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-05

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; update basic parameters section.
03	2023.06	Add ER20B-1760-HI.
04	2024.05	Update basic parameters section.
05	2024.06	Updated Table 1-2 Control cabinet installation parameters in Section 1.4 to include cable allowance, plug size, and cable bend radius to the robot base.

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 safety area and others;
   - To work in a safety area;
   - **The above-mentioned personnel must receive training on the robot.**
3. Maintenance personnel
   - To operate the robot;
   - To teach the robot in a safety area and others;
   - To carry out the robot maintenance (repair, adjustment, replacement);
   - To work in a safety area;
   - **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** Attention should be paid to the danger of high voltage and electric shock at the place where this sign is affixed.
	**High temperature** 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** 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** There is a danger of wounding by robot when working within the motion range of robot.
	**No disassembly** 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-1760-HI
	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

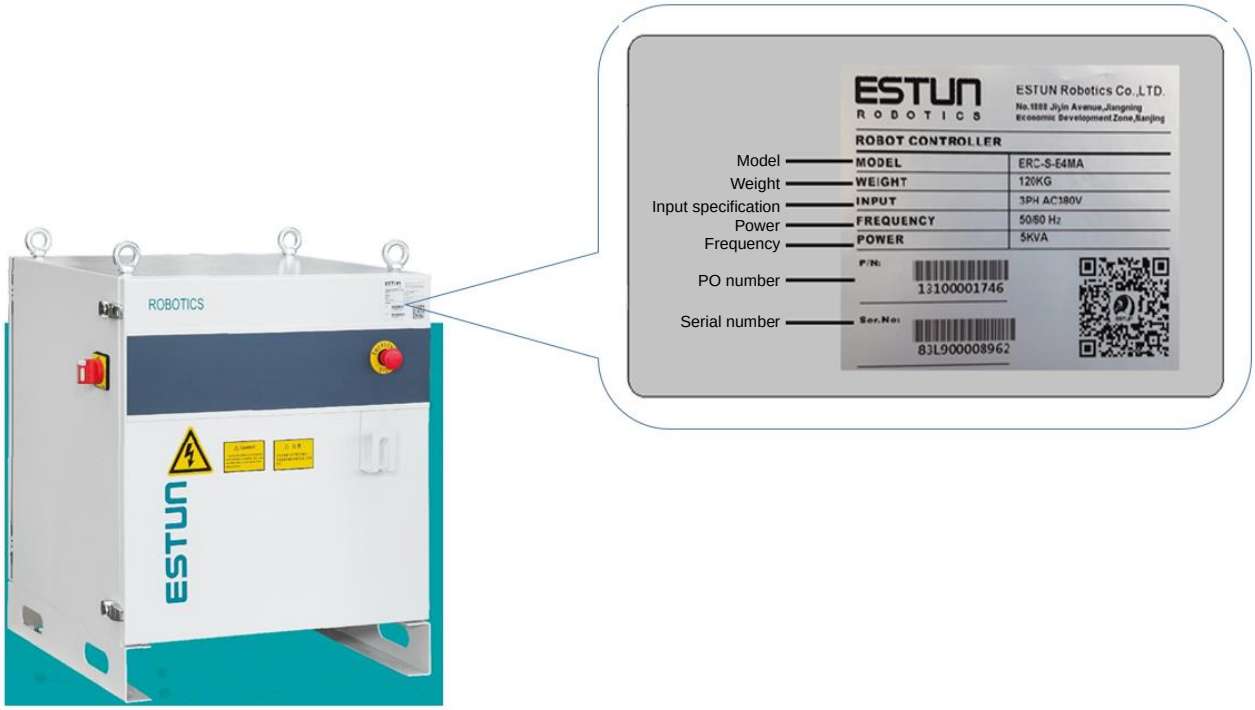


Figure 1.1 Information on nameplate of electric cabinet

1.2 Designation

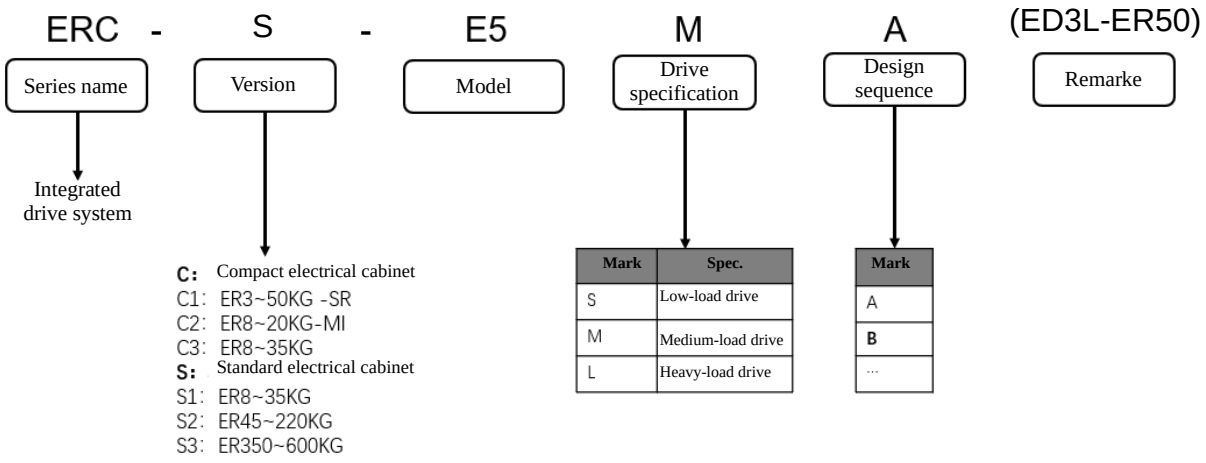


Figure 1.2 Designation

1.3 Components

Description of appearance

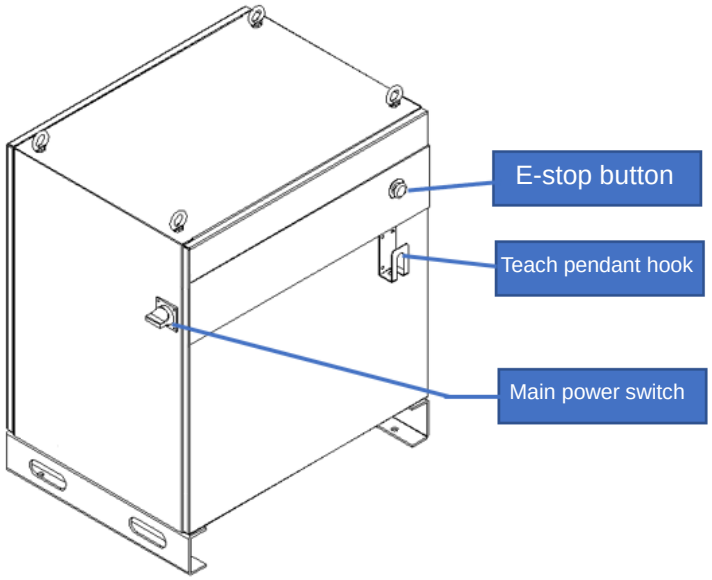
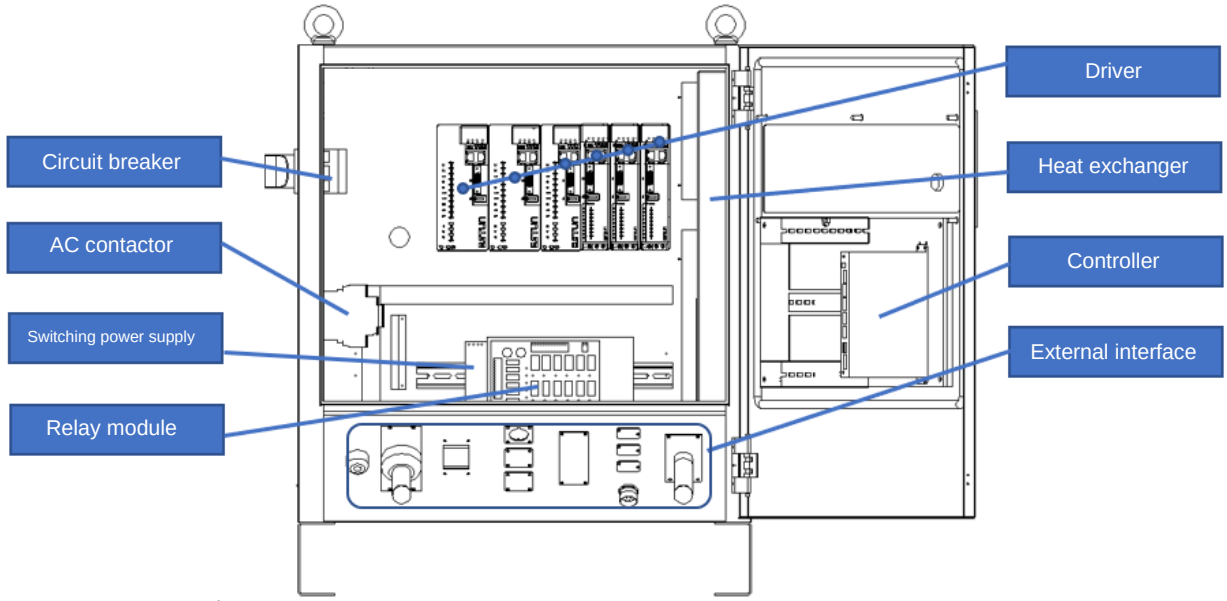


Figure 1.3 Description of appearance

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.



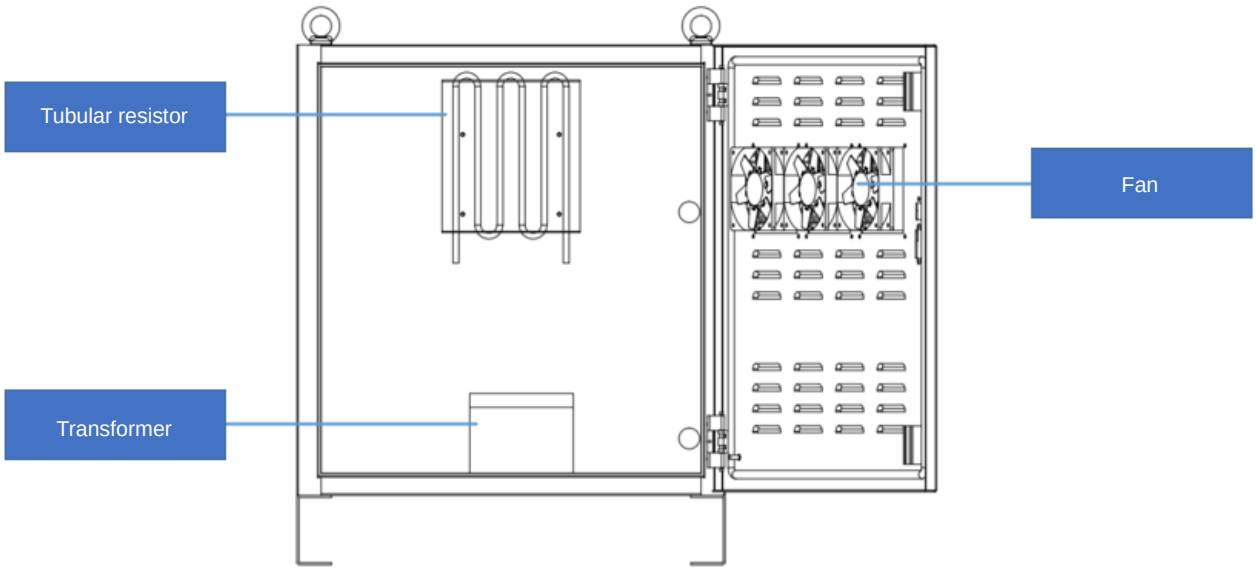


Figure 1.4 Internal structure

External interface

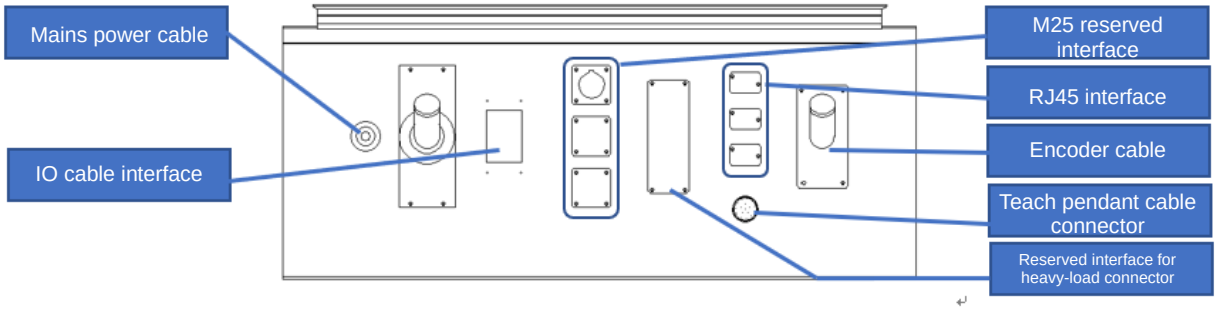


Figure 1.5 External interface

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	2.5	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
				0.44	ER8-2000-CW
				0.44	ER8-2000-CW-T

				0.73	ER10-2000-CW
			3	1.3	ER20/10-2000-HI
				1.3	ER20B/10-2010-HI
				2.76	ER20-1780
				1.61	ER20-1780-HI
				1.17	ER20B-1760
				1.09	ER20B-1760-HI
				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

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℃ Humidity: 20%~80%RH
Communication interface with peripherals (additional module required)	Standard: EtherCAT, Modbus TCP, TCP/IP; Optional: Profinet, Profibus, CCLINK, EtherNet IP
Total cable length to robot	Standard: 8m Options: 10m, 15m, 20m, 10m (flexible), 15m (flexible), 20m (flexible)
Space for cables to the robot base	Non-flexible cables: ⩾800mmm Flexible cables: ⩾300mmm
To robot base heavy duty connector plug size	120*45*75.5 (mm, L*W*H)
Power cable bending radius	Non-flexible cables: ⩾690mmm Flexible cables: ⩾200mmm
Encoder cable bending radius	Non-flexible cables: ⩾400mmm Flexible cables: ⩾200mmm
IO cable bending radius	Non-flexible cables: ⩾260mmm Flexible cables: ⩾130mmm
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

Item	Spec.
Number of control axes	4～6
Storage environment	Temperature: -25℃～55℃ 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

