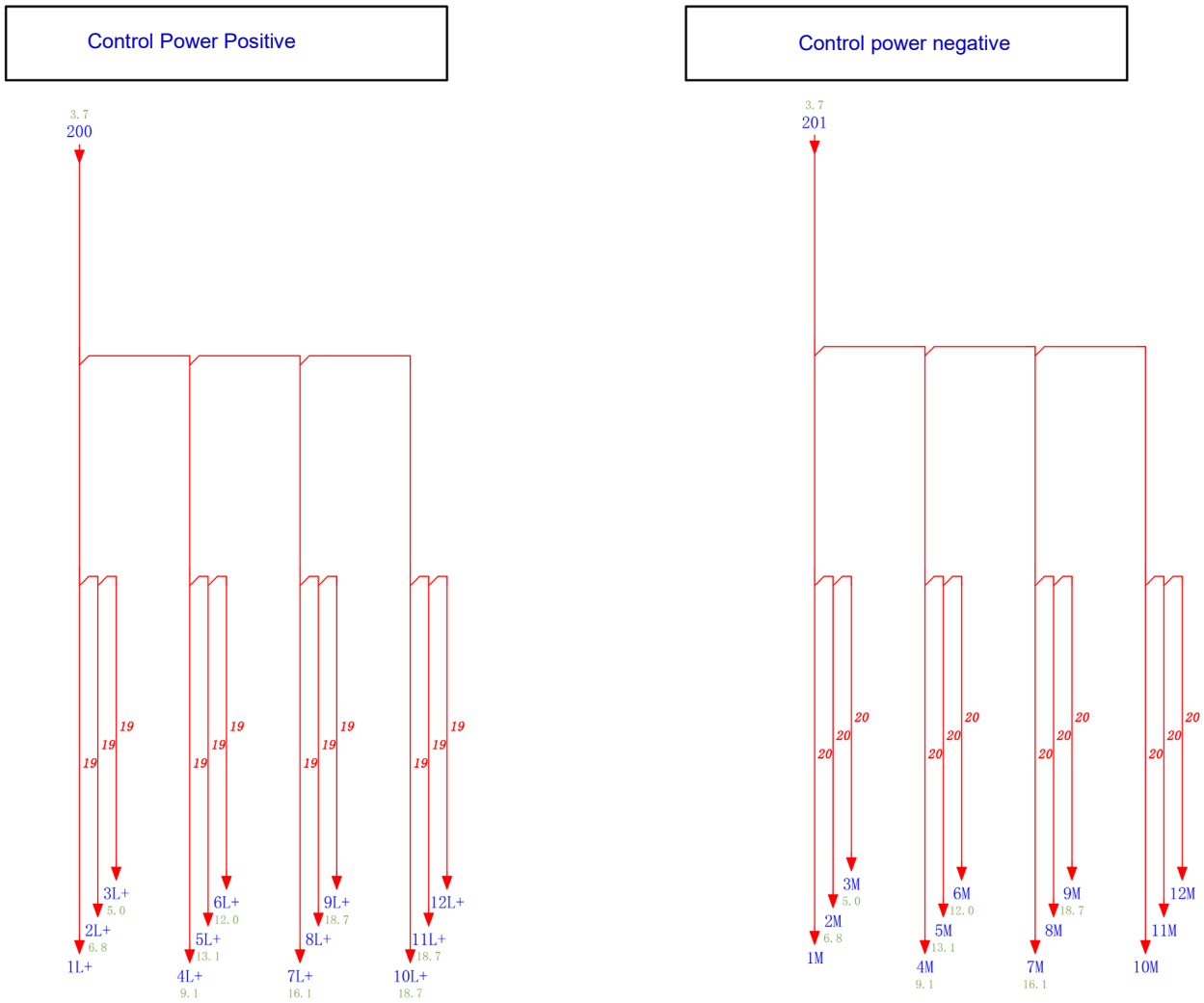
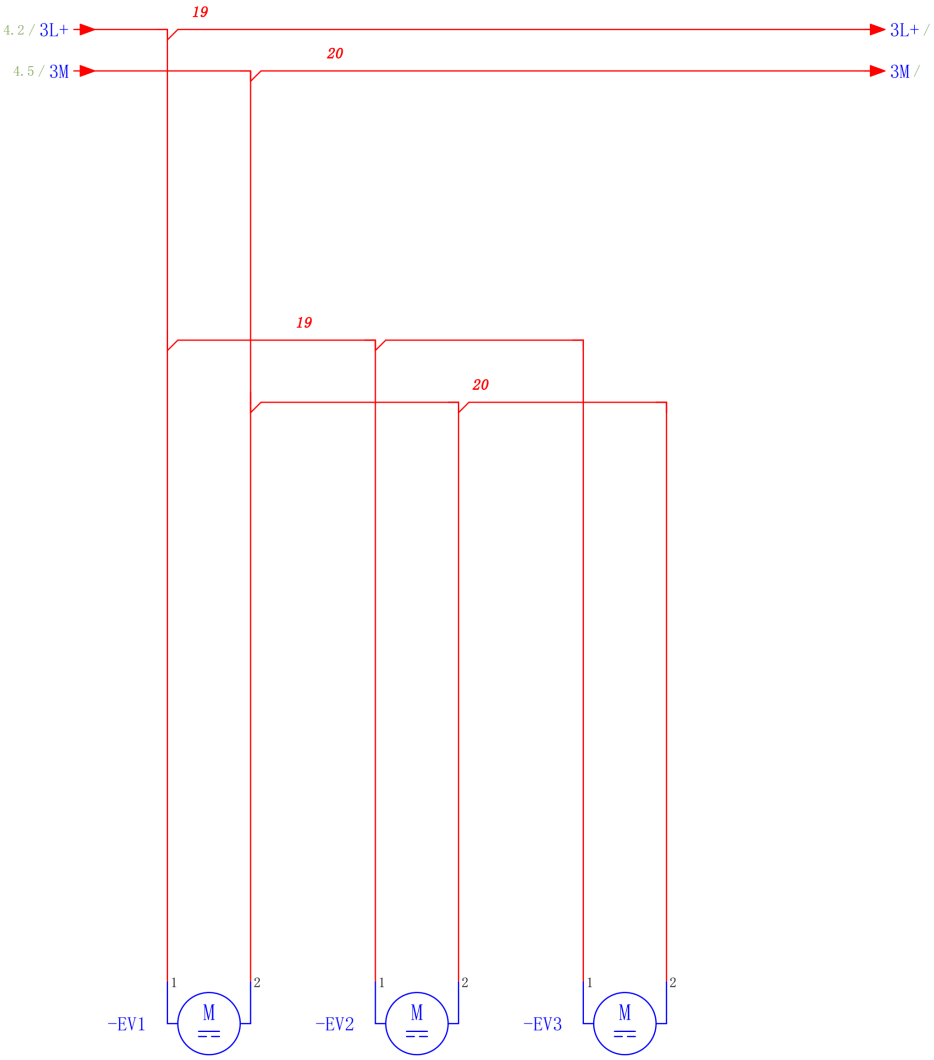



Figure 3.6 Control power supply 24V

Cooling fan




EV1~EV3 rear door DC fan
Please note! The fan blows air outside the cabinet!

Figure 3.7 Cooling fan

DC 24V control loop

| Servo power-on indication | Servo mains control | Servo alarm circuit | E-stop pendant, provided or not |
|---|---|---|---|

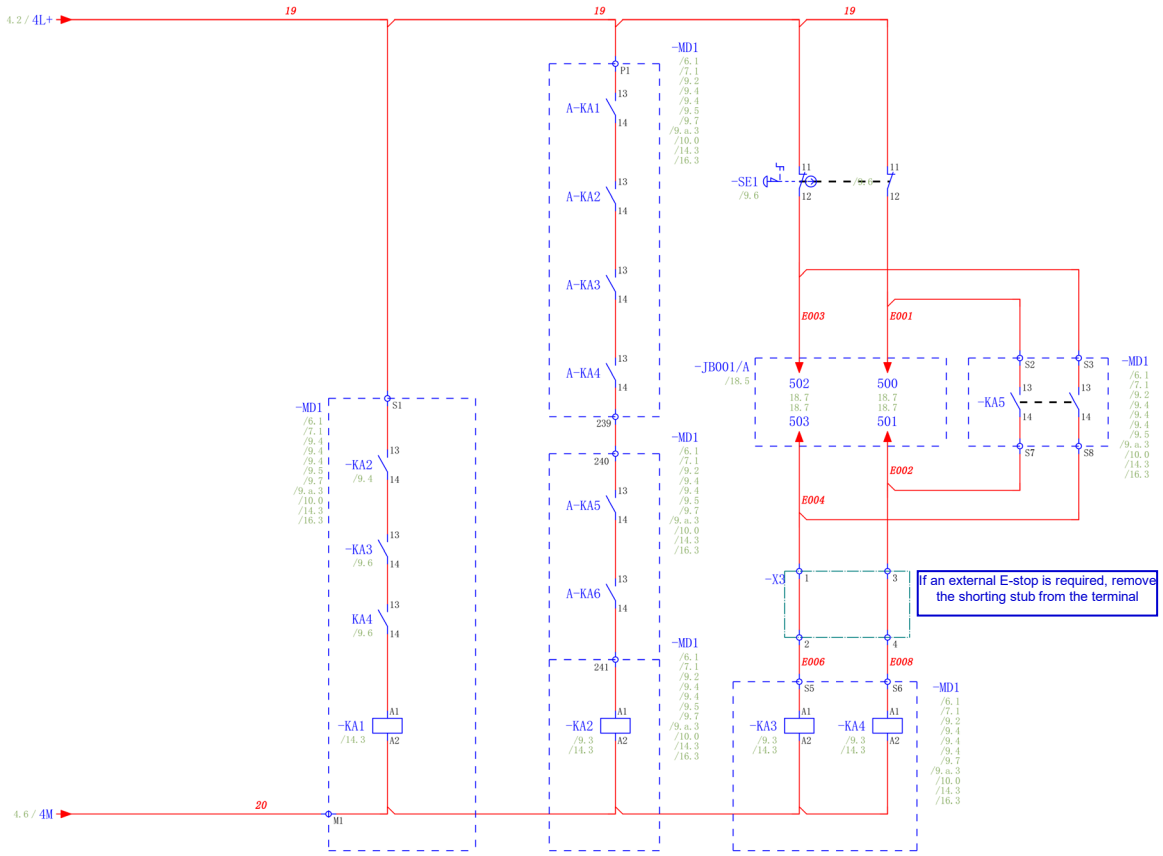



Figure 3.8 DC 24V control loop

AC 220V control loop

Servo main contactor control

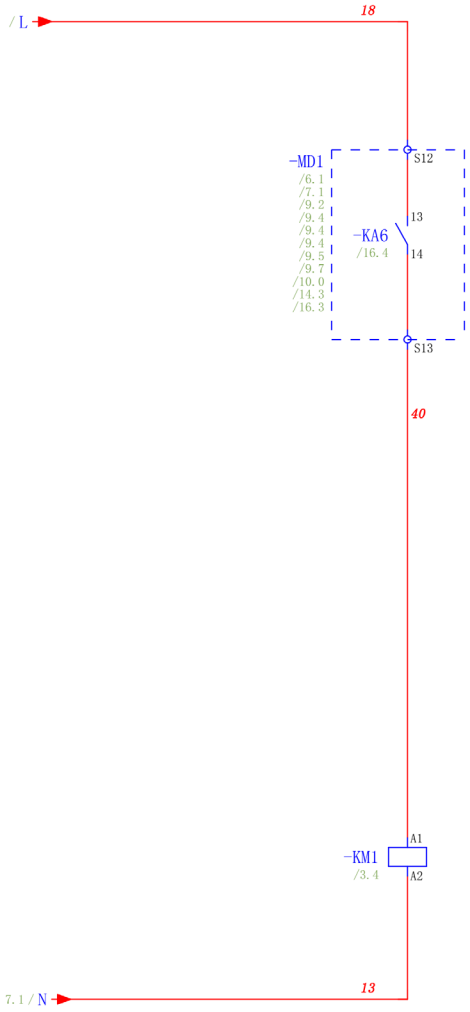



Figure 3.9 AC 220V control loop

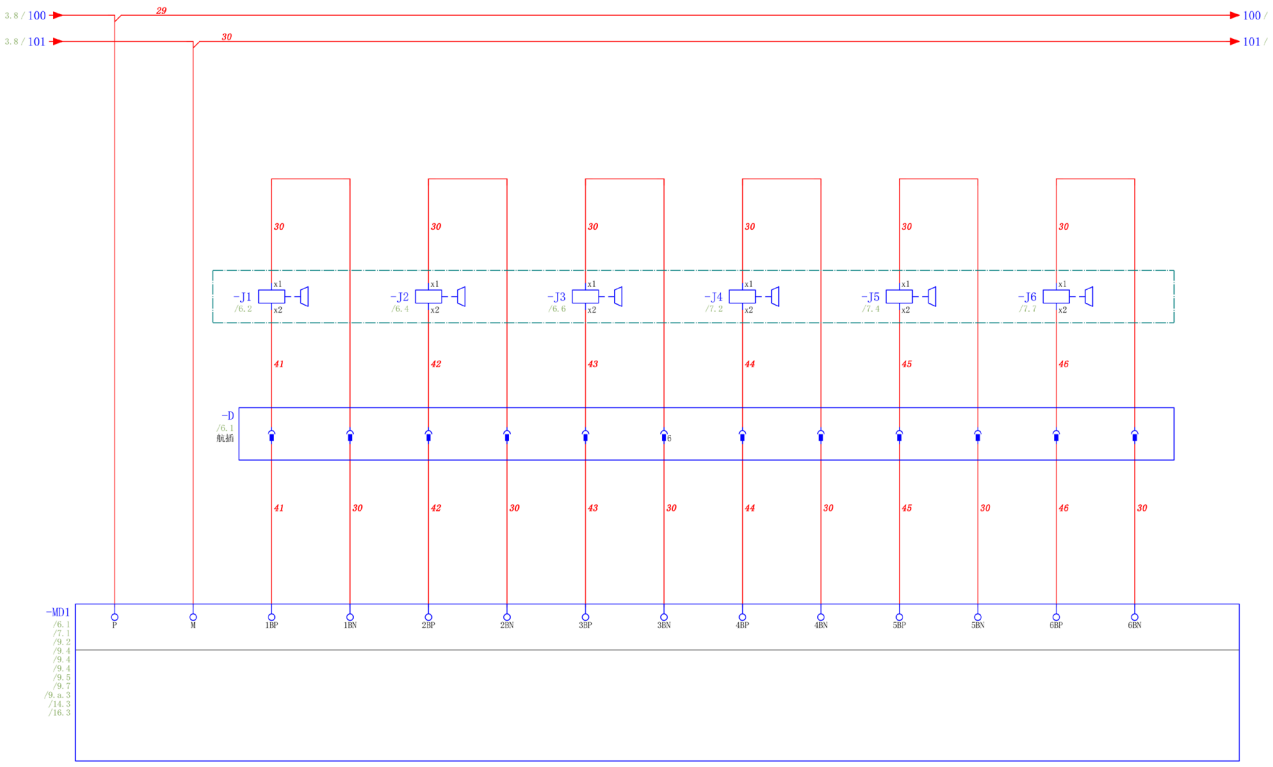



Figure 3.10 Motor brake

## 3.6 Teach pendant

### 3.6.1 Precautions for using teach pendant

1. Handle with care and avoid dropping, throwing, or striking the teach pendant, as this may cause damage or malfunction. When not in use, hang it on the dedicated holder to prevent accidental dropping (our internal drop test result is satisfactory at a height of 1 meter);
2. Do not use sharp objects such as screws, knives, or pen tips to operate the touch screen. This may damage the touch screen. Use your fingers or a stylus pen to operate the touch screen;
3. When no USB devices are connected, make sure to cover the USB ports with protective caps to avoid exposing them to dust, which could cause interruptions or failures;
4. When using USB plugs, do not apply excessive force. Normal use is sufficient;
5. If the USB is not recognized, unplug the USB drive, power off, and then plug it back in after powering on;
6. When using the E-stop button or key, do not apply excessive force. Normal use is sufficient;
7. The power-on time is 40 seconds for the system to start up properly. Do not power off prematurely to avoid file loss;
8. When storing cables, do not place them under heavy machinery to avoid crushing, cutting, or pulling them apart;
9. Follow our defined wiring guidelines to avoid connection errors and potential issues;
10. The teach pendant is not explosion-proof. Do not use it in explosive environments or work units;
11. Keep the teach pendant away from water, oil, and similar environments;
12. The new T76 teach pendant can be used with all models, while the old one is only compatible with PNP module control cabinets.

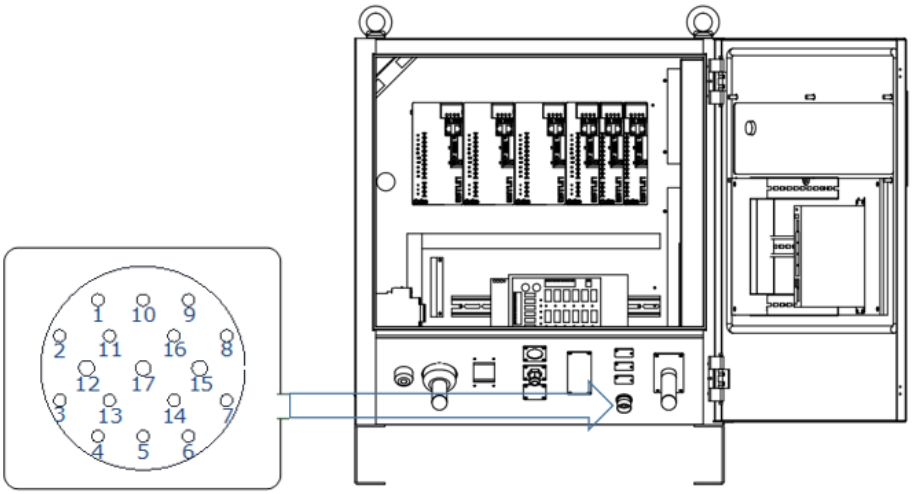
### 3.6.2 Apperance of teach pendant


1. LCD display area; 2. Emergency-stop button; 3. Mode switch; 4. Keyboard area; 5. Indicator LED; 6. Enable switch; 7. Suspension bracket; 8. Cable connection area; 9. USB interface; 10. Operation pen

| Name | Description |
|---|---|
| **Processor** | 335X basic frequency 800mHZ, DDRIII 512M |
| **Memory/Storage** | NANDflash 512M |
| **LCD screen** | TFT 7 Inch 800*480 |
| **Touchscreen** | 4-wire resistive screen |
| **Operating system** | Linux |
| **External USB** | 2.0*1 |
| **Indicator lights** | Indicator LEDs: 3 pcs |
| **Communication** | ETHERNET (100M) |
| **Accessories** | Emergency stop; key switch; enable switch (3 digits) |
| **Display color quality** | 16-bit color |
| **Power consumption** | 24V 1A |
| **Compatible power supply models** | DC24V 1A and above |

| Name | Description |
|---|---|
| **Housing material, color** | ABS/PC; BLACK/GRAY |
| **Operating environment** | Operating temperature: 0°C to 45°C |
| **Storage temperature** | -20°C to 70°C |

### 3.6.3 Teach pendant interface definition




| Pin | Definition | Description | Pin | Definition | Description |
|---|---|---|---|---|---|
| 1 | +24V | 24V power supply | 10 | — | Reserved |
| 2 | GND | Power ground | 11 | — | Reserved |
| 3 | ES1+ | E-stop 1+ | 12 | ED2+ | Teach pendant enable 2+ |
| 4 | ES1- | E-stop 1- | 13 | TD+ | Teach pendant EtherNet transfer data+ |
| 5 | ES2+ | E-stop 2+ | 14 | TD- | Teach pendant EtherNet transmit data- |
| 6 | ES2- | E-stop 2- | 15 | RD+ | Teach pendant EtherNet receive data+ |
| 7 | ED1+ | Teach pendant enable 1+ | 16 | RD- | Teach pendant EtherNet receive data- |
| 8 | ED1- | Teach pendant enable 1+ | 17 | ED2- | Teach pendant enable 2- |
| 9 | — | Reserved | — | — | — |

### 3.6.4 Teach pendant connection

This product can be equipped with a teach pendant for robot teaching and programming. The connection is illustrated as shown in the figure below. For detailed operation of the teach pendant, please refer to the programming manual of the teach pendant.