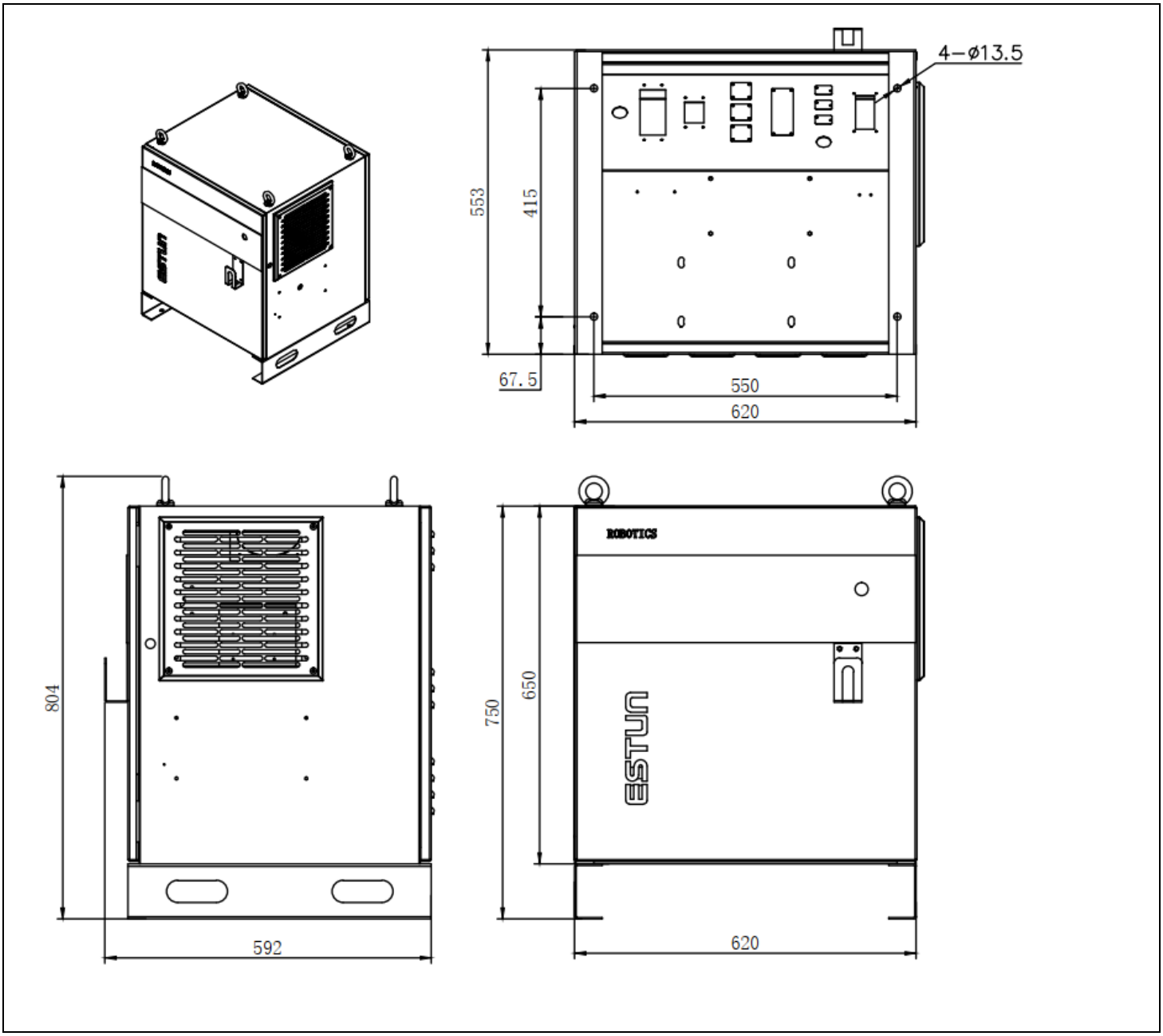


Figure 1.6 Overall dimensions

Chapter 2 Transportation & Installation

2.1 Transportation

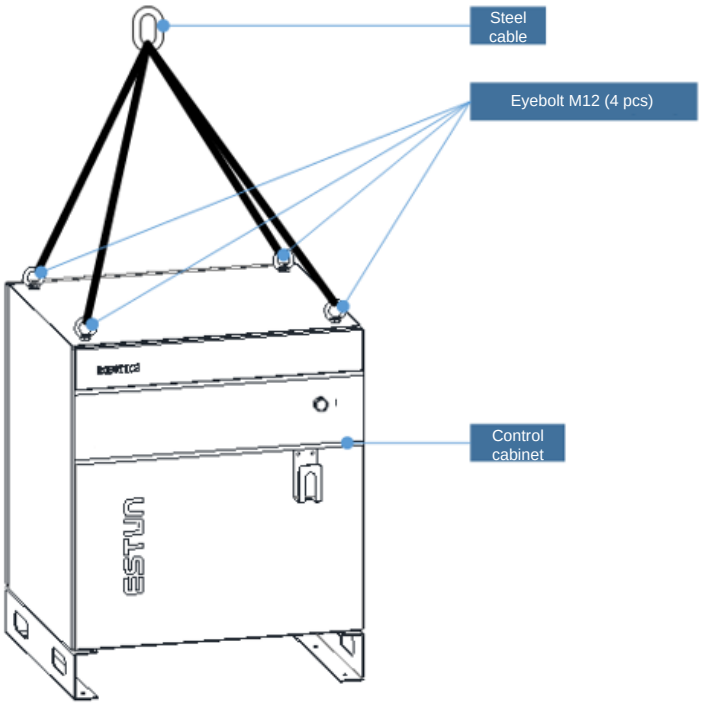
CAUTION

- 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:

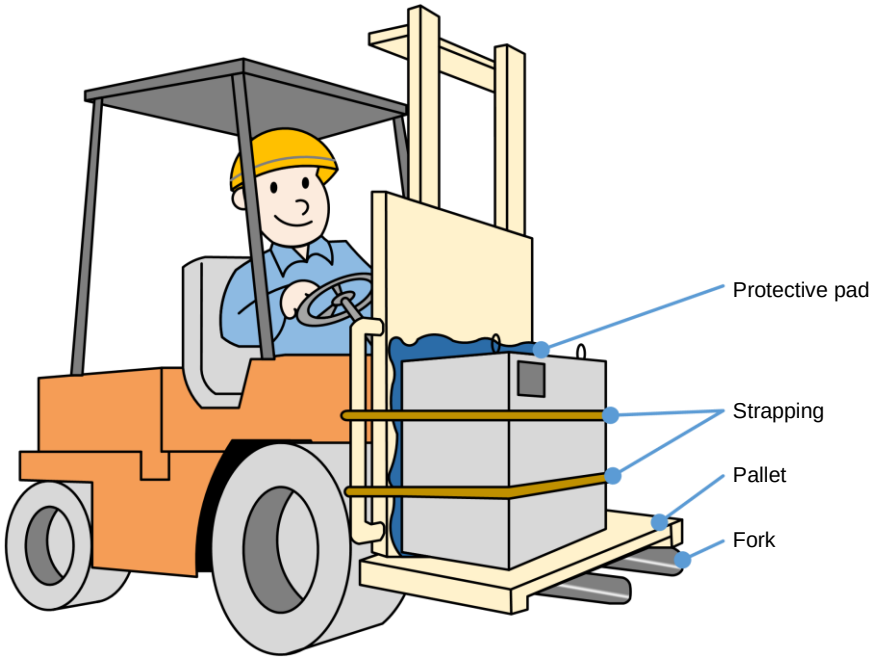
- Confirm the weight of the control cabinet and use a wire rope with a load capacity greater than the weight of the control cabinet for lifting.
- Install the lifting eye bolts securely before lifting.
- The lifting eye bolts should not be removed.



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).

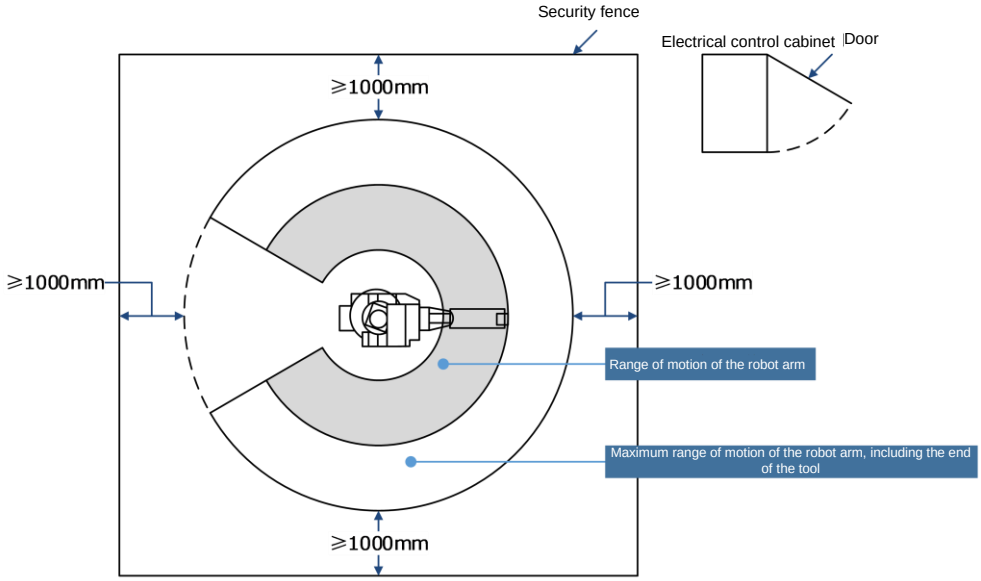
- There should be no ion or non-ion interference.

Instructions for users:

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

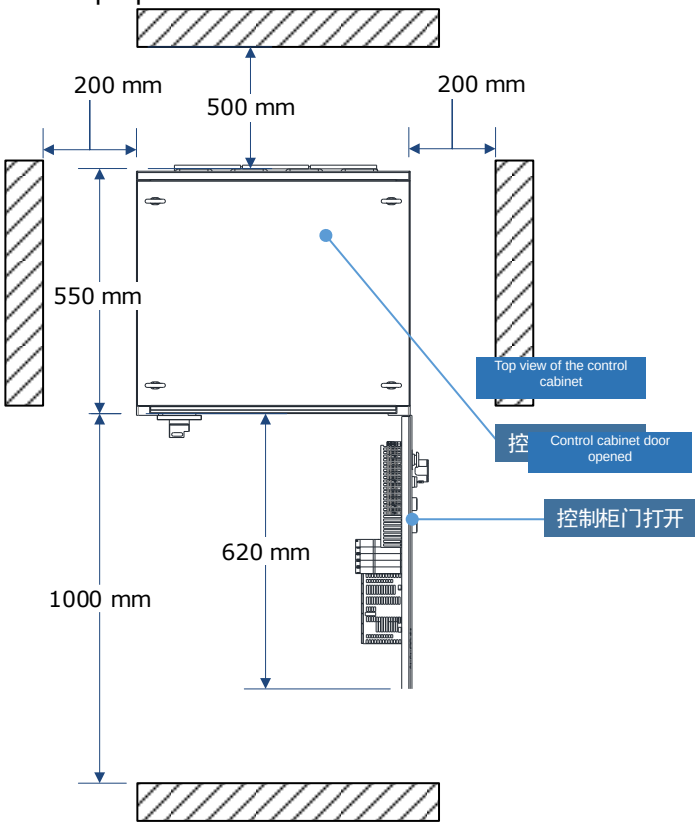
2.2.2 Installation location

- 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.

Figure 3.1 External interface

Figure 3.1 External interface

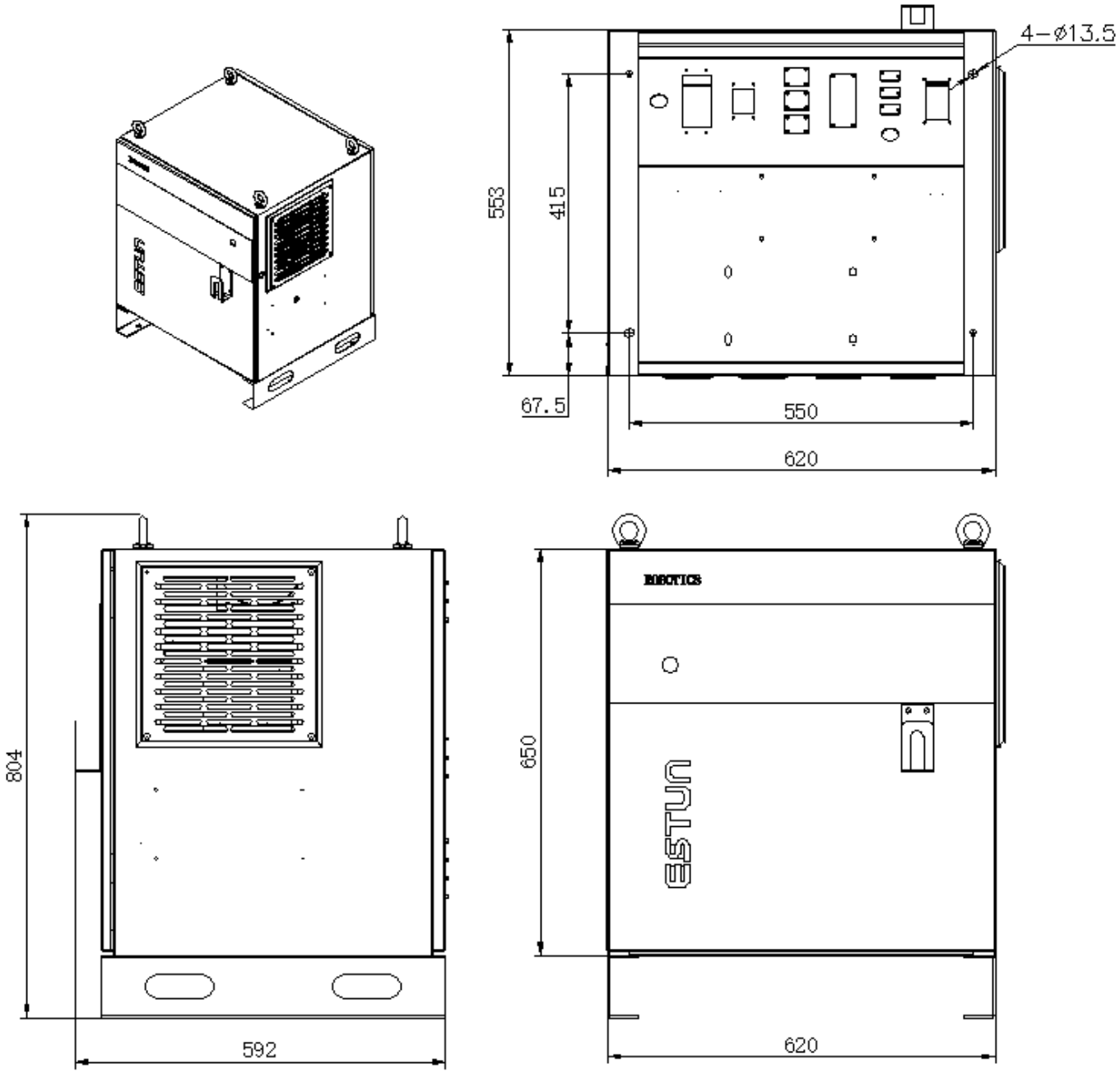


Figure2.1 Assembly Dimension Drawing

Chapter 3 Wiring & Connection

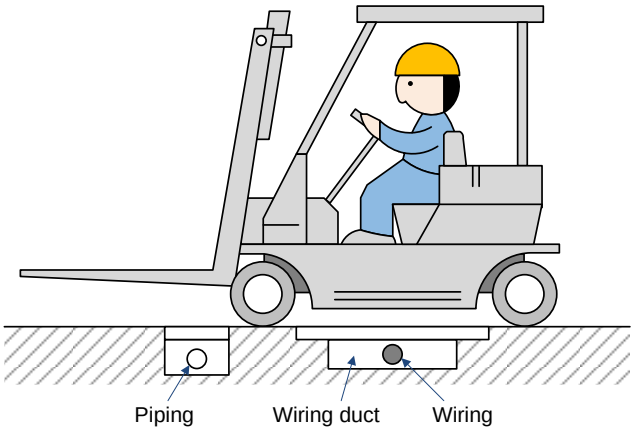
- The system must be electrically grounded to avoid fire, electric shock and bodily injury.
- Turn off the main power switch prior to wiring and inspection to avoid electric shock and bodily injury.
- Be sure to turn off the main power supply for at least 5 minutes prior wiring and inspection. There 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.

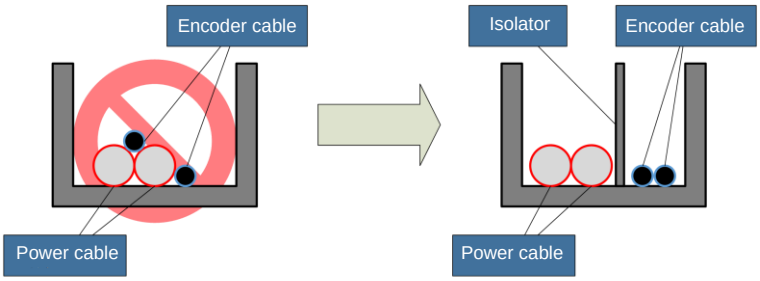
3.1 Precautions for cable connection

- 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

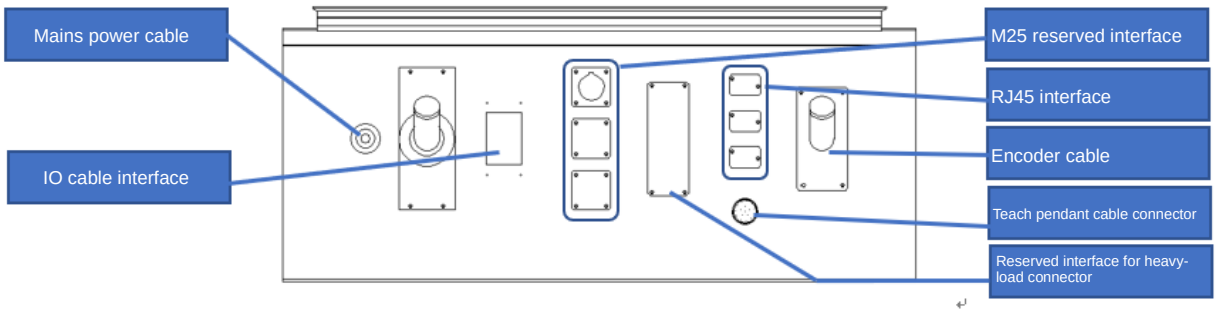


Figure 3.1 External interface

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.** System interface: 9DI/8DO: System interface: 16DI/16DO, user interface: 7DI/8DO; System interface: 32DI/32DO, user interface: 23DI/24DO; System interface: 48DI/48DO, user interface: 39DI/40DO.

3.4 Basic diagram

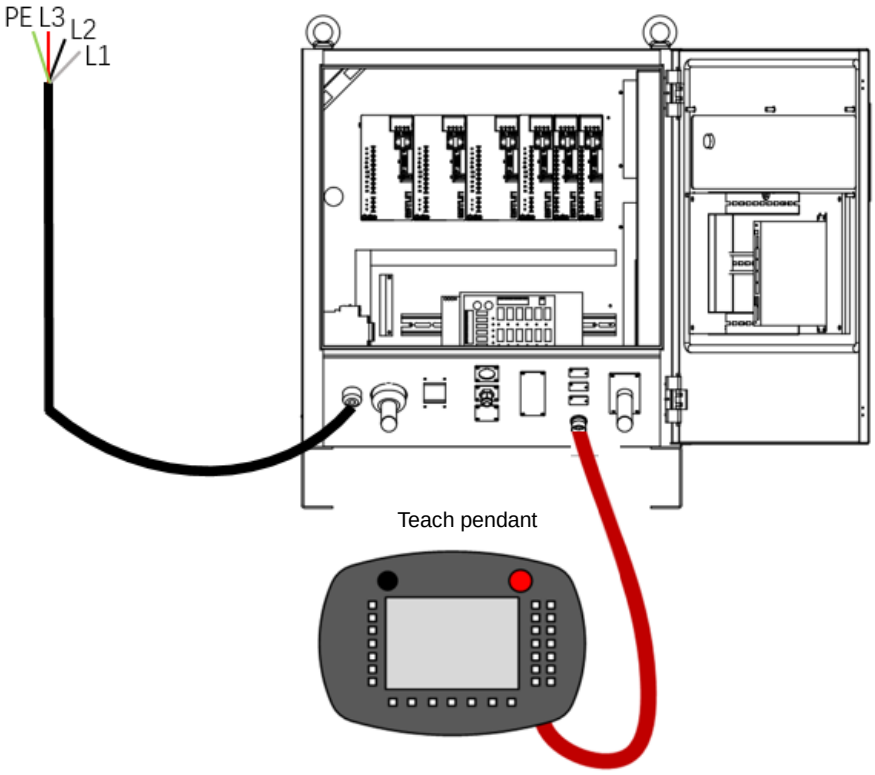


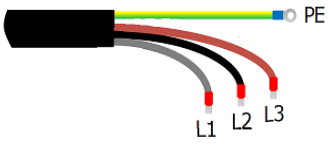
Figure 3.2 Basic diagram

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

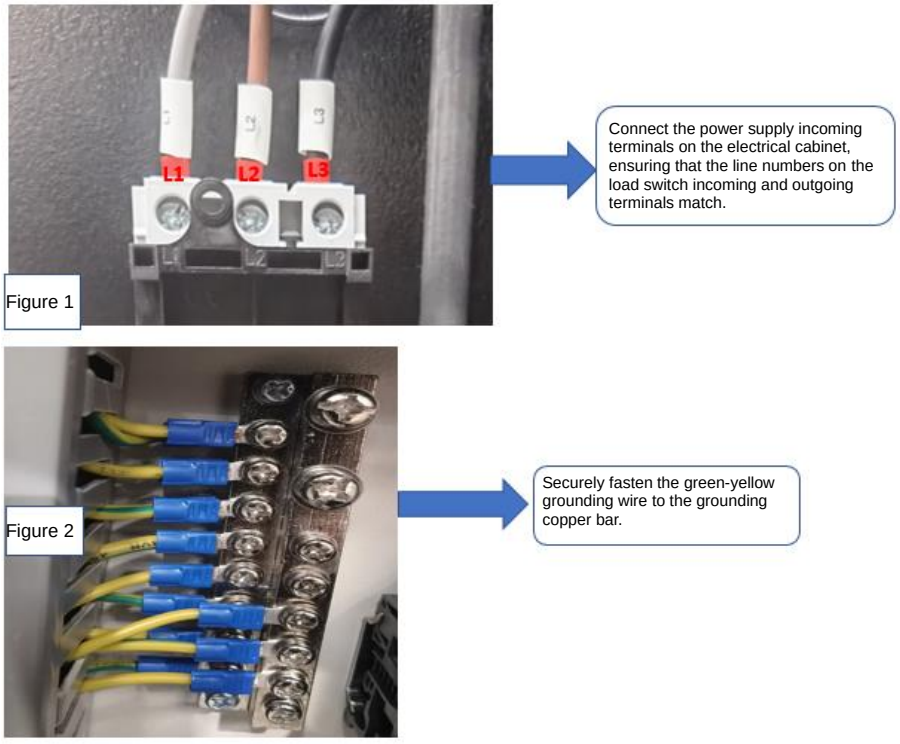


Figure 3.3 Power harness assembly illustration (3-phase 1)

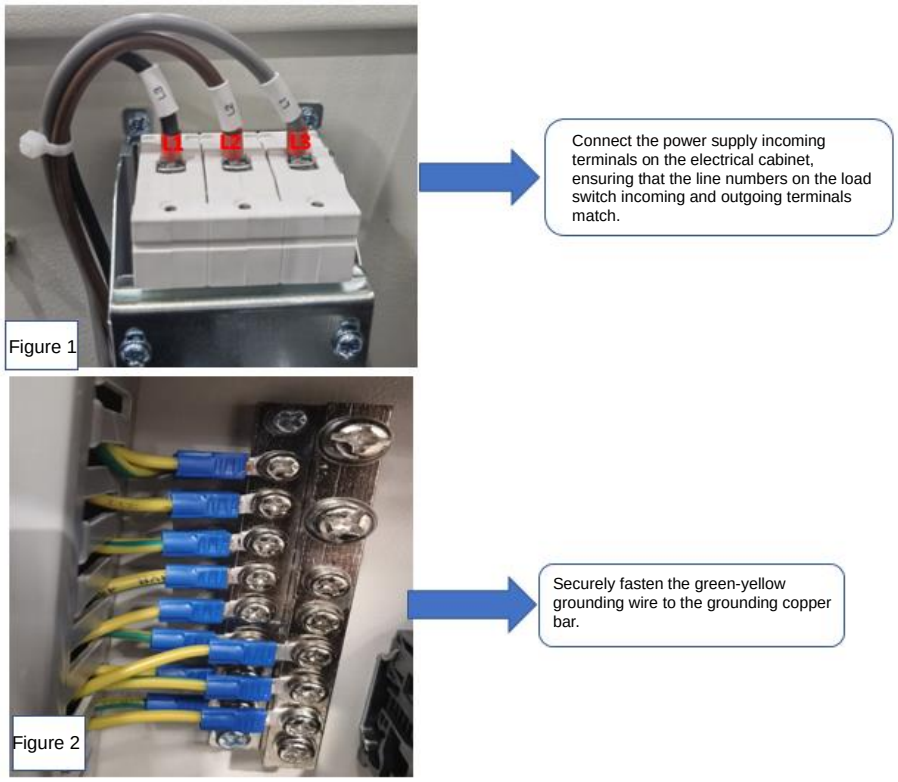


Figure 3.4 Power harness assembly illustration (3-phase 2)

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

AC380V power supply	Filter	Master switch	Drive power supply	AC220 control power	Holding brake power supply	Control power supply

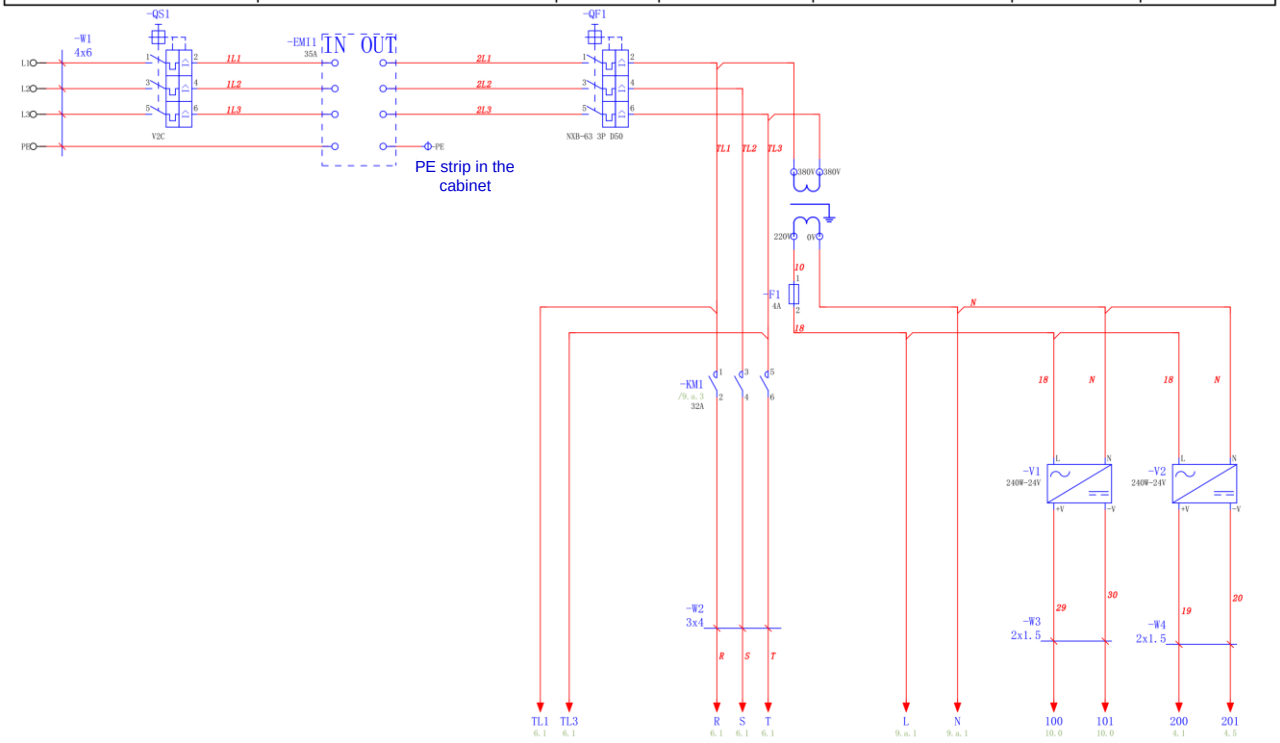


Figure 3.5 Three-phase power distribution

Control power supply 24V

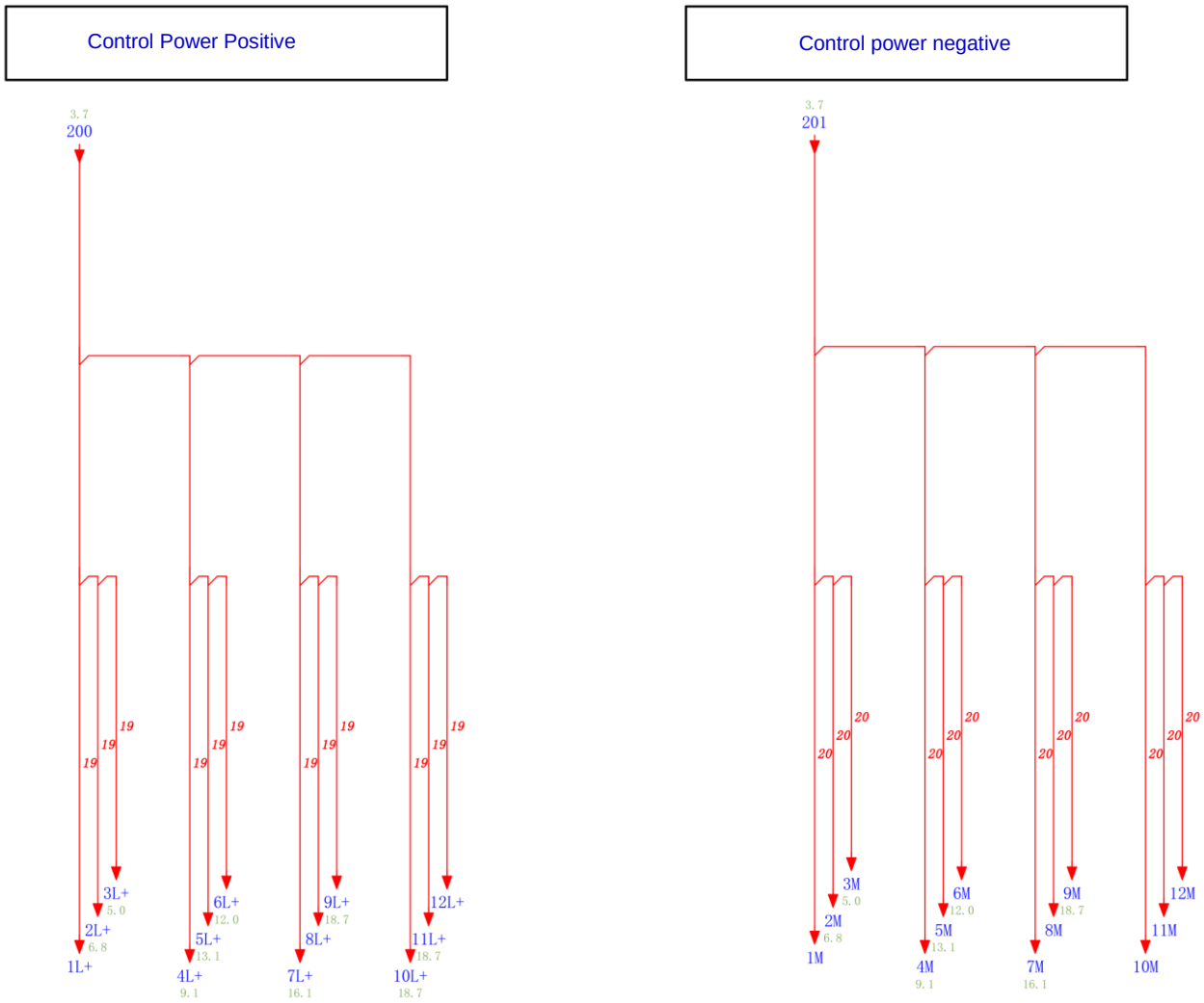
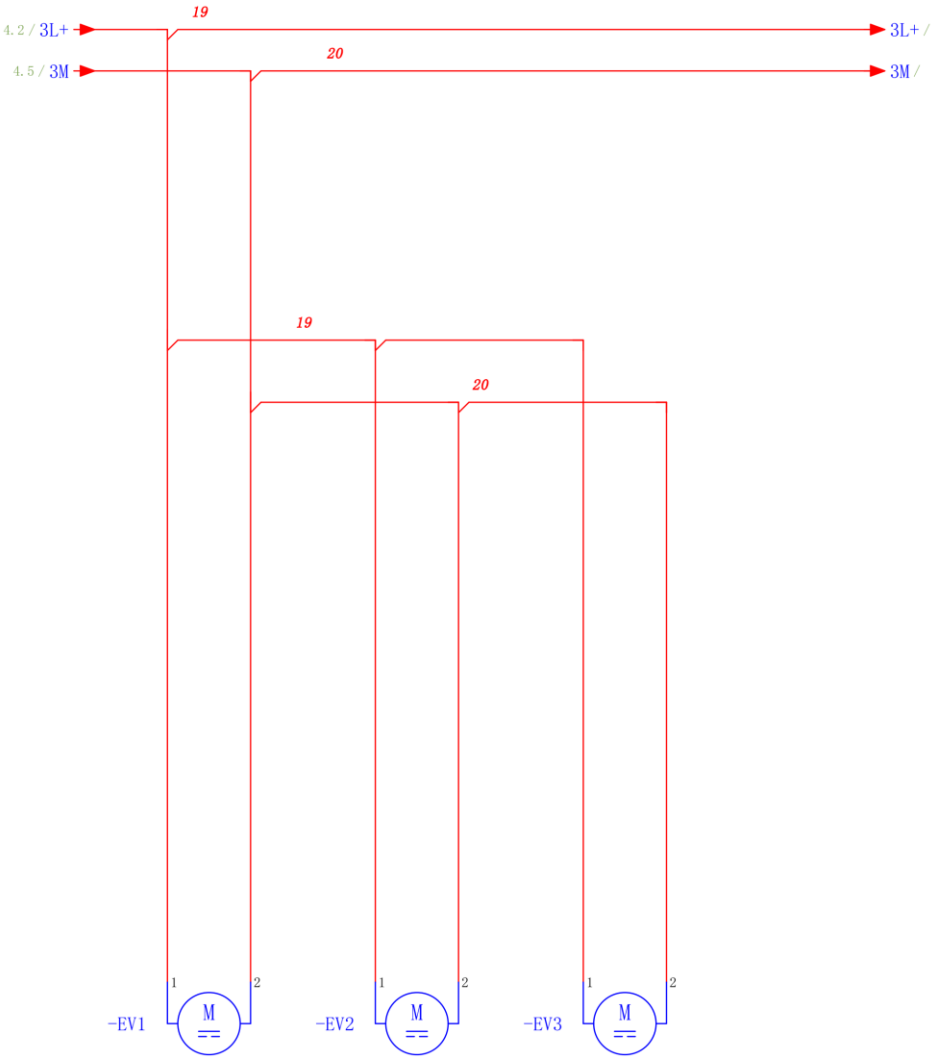