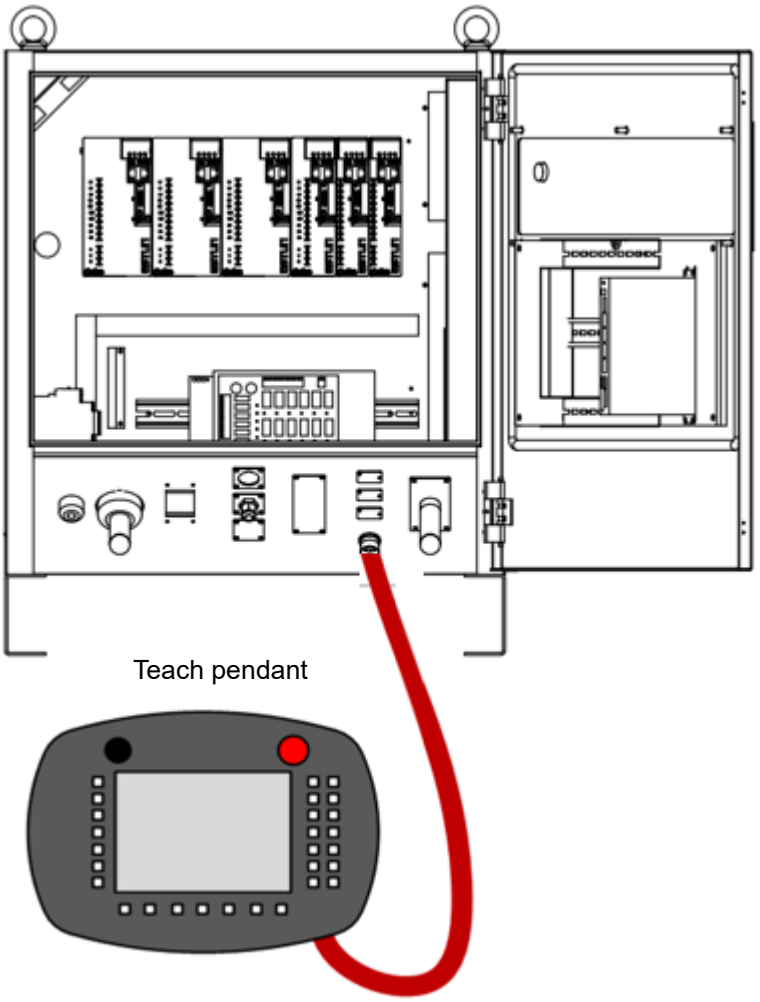



Figure 3.11 Teach pendant wiring

### 3.6.5 Electrical principle

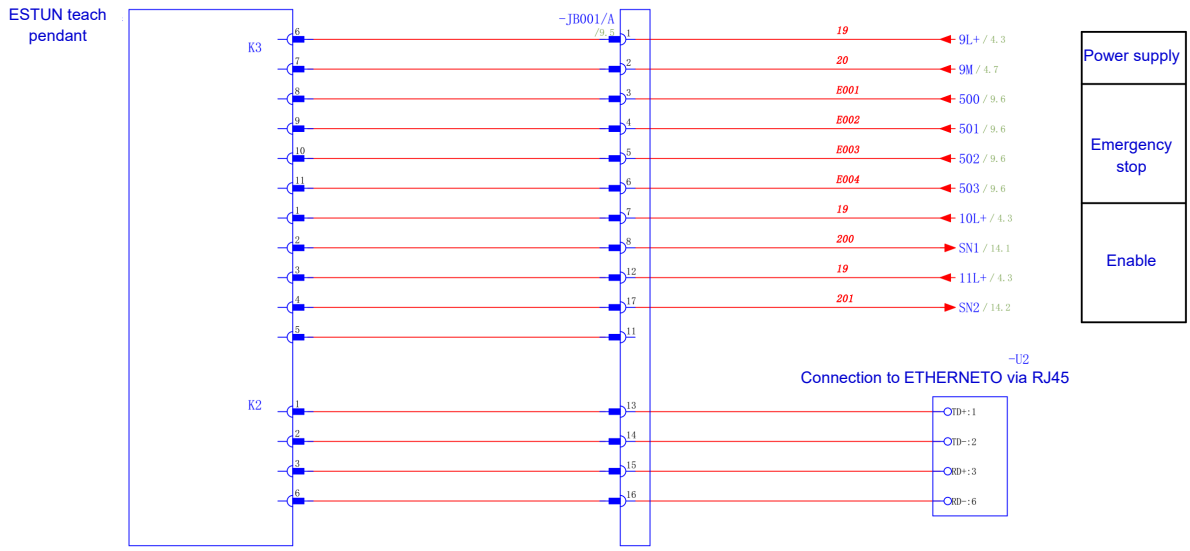


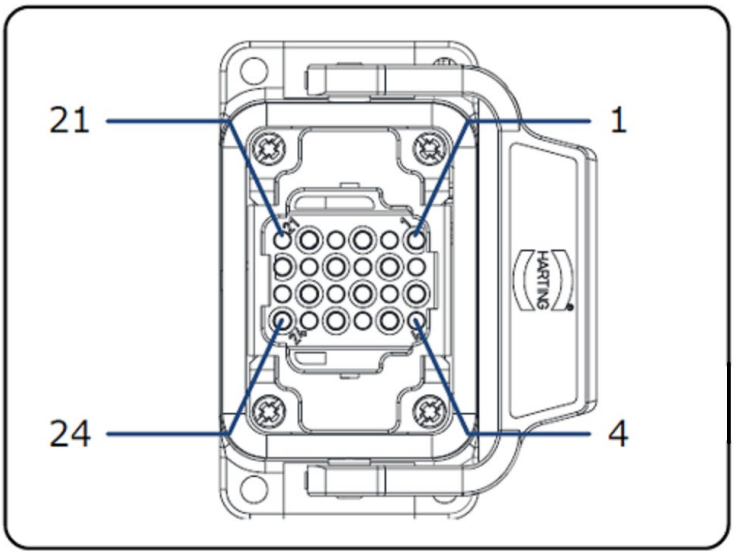

Figure 3.12 Teach pendant wiring

## 3.7 IO wiring

### 3.7.1 IO wiring

IO interface definition

| | |
|---|---|
| 说 明 | The figure below shows the aviation plug at body side |



| Pin | Definition | Pin | Definition |
|---|---|---|---|
| 1 | L01 | 13 | L13 |
| 2 | L02 | 14 | L14 |
| 3 | L03 | 15 | L15 |
| 4 | L04 | 16 | L16 |
| 5 | L05 | 17 | L17 |
| 6 | L06 | 18 | L18 |
| 7 | L07 | 19 | L19 |
| 8 | L08 | 20 | L20 |
| 9 | L09 | 21 | L21 |
| 10 | L10 | 22 | L22 |
| 11 | L11 | 23 | L23 |
| 12 | L12 | 24 | L24 |

## Signal specifications

The technical specifications of the digital input/output expansion module EC4-1616BWE are shown in the table below.

Table 3-2 Table of technical parameters EC4-1616BWE

| | |
|---|---|
| **Interface parameters** | |
| Bus protocol | EtherCAT |
| Number of I/O stations | Depending on the master |
| Data transmission medium | Ethernet/EtherCAT CAT5 cable |
| Transmission distance | ≤ 100 m (station-to-station distance) |
| Transmission rate | 100 Mbps |
| Bus interface | 2xRJ45 |
| **Technical parameters** | |
| Configuration mode | Via Master |
| Power supply | 18 to 36 VDC |
| Electrically isolated | 500 V |
| Weight | Approx. 140 g |
| Dimensions | 102 mmx72 mmx25 mm |
| Operating temperature | -10 to +60°C |
| Storage temperature | -20 to +75°C |
| Relative humidity | 95%, non-condensing |
| IP grade | IP20 |
| **Digital input** | |
| Rated voltage | 24 VDC (±25%) |
| Number of signal points | 16 |
| Signal type | PNP |
| "0" signal voltage (PNP) | -3~+3 V |
| "1" signal voltage (PNP) | 15~30 V |
| Input filtering | 3 ms |
| Input current | 4 mA |
| Isolation method | Optocoupler isolation |
| Isolation withstand voltage | 500 V |
| Channel indicator | Green LED |
| **Transistor output** | |
| Rated voltage | 24 VDC (±25%) |
| Number of signal points | 16 |
| Signal type | PNP |
| Load type | Resistive load, inductive load |
| Single-channel rated current | 250mA |
| Port protection | Over-voltage, over-current protection |

| | |
|---|---|
| Isolation method | Optocoupler isolation |
| Isolation withstand voltage | 500 V |
| Channel indicator | Green LED |

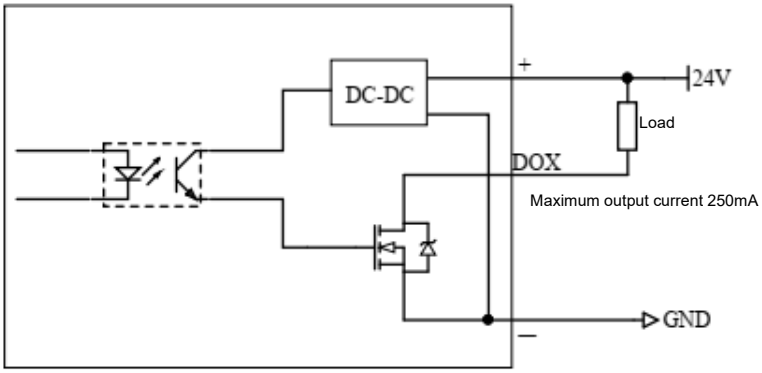



Figure 3.13 DO NPN type wiring diagram

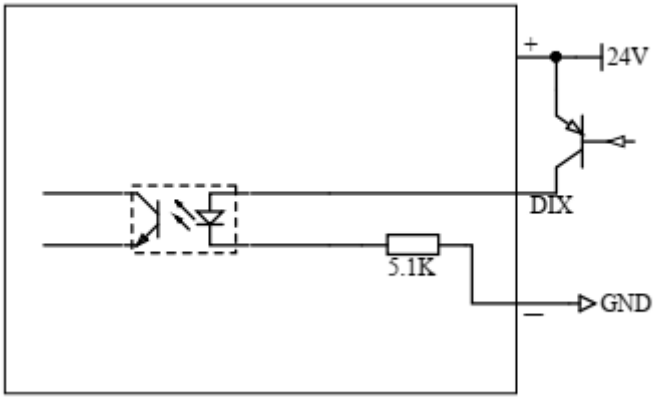



Figure 3.14 DI PNP type wiring diagram

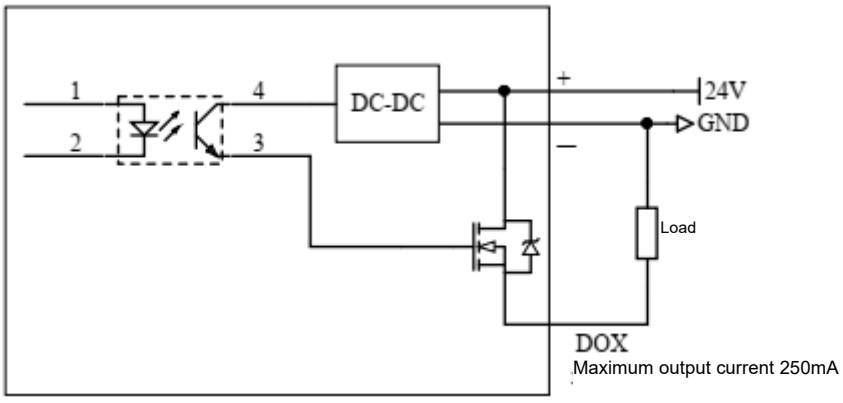



Figure 3.15 DO PNP type wiring diagram

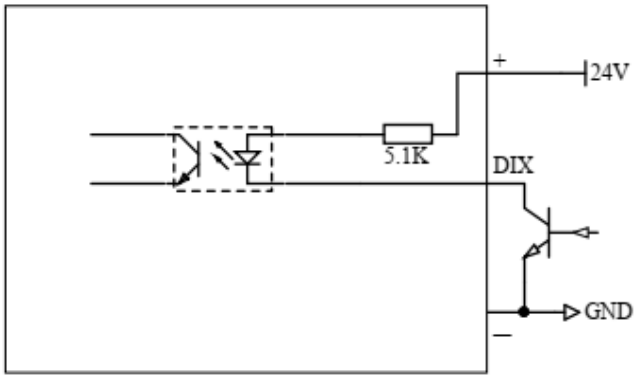



Figure 3.16 DI NPN type wiring diagram

## 3.7.2 Encoder wiring

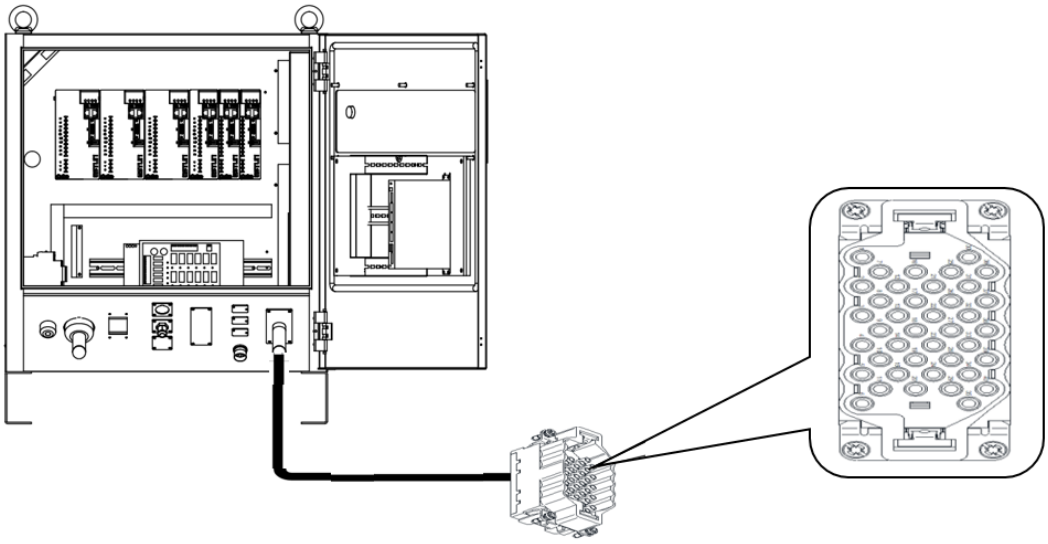


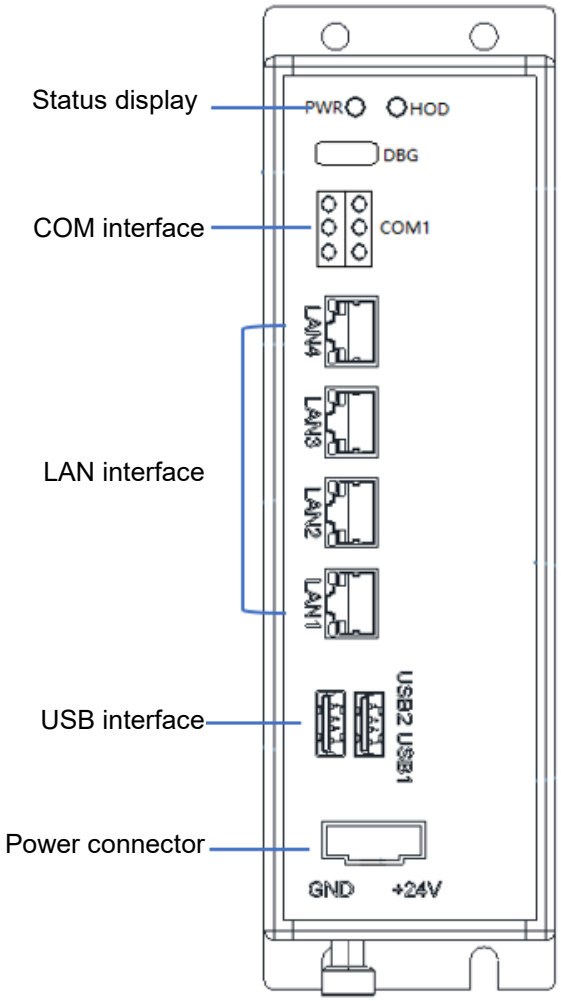
Table 3-1 Encoder - Aviation plugs

| Pin | Definition | Description | Pin | Definition | Description |
|---|---|---|---|---|---|
| 1 | S1＋ | Wiring of the J1 motor encoder | 21 | S4＋ | Wiring of the J4 motor encoder |
| 2 | S1－ | | 22 | S4－ | |
| 3 | — | | 23 | — | |
| 4 | — | | 24 | — | |
| 5 | 5V-1 | | 25 | 5V-4 | |
| 6 | 0V-1 | | 26 | 0V-4 | |
| 7 | S2＋ | Wiring of the J2 motor encoder | 27 | S5＋ | Wiring of the J5 motor encoder |
| 8 | S2－ | | 28 | S5－ | |
| 9 | — | | 29 | — | |
| 10 | — | | 30 | — | |

| Pin | Definition | Description | Pin | Definition | Description |
|---|---|---|---|---|---|
| 11 | — | | 31 | — | |
| 12 | 5V-2 | | 32 | 5V-5 | |
| 13 | 0V-2 | | 33 | 0V-5 | |
| 14 | S3＋ | Wiring of the J3 motor encoder | 34 | S6＋ | Wiring of the J6 motor encoder |
| 15 | S3－ | | 35 | S6－ | |
| 16 | — | | 36 | — | |
| 17 | — | | 37 | — | |
| 18 | 5V-3 | | 38 | 5V-6 | |
| 19 | 0V-3 | | 39 | 0V-6 | |
| 20 | — | | 40 | — | |

## 3.8 Controller

The controller is the motion control device of the robot system, which receives instructions from the teach pendant and sends control signals. It is the core component of the system.



| Item | Description |
|---|---|
| Power supply interface | Connected to switching power supply (DC 24V±10%) |
| Serial interface | — |
| LAN interface | Standard RJ45 connectors (3 in total), connected to:<br>● RJ45 connector of the Teach pendant<br>● Coupler<br>● RJ45 connector of the control cabinet |
| Status display | 7-segment LED digital display tube |
| USB interface | — |

Communication connections

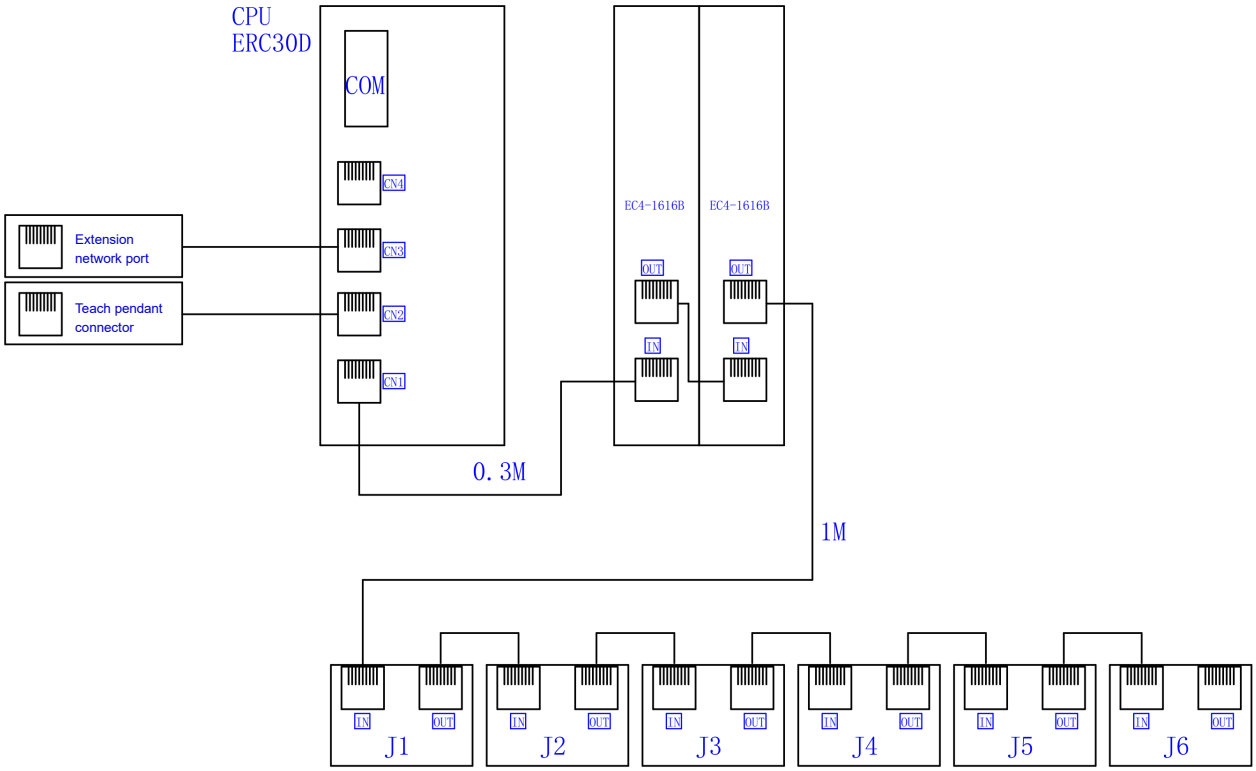



Figure 3.17 Communication connections

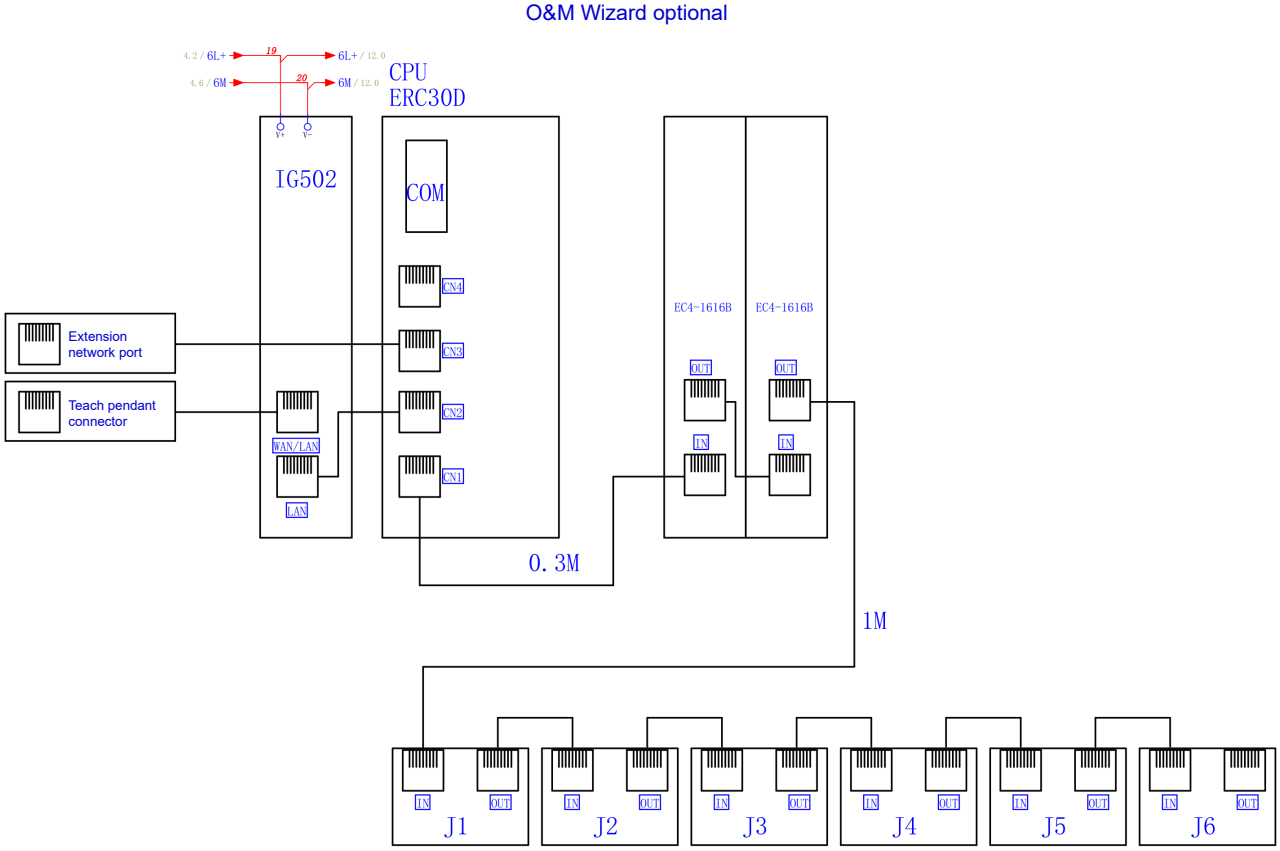



Figure 3.18 Communication connections (optional O&M wizard)