Figure 3.6 Control power supply 24V

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

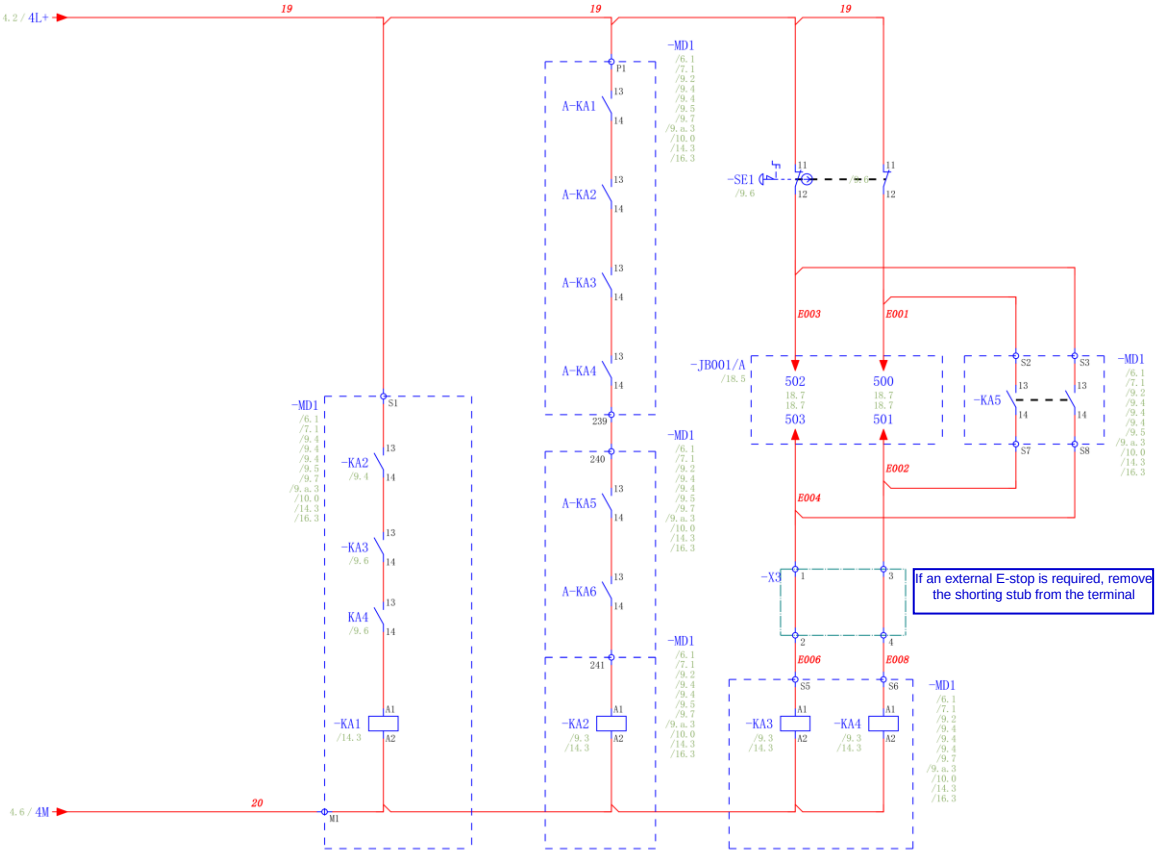


Figure 3.8 DC 24V control loop

AC 220V control loop

Servo main contactor control

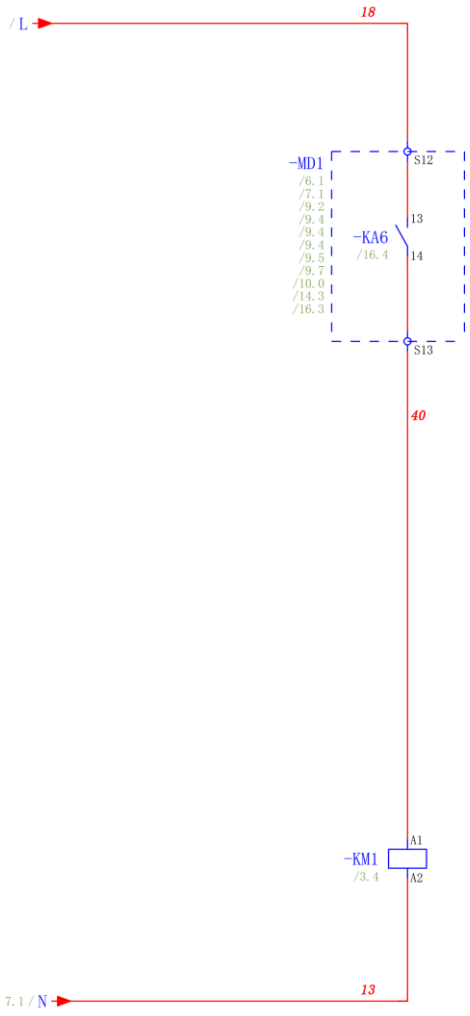


Figure 3.9 AC 220V control loop

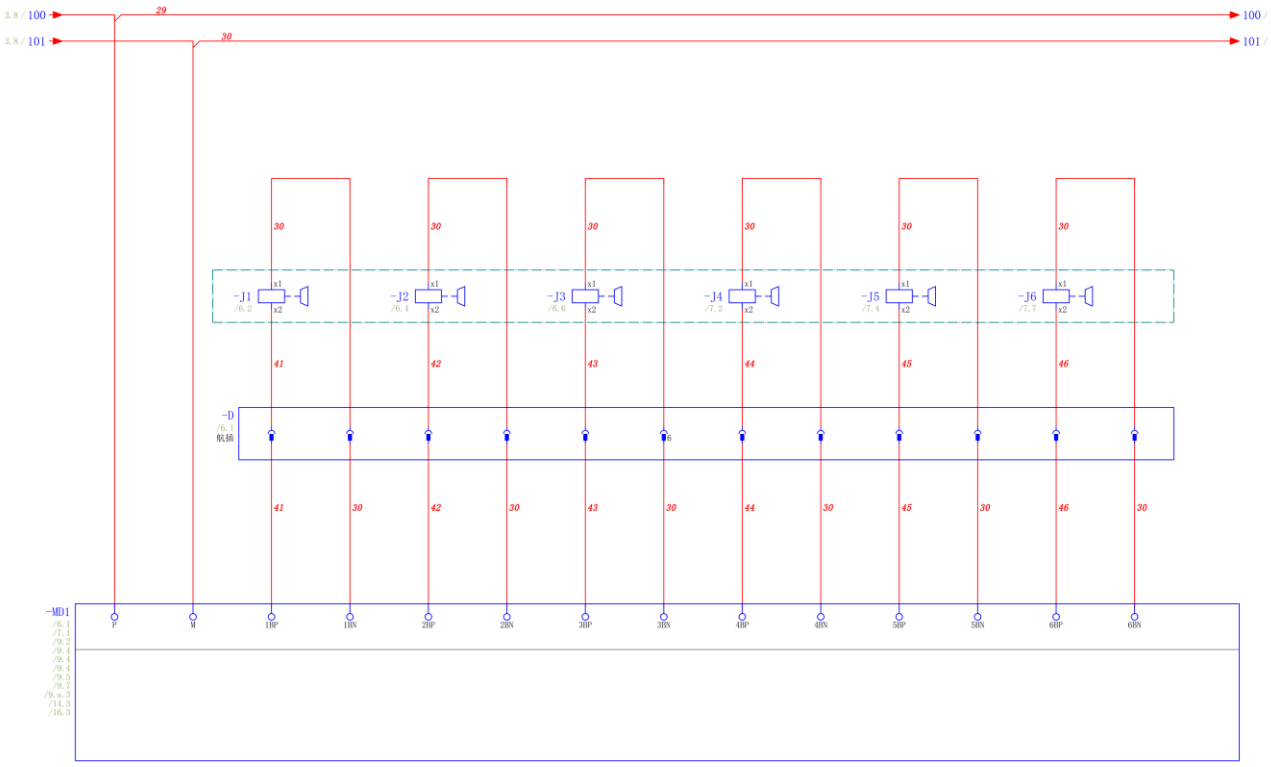


Figure 3.10 Motor brake

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

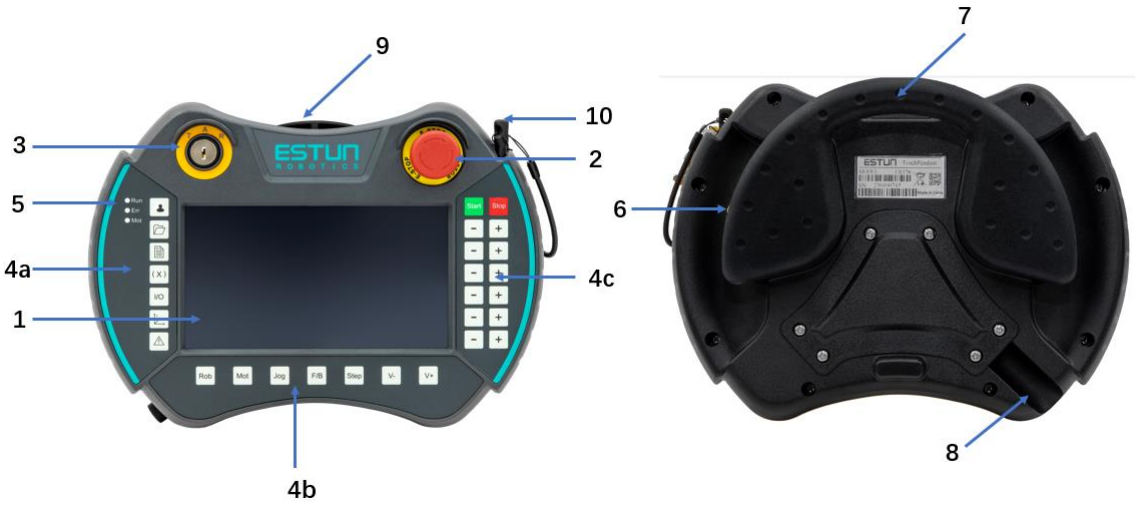


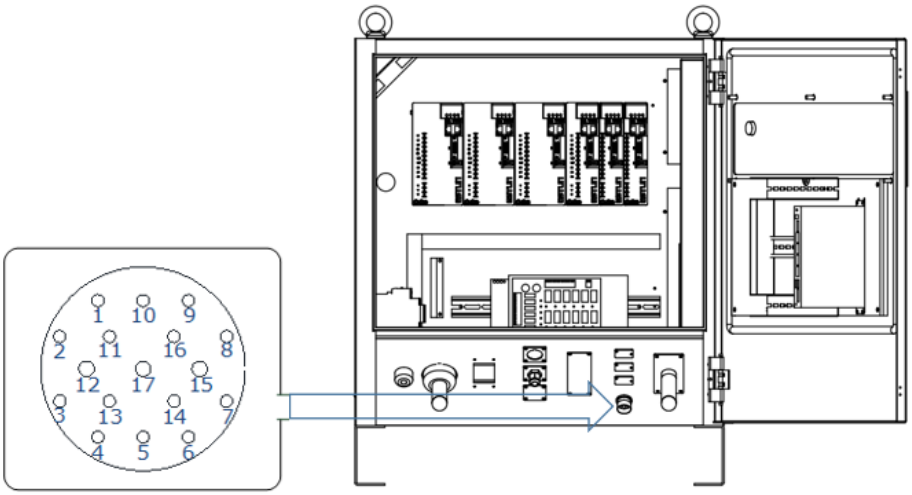
Figure 3.11 Exterior of the teach pendant

Number	Description
1	LCD display area
2	Emergency-stop button
3	Mode switch
4a, 4b, 4c	Global Function Keys
5	Indicator LED
6	Servo 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

Name	Description
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
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+

Pin	Definition	Description	Pin	Definition	Description
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.