E-stop wiring

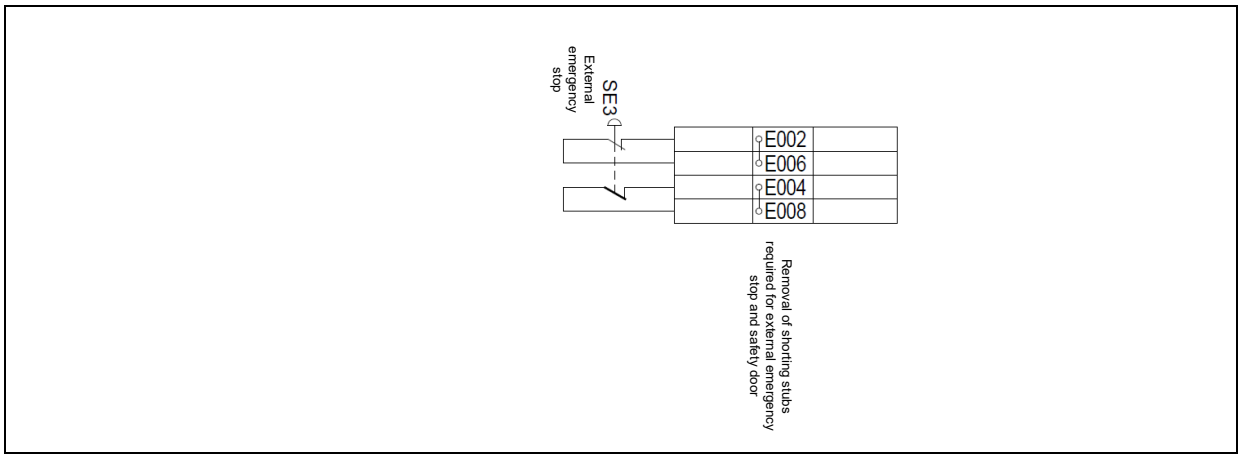



Figure 3.19 E-stop wiring diagram

| | |
|---|---|
| NOTE | **Wiring terminals E002 and E006 may connect to external emergency stop signals, and wiring terminals E004 and E008 may connect to external emergency stop signals. When there is an external emergency stop or safety door signal, the splice should be removed.** |

## Coupler power supply

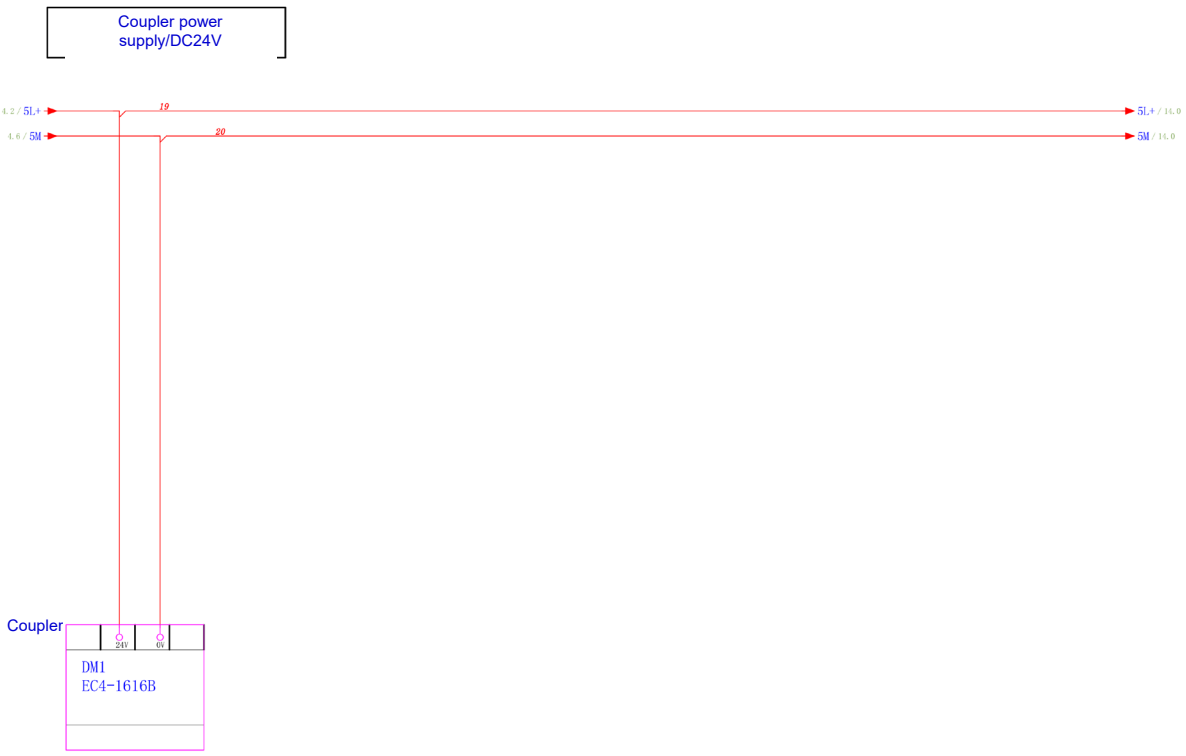



Figure 3.20 Coupler power supply

## Input module

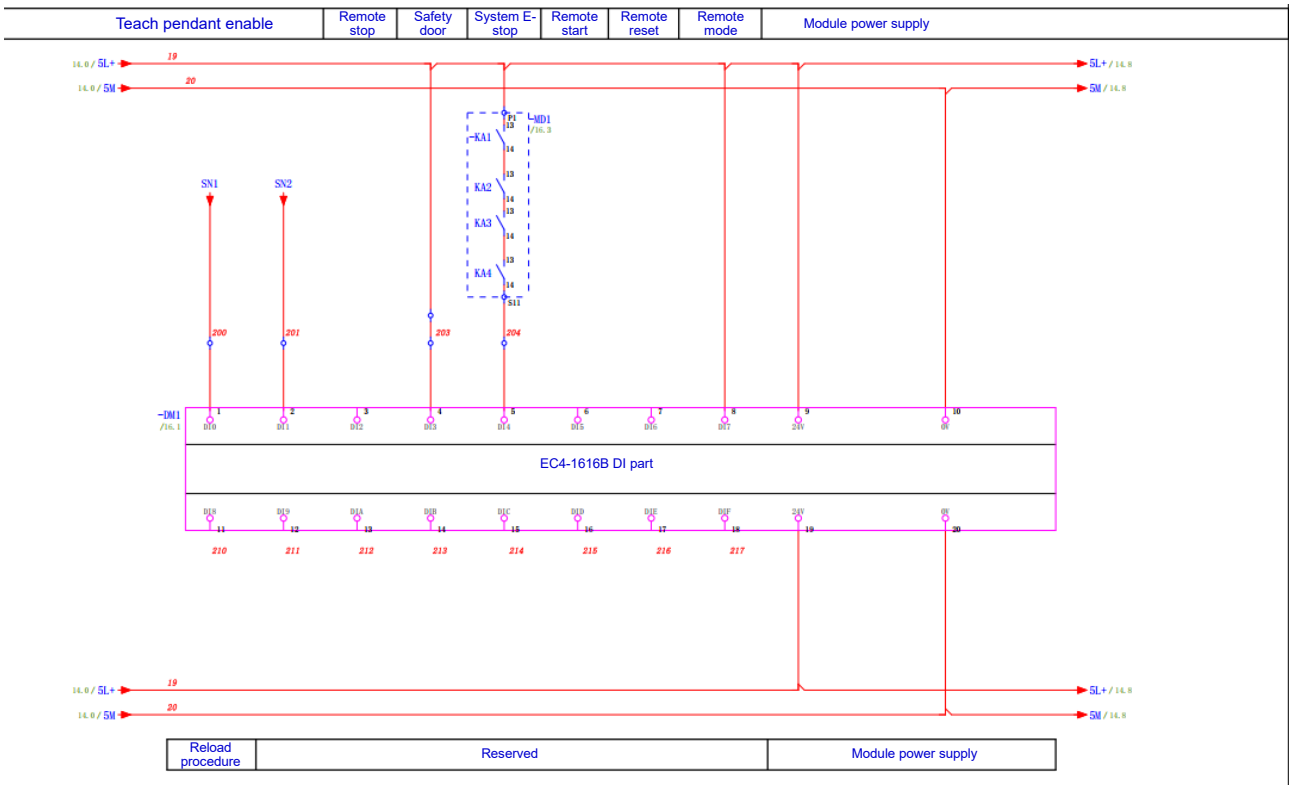



Figure 3.21 Input module

## Output module

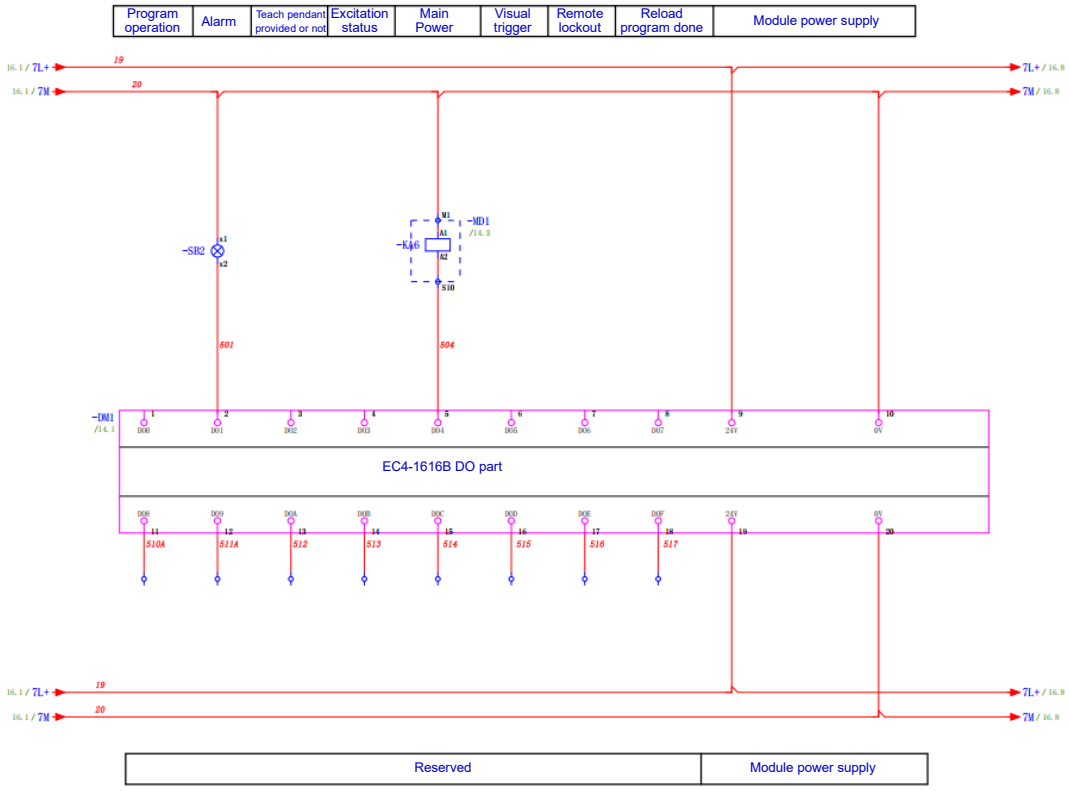
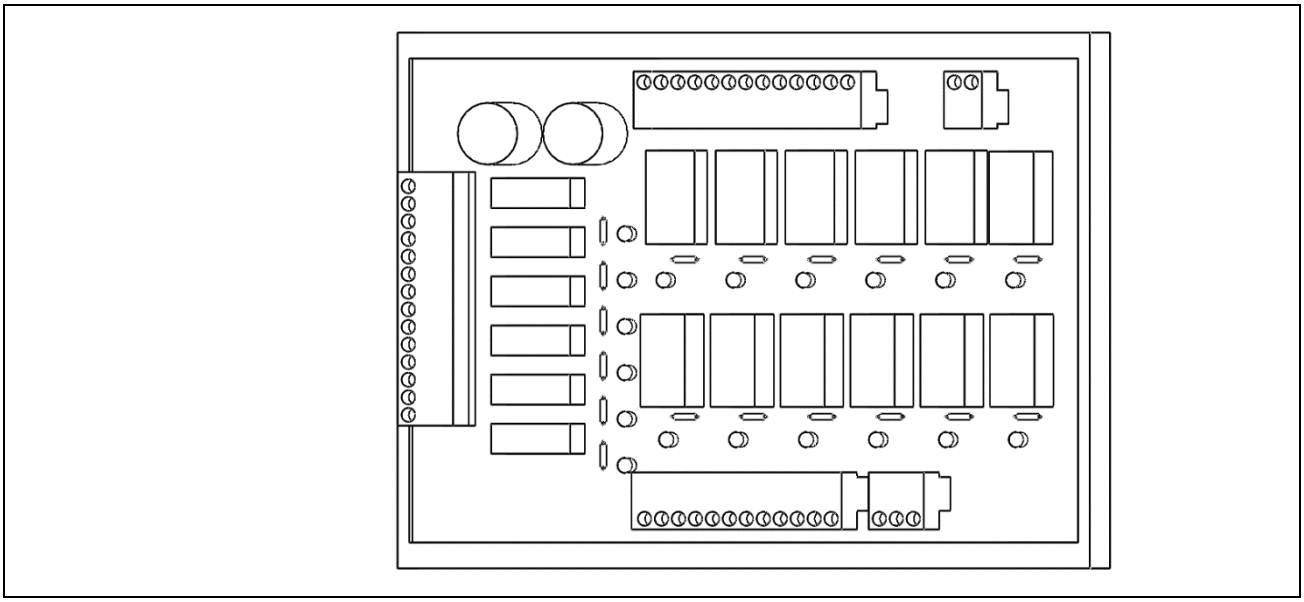
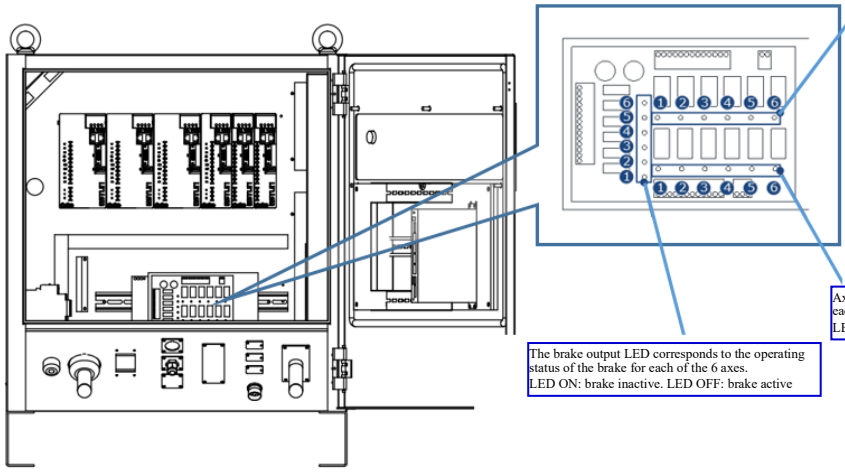



Figure 3.22 Output module

## 3.9 Relay module

The model of the relay module is 11261100001 (relay module ER-Relay-A). Its integrated 18 LED indicators indicate the current status in detail, which has a guiding effect on the maintenance of the internal lines of the control cabinet.






| No. | Description | LED ON | LED OFF |
|---|---|---|---|
| 1 | Servo mains indicator | ON | OFF |
| 2 | E-stop LED | No E-stop | With E-stop |
| 3 | | | |
| 4 | Servo alarm LED | No alarm | With alarm |
| 5 | Teach pendant LED | Provided | Not provided |
| 6 | Servo mains indicator | ON | OFF |

Figure 3.23 Relay module schematic diagram LEDs

The electrical schematic diagram of relay module is shown below.

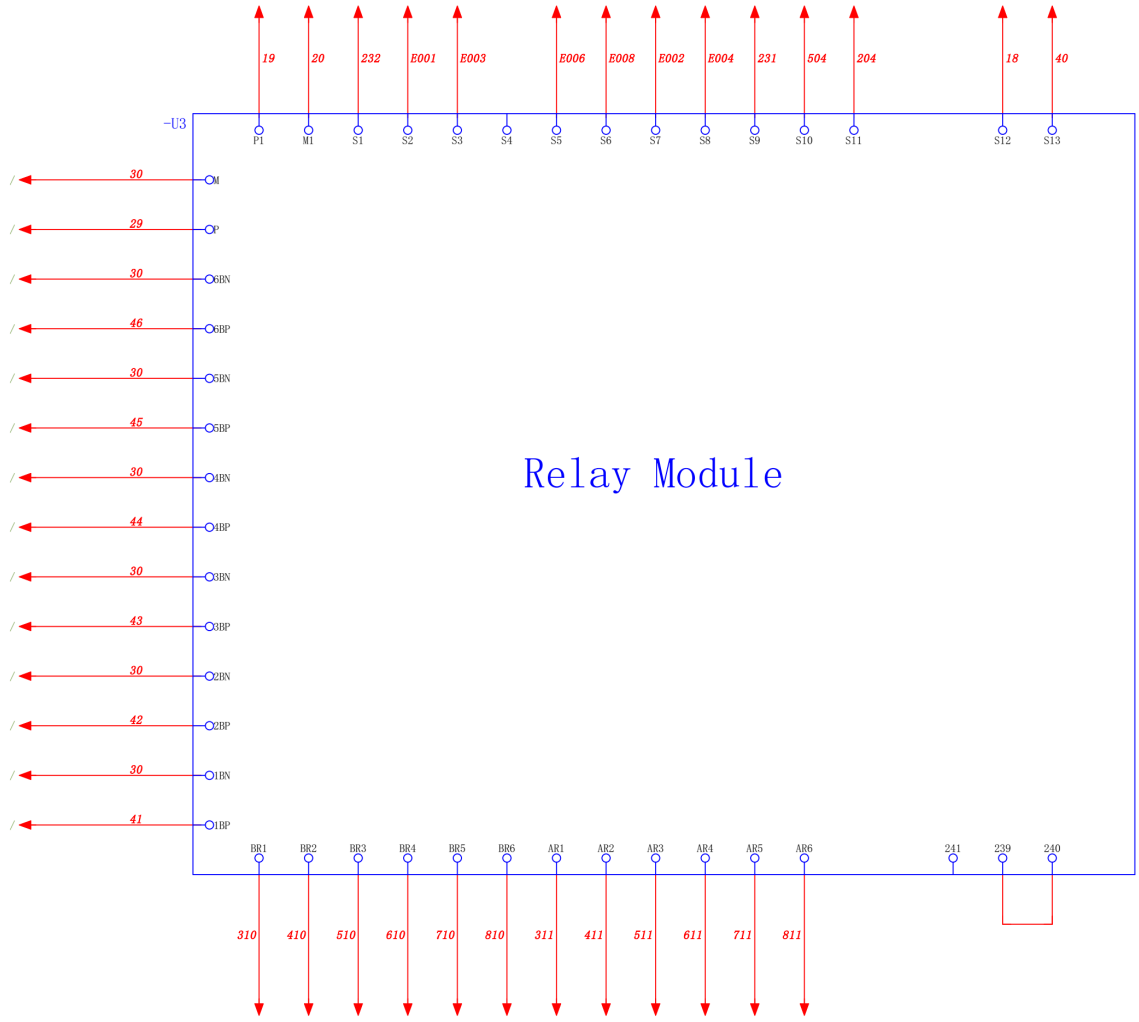



Figure 3.24 Relay module

# Chapter 4 Debugging

## 4.1 Checks before power-on

Before powering on the control cabinet, please check and confirm the following items, and make necessary adjustments if needed.

| S/N | Content |
|---|---|
| 1 | Inspect the appearance of the control cabinet both inside and outside. |
| 2 | Check if the fastening screws are securely connected. |
| 3 | Verify the status of connectors and installation locations of each unit in the control cabinet. |
| 4 | Connect the cables between the control cabinet and the robot. |
| 5 | Disconnect the power supply from the circuit breaker and connect the input power supply cable. |
| 6 | Confirm the input power supply voltage. |
| 7 | Press the emergency stop button on the control panel and power on. |
| 8 | Verify the interface signals between the control cabinet and the robot. |
| 9 | Confirm and set various parameters. |
| 10 | Release the emergency stop on the operating panel. |
| 11 | Confirm the movement of each axis under manual feed. |
| 12 | Verify the operation of each interface signal. |
| 13 | Confirm the operation status of peripheral device control interface signals. |

## 4.2 Use of teach pendant

### 4.2.1 Connection of teach pendant

Please refer to “4.2.1 Connection of teach pendant” for the connection and wiring method of the teach pendant.

### 4.2.2 Editing method

The modification of drive unit parameters can be completed by following the steps below.

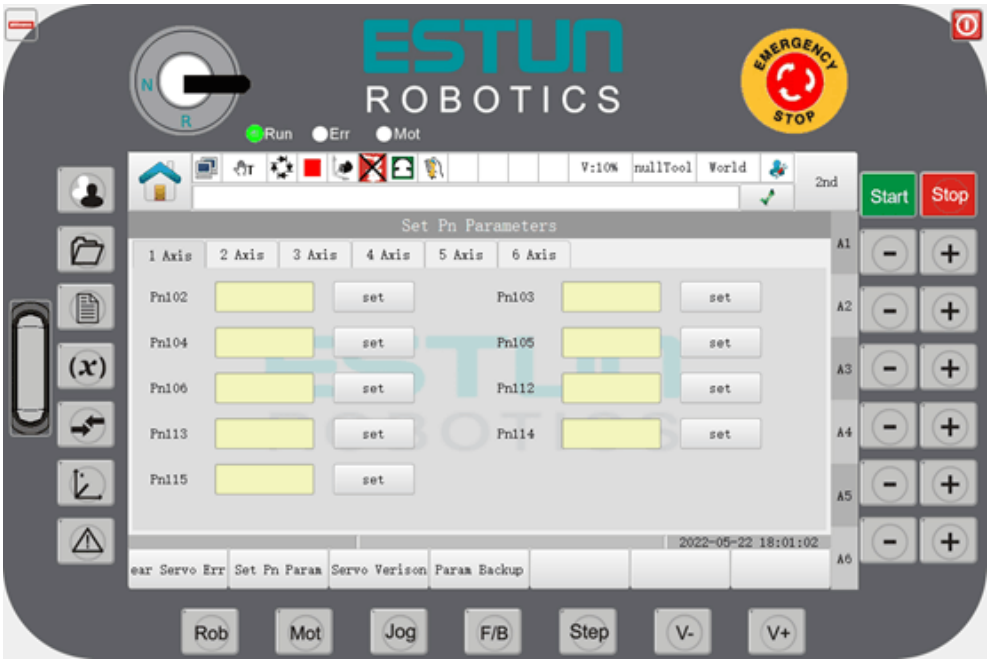
Step 1: When the main power is turned on, the control cabinet undergoes an initialization diagnosis.

The teach pendant screen will display the initialization screen as shown in the figure below.


Step 2: After initialization is completed, check the system's operating status using the status indicator LEDs on the teach pendant. The Run indicator LED should be continuously on, and the Err indicator LED should be off, indicating a normal operating state.

Step 3: When the teach pendant displays the Home screen, select "General Settings > Servo Management".


Step 4: Select the "Set Pn Parameters" tab. When the teach pendant displays the "Set Pn Parameters" screen, choose the tab corresponding to the desired drive axis (e.g., Axis 1) and click the "Set" button.




Step 5: In the parameter dialog box that appears, set the desired parameters.

NOTE Please note that the teach pendant can only be used to set certain Pn parameters. If you wish to set more parameters, please use the operating panel.

## 4.3 Use of ESView software

### 4.3.1 Connecting the servo drive unit

To perform online operations, connect the PC and the servo drive unit using a USB-RS485 (RJ45) communication cable.

Please follow the guided steps below to connect the servo drive unit.

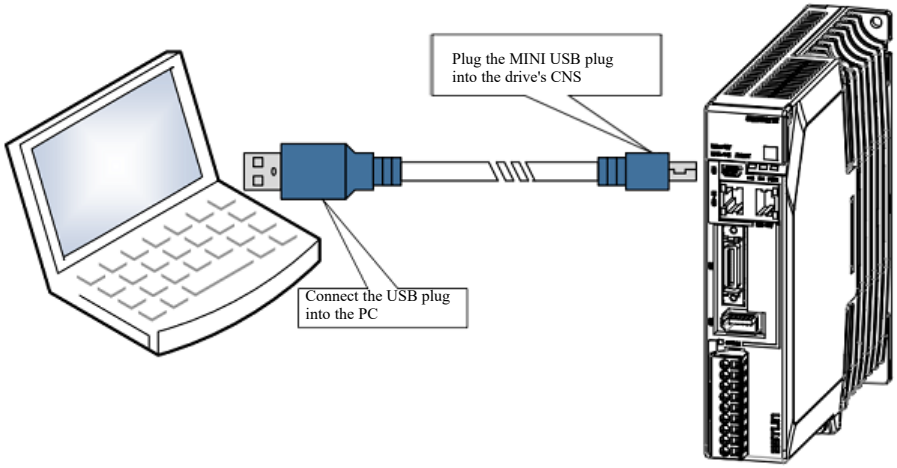
Step 1: Press the "Stop" button on the control cabinet to disconnect the main power.

Step 2: Rotate the "I-ON" switch to "O-OFF" to disconnect the control power.

Step 3: Unlock the latch on the control cabinet door to open it.

Step 4: Check and wait for all indicator lights in the cabinet to turn off (generally for at least 5 minutes).

Step 5: Refer to the connection diagram in the provided figure below, and use a USB-RS485 (RJ45) communication cable to connect the PC and the servo drive unit.




Step 6: Rotate the "O-OFF" switch to "I-ON" to power on the control.

At this point, the PC has successfully connected to the servo drive unit.

### 4.3.2 Installing ESView

System Requirements

Users are required to have a personal computer that meets the following basic conditions:

| Item | Description |
|---|---|
| OS | Windows 7 (32-bit/64-bit)<br>Windows 10 (32-bit/64-bit)<br>Description:<br>English, Chinese (Simplified) versions of the above OS |
| CPU | 1.6GHz and above |
| Memory | System memory 1GB and above<br>Graphics card memory 64MB and above |
| Hard disk capacity | At least 1GB remaining |
| Serial communication function | USB port |
| Display | 1027 x 768 pixels and above<br>24bit color (TrueColor) and above |

## Preparation before installation

Please make the following preparations before installation: Windows operating system, communication cable, and decompression software.

Log in to the official website of ESTUN at www.estun.com and navigate to the "Downloads" section to find and download the ESView software.

If you are unable to obtain the software or require assistance, please contact ESTUN engineers.

- Power on your computer and start Windows.
- If Windows is already running, close any other software that is currently running.
- Copy the compressed file of ESView to any directory on your personal computer.
- If your personal computer is already connected to a drive unit, disconnect the connection.
- If you want to reinstall ESView, it is recommended to uninstall any previously installed ESView software first.

## Software installation

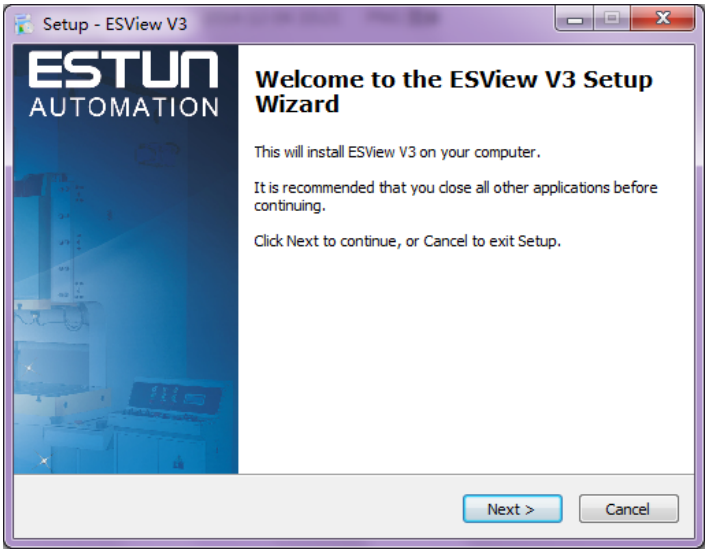
To ensure a successful installation, please close other running software and ensure that the Windows user has administrator privileges.

Follow the guided steps below to install ESView.

Step 1: Open and extract the ESView compressed file to any directory on your personal computer.

Step 2: Double-click and run the ESView installation program to launch the ESView installation wizard, as shown in Table 4-1.

Table 4-1: Starting ESView installation




Step 3: Follow the prompts in the installation wizard to install ESView on your PC.

### 4.3.3 Enabling ESView

Online operation

Through online operation, you can upload, download, and perform other operations on the parameters of the servo drive unit.

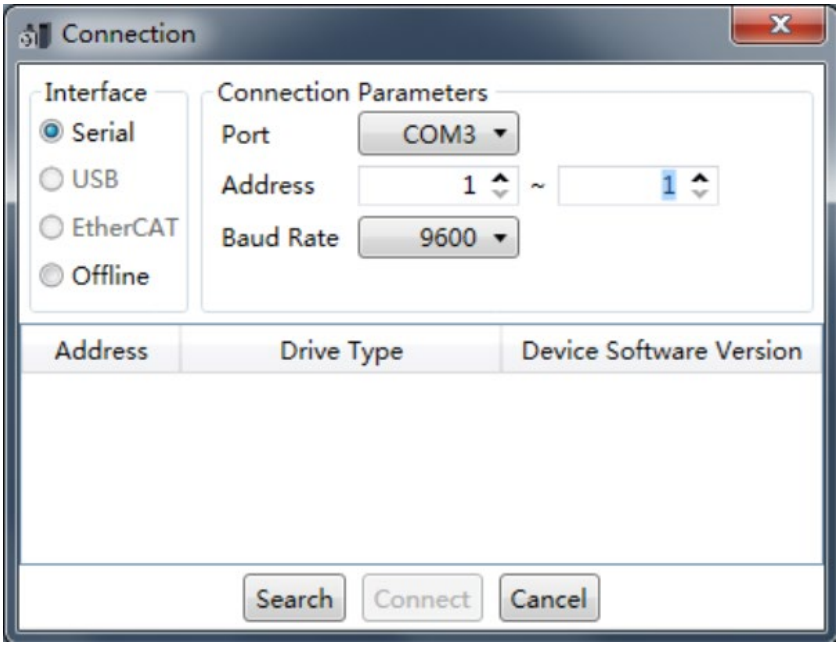
To perform online operations, connect the PC and the servo drive unit using a USB-RS485 (RJ45) communication cable.

Step 1: Connect the drive unit to the PC using a USB connection cable.

Step 2: From the Windows Start menu, select "All Programs > ESView > ESView" or double-click the shortcut of the "ESView" program on the desktop.

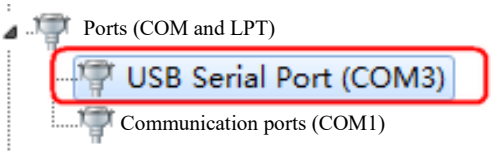
Step 3: After launching the ESView program, the "Communication Settings" dialog box will automatically appear. If ESView is already enabled, choose the menu "Home > Connect" in the ESView program, or simply click.

Step 4: Select "Serial".




Step 5: Configure the "Communication Parameters".

- Port: Select the correct serial port number from the drop-down list.
  Users can open the computer's "Device Manager" and find the port number under "Ports → USB Serial Port (COMx)". For example, if the port is "COM3", it will be displayed as shown in the figure below.




- Address: Set the communication address range for device detection. The default address at the factory is as follows:

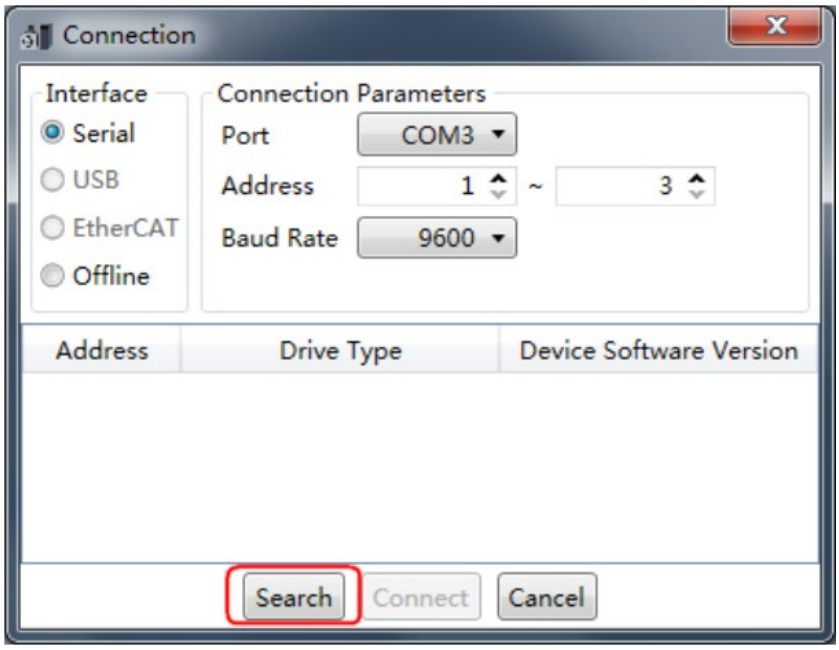
| Robot axis number | ESView display ID | Default address |
|---|---|---|
| J1 axis | #1 | 1 |

| Robot axis number | ESView display ID | Default address |
|---|---|---|
| J6 axis | #2 | |
| J2 axis | #1 | 2 |
| J5 axis | #2 | |
| J3 axis | #1 | 3 |
| J4 axis | #2 | |

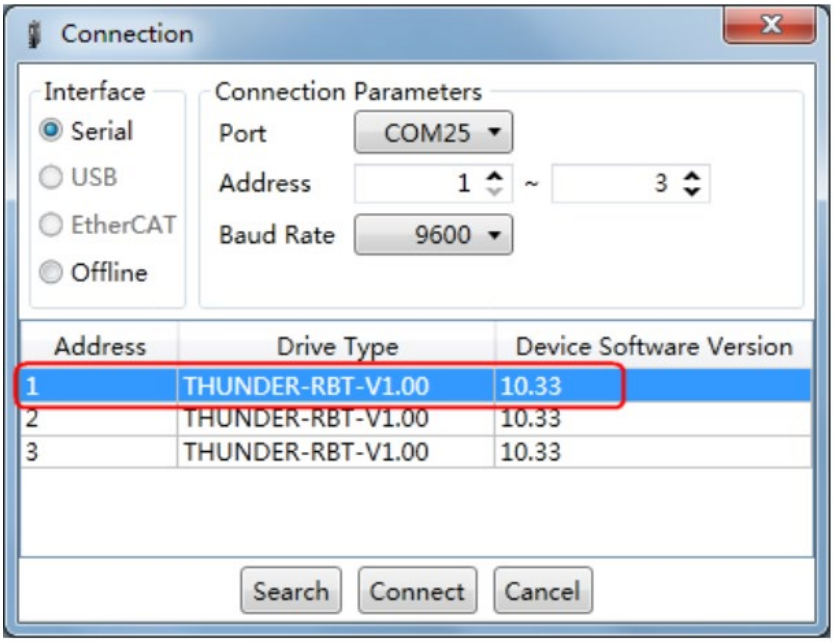
NOTE The "Address" can be viewed or modified using Pn701.

- Baud Rate: Set the communication speed with the device. The actual communication speed can be viewed using parameter Pn700.0, with a default value of 9600.

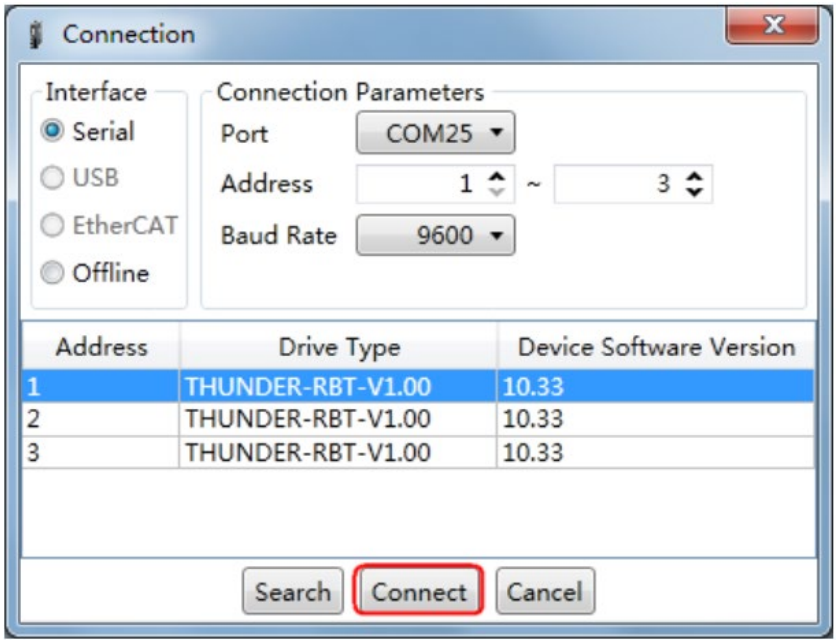
Step 6: Click on "Search".




Step 7: Select the desired drive device to connect. In the example below, a drive device with an address of "1" is selected.




Step 8: Click on "Connect".




Step 9: Once in the main window of ESView, the connected device will be displayed in the left "Devices" column. Users can now make necessary settings to the drive unit or motor in real-time.

Offline Operation

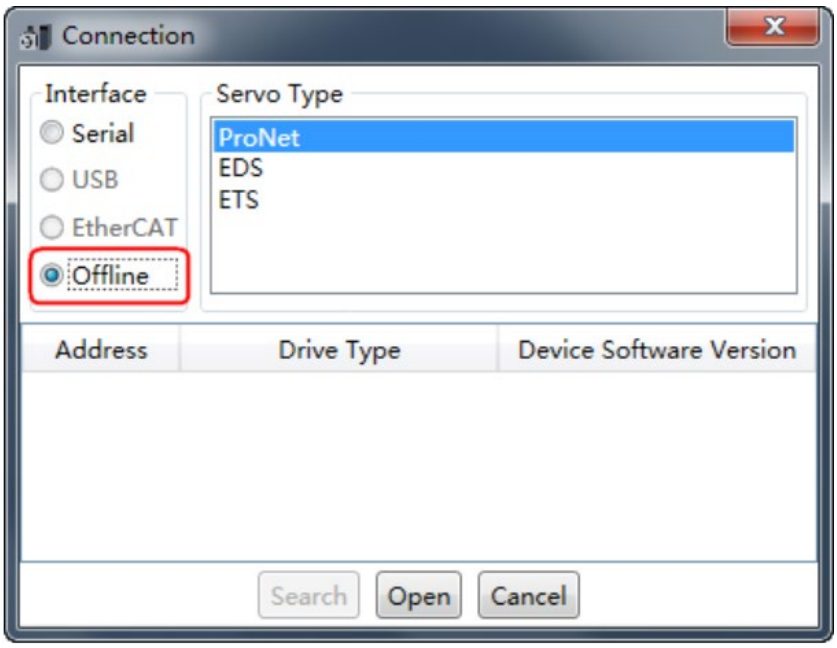
In offline operation, users can perform image operations such as oscilloscope, FFT, mechanical analysis, etc., without the need to connect any devices.

Although there is no need to connect the actual drive unit, certain functionalities are limited and cannot be configured correctly.

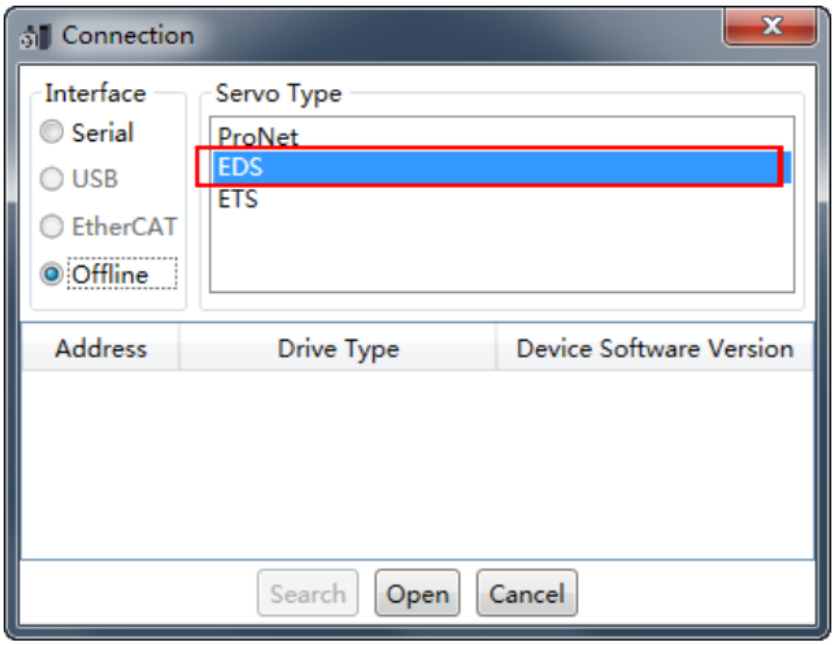
Step 1: From the Windows Start menu, select "All Programs > SView > SView" or double-click the shortcut of the "ESView" program on the desktop.