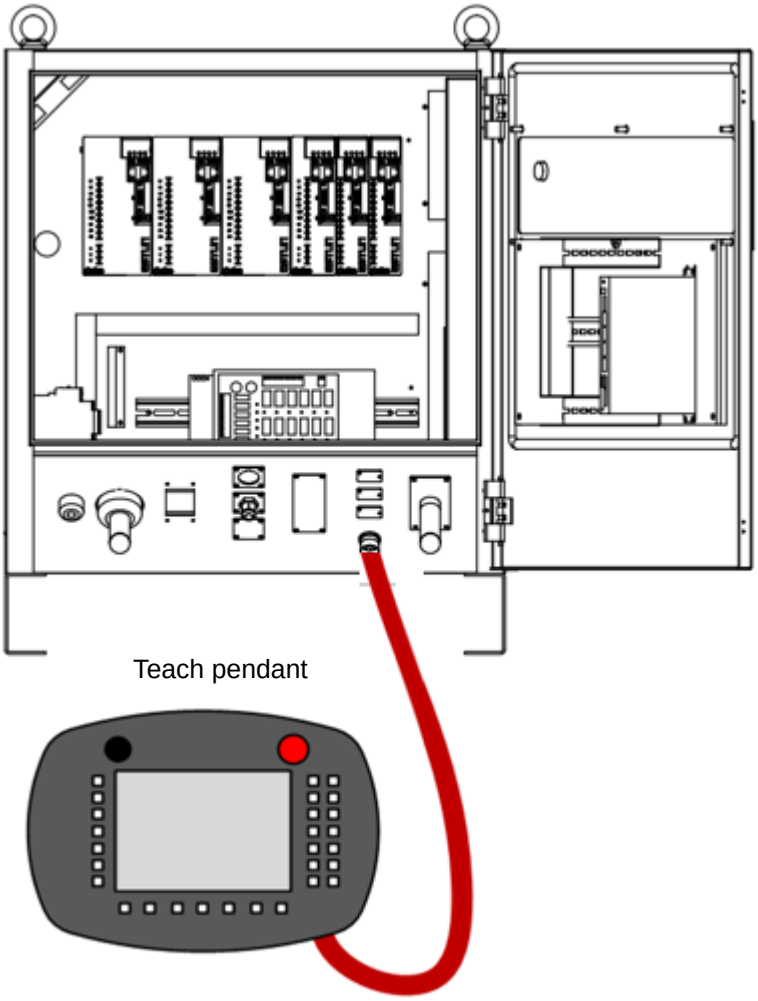


Figure 3.12 Teach pendant wiring

3.6.5 Electrical principle

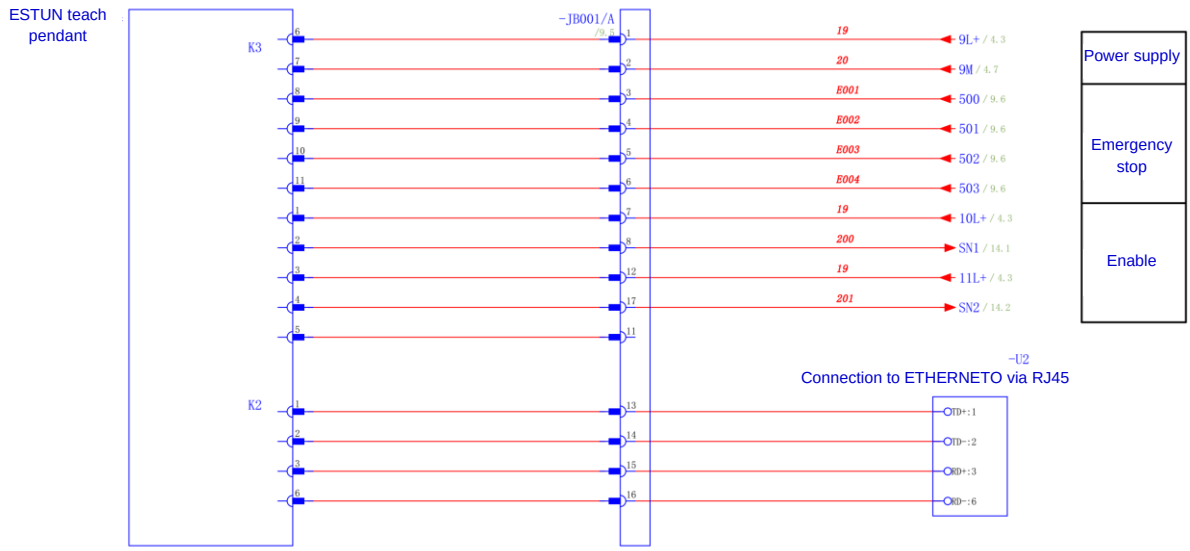


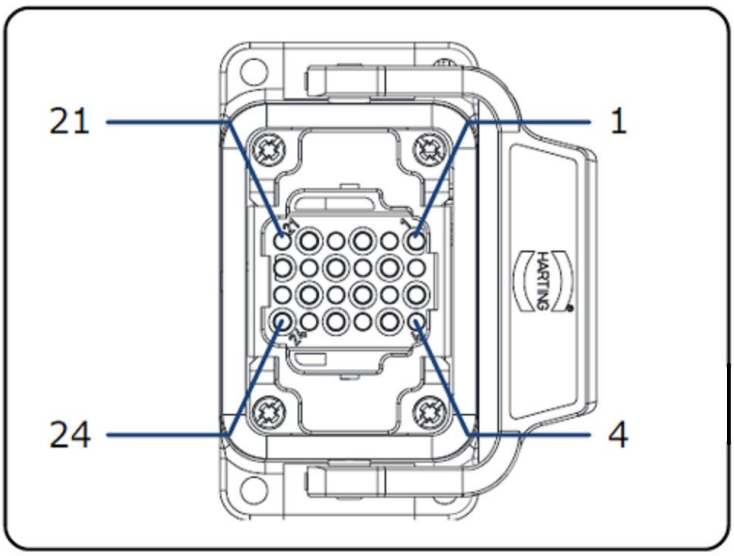
Figure 3.13 Teach pendant wiring

3.7 IO wiring

3.7.1 IO wiring

IO interface definition

NOTE	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

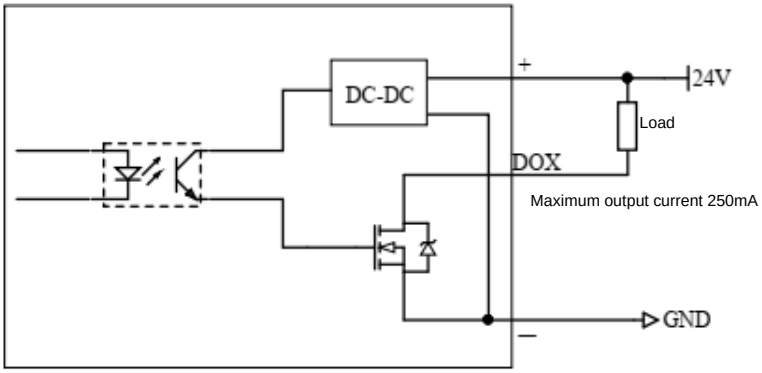


Figure 3.14 DO NPN type wiring diagram

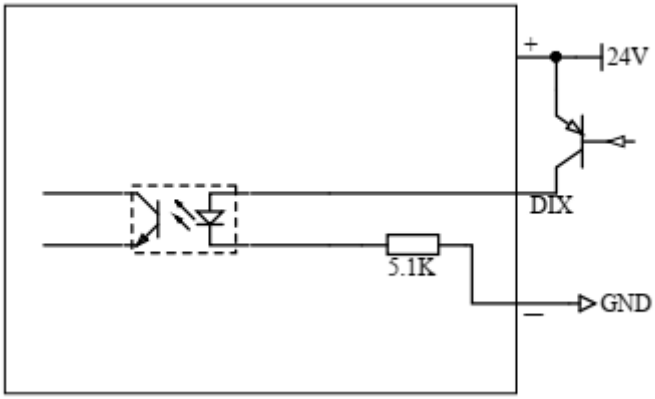


Figure 3.15 DI PNP type wiring diagram

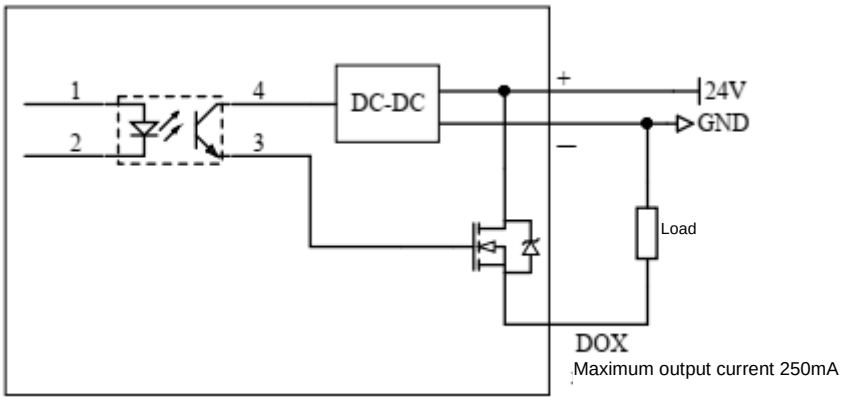


Figure 3.16 DO PNP type wiring diagram

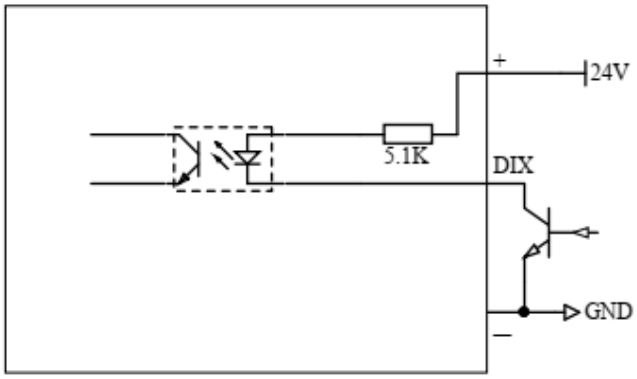


Figure 3.17 DI NPN type wiring diagram

3.7.2 Encoder wiring

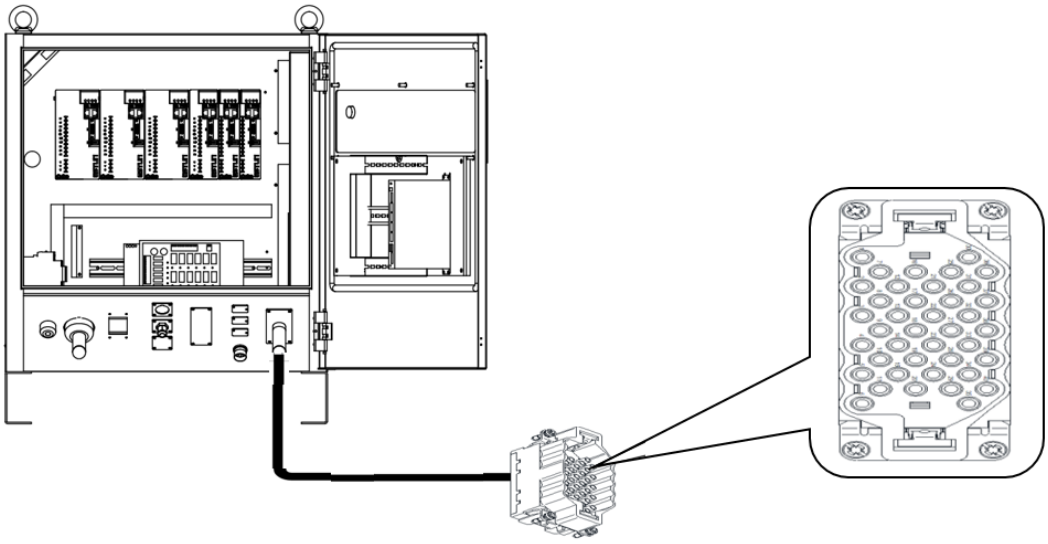


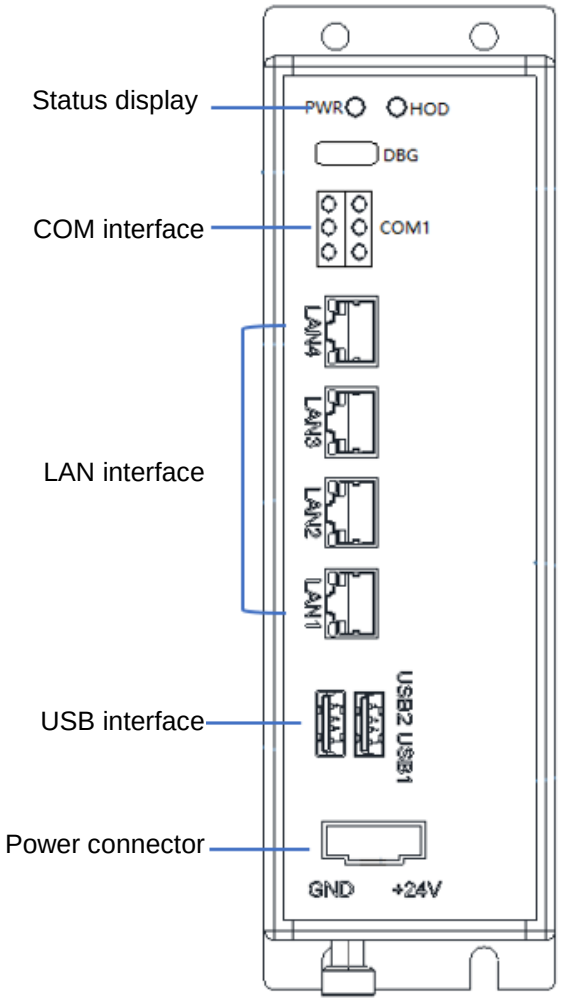
Table 3-1 Encoder - Aviation plugs

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: ● RJ45 connector of the Teach pendant ● Coupler ● RJ45 connector of the control cabinet
Status display	7-segment LED digital display tube
USB interface	—

Communication connections

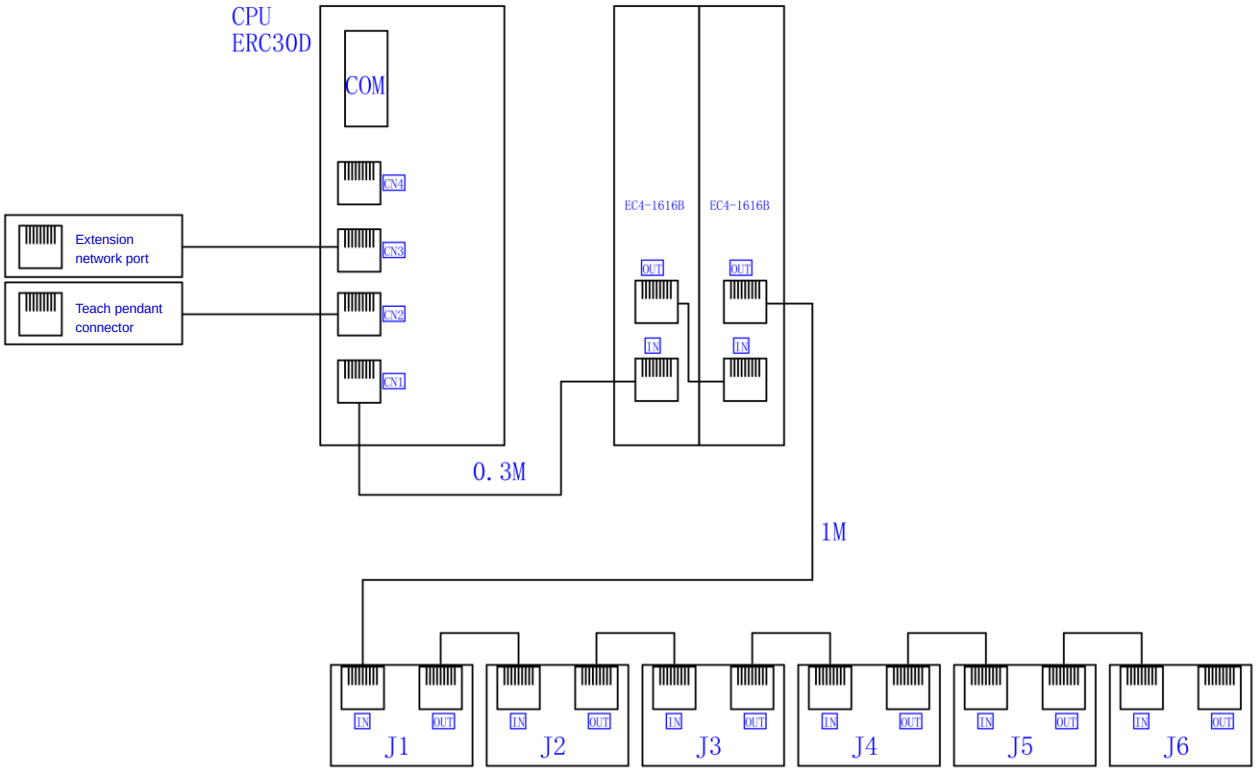


Figure 3.18 Communication connections

O&M Wizard optional

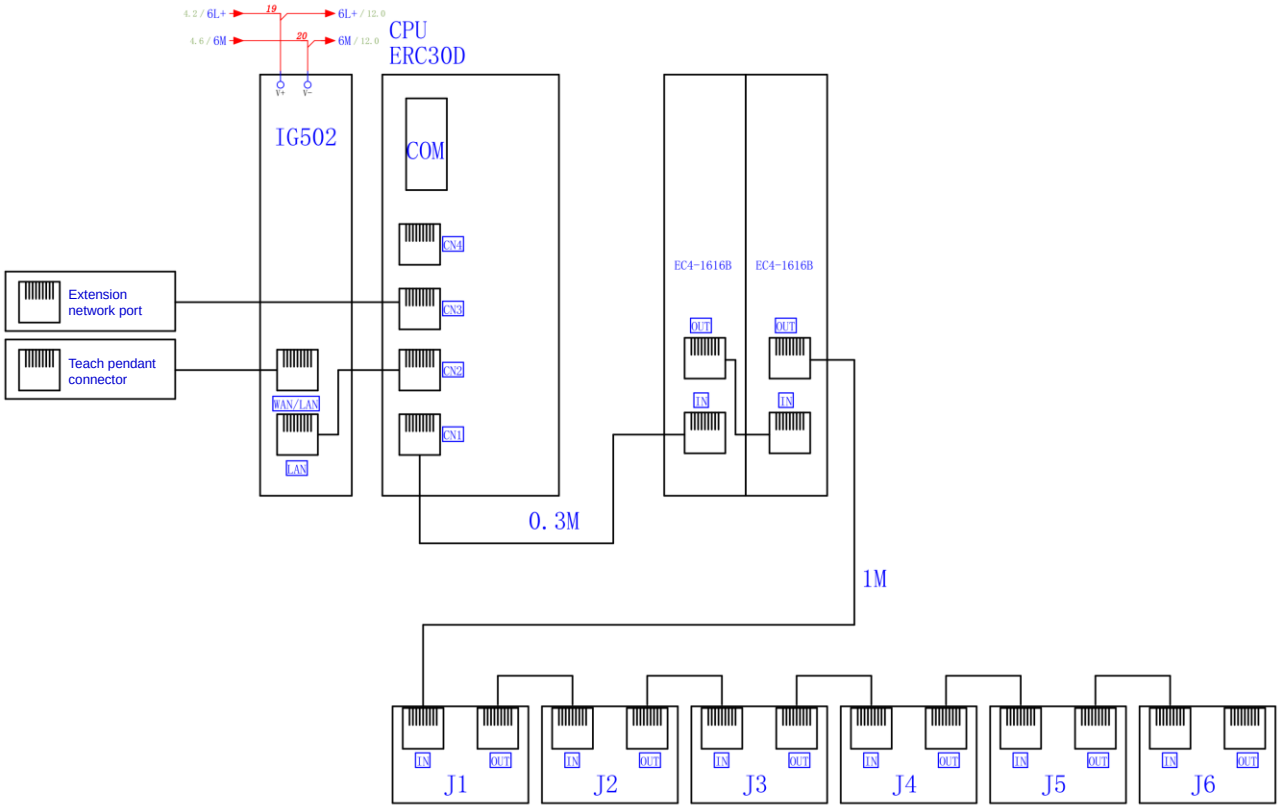


Figure 3.19 Communication connections (optional O&M wizard)