Step 2: After launching the ESView program, the "Connection" dialog box will automatically appear. If ESView is already enabled, choose the menu "Home > Connect Servo".

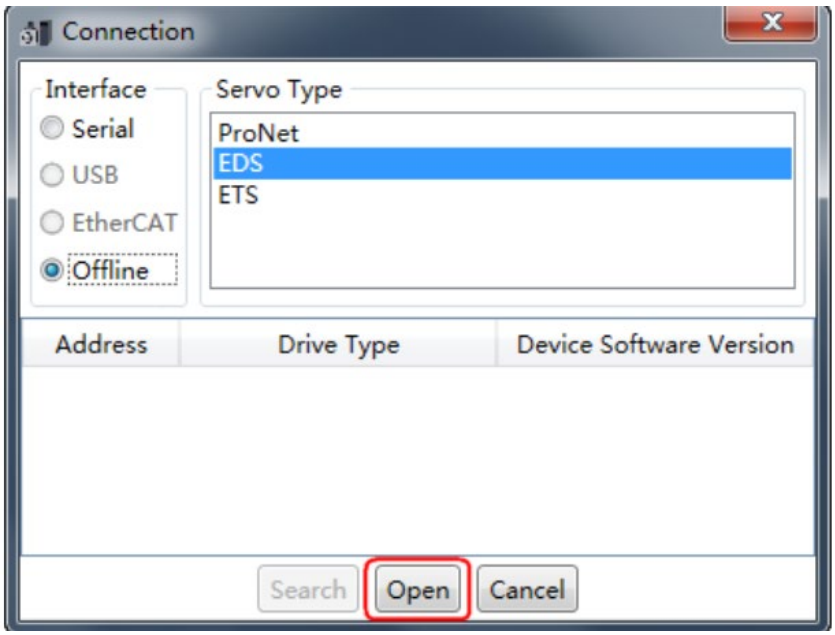
Step 3: Select "Offline".




Step 4: Choose the desired "Drive Type" for configuration, such as "EDS".




Step 5: Click on "Open".




Step 6: Once in the main window of ESView, the created offline device will be displayed in the left "Devices" column.

| | |
|---|---|
| NOTE | Certain functionalities are limited and cannot be configured correctly in offline operation. |

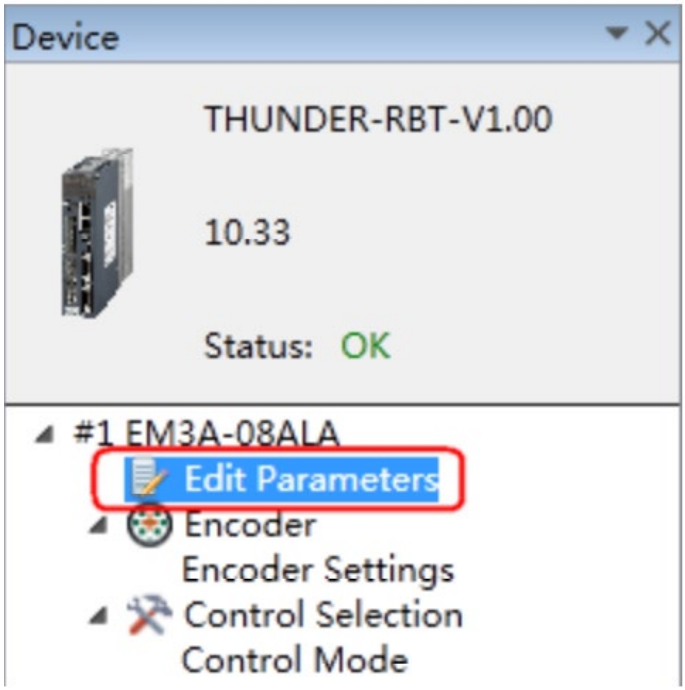
### 4.3.4 Parameter settings

In the "Parameter Edit" window, users can perform the following operations:

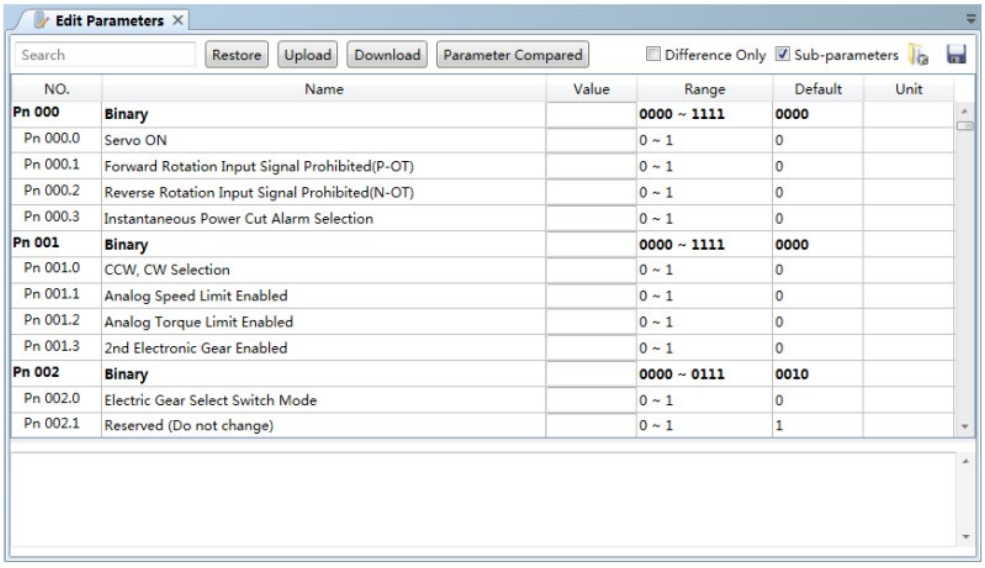
- Upload Parameters
- Edit Parameters
- Search Parameters
- Download Parameters
- Restore Factory Values
- Save Parameters
- Compare Parameters

To open the "Parameter Edit" window, follow the guided steps below:

Step 1: Double-click on the "Parameter Edit" option in the device column of ESView.




Step 2: The "Parameter Edit" window will appear in the "Function Display Area."




| NO. | Name | Value | Range | Default | Unit |
|---|---|---|---|---|---|
| **Pn 000** | **Binary** | | **0000 ~ 1111** | **0000** | |
| Pn 000.0 | Servo ON | | 0 ~ 1 | 0 | |
| Pn 000.1 | Forward Rotation Input Signal Prohibited(P-OT) | | 0 ~ 1 | 0 | |
| Pn 000.2 | Reverse Rotation Input Signal Prohibited(N-OT) | | 0 ~ 1 | 0 | |
| Pn 000.3 | Instantaneous Power Cut Alarm Selection | | 0 ~ 1 | 0 | |
| **Pn 001** | **Binary** | | **0000 ~ 1111** | **0000** | |
| Pn 001.0 | CCW, CW Selection | | 0 ~ 1 | 0 | |
| Pn 001.1 | Analog Speed Limit Enabled | | 0 ~ 1 | 0 | |
| Pn 001.2 | Analog Torque Limit Enabled | | 0 ~ 1 | 0 | |
| Pn 001.3 | 2nd Electronic Gear Enabled | | 0 ~ 1 | 0 | |
| **Pn 002** | **Binary** | | **0000 ~ 0111** | **0010** | |
| Pn 002.0 | Electric Gear Select Switch Mode | | 0 ~ 1 | 0 | |
| Pn 002.1 | Reserved (Do not change) | | 0 ~ 1 | 1 | |

Uploading Parameters

There are two ways to upload parameters: "Upload All" and "Upload Selected Items."

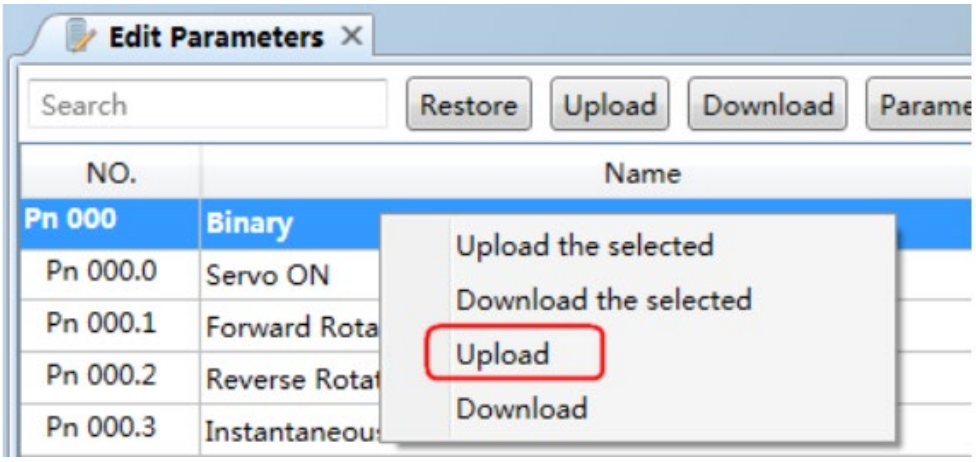
- **Upload All:**

  **Method 1:**

  In the "Parameter Edit" window, click on "Upload All." After a moment, ESView will read and display the settings of all parameters from the drive unit in the "Device Value" column.

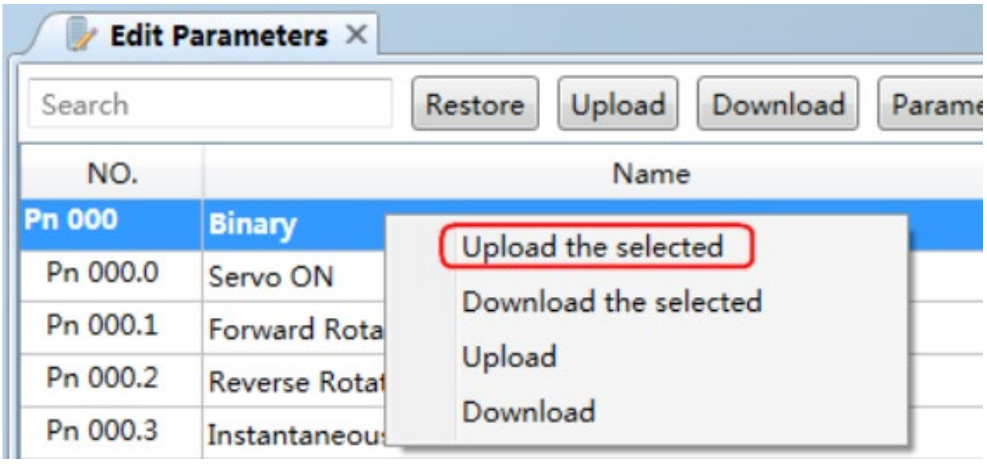

  **Method 2:**

  Users can also right-click on any non-editable area of the parameter list and select "Upload All" from the pop-up menu.



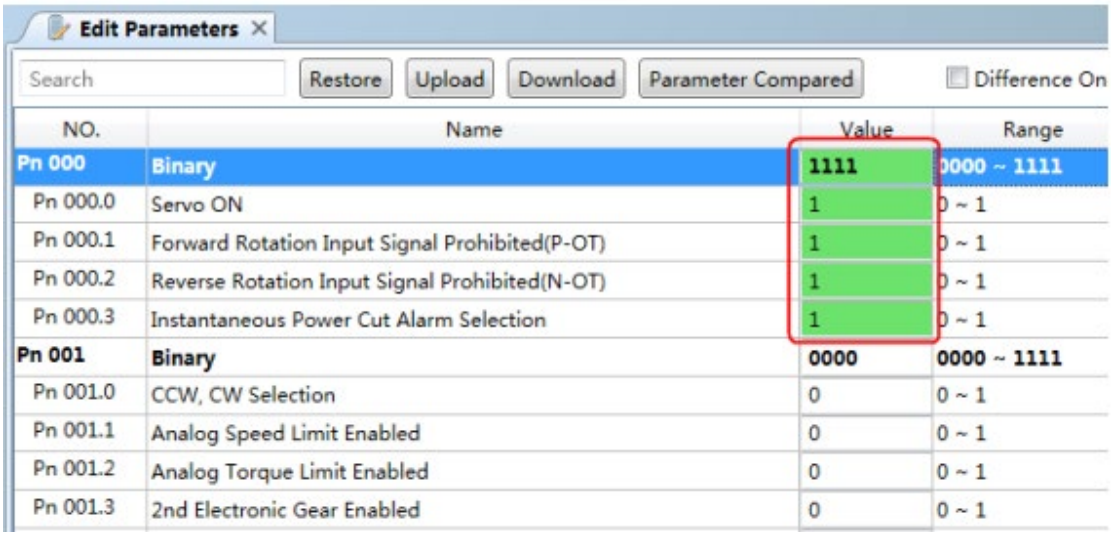

- **Upload Selected Items**

In the "Parameter Edit" window, users can either drag the mouse to select specific parameters or hold down the "Ctrl" key on the keyboard and individually select the parameters to be read. Then, right-click on one of the selected items and choose "Upload Selected Items" from the pop-up menu.



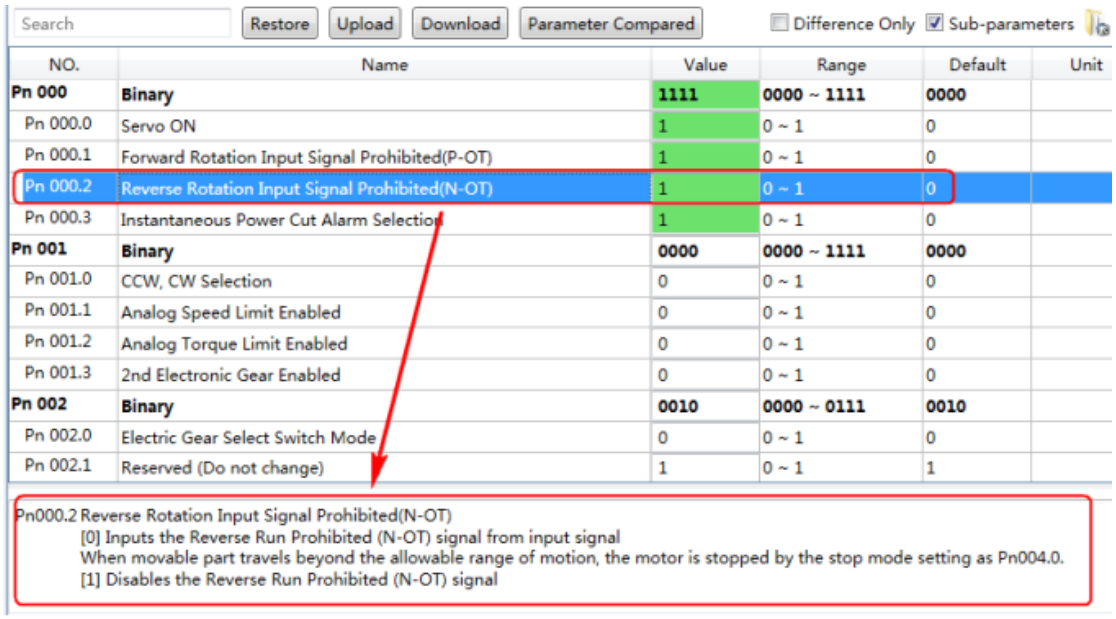
## Edit Parameters

After successfully uploading parameters, users can directly modify the desired parameters in the "Device Value" column, and the parameters will be updated accordingly.




| NO. | Name | Value | Range |
|---|---|---|---|
| **Pn 000** | **Binary** | **1111** | **0000 ~ 1111** |
| Pn 000.0 | Servo ON | 1 | 0 ~ 1 |
| Pn 000.1 | Forward Rotation Input Signal Prohibited(P-OT) | 1 | 0 ~ 1 |
| Pn 000.2 | Reverse Rotation Input Signal Prohibited(N-OT) | 1 | 0 ~ 1 |
| Pn 000.3 | Instantaneous Power Cut Alarm Selection | 1 | 0 ~ 1 |
| **Pn 001** | **Binary** | **0000** | **0000 ~ 1111** |
| Pn 001.0 | CCW, CW Selection | 0 | 0 ~ 1 |
| Pn 001.1 | Analog Speed Limit Enabled | 0 | 0 ~ 1 |
| Pn 001.2 | Analog Torque Limit Enabled | 0 | 0 ~ 1 |
| Pn 001.3 | 2nd Electronic Gear Enabled | 0 | 0 ~ 1 |

When editing parameters, detailed explanations for each parameter will be displayed below the parameter list, providing assistance for user configuration.

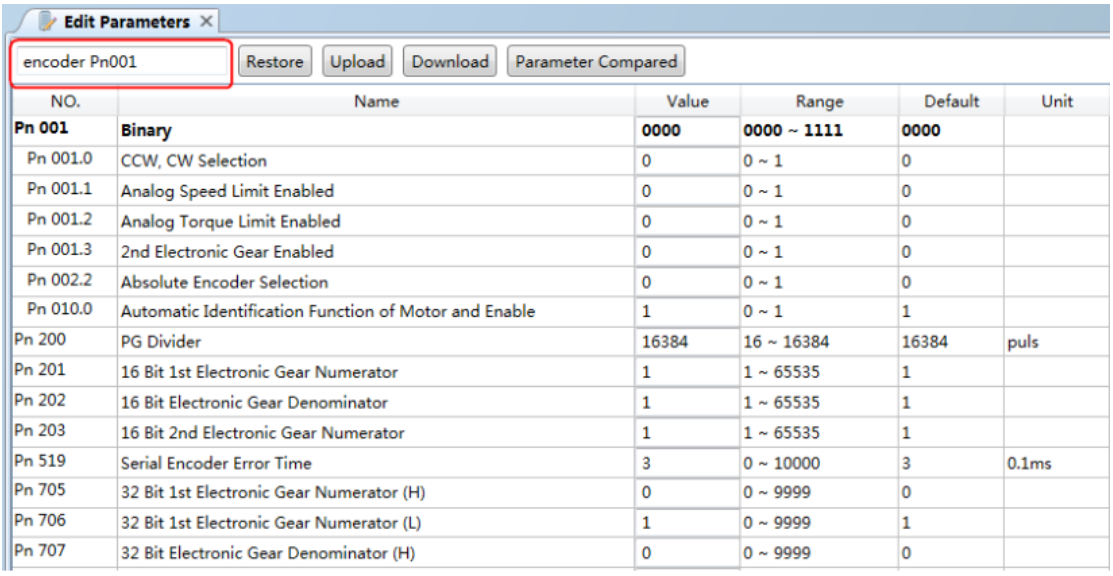



| NO. | Name | Value | Range | Default | Unit |
|---|---|---|---|---|---|
| **Pn 000** | **Binary** | **1111** | **0000 ~ 1111** | **0000** | |
| Pn 000.0 | Servo ON | 1 | 0 ~ 1 | 0 | |
| Pn 000.1 | Forward Rotation Input Signal Prohibited(P-OT) | 1 | 0 ~ 1 | 0 | |
| Pn 000.2 | Reverse Rotation Input Signal Prohibited(N-OT) | 1 | 0 ~ 1 | 0 | |
| Pn 000.3 | Instantaneous Power Cut Alarm Selection | 1 | 0 ~ 1 | 0 | |
| **Pn 001** | **Binary** | **0000** | **0000 ~ 1111** | **0000** | |
| Pn 001.0 | CCW, CW Selection | 0 | 0 ~ 1 | 0 | |
| Pn 001.1 | Analog Speed Limit Enabled | 0 | 0 ~ 1 | 0 | |
| Pn 001.2 | Analog Torque Limit Enabled | 0 | 0 ~ 1 | 0 | |
| Pn 001.3 | 2nd Electronic Gear Enabled | 0 | 0 ~ 1 | 0 | |
| **Pn 002** | **Binary** | **0010** | **0000 ~ 0111** | **0010** | |
| Pn 002.0 | Electric Gear Select Switch Mode | 0 | 0 ~ 1 | 0 | |
| Pn 002.1 | Reserved (Do not change) | 1 | 0 ~ 1 | 1 | |

## Search Parameters

Operating steps:

1. In the "Parameter Edit" window, click on the search input box.
2. Enter the desired keyword(s) in the input box ("NO.", "Name", "Device Value", "Range", "Default Value", "Unit", or any characters in the detailed parameter explanation).
3. To search for multiple criteria simultaneously, add one or more spaces between the keywords. The window will display all parameters that match any of the specified keywords.



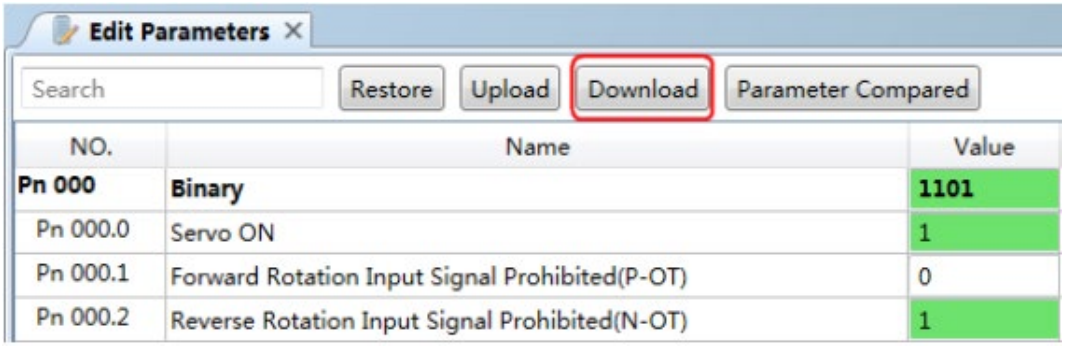

| NO. | Name | Value | Range | Default | Unit |
|---|---|---|---|---|---|
| **Pn 001** | **Binary** | **0000** | **0000 ~ 1111** | **0000** | |
| Pn 001.0 | CCW, CW Selection | 0 | 0 ~ 1 | 0 | |
| Pn 001.1 | Analog Speed Limit Enabled | 0 | 0 ~ 1 | 0 | |
| Pn 001.2 | Analog Torque Limit Enabled | 0 | 0 ~ 1 | 0 | |
| Pn 001.3 | 2nd Electronic Gear Enabled | 0 | 0 ~ 1 | 0 | |
| Pn 002.2 | Absolute Encoder Selection | 0 | 0 ~ 1 | 0 | |
| Pn 010.0 | Automatic Identification Function of Motor and Enable | 1 | 0 ~ 1 | 1 | |
| Pn 200 | PG Divider | 16384 | 16 ~ 16384 | 16384 | puls |
| Pn 201 | 16 Bit 1st Electronic Gear Numerator | 1 | 1 ~ 65535 | 1 | |
| Pn 202 | 16 Bit Electronic Gear Denominator | 1 | 1 ~ 65535 | 1 | |
| Pn 203 | 16 Bit 2nd Electronic Gear Numerator | 1 | 1 ~ 65535 | 1 | |
| Pn 519 | Serial Encoder Error Time | 3 | 0 ~ 10000 | 3 | 0.1ms |
| Pn 705 | 32 Bit 1st Electronic Gear Numerator (H) | 0 | 0 ~ 9999 | 0 | |
| Pn 706 | 32 Bit 1st Electronic Gear Numerator (L) | 1 | 0 ~ 9999 | 1 | |
| Pn 707 | 32 Bit Electronic Gear Denominator (H) | 0 | 0 ~ 9999 | 0 | |

Download Parameters

- Download All

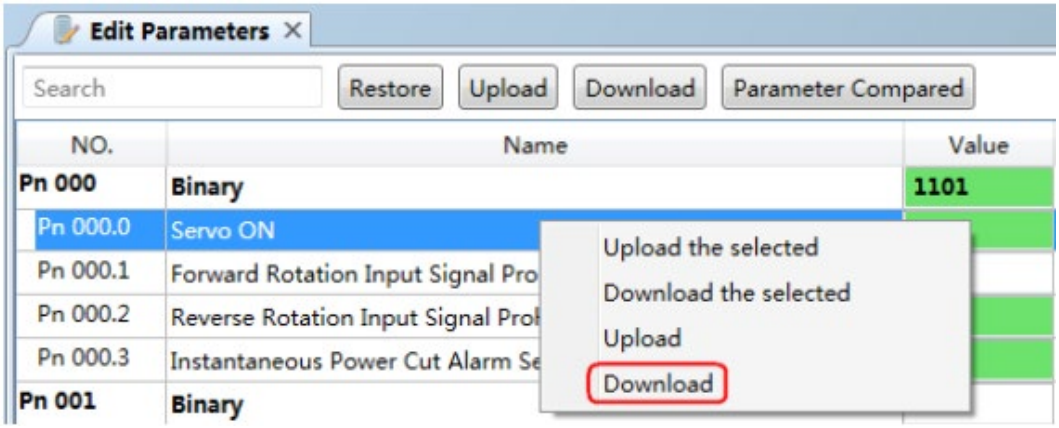
**Method 1:**

In the "Parameter Edit" window, click on "Download All." After a moment, the edited parameters will be written to the drive unit.



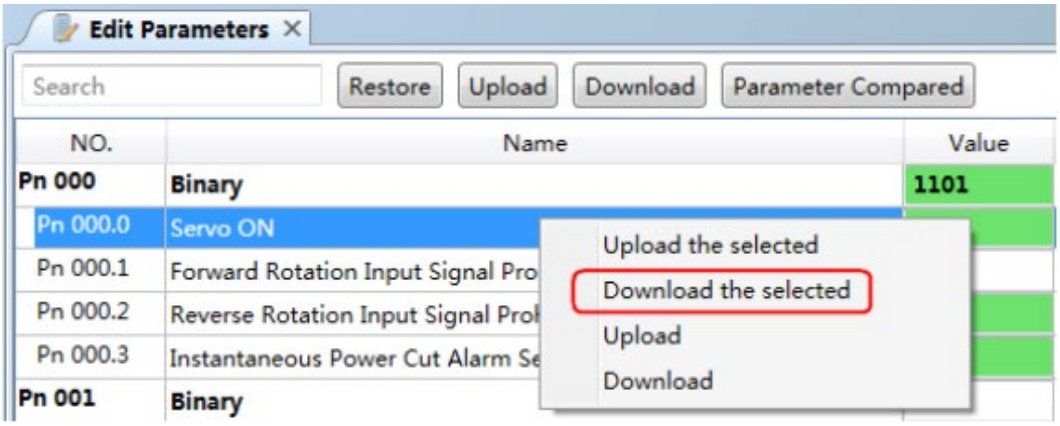

**Method 2:**

Users can also right-click on any non-editable area of the parameter list and select "Download All" from the pop-up menu.




- Download Selected Items

In the "Parameter Edit" window, users can either drag the mouse to select specific parameters or hold down the "Ctrl" key on the keyboard and individually select the parameters to be downloaded. Then, right-click on one of the selected items and choose "Download Selected Items" from the pop-up menu.




CAUTION

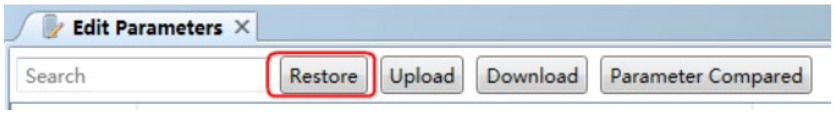
If the page displays a "Failed to download parameters" message, please check the connection between the drive unit and the PC.

Restore Factory Values

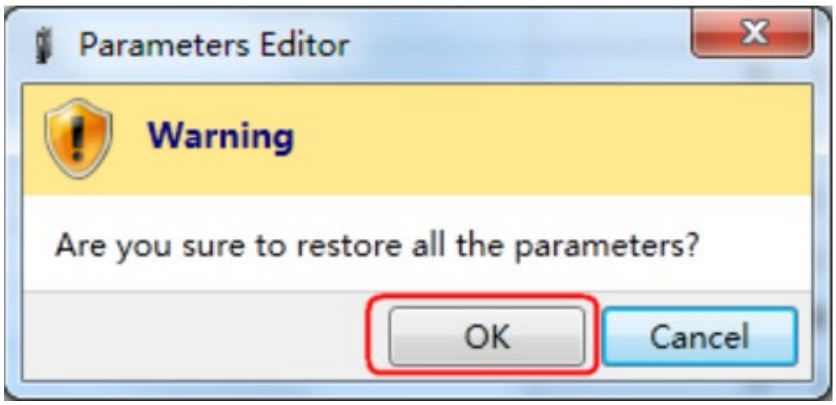
CAUTION

Performing "Restore Factory Values" will reset the parameters in the drive unit (excluding certain specified parameters) to their default settings. Please proceed with caution.

Step 1: In the "Parameter Edit" window, click on "Restore Factory Values."




Step 2: After confirming the action, click "OK" in the pop-up warning box.

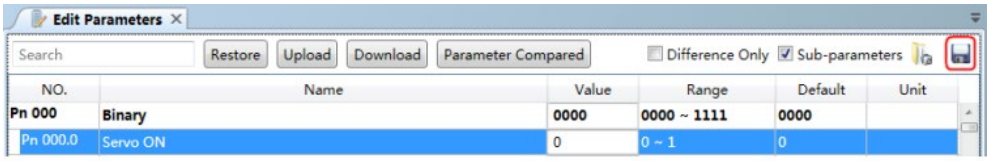



Step 3: ESView will send the restore factory values command to the drive unit, and the device will begin the restore operation.

Save Parameters:

Users can save the current parameter configuration to a local path on the PC.

Step 1: In the "Parameter Edit" window, click on the save icon .




Step 2: In the pop-up "Save As" dialog box, select the desired path to store the parameter file.

Step 3: Click "Save."

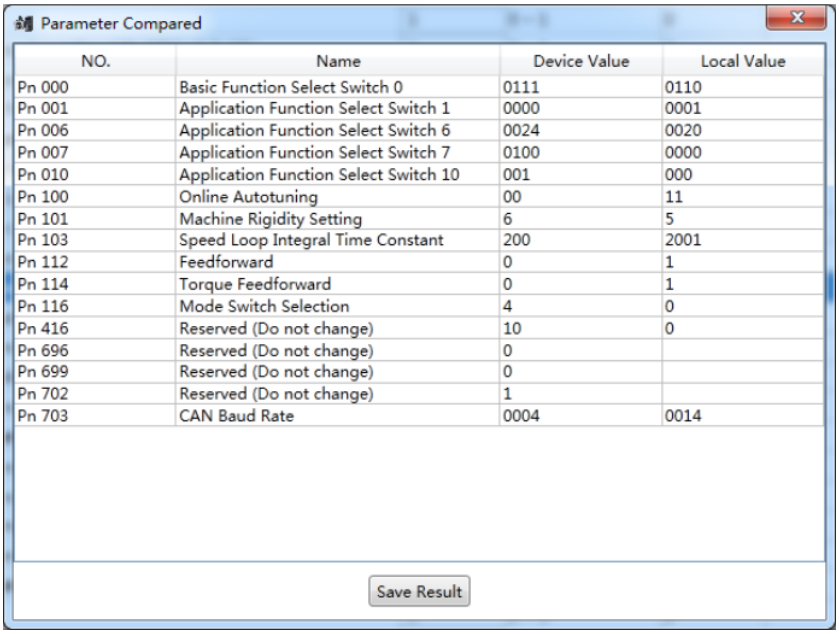
## Compare Parameters

Compare Parameters is an operation that compares the parameter values in the device with the parameter values in an offline file on the PC. Please follow the following steps to perform this operation.

Step 1: Refer to the "Upload Parameters" section and perform a parameter read operation.

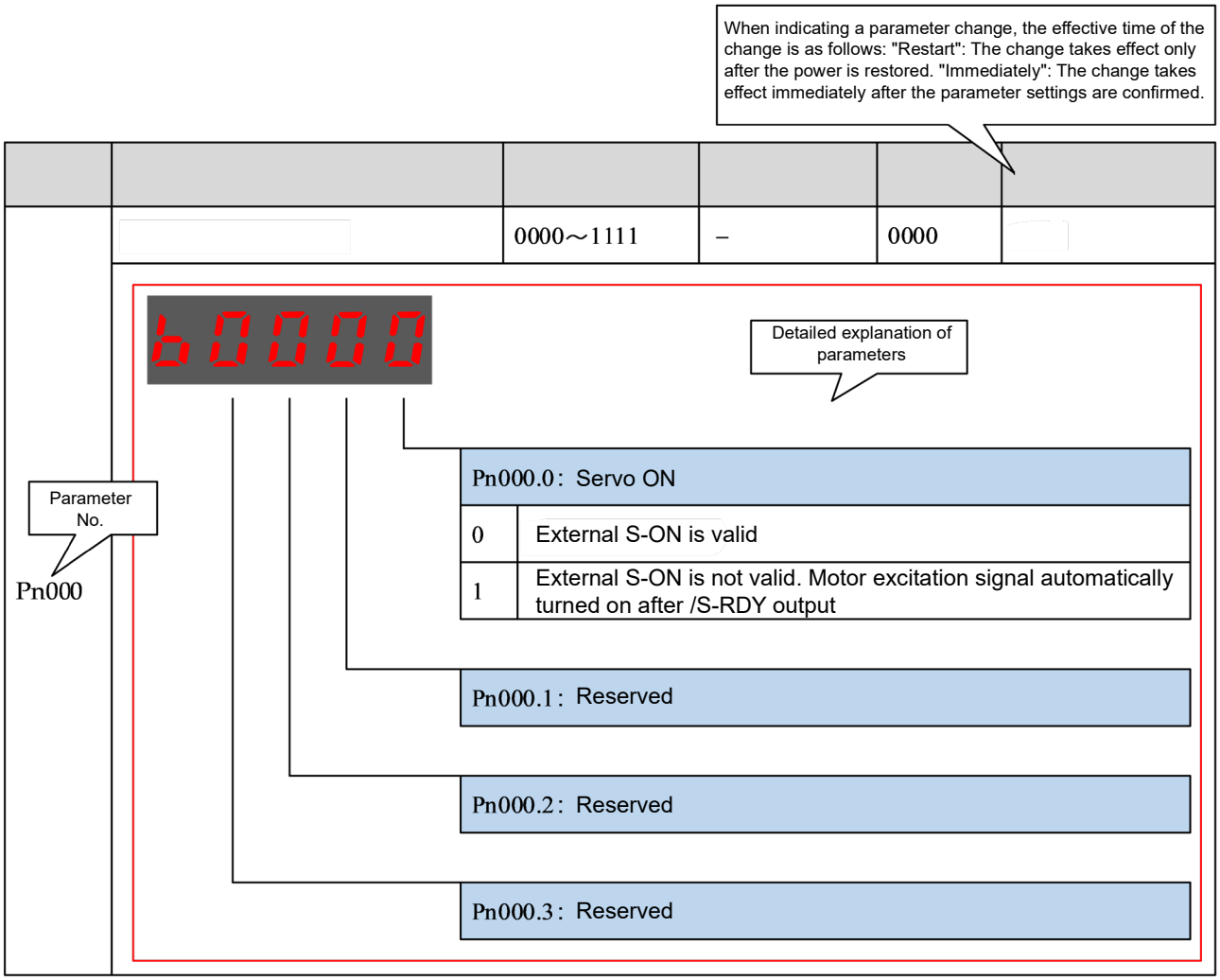
Step 2: Click on "Parameter Comparison" and select the correct offline file in the pop-up dialog box.

Step 3: ESView will automatically perform the parameter comparison operation and list the parameters with differences in the interface, as shown in the figure below.



## 4.4 Definition of parameters

Instructions for use



Detailed explanation of parameters

| No. | Name | Scope | Unit | Factory value | When to take effect |
|---|---|---|---|---|---|
| Pn000 | Basic function settings 0 | 0000～0111 | – | 0110 | Restart |

| | |
|---|---|
| Pn000.0: Servo ON | |
| | External S-ON is valid |
| | External S-ON is not valid. Motor excitation signal automatically turned on after /S-RDY output |
| Pn000.1: Reserved | |
| Pn000.2: Reserved | |
| Pn000.3: Reserved | |

| No. | Name | Scope | Unit | Factory value | When to take effect |
|---|---|---|---|---|---|
| Pn003 | Application function settings 3 | 0000～1111 | – | 0000 | Restart |

| | |
|---|---|
| Pn003.0: Reserved | |
| Pn003.1: Reserved | |
| Pn003.2: Low-speed compensation | |
| | No low-speed compensation |
| | There is no low-speed compensation to prevent motor crawling, but sometimes it may cause low-speed vibrations in the motor. The strength of compensation depends on the value of Pn129. |
| Pn003.3: Overload enhancement (Not applicable for EM3A-type motor) | |
| | No enhancement of motor overload capacity. |
| | Enhancement of motor overload capacity. |

| No. | Name | Scope | Unit | Factory value | When to take effect |
|---|---|---|---|---|---|
| Pn005 | Application function settings 5 | 1000～1301 | – | 1000 | Restart |


| Pn005.0: Torque Feedforward Method | |
|---|---|
| | General torque feedforward |
| | High-speed torque feedforward |

| Pn005.1: Reserved |
|---|

| Pn005.2: Deviation alarm enable | |
|---|---|
| | Disable deviation alarm |
| | Enable deviation alarm, triggers an alarm when the deviation counter value exceeds the setting of Pn504 |
| | Reserved |
| | Reserved |

| Pn005.3: Reserved |
|---|

| No. | Name | Scope | Unit | Factory value | When to take effect |
|---|---|---|---|---|---|
| Pn006 | Application function settings 6 | 0000～0104 | – | 0004 | Restart |


| Pn006.0: Bus type | |
|---|---|
| | Not using bus control, but the internal speed parameter control |
| | Reserved |
| | Using EtherCAT bus |

Pn006.1: Reserved

| Pn006.2: Low-frequency vibration suppression switch | |
|---|---|
| | Not enabling low-frequency vibration suppression function |
| | Enabling low-frequency vibration suppression function |

Pn006.3: Reserved

| No. | Name | Scope | Unit | Factory value | When to take effect |
|---|---|---|---|---|---|
| Pn008 | Application function settings 8 | 0000～0001 | – | 0001 | Restart |


| Pn008.0: Alarm/warning selection | |
|---|---|
| | Alarm |
| | Warning |

| Pn008.1: Axis shielding | |
|---|---|
| | Axis enable |
| | Axis shielding |

Pn008.2: Reserved

Pn008.3: Reserved

| No. | Name | Scope | Unit | Factory value | When to take effect |
|---|---|---|---|---|---|
| Pn100 | Application function settings 100 | 0000～0036 | – | 0000 | Restart |


| Pn100.0: Load Inertia Setting Selection | |
|---|---|
| | Manually set the percentage of load inertia (Pn106) |
| | Use conventional inertia online identification when the load inertia remains unchanged |
| | Use conventional inertia online identification when the load inertia changes slightly |
| | Use conventional inertia online identification when the load inertia changes significantly |
| | Use vertical inertia online identification when the load inertia remains unchanged |
| | Use vertical inertia online identification when the load inertia changes slightly |
| | Use vertical inertia online identification when the load inertia changes significantly |

| Pn100.1: Tuning Mode Selection | |
|---|---|
| | 0 - Manual adjustment mode |
| | 1 - Standard automatic tuning (balancing responsiveness and stability) |
| | 2 - Stable automatic tuning (prioritizing stability, minimizing overshoot or oscillation) |
| | 3 - Positioning automatic tuning (prioritizing responsiveness, minimizing positioning time) |
| In the following situations, automatic tuning cannot be effective, and Pn100.1 should be set to 0:<br>• The motor's maximum speed is less than 100 rpm<br>• The motor's acceleration and deceleration rate is less than 5,000 rpm/s<br>• Significant mechanical clearance exists during motion<br>• Significant speed-load differences exist during motion | |

| Pn100.2: Reserved |
|---|

| Pn100.3: Reserved |
|---|

| No. | Name | Scope | Unit | Factory value | When to take effect |
|---|---|---|---|---|---|
| Pn102 | Speed loop gain | 1～4000 | Hz | 250 | Immediately |
| | This value determines the magnitude of the speed loop gain. | | | | |
| Pn103 | Speed loop integral time | 1～4096 | 0.25ms | 80 | Immediately |
| | Decreasing this value will shorten the positioning time and improve the speed response. | | | | |
| Pn104 | Position loop gain | 0～1000 | 1/s | 40 | Immediately |
| | This value determines the amount of gain in the position loop.<br>Increasing this value increases the servo rigidity of the position control, but too large a value may cause oscillations. | | | | |
| Pn105 | Torque command filter time constants | 0～2500 | 0.025ms | 40 | Immediately |
| | Setting the torque command filter can eliminate or reduce mechanical vibration, but may introduce mechanical vibration if not set properly. | | | | |
| Pn106 | Percentage of load inertia | 0～20000 | % | 0 | Immediately |
| | Ratio of load inertia to motor rotor inertia.<br>Set value = (Load inertia/Motor rotor inertia) x 100 | | | | |
| Pn127 | Low-speed measurement filtering | 0～100 | 0.25 ms | 4 | Immediately |
| | This parameter is used for filtering at low-speed measurement. If the value is set too high, the measurement will lag at low speed. | | | | |
| Pn305 | JOG speed | 0～6000 | rpm | 50 | Immediately |
| | The magnitude of the speed command when the JOG is running and the direction is determined by the keys. | | | | |
| Pn500 | Positioning error | 0～5000 | 1 pulse | 10 | Immediately |
| | When the deviation counter value is less than this value, the /COIN signal is output. | | | | |

<table>
<tr><th>No.</th><th>Name</th><th>Scope</th><th>Unit</th><th>Factory value</th><th>When to take effect</th></tr>
<tr><td rowspan="2">Pn506</td><td>Basic waiting process</td><td>0～500</td><td>10 ms</td><td>50</td><td>Immediately</td></tr>
<tr><td colspan="5">The standard setting is to turn off the servo while the /BK output (brake activation) is active. In this case, due to the mechanical construction and characteristics of the brake, the mechanical system may experience slight movement under the influence of gravity. By using the user constant to delay the servo-off action, this movement can be eliminated. This parameter only affects motor stop or lower speeds.</td></tr>
<tr><td rowspan="2">Pn508</td><td>Brake waiting time</td><td>10～100</td><td>10 ms</td><td>50</td><td>Immediately</td></tr>
<tr><td colspan="5">If the delay after servo-off exceeds the value set by this parameter, the /BK signal will be output.<br>The /BK signal will also be output if either the brake waiting speed or the brake waiting time meets the specified conditions.</td></tr>
<tr><td rowspan="2">Pn511</td><td>Output signal distribution</td><td>0000～0004</td><td>–</td><td>0002</td><td>Restart</td></tr>
<tr><td colspan="5">


Pn511.0: Assign signals for CN13-20, 21/CN13-45, 46/CN13-3, 4/CN13-28, 29/CN13-12, 13/CN13-37, 38
<table>
<tr><td></td><td>COIN/VCMP</td></tr>
<tr><td></td><td>TGON</td></tr>
<tr><td></td><td>S-RDY</td></tr>
<tr><td></td><td>CLT</td></tr>
<tr><td></td><td>WARN</td></tr>
</table>
Pn511.1: Reserved<br>
Pn511.2: Reserved<br>
Pn511.3: Reserved
</td></tr>
<tr><td rowspan="2">Pn704</td><td>Bus communication nodes</td><td>0～127</td><td>–</td><td>1</td><td>Restart</td></tr>
<tr><td colspan="5">To set the node number of the drive unit in the communication network.</td></tr>
</table>

| No. | Name | Scope | Unit | Factory value | When to take effect |
|---|---|---|---|---|---|
| Pn840 | Encoder selection | 0000～FF03 | – | 0003 | Immediately |


Pn840.0: Encoder type

| | |
|---|---|
| | 17-bit absolute encoder |

Pn840.1: Reserved

Pn840.2: Reserved

Pn840.3: Reserved

# Chapter 5 Troubleshooting

## 5.1 Alarm check

During the operation of the robot, alarms that occur can be viewed using the teach pendant or ESView.