E-stop wiring

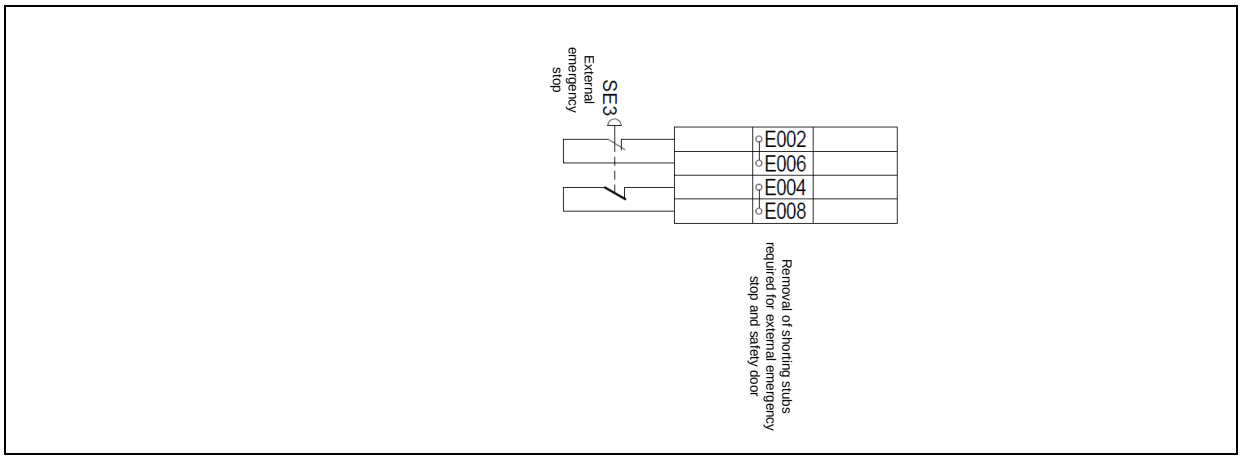


Figure 3.20 E-stop wiring diagram

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

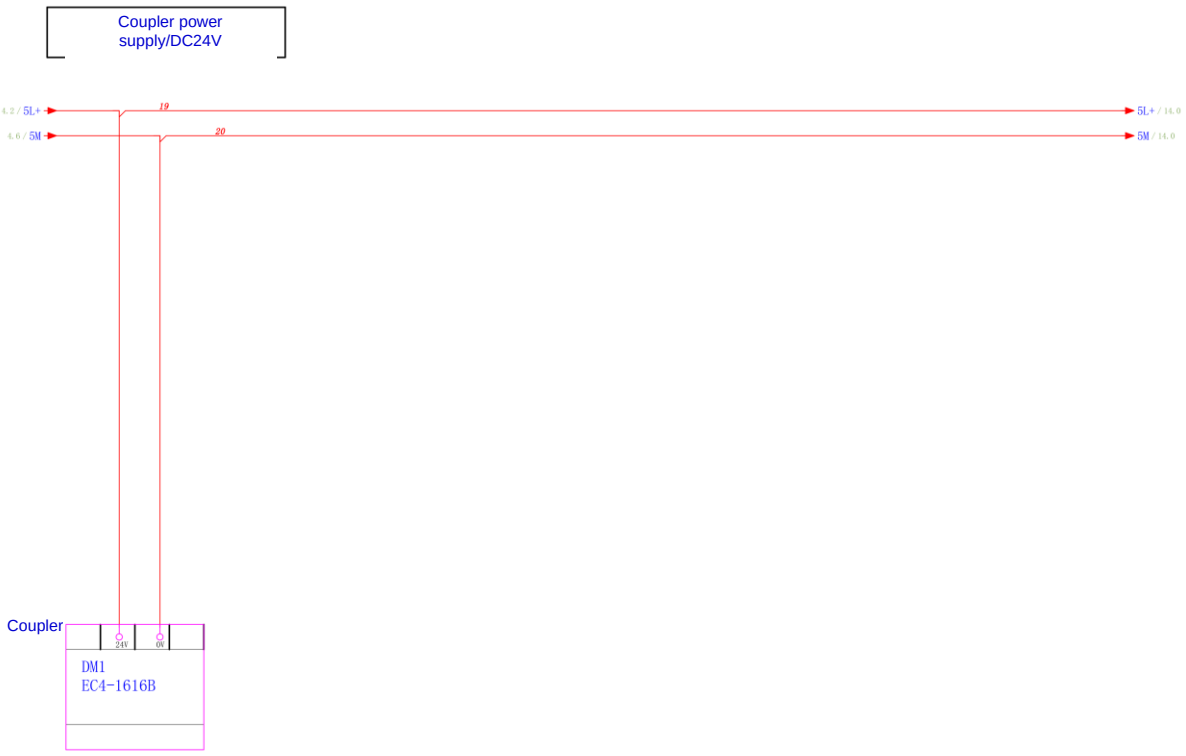


Figure 3.21 Coupler power supply

Input module

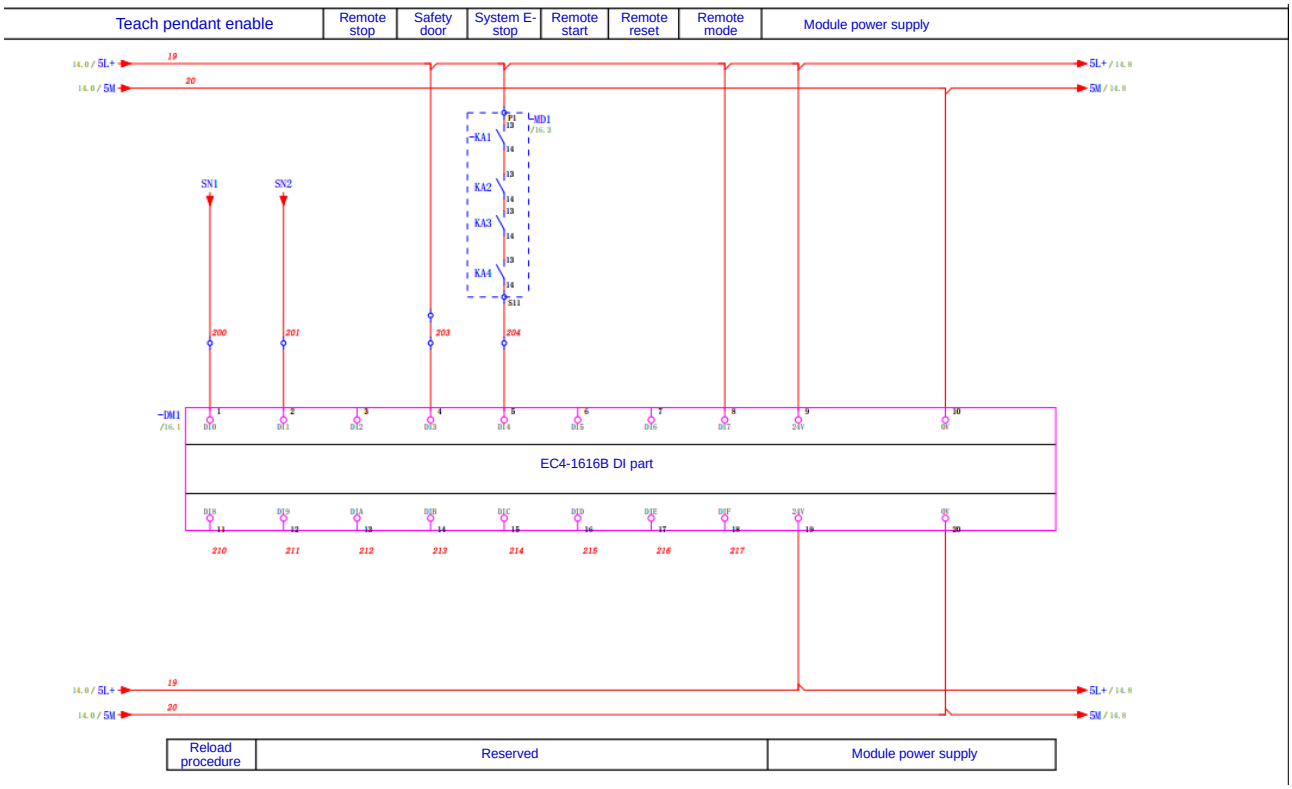


Figure 3.22 Input module

Output module

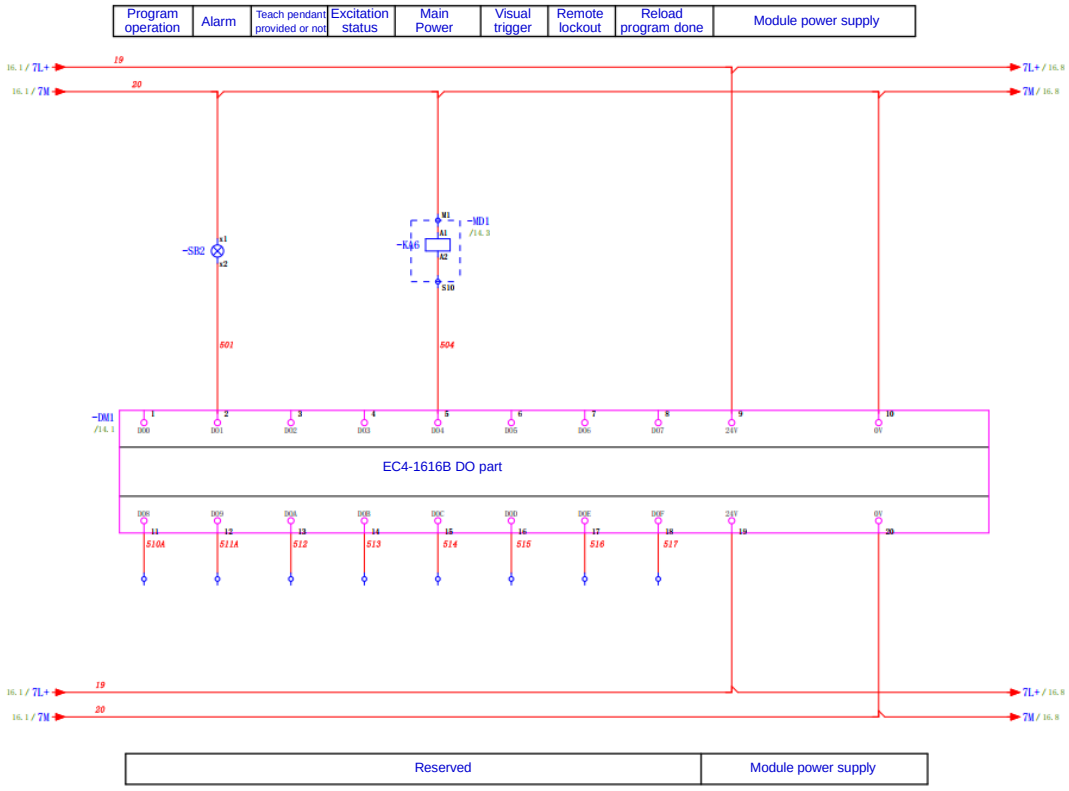
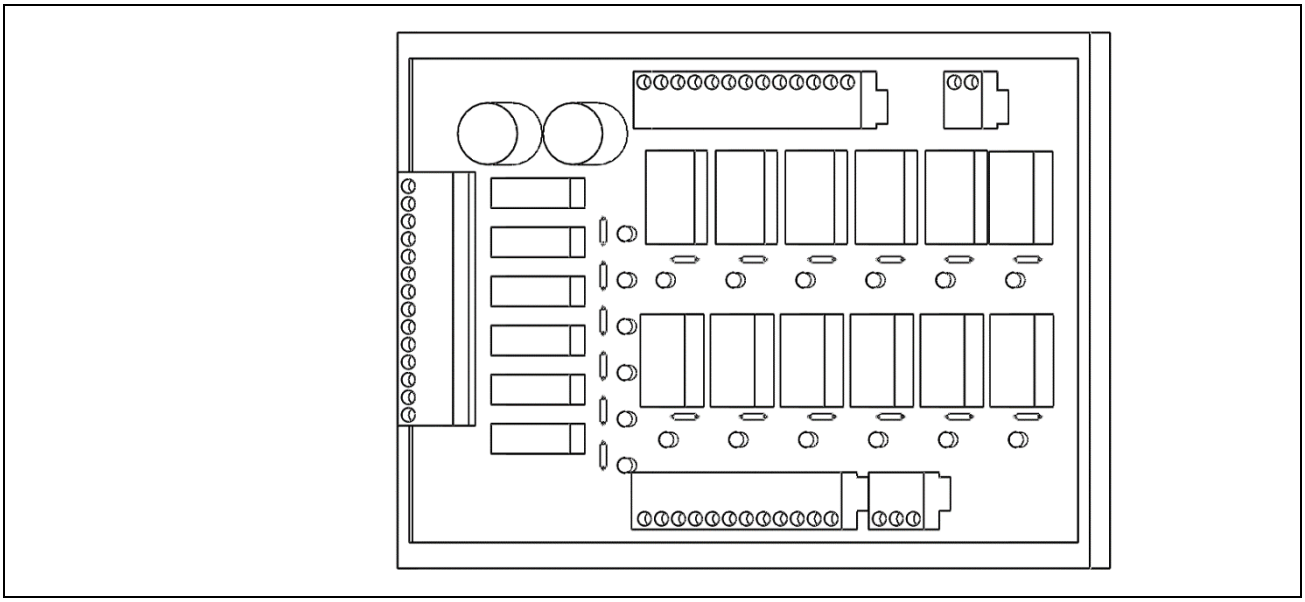
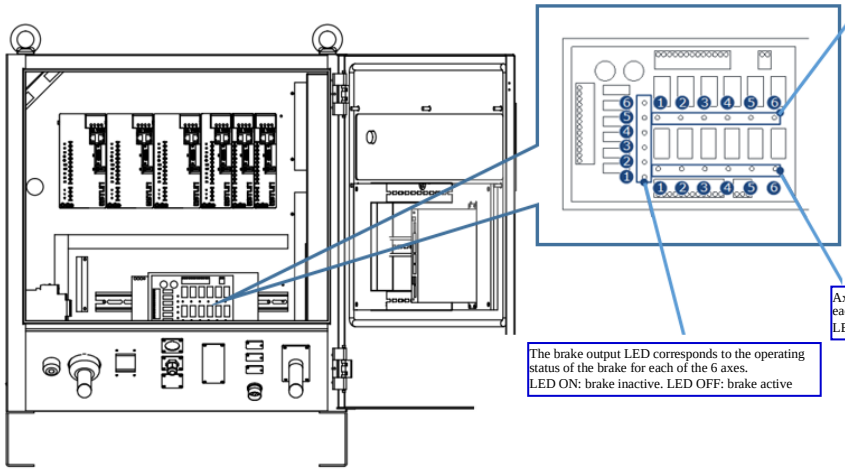


Figure 3.23 Output module

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 3.24 Relay module schematic diagram LEDs

The electrical schematic diagram of relay module is shown below.