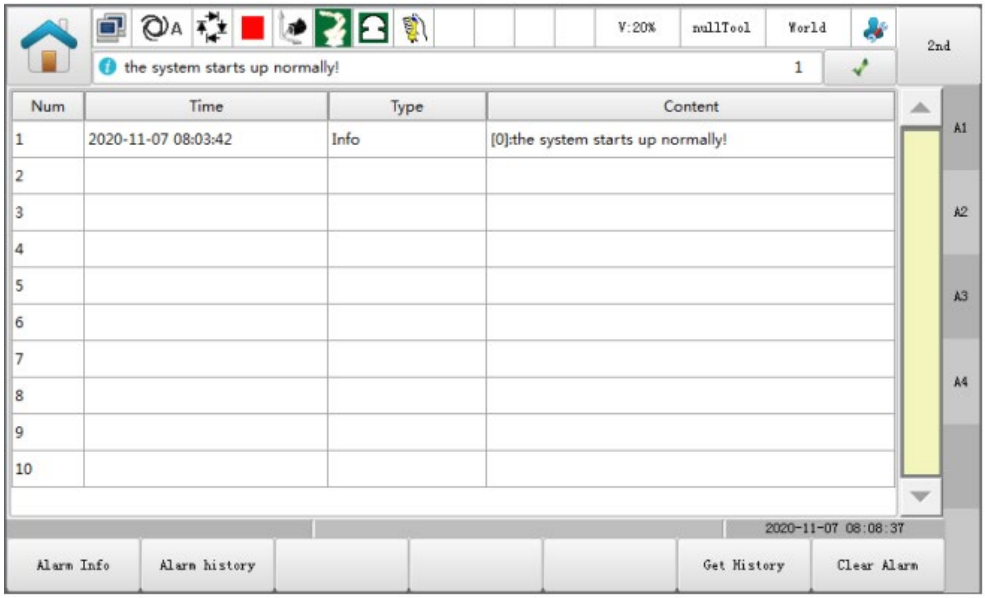
Once an alarm occurs, the robot will stop its motion and the user will need to take necessary actions to resolve the issue before resuming robot operation.

In the case of multiple alarms, only the information of the last alarm will be displayed in the message prompt bar.

### 5.1.1 Viewing alarms with teach pendant

When an alarm occurs during the robot's motion, it will immediately stop its motion. The teach pendant will display the alarm icon, and users can access the System Log interface to view detailed information about the alarm.

By entering the "System Log" section on the teach pendant screen, users can view the alarm information.




For detailed information about alarms, please refer to "Section 5.2 Alarm list".

Current Alarms

Clicking on "Current Alarms" will display the currently active and uncleared alarms on the interface.

Historical Alarms

Clicking on "Historical Alarms" will display the alarm information that occurred since the last power-on.

Get Historical Alarms

Clicking on "Get Historical Alarms" will synchronize all historical alarm information from the controller and update the historical alarm interface.

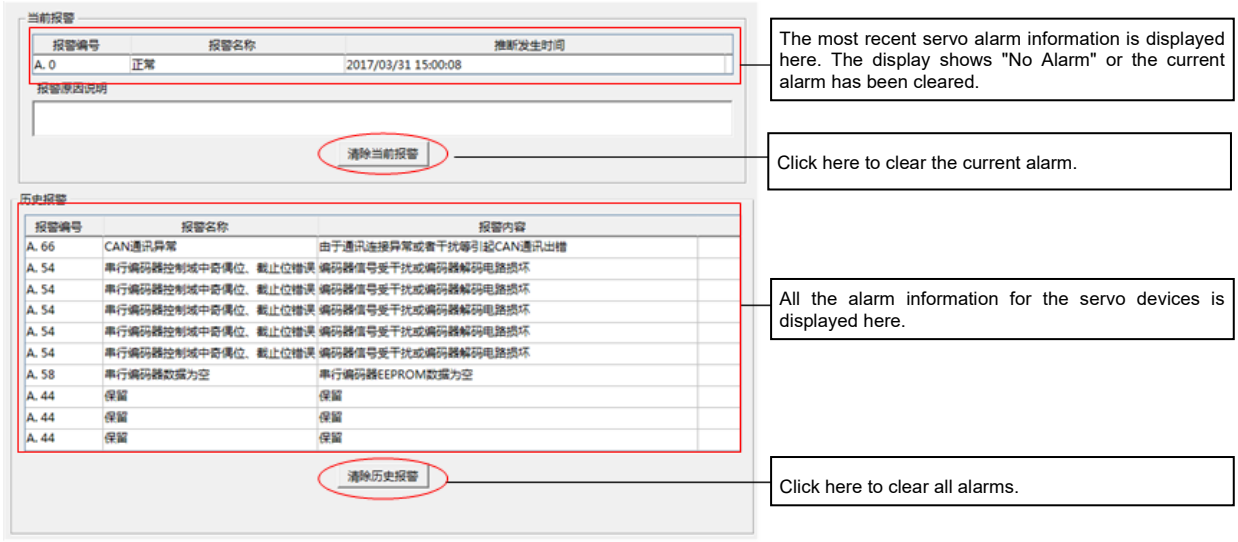
Clear Alarms

If there are any current alarms, clicking on "Clear Alarms" will attempt to clear and reset the system to continue normal operation.

Users can also click the button on the alarm information bar to clear alarms.

### 5.1.2 Viewing alarms with ESView

When an alarm occurs within the servo drive unit, the user can select "Tools→Alarm Information" or click directly on the toolbar to enter the "Alarm Information" window to view and reset the servo's alarm information and historical alarm information.




## 5.2 Alarm list

| No. | Name | Cause of fault | Solution |
|---|---|---|---|
| A.01 | Parameter destruction | The parameters stored in the EEPROM may be disturbed or accidentally damaged | Restore factory settings (Fn001) and reconfigure parameters |
| | | The drive unit may be damaged | Replace the servo drive board |
| A.02 | ADC conversion channel malfunction | Wiring errors in the analog input channels can lead to damage of the drive unit's analog input channels (currently applicable only to general-purpose drives) | Ensure correct wiring for analog input interface |
| | | Excessive analog input voltage (beyond the allowable differential input voltage of ±10V) can cause damage to the drive unit's analog input channels (currently applicable only to general-purpose drives) | Provide permissible differential input voltage for analog input |
| | | The drive unit may be damaged | Replace the servo drive unit |

| No. | Name | Cause of fault | Solution |
|---|---|---|---|
| A.03 | Overspeed | Errors in the drive unit parameter settings, such as improper electronic gear ratio configuration | • Check if the electronic gear ratio setting is within the specified range: Input pulse frequency * electronic gear ratio < 500kHz<br>• If > 500kHz, reduce the set speed (system command value) |
| | | Incorrect phase sequence of the motor power cables | • Check the motor power cables<br>• Ensure that the power cables, encoder cables, and corresponding drive units are properly connected for each axis motor |
| A.04 | Overload | Parameter setting errors | Set the correct values for Pn8402 and Pn0053 |
| | | Incorrect phase of motor<br>Incorrect phase sequence of the motor power cables<br>Damage or short circuit of the power cables | Properly make and connect the power cables, ensuring that the U, V, W, and GND of the motor correspond to the drive unit |
| | | Undersized selection<br>Excessive mechanical load | Select a servo drive unit with appropriate specifications, ensuring sufficient margin |
| | | Poor initial running-in of the new equipment | If the motor produces abnormal noise or overheats during operation, check the motor load or the drive unit's PID parameters. Additionally, perform regular lubrication and maintenance to ensure proper functioning; ensure that the mechanical connections are secure and free from any jamming or binding |
| | | The brake is not disengaged | When using a brake motor, ensure that the brake is correctly engaged (brake operating voltage: 24V) before operating the motor |
| | | Damage to the drive unit or motor | • Replace the servo drive unit<br>• Replace the servo motor |
| A.05 | Position deviation counter overflow | Incorrect drive unit parameter settings in position control mode, such as excessively low thrust limit value leading to motor stalling | Set the correct thrust limit parameter value for the drive unit |
| A.06 | Position deviation pulse overflow | Drive unit parameter setting error, such as position deviation pulse exceeding the value of parameter Pn504 | • Set Pn0052 = 0<br>• Set the correct value for Pn504 |
| A.07 | Inappropriate configuration of electronic gear ratio and desired pulse frequency | Improper electronic gear configuration | To meet the condition of not generating A07 alarm: Sent pulse frequency * electronic gear ratio < 32767 * 10000 |
| | | Excessive pulse frequency | To meet the condition of not exceeding the maximum speed: If the maximum speed is 4500mm/s = 75r/s, sent pulse frequency * electronic gear ratio < 75 * motor encoder resolution |

| No. | Name | Cause of fault | Solution |
|---|---|---|---|
| A.08 | Issue with current detection channel 1 | Excessive U-phase current | Perform Fn005 operation to bias the current channel and then restore factory settings |
| | | Drive unit malfunction | Replace the servo drive unit |
| A.09 | Issue with current detection channel 1 | Excessive V-phase current | Perform Fn005 operation to bias the current channel and then restore factory settings |
| | | Drive unit malfunction | Replace the servo drive unit |
| A.12 | Overcurrent | Improper drive unit parameter settings, such as PID parameters | Set reasonable PID parameters to avoid excessive gain causing motor vibration or abnormal noise |
| | | Damage to the power cables<br>Incorrect phase sequence of the motor power cables<br>Phase error of the motor | Check the U, V, W phase sequence of the motor power line to ensure it corresponds to the drive unit side |
| | | Damage to the encoder cables | Separate the encoder cable from the main circuit power supply line to reduce potential interference |
| | | Drive unit damage | • Only connect the power line without sending commands from the host computer, and after power on/off, check if the servo itself is faulty<br>• Replace the servo drive unit |
| | | Motor damage | Replace the servo motor |
| A.13 | Overvoltage | Insufficient discharge capacity of the drive unit leads to increased pump energy, elevated bus voltage, and potential alarms A13, A15, and A16 | Replace the small resistor with a high-power discharge resistor |
| | | Power supply voltage issues | Check if the main circuit power supply voltage is within the allowable range |
| A.14 | Undervoltage | Low main circuit power supply voltage | • Check if the main circuit power supply voltage is within the allowable range.<br>• Short-circuit between ⊕1 and ⊕2 |
| | | Damaged drive unit | Replace the servo drive unit |
| A.15 | Discharge resistor damaged | Faulty discharge resistor | • Replace the discharge resistor<br>CAUTION For PRONET series drive units with a power of 400W or below using external discharge resistors, set Pn521.0=0 |
| | | Damaged drive unit | Replace the servo drive unit |

| No. | Name | Cause of fault | Solution |
|---|---|---|---|
| A.16 | Abnormal regeneration | High power supply voltage | The power supply voltage should meet the requirements:<br>• 200V drive unit power supply range: 200~230VAC +10%~-15%<br>• 400V drive unit power supply range: 380~440VAC +10%~-15% |
| | | Excessive DC bus voltage | • Increase acceleration and deceleration time<br>• Select a suitable external regeneration resistor (in principle, the resistance should be as small as possible within the specified range, and the power should be increased. Additionally, for individual drive units of 400W or below, if an external regenerative resistor is used, set Pn521.0=0) |
| | | Incorrect connection of motor power lines U, V, W, and GND, or short circuit between motor phases U, V, W, and GND | Ensure correct wiring of motor power lines |
| | | Damaged drive unit | Replace the servo drive unit |
| | | Damaged motor | Replace the servo motor |
| A.18 | IGBT overheating alarm | IPM temperature detection exceeding the set threshold | Check the ambient temperature and reduce the load |
| A.1D | Temperature sensor on the drive board disconnected | Temperature sensor not connected or damaged | Please contact ESTUN or an authorized distributor |
| A.20 | Open phase in the power line | One phase of the main circuit power supply not connected | Ensure correct wiring of the main circuit power supply line |
| A.25<br>A.26<br>A.27 | Motor power lines U/V/W experiencing overcurrent | Mechanical binding | Check if there are any obstacles in the operation of the load |
| | | Incorrect phase sequence of motor power lines UVW | Ensure correct wiring of motor power lines |

| No. | Name | Cause of fault | Solution |
|---|---|---|---|
| A.39 | Module current exceeds limits | Detection of module working current exceeding the set parameters | Check and reset Pn8403 |
| A.40 | Motor power level is not within the specified range | Incorrect setting of Pn8403 | Check and reset Pn8403 |
| A.42 | Incorrect motor model | Incompatibility between motor and drive unit | Re-select the appropriate model |
| A.43 | Incorrect servo drive unit/encoder model | Mismatch between drive power and motor encoder resolution | • Check if Pn8402 parameter corresponds to the drive unit power<br>• Check if Pn8400 parameter corresponds to the drive unit encoder resolution<br>• The absolute motor phase value is incorrect, and the motor needs to be written with phase using the Fn012 motor phase writing operation |
| A.45 | Absolute encoder multi-turn information error | Error in multi-turn information | Perform clearing operations using Fn010 and Fn011 |
| | | Battery box voltage remaining below 25V for an extended period | Ensure that the battery voltage in the battery box is 36V |
| A.46 | Absolute encoder multi-turn overflow | Overflow of multi-turn information | • If it is running unidirectionally for a long time, try setting PN0071=1 for shielding<br>• Perform clearing operations using Fn010 and Fn011 |
| A.47 | Low battery voltage | Encoder battery voltage below 25V | • Ensure that the battery box voltage is 36V<br>• Perform clearing operations using Fn010 and Fn011 |
| A.48 | Battery voltage under-voltage | Encoder battery voltage below 31V | |
| A.49 | Encoder feedback position jump | Excessive acceleration in motor feedback or interference in encoder feedback signal | • Try winding a magnetic ring around the encoder cable and motor power lines (at least 3 turns or more)<br>• Try connecting one wire from the shield layer of the encoder cable to the motor body<br>• Use shielded twisted-pair cables for the encoder cable, and ensure that the shield layer is grounded at both ends |
| A.50 | Serial encoder communication timeout | Poor contact of encoder cable connector on the drive unit side | Ensure correct assembly of the encoder cable |
| | | Poor contact of encoder connector on the motor side | Ensure proper connection of the contact elements in the encoder cable |
| | | Welding defects, soldering errors, cold joints, or poor connections at the connectors on both ends of the encoder cable | Ensure the encoder cable is free from damage or breakage |

| No. | Name | Cause of fault | Solution |
|---|---|---|---|
| | | Damaged encoder cable | Strictly prohibit hitting the motor shaft and rear cover during motor installation to prevent damage to the motor encoder |
| | | Damaged drive unit | Replace the drive unit |
| | | Damaged motor | Replace the motor |
| A.51 | Absolute encoder detects overspeed alarm | Battery not connected or insufficient battery voltage | • Ensure the battery box voltage is 36V<br>• Perform a reset using the Fn010 and Fn011 operations |
| | | Motor experiencing excessive acceleration due to external reasons when the battery voltage is normal and the drive unit is not powered | |
| A.52 | Serial encoder absolute state error | External interference | • Try winding a magnetic ring around the encoder cable and motor power lines (at least three turns)<br>• Try connecting a wire from the shield layer of the encoder cable to the motor body<br>• Use shielded twisted-pair cables for the encoder cable, with both ends of the shield layer grounded |
| | | Damaged encoder cable | Replace the encoder cable |
| | | Damaged drive unit | Replace the drive unit |
| | | Damaged motor | Replace the motor |
| A.53 | Serial encoder calculation error | External interference | • Try winding a magnetic ring around the encoder cable and motor power lines (at least three turns)<br>• Try connecting a wire from the shield layer of the encoder cable to the motor body<br>• Use shielded twisted-pair cables for the encoder cable, with both ends of the shield layer grounded |
| | | Damaged encoder cable | Replace the encoder cable |
| | | Damaged drive unit | Replace the drive unit |
| | | Damaged motor | Replace the motor |
| A.54 | Serial encoder control field parity bit or stop bit error | External interference | • Try winding a magnetic ring around the encoder cable and motor power lines (at least three turns)<br>• Try connecting a wire from the shield layer of the encoder cable to the motor body<br>• Use shielded twisted-pair cables for the encoder cable, with both ends of the shield layer grounded |
| | | Damaged encoder cable | Replace the encoder cable |
| | | Damaged drive unit | Replace the drive unit |
| | | Damaged motor | Replace the motor |

| No. | Name | Cause of fault | Solution |
|---|---|---|---|
| A.55 | Serial encoder communication data checksum error | External interference | • Try winding a magnetic ring around the encoder cable and motor power lines (at least three turns)<br>• Try connecting a wire from the shield layer of the encoder cable to the motor body<br>• Use shielded twisted-pair cables for the encoder cable, with both ends of the shield layer grounded |
| | | Damaged encoder cable | Replace the encoder cable |
| | | Faulty drive unit | Replace the drive unit |
| | | Damaged motor | Replace the motor |
| A.56 | Serial encoder stop bit error in status field | External interference | • Try winding a magnetic ring around the encoder cable and motor power lines (at least three turns)<br>• Try connecting a wire from the shield layer of the encoder cable to the motor body<br>• Use shielded twisted-pair cables for the encoder cable, with both ends of the shield layer grounded |
| | | Damaged encoder cable | Replace the encoder cable |
| | | Faulty drive unit | Replace the drive unit |
| | | Damaged motor | Replace the motor |
| A.58 | Serial encoder data is empty | Incorrect parameter setting for drive unit encoder type (Pn840.0) | Correctly set Pn8400 according to the motor's model |
| | | Loss of motor phase, requiring re-writing of phase to serial encoder EEPROM | Perform a rephasing operation on the motor to write the phase value into the serial encoder's EEPROM |
| | | External interference | • Try winding a magnetic ring around the encoder cable and motor power lines (at least three turns)<br>• Try connecting a wire from the shield layer of the encoder cable to the motor body<br>• Use shielded twisted-pair cables for the encoder cable, with both ends of the shield layer grounded |
| | | Faulty drive unit | Replace the drive unit |
| A.59 | Serial encoder data format error | Incorrect parameter setting for drive unit encoder type (Pn840.0) | Correctly set Pn8400 according to the motor's model |
| | | Loss of motor phase, requiring re-writing of phase to serial encoder EEPROM | Perform a rephasing operation on the motor to write the phase value into the serial encoder's EEPROM |

| No. | Name | Cause of fault | Solution |
|---|---|---|---|
| | | External interference | • Try winding a magnetic ring around the encoder cable and motor power lines (at least three turns)<br>• Try connecting a wire from the shield layer of the encoder cable to the motor body<br>• Use shielded twisted-pair cables for the encoder cable, with both ends of the shield layer grounded |
| A.70 | EtherCAT synchronization signal error | EtherCAT master station configured with incorrect cycle settings | Ensure the main station is set with the correct communication cycle |
| | | SYNC0 not synchronized with the drive unit | • Ensure SYNC0 is synchronized with the drive unit<br>• Alarming can be reset using status word 6040 |
| A.71 | EtherCAT synchronization module error | Faulty drive unit | Replace the drive unit |
| A.80 | External data line or address line or RAM abnormal | Faulty drive unit | Replace the drive unit |
| A.00 | No error displayed | — | — |

# Chapter 6 Maintenance

## 6.1 Maintenance precautions

Before performing maintenance, please carefully read the following content and ensure a thorough understanding of the methods for safe maintenance.


- Maintenance of the robot system must be carried out by personnel who have received safety training. Trained personnel refer to individuals who have undergone safety training in accordance with the laws and regulations of their respective countries, specifically designed to provide knowledge on industrial robots, their operation, programming, inspection, and related regulations.
- Do not disassemble parts that are not described in this manual or perform maintenance using methods different from those specified. This could result in the robot system malfunctioning or serious safety issues.
- Do not enter the robot's workspace while it is powered on.
- Always verify the robot's movement from outside the safety barrier after replacing components.
- Before formal operation, confirm the correct operation status of the emergency stop switch and safety door switch.


- Except for maintenance operations, do not open the control cabinet cover to avoid electrical hazards.
- Always replace components after turning off the power to the control cabinet and associated devices.
- Do not disconnect motor connectors while the power is on.
- Perform maintenance, inspections, and other tasks in teams of two, with one person maintaining a posture to immediately press the emergency stop button and the other person remaining vigilant to complete the task quickly and ensure a clear path for retreat.


- Do not disassemble parts that are not covered in this manual.
- Maintenance personnel must keep the robot key secure, and unauthorized personnel should not modify programs or parameters.

## 6.2 Daily inspection

To ensure the normal functioning of the product and protect it from damage, it is necessary to perform regular maintenance and inspections.

If the equipment is located in the following environments, reduce the inspection interval:

- Temperature, humidity, dust, and vibration in the environment
- High-temperature environment
- Frequent start-stop situations
- Environments with AC power and load fluctuations
- Environments with significant vibration or impact
- Environments with corrosive substances, such as acids or alkalis

To ensure the proper functioning of the product and prevent damage, daily confirmation should be made for the following items:

| Item | Content | Solution |
|---|---|---|
| Installation environment | Check the control cabinet and surrounding cables for abnormalities | ● Verify if the installation brackets are vibrating.<br>● Check for loose or corroded connections at cable terminals. |
| Input voltage | Input power voltage | ● Confirm if the input voltage is within the allowable range.<br>● Check for any significant load starting in the vicinity. |
| Terminals | Control cabinet terminals | ● Ensure that the bolts on both sides of the input, output, and other terminals are tightened. |

## 6.3 Regular inspection

Regular inspections should be conducted on areas that are difficult to inspect during operation. It is essential to maintain the control cabinet in a clean state and effectively remove accumulated dust from the product surface to prevent dust, especially metal dust, from entering the internal components.

(●: Replace ○: Check)

| Inspection Frequency | | | Maintenance | | | Inspection Parts | Content | Inspection/Handling Method |
|---|---|---|---|---|---|---|---|---|
| Weekly | 3 months | 1 year | 4 years | 5 years | 8 years | | | |
| ○ | | | | | | Electric cabinet body | Splash, dust and other impurities adhered | Visual confirmation, cleaning |
| ○ | | | | | | Rear body of control cabinet | Splash, dust and other impurities adhered, and other debris should be closely inspected, with particular emphasis on checking whether the transformer terminals are covered in dust, to prevent short circuits | Visual confirmation, cleaning |
| ○ | | | | | | Warning label on electrical cabinet | Peeling, defacement | Visual confirmation, cleaning. Replace the sticker when there are obvious stains or the |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | surface begins to peel |
| ○ | | | | | | Fan | Normal operation confirmation | Visual confirmation, cleaning |
| ○ | | | | | | Filter sponge | Dirt and blockage | Visual confirmation, cleaning and replacement |
| ○ | | | | | | Teach pendant console, electric cabinet operation panel, other operating switches | Confirm the function of indicator light, operation switch, button switch, etc. | Visual confirmation |
| | | | | | | Teach pendant control table, control cabinet operation panel | Check the E-stop button and enable the switch | Please make sure that all E-top buttons and enable switches can effectively cut off the servo power during operation. |
| | ○ | | ● | | ● | Cable set, teach pendant cable, other external wiring | Make sure there is no damage, broken, loose joints | Visual check. Tighten. If the cable is damaged, replace it. |
| | | ○ | | | ● | Teach pendant | Confirmation of damage, cleaning of operation position, confirmation of LCD display | Visual check and cleaning. When the display of the LCD screen becomes obviously dark, replace the teach pendant. |
| | | | | | ● | Overhaul | | |


Use a soft cloth to remove dust when cleaning. Do not use equipment such as air blowers to blow away dust. Wind pressure can cause dust to enter the fan and the blade to rotate at a speed exceeding the specified speed, which may cause fan failure or affect its life. Use a vacuum cleaner only on the blade part, do not vacuum on the rotating part and the main body. This may cause the fan to fail or affect its life.

## 6.4 Items to confirm during installation adjustment

During installation adjustment, follow the table below to confirm the adjustment.

| S/N | Content |
|---|---|
| 1 | Contents |
| 2 | Inspect the outside and inside outlook of control cabinet |
| 3 | Check the fixing screws are properly connected |
| 4 | Confirm the installation positions of connectors and control cabinet units. |
| 5 | Connect the cable between control cabinet and robot. |
| 6 | Disconnect the power supply of the breaker and connect the input power cable. |
| 7 | Check and confirm the input power voltage. |

| | |
|---|---|
| 8 | Press the emergency stop button on the operation panel to switch on the power. |
| 9 | Confirm the interface signal between the control cabinet and the robot. |
| 10 | Confirm and set the parameters. |
| 11 | Contact emergency stop of operation panel. |
| 12 | Confirm the motion of each axis under manual feed. |
| 13 | Confirm the signal action of each interface. |

## 6.5 List of spare parts

Table 6-1 List of spare parts of ER8-2000-HW Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 51600000145 | Switch power DRL-24V120W1EN[DELTA] | 1 |
| 2 | 51600000144 | Switch power DRL-24V240W1EN[DELTA] | 1 |
| 3 | 11261100001 | Extension module ER-Relay-A-Relay module | 1 |
| 4 | 31600000370 | Tubular resistor 1200W40Ω*2+750W25Ω+200W45Ω+50W45*2 | 1 |
| 5 | 52900000072 | Fan cover ZL-803(Grey)(Flame retardant) | 4 |
| 6 | 11200000532 | ED3L Servo drive ED3L-30DEA-R1[JZ] | 2 |
| 7 | 11200000486 | ED3L Servo drive ED3L-15AEA-R1[JZ] | 1 |
| 8 | 11200000484 | ED3L Servo drive ED3L-04AEA-R1[JZ] | 1 |
| 9 | 11200000483 | ED3L Servo drive ED3L-01AEA-R1[JZ] | 2 |
| 10 | 13200000905 | Straight-end network cable VS-IP20-IP20-LI/0.3-CAT5E/ Pre-freezing | 1 |
| 11 | 13200001469 | Straight-end network cable VS-IP20-IP20-LI/0.2-CAT5E | 5 |
| 12 | 13200000908 | Straight-end network cable VS-IP20-IP20-LI/1.5-CAT5E | 1 |
| 13 | 52911610002 | Axial flow fan SJ1238HD2BPL | 4 |
| 14 | 52200000465 | IO module XB6-1616BWE(PNP) | 1 |
| 15 | 51400000013 | Circuit breaker NXB-63 3P D32 | 1 |

Table 6-2 List of spare parts of ER8-2000-CW Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 51600000145 | Switch power DRL-24V120W1EN[DELTA] | 1 |
| 2 | 51600000144 | Switch power DRL-24V240W1EN[DELTA] | 1 |
| 3 | 11261100001 | Extension module ER-Relay-A-Relay module | 1 |
| 4 | 31600000371 | Tubular resistor 1200W40Ω*2+750W25Ω+500W25Ω+200W45Ω | 1 |
| 5 | 11200000532 | ED3L Servo drive ED3L-30DEA-R1[JZ] | 2 |
| 6 | 11200000486 | ED3L Servo drive ED3L-15AEA-R1[JZ] | 1 |
| 7 | 11200000485 | ED3L Servo drive ED3L-08AEA-R1[JZ] | 1 |
| 8 | 11200000484 | ED3L Servo drive ED3L-04AEA-R1[JZ] | 2 |
| 9 | 13200000905 | Straight-end network cable VS-IP20-IP20-LI/0.3-CAT5E/ Pre-freezing | 1 |
| 10 | 13200001469 | Straight-end network cable VS-IP20-IP20-LI/0.2-CAT5E | 5 |
| 11 | 13200000908 | Straight-end network cable VS-IP20-IP20-LI/1.5-CAT5E | 1 |
| 12 | 52911610002 | Axial flow fan SJ1238HD2BPL | 4 |
| 13 | 52200000465 | IO module XB6-1616BWE(PNP) | 1 |
| 14 | 51400000013 | Circuit breaker NXB-63 3P D32 | 1 |

Table 6-3 List of spare parts of ER8-1500-CW Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 51600000145 | Switch power DRL-24V120W1EN[DELTA] | 1 |
| 2 | 51600000144 | Switch power DRL-24V240W1EN[DELTA] | 1 |
| 3 | 11261100001 | Extension module ER-Relay-A-Relay module | 1 |
| 4 | 31100010132 | Tubular resistor 1000W25Ω*2+600W25Ω+300W45Ω+100W45*2 | 1 |
| 5 | 11200000486 | ED3L Servo drive ED3L-15AEA-R1[JZ] | 2 |

| | | | |
|---|---|---|---|
| 6 | 11200000485 | ED3L Servo drive ED3L-08AEA-R1[JZ] | 1 |
| 7 | 11200000484 | ED3L Servo drive ED3L-04AEA-R1[JZ] | 3 |
| 8 | 13200000905 | Straight-end network cable VS-IP20-IP20-LI/0.3-CAT5E/ Pre-freezing | 1 |
| 9 | 13200001469 | Straight-end network cable VS-IP20-IP20-LI/0.2-CAT5E | 5 |
| 10 | 13200000908 | Straight-end network cable VS-IP20-IP20-LI/1.5-CAT5E | 1 |
| 11 | 52911610002 | Axial flow fan SJ1238HD2BPL | 4 |
| 12 | 52200000465 | IO module XB6-1616BWE(PNP) | 1 |
| 13 | 51400000013 | Circuit breaker NXB-63 3P D32 | 1 |

Table 6-4 List of spare parts of ER8-1450-HW Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 51600000145 | Switch power DRL-24V120W1EN[DELTA] | 1 |
| 2 | 51600000144 | Switch power DRL-24V240W1EN[DELTA] | 1 |
| 3 | 13200000908 | Straight-end network cable VS-IP20-IP20-LI/1.5-CAT5E | 1 |
| 4 | 13200000905 | Straight-end network cable VS-IP20-IP20-LI/0.3-CAT5E/ Pre-freezing | 2 |
| 5 | 13200001469 | Straight-end network cable VS-IP20-IP20-LI/0.2-CAT5E | 5 |
| 6 | 11200000541 | Extension module ER-Relay-A-BJ-Relay module | 1 |
| 7 | 51400000013 | Circuit breaker NXB-63 3P D32 | 1 |
| 8 | 52911610002 | Axial flow fan SJ1238HD2BPL | 3 |
| 9 | 52200000311 | EtherCAT coupler XB6-EC2002STE | 1 |
| 10 | 52200000465 | IO module XB6-1616BWE(PNP) | 1 |
| 11 | 31100010132 | Tubular resistor 1000W25Ω*2+600W25Ω+300W45Ω+100W45 | 1 |
| 12 | 11200000486 | ED3L Servo drive ED3L-15AEA-R1[JZ] | 2 |
| 13 | 11200000485 | ED3L Servo drive ED3L-08AEA-R1[JZ] | 1 |
| 14 | 11200000484 | ED3L Servo drive ED3L-04AEA-R1[JZ] | 1 |
| 15 | 11200000483 | ED3L Servo drive ED3L-01AEA-R1[JZ] | 2 |

Table 6-5 List of spare parts of ER10-2000-CW Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 51600000145 | Switch power DRL-24V120W1EN[DELTA] | 1 |
| 2 | 51600000144 | Switch power DRL-24V240W1EN[DELTA] | 1 |
| 3 | 13200000908 | Straight-end network cable VS-IP20-IP20-LI/1.5-CAT5E | 1 |
| 4 | 13200000905 | Straight-end network cable VS-IP20-IP20-LI/0.3-CAT5E/ Pre-freezing | 2 |
| 5 | 13200001469 | Straight-end network cable VS-IP20-IP20-LI/0.2-CAT5E | 5 |
| 6 | 11200000541 | Extension module ER-Relay-A-BJ-Relay module | 1 |
| 7 | 51400000013 | Circuit breaker NXB-63 3P D32 | 1 |
| 8 | 52911610002 | Axial flow fan SJ1238HD2BPL | 3 |
| 9 | 52200000311 | EtherCATcoupler XB6-EC2002STE | 1 |
| 10 | 52200000465 | IO module XB6-1616BWE(PNP) | 1 |
| 11 | 31600000353 | Tubular resistor 1200W40Ω*2+1000W40Ω+500W25Ω+200W45 | 1 |
| 12 | 11200000532 | ED3L Servo drive ED3L-30DEA-R1[JZ] | 2 |
| 13 | 11200000531 | ED3L Servo drive ED3L-20DEA-R1[JZ] | 1 |
| 14 | 11200000485 | ED3L Servo drive ED3L-08AEA-R1[JZ] | 1 |
| 15 | 11200000484 | ED3L Servo drive ED3L-04AEA-R1[JZ] | 2 |

Table 6-6 List of spare parts of ER12B-1510 Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 51600000145 | Switch power DRL-24V120W1EN[DELTA] | 1 |
| 2 | 51600000144 | Switch power DRL-24V240W1EN[DELTA] | 1 |
| 3 | 13200000908 | Straight-end network cable VS-IP20-IP20-LI/1.5-CAT5E | 1 |
| 4 | 13200000905 | Straight-end network cable VS-IP20-IP20-LI/0.3-CAT5E/ Pre-freezing | 2 |
| 5 | 13200001469 | Straight-end network cable VS-IP20-IP20-LI/0.2-CAT5E | 5 |
| 6 | 11200000541 | Extension module ER-Relay-A-BJ-Relay module | 1 |
| 7 | 51400000013 | Circuit breaker NXB-63 3P D32 | 1 |
| 8 | 52911610002 | Axial flow fan SJ1238HD2BPL | 3 |
| 9 | 52200000469 | IO module EC4-1616BWE(PNP) | 1 |
| 10 | 31100010132 | Tubular resistor 1000W25Ω*2+600W25Ω+300W45Ω+100W45 | 1 |
| 11 | 11200000486 | ED3L Servo drive ED3L-15AEA-R1[JZ] | 2 |
| 12 | 11200000485 | ED3L Servo drive ED3L-08AEA-R1[JZ] | 1 |
| 13 | 11200000484 | ED3L Servo drive ED3L-04AEA-R1[JZ] | 3 |

Table 6-7 List of spare parts of ER15-1520-PR Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 51600000145 | Switch power DRL-24V120W1EN[DELTA] | 1 |
| 2 | 51600000144 | Switch power DRL-24V240W1EN[DELTA] | 1 |
| 3 | 13200000908 | Straight-end network cable VS-IP20-IP20-LI/1.5-CAT5E | 1 |
| 4 | 13200000905 | Straight-end network cable VS-IP20-IP20-LI/0.3-CAT5E/ Pre-freezing | 2 |
| 5 | 13200001469 | Straight-end network cable VS-IP20-IP20-LI/0.2-CAT5E | 5 |
| 6 | 11200000541 | Extension module ER-Relay-A-BJ-Relay module | 1 |
| 7 | 51400000013 | Circuit breaker NXB-63 3P D32 | 1 |
| 8 | 52911610002 | Axial flow fan SJ1238HD2BPL | 3 |
| 9 | 52200000469 | IO module EC4-1616BWE(PNP) | 1 |
| 10 | 31100010132 | Tubular resistor 1000W25Ω*2+600W25Ω+300W45Ω+100W45 | 1 |
| 11 | 11200000486 | ED3L Servo drive ED3L-15AEA-R1[JZ] | 2 |
| 12 | 11200000485 | ED3L Servo drive ED3L-08AEA-R1[JZ] | 1 |
| 13 | 11200000484 | ED3L Servo drive ED3L-04AEA-R1[JZ] | 3 |

Table 6-8 List of spare parts of ER20/10 Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 51600000145 | Switch power DRL-24V120W1EN[DELTA] | 1 |
| 2 | 51600000144 | Switch power DRL-24V240W1EN[DELTA] | 1 |
| 3 | 13200000907 | Straight-end network cable VS-IP20-IP20-LI/1.0-CAT5E | 1 |
| 4 | 13200000905 | Straight-end network cable VS-IP20-IP20-LI/0.3-CAT5E/ Pre-freezing | 2 |
| 5 | 13200001469 | Straight-end network cable VS-IP20-IP20-LI/0.2-CAT5E | 5 |
| 6 | 11200000532 | ED3L Servo drive ED3L-30DEA-R1[JZ] | 2 |
| 7 | 11200000531 | ED3L Servo drive ED3L-20DEA-R1[JZ] | 1 |
| 8 | 11200000485 | ED3L Servo drive ED3L-08AEA-R1[JZ] | 1 |
| 9 | 11200000484 | ED3L Servo drive ED3L-04AEA-R1[JZ] | 2 |
| 10 | 11200000541 | Extension module ER-Relay-A-BJ-Relay module | 1 |
| 11 | 52200000469 | IO module EC4-1616BWE(PNP) | 1 |
| 12 | 31600000353 | Tubular resistor 1200W40Ω*2+1000W40Ω+500W25Ω+200W45 | 1 |
| 13 | 52911610002 | Axial flow fan SJ1238HD2BPL | 1 |

| | | | |
|---|---|---|---|
| 14 | 52900000472 | 风机　SJ1751HD2BAL 5000RPM | 2 |
| 15 | 51400000013 | Circuit breaker　NXB-63 3P D32 | 1 |

Table 6-9 List of spare parts of ER20B-1745-PV Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 52911610002 | Axial flow fan　SJ1238HD2BPL | 4 |
| 2 | 15000000053 | Robot controller ERC30E | 1 |
| 3 | 51433300001 | Common fuse base RT18-32 | 1 |
| 4 | 51500000076 | AC contactor NXC-22 220V | 2 |
| 5 | 52300000297 | Mushroom button　NP8-02ZS/1 Red | 1 |
| 6 | 51410510012 | Load switch body　V2C | 1 |
| 7 | 51410520006 | Load switch panel KCF-1PZC | 1 |
| 8 | 51400000013 | Circuit breaker　NXB-63 3P D32 | 1 |
| 9 | 25100000070 | PNP Type EC4 Kit 16DI/16DO　for customer use 7DI/8DO | 1 |

Table 6-10 List of spare parts of ER20-1780 Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 51600000145 | Switch power　DRL-24V120W1EN[DELTA] | 1 |
| 2 | 51600000144 | Switch power　DRL-24V240W1EN[DELTA] | 1 |
| 3 | 13200000908 | Straight-end network cable　VS-IP20-IP20-LI/1.5-CAT5E | 1 |
| 4 | 13200000905 | Straight-end network cable　VS-IP20-IP20-LI/0.3-CAT5E/ Pre-freezing | 2 |
| 5 | 13200001469 | Straight-end network cable　VS-IP20-IP20-LI/0.2-CAT5E | 5 |
| 6 | 11200000541 | Extension module　ER-Relay-A-BJ-Relay module | 1 |
| 7 | 51400000013 | Circuit breaker　NXB-63 3P D32 | 1 |
| 8 | 52911610002 | Axial flow fan　SJ1238HD2BPL | 3 |
| 9 | 52900000472 | 风机　SJ1751HD2BAL 5000RPM | 2 |
| 10 | 52200000469 | IO module EC4-1616BWE(PNP) | 1 |
| 11 | 31600000353 | Tubular resistor 1200W40Ω*2+1000W40Ω+500W25Ω+200W45 | 1 |
| 12 | 11200000532 | ED3L Servo drive　ED3L-30DEA-R1[JZ] | 2 |
| 13 | 11200000531 | ED3L Servo drive　ED3L-20DEA-R1[JZ] | 1 |
| 14 | 11200000485 | ED3L Servo drive　ED3L-08AEA-R1[JZ] | 1 |
| 15 | 11200000484 | ED3L Servo drive　ED3L-04AEA-R1[JZ] | 2 |

Table 6-11 List of spare parts of ER20B-1760 Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 51600000145 | Switch power　DRL-24V120W1EN[DELTA] | 1 |
| 2 | 51600000144 | Switch power　DRL-24V240W1EN[DELTA] | 1 |
| 3 | 13200000908 | Straight-end network cable　VS-IP20-IP20-LI/1.5-CAT5E | 1 |
| 4 | 13200000905 | Straight-end network cable　VS-IP20-IP20-LI/0.3-CAT5E/ Pre-freezing | 2 |
| 5 | 13200001469 | Straight-end network cable　VS-IP20-IP20-LI/0.2-CAT5E | 5 |
| 6 | 11200000541 | Extension module　ER-Relay-A-BJ-Relay module | 1 |
| 7 | 51400000013 | Circuit breaker　NXB-63 3P D32 | 1 |
| 8 | 52911610002 | Axial flow fan　SJ1238HD2BPL | 3 |
| 9 | 52200000469 | IO module EC4-1616BWE(PNP) | 1 |
| 10 | 31600000371 | Tubular resistor 1200W40Ω*2+750W25Ω+500W25Ω+200W45Ω | 1 |
| 11 | 11200000532 | ED3L Servo drive　ED3L-30DEA-R1[JZ] | 2 |
| 12 | 11200000487 | ED3L Servo drive　ED3L-20AEA-R1[JZ] | 1 |
| 13 | 11200000485 | ED3L Servo drive　ED3L-08AEA-R1[JZ] | 1 |

| | | | |
|---|---|---|---|
| 14 | 11200000484 | ED3L Servo drive　ED3L-04AEA-R1[JZ] | 2 |

Table 6-12 List of spare parts of ER30～ER35 Series Robot ED3L Control Cabinet

| S/N | Material No. | Name | Qty. |
|---|---|---|---|
| 1 | 51600000145 | Switch power　DRL-24V120W1EN[DELTA] | 1 |
| 2 | 51600000144 | Switch power　DRL-24V240W1EN[DELTA] | 1 |
| 3 | 13200000907 | Straight-end network cable　VS-IP20-IP20-LI/1.0-CAT5E | 1 |
| 4 | 13200000905 | Straight-end network cable　VS-IP20-IP20-LI/0.3-CAT5E/ Pre-freezing | 2 |
| 5 | 13200001469 | Straight-end network cable　VS-IP20-IP20-LI/0.2-CAT5E | 5 |
| 6 | 11200000532 | ED3L Servo drive　ED3L-30DEA-R1[JZ] | 2 |
| 7 | 11200000531 | ED3L Servo drive　ED3L-20DEA-R1[JZ] | 1 |
| 8 | 11200000485 | ED3L Servo drive　ED3L-08AEA-R1[JZ] | 2 |
| 9 | 11200000484 | ED3L Servo drive　ED3L-04AEA-R1[JZ] | 1 |
| 10 | 11200000541 | Extension module　ER-Relay-A-BJ-Relay module | 1 |
| 11 | 52200000469 | IO module　EC4-1616BWE(PNP) | 1 |
| 12 | 31600000356 | Tubular resistor 1200W40Ω*2+1000W40Ω+500W25Ω*2+200W | 1 |
| 13 | 52911610002 | Axial flow fan　SJ1238HD2BPL | 1 |
| 14 | 52900000472 | 风机　SJ1751HD2BAL 5000RPM | 2 |
| 15 | 51400000013 | Circuit breaker　NXB-63 3P D32 | 1 |

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