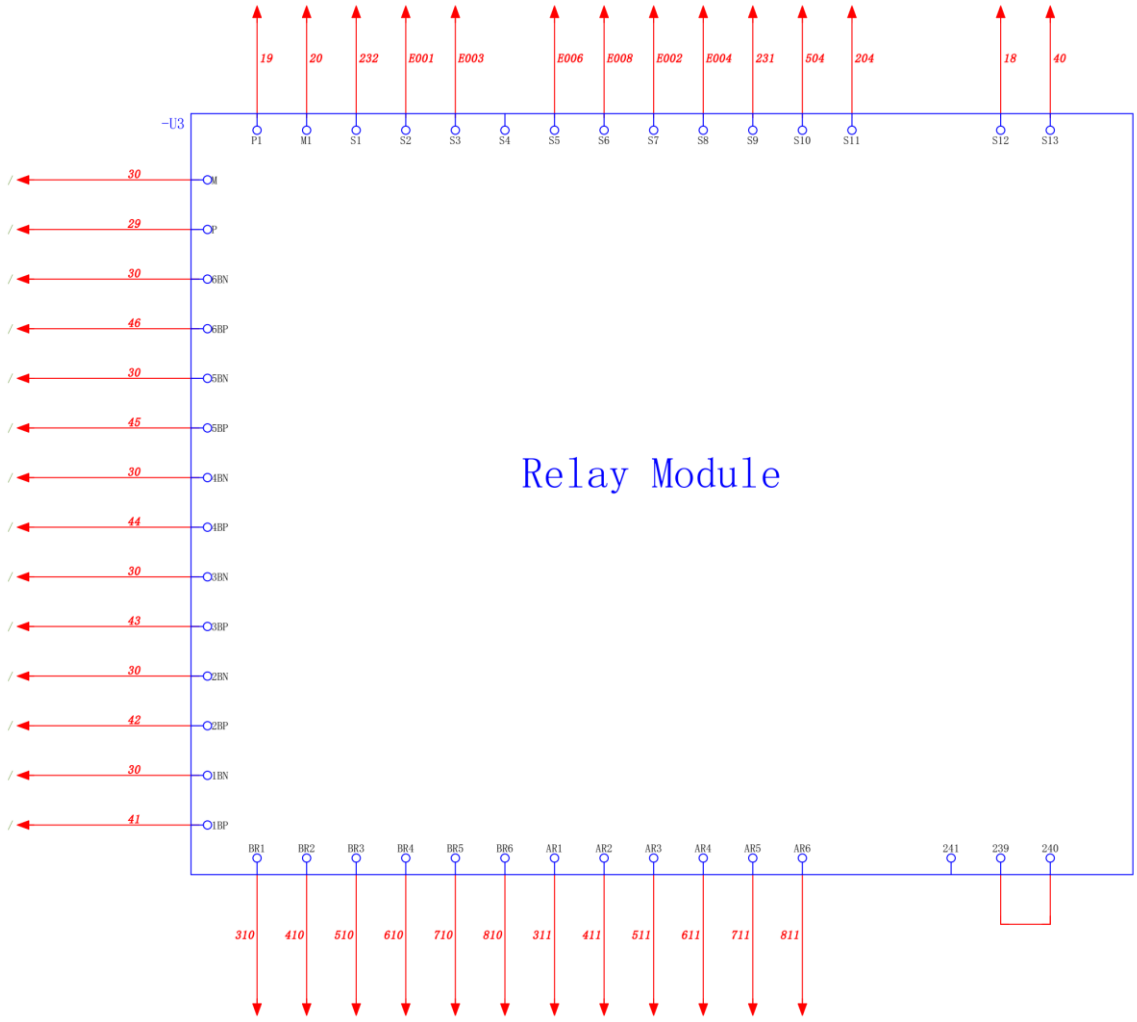


Figure 3.25 Relay module

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

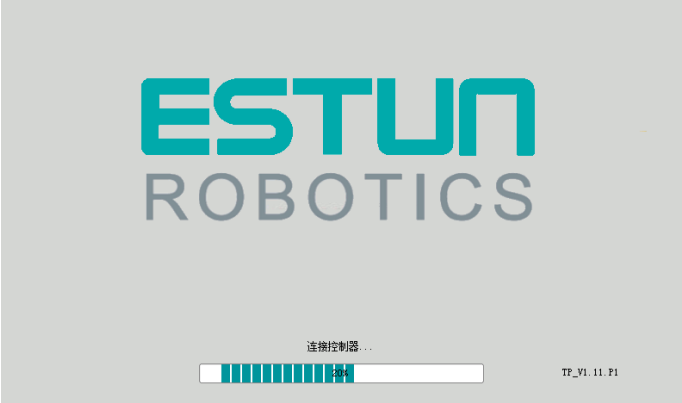
Please refer to “4.2.1 Connection of teach pendant” for the connection and wiring method of the teach pendant.

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.

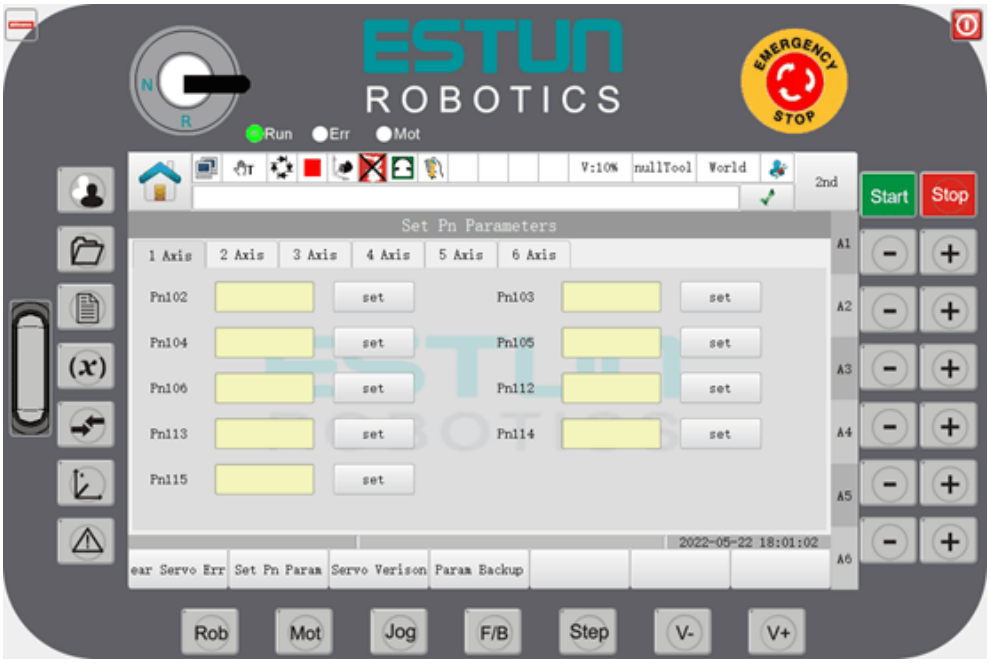
The teach pendant screen will display the initialization screen as shown in the figure below.



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.

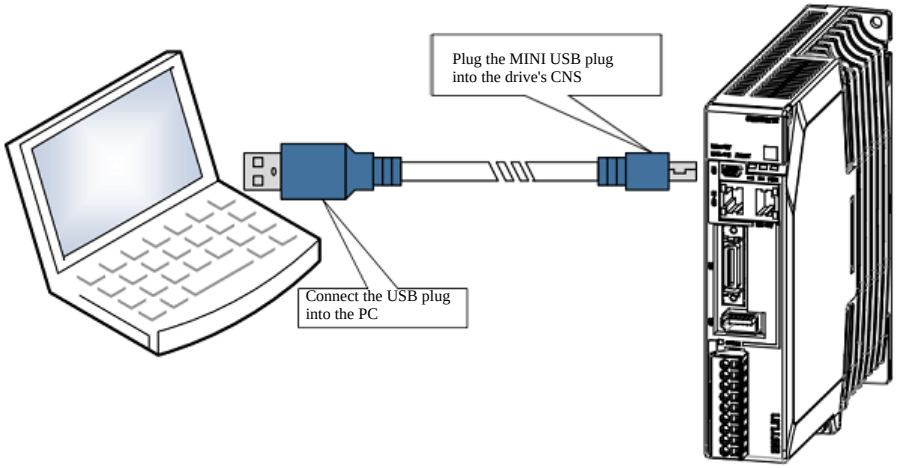
Step 1: Press the "Stop" button on the control cabinet to disconnect the main power.

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) Windows 10 (32-bit/64-bit) Description: English, Chinese (Simplified) versions of the above OS
CPU	1.6GHz and above
Memory	System memory 1GB and above 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 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 Figure.

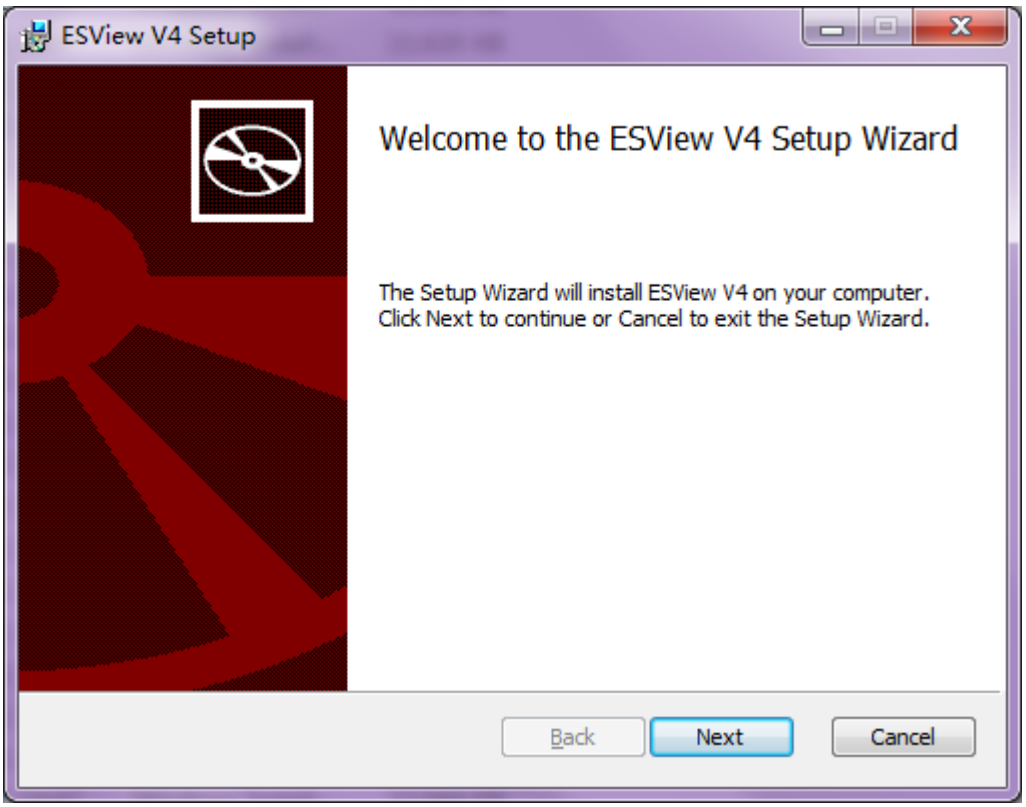


Figure 4.1 Starting ESView installation

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

Install USB Driver

After installing the ESView V4 software successfully, you may also need to install the USB driver. If you have successfully installed a USB drive, you can skip what is described in this section, otherwise follow the steps below to install the USB driver.

> **Note**
>
> Since the USB Driver can only support one designated port, you shall reinstall the USB Driver if you replaced another port on the PC side, or you can use the previous port.

Please follow the instructions below to install the USB driver.

Step 1 After installing the ESView V4 software successfully, connect the Drive to the PC by using the USB connection cable.

Step 2 Open the main directory of ESView V4 software (default location is *C:\ESView V4*\), and extract the **USB Drivers.rar** compressed file to an appropriate directory of your PC.

Step 3 Open Device Manager:

- For Win7 OS, select Start > Control Panel

Click Device Manager on the displayed All Control Panel Items

- For Win10 OS, just right-click Start, and select Device Manager on the pop-up menu.

Step 4 An exclamatory mark attaches to the option **Other devices** > **ESTUN USB COMM** in **Device Manager** window, which indicates an error occurs in the driver and needs to update, as shown in Figure

Figure 4.2 An error occurs in the driver

Step 5 Right-click **ESTUN USB COMM**, and select **Update driver** on the pop-up menu

Figure 4.3 Update driver

Step 6 Click Browse my computer for driver software on the Update Drivers dialog box

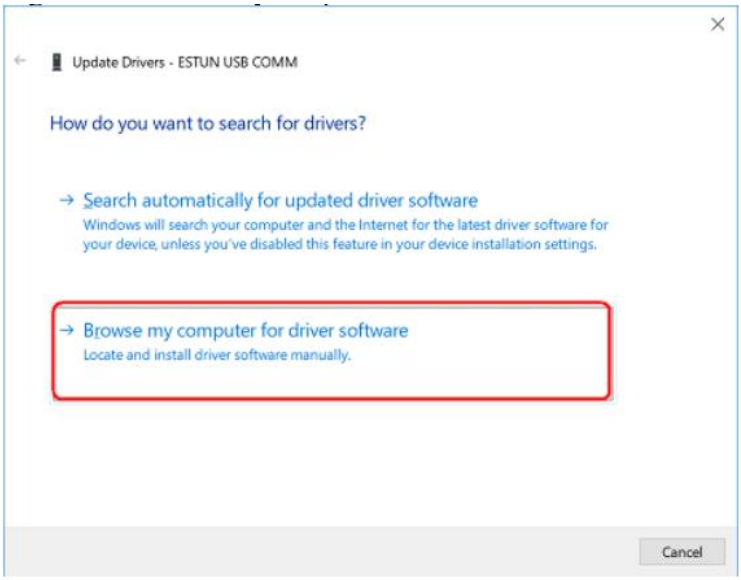


Figure 4.4 Browse my computer for driver software

Step 7 Click Let me pick from a list of available drivers on my computer.

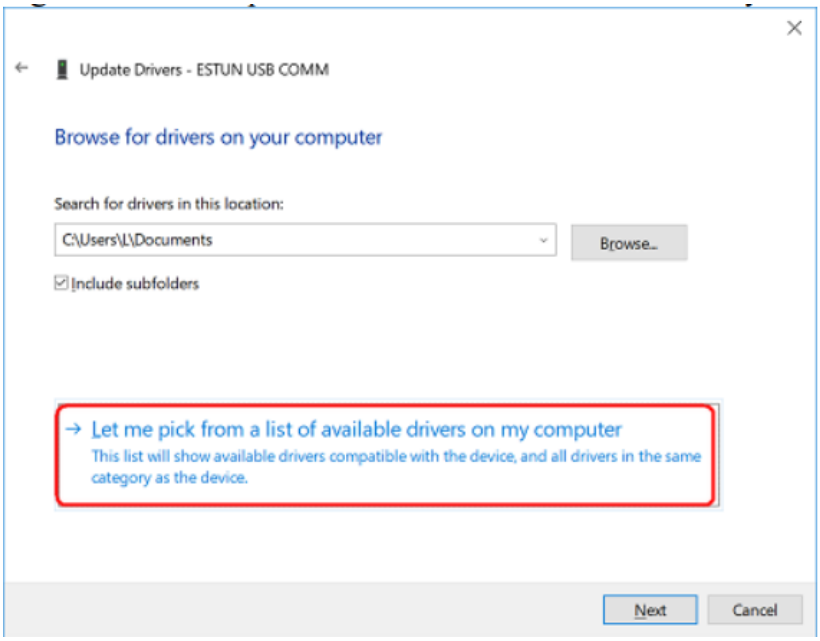


Figure 4.5 Let me pick from a list of available drivers on my computer

Step 8 Click Next.

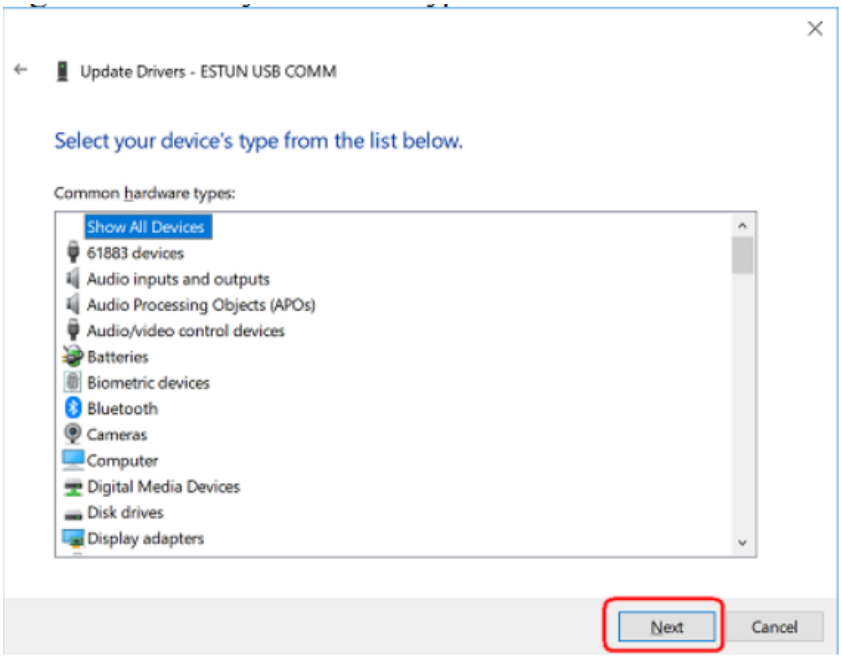


Figure 4.6 Select your device's type from the list below

Step 9 Click Have Disk.

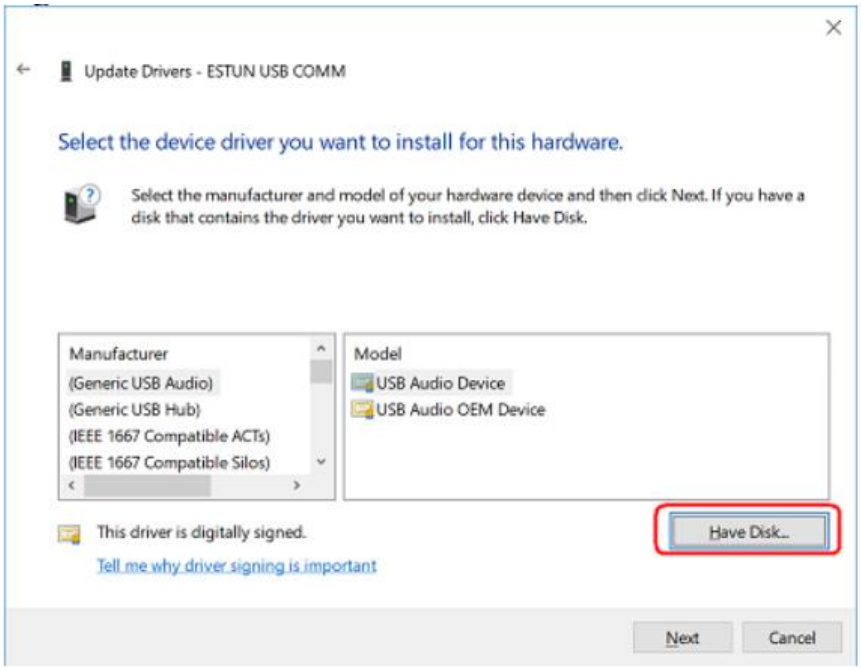


Figure 4.7 Have Disk

Step 10 Click Browse on the Install From Disk dialog box.

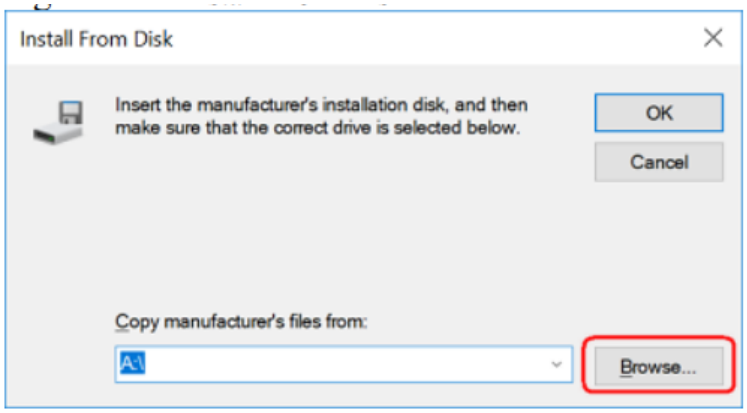


Figure 4.8 Browse files

Step 11 Set the **Look in** as the directory of *ESView V4* decompressed file *\USB Drivers\windows_drivers* on the **Locate File** dialog box.

Step 12 Choose *usb_dev_bulk.inf*, and then click **Open**.

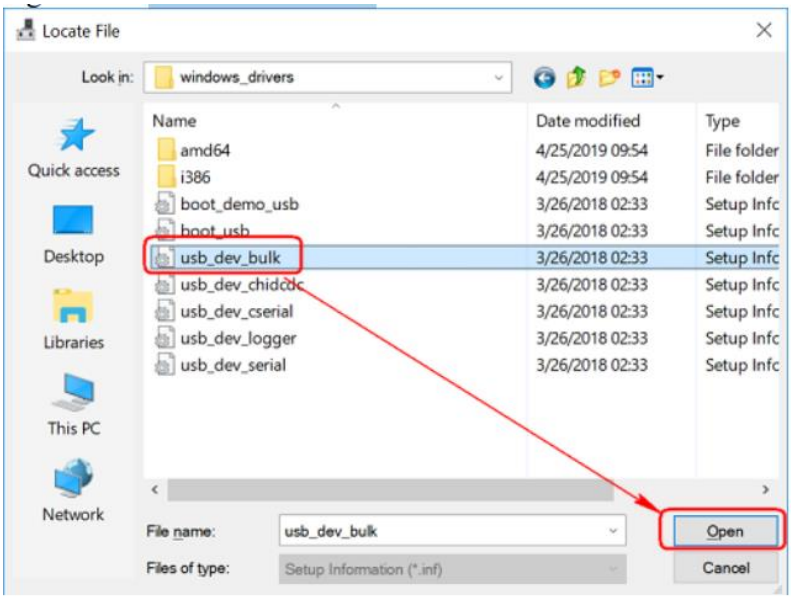


Figure 4.9 Choose the driver file

Step 13 Click **OK** on the **Install From Disk** dialog box.

Step 14 Choose **Generic Bulk Device**, and then click **Next.**

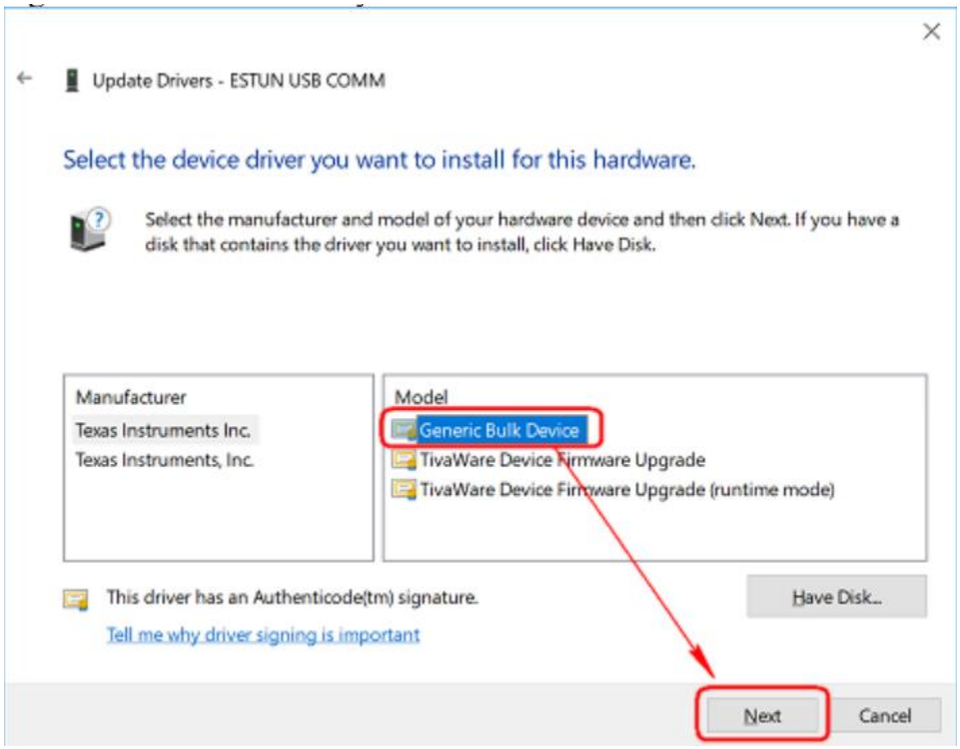


Figure 4.10 Select the driver you want to install for this hardware

Step 15 Click Yes on the Update Driver Warning dialog box.

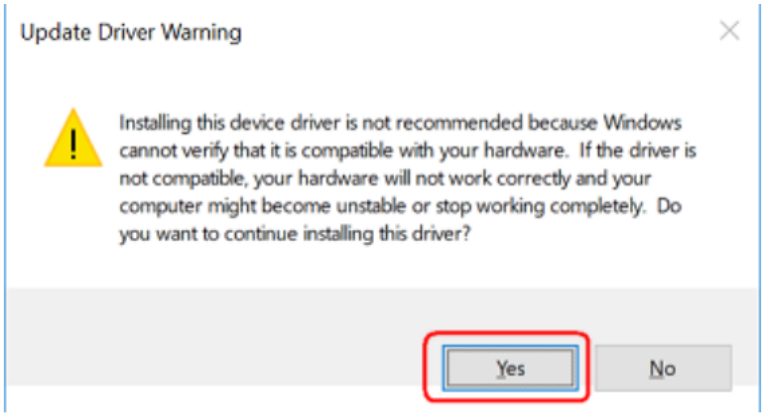


Figure 4.11 Confirm the driver updating

Step 16 Wait for a while, and then click **Install** on the **Windows Security** dialog box.

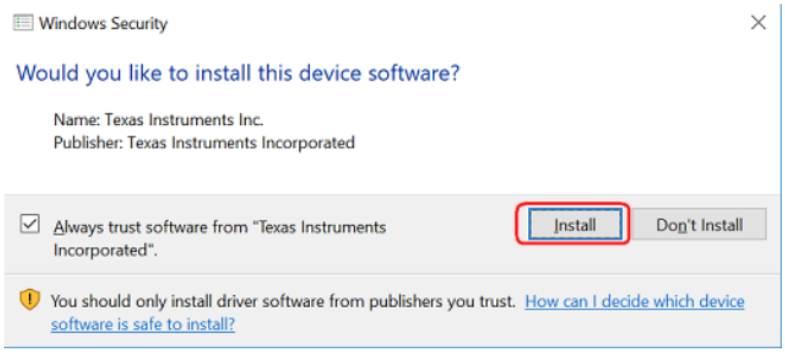


Figure 4.12 Confirm the installation

Step17 The driver will be automatically installed to your PC, and then the installation result will be displayed. Click **Close** to complete the USB driver installation.

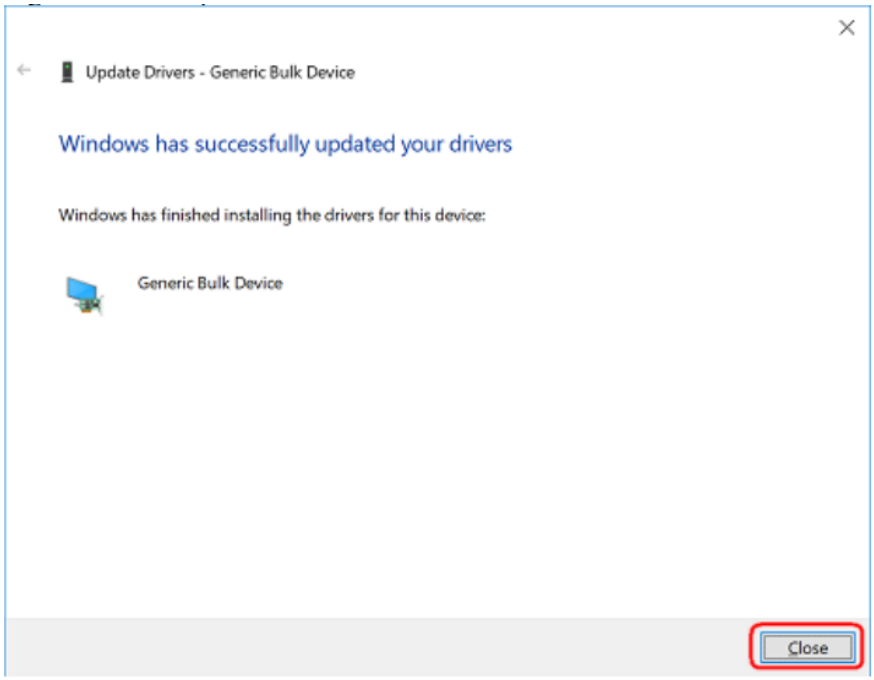


Figure 4.13 Complete the USB driver installation

4.3.3 Enabling ESView

Online operation

The parameters only can be written into or read from the Drive under the online operation. It is recommended that you perform an online operation for the first time to set the Drive.

You need to connect the Drive to the PC by using the USB connection cable before the online operation.

Step 1 Connect the Drive to the PC by using the USB connection cable.

Step 2 Select **Programs** > **ESView V4** > **ESView V4** from the Windows **Start** Menu.

Also, you can find and click *ESView V4* shortcut on the desktop of Windows.

Step 3 The **Connect** dialog box will be displayed.

If you had started *ESView V4*, select **Home** > **Connect** in the **Menu** Bar

Step 4 Select **USB**.

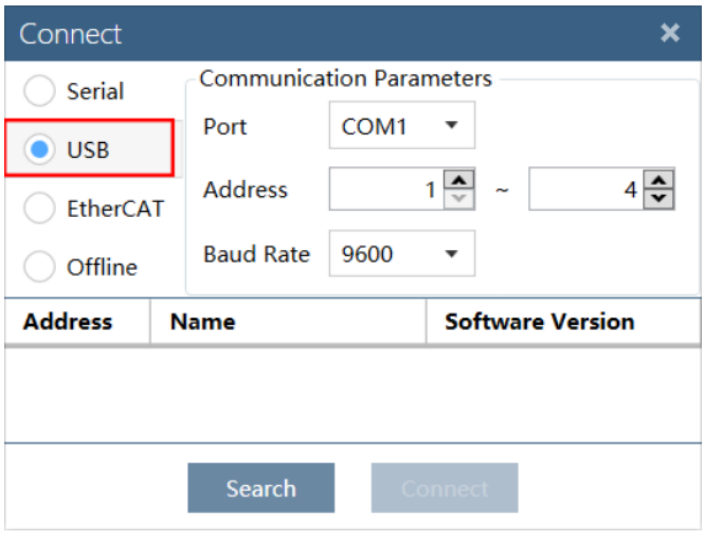


Figure 4.14 Select connect

Step 5 Click **Search**.

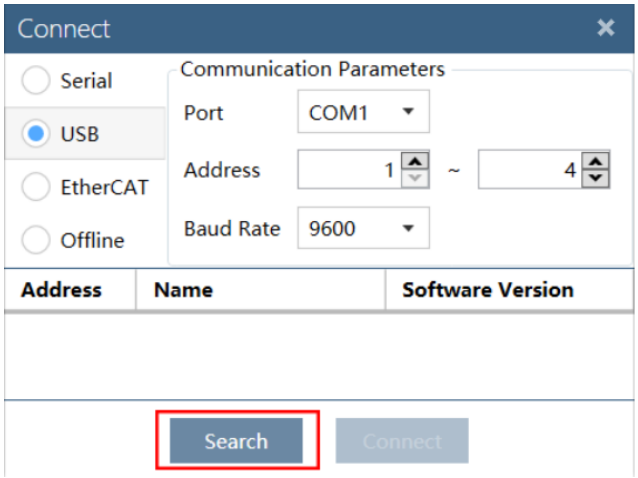


Figure 4.15 Search device

Step 6 Select the found device.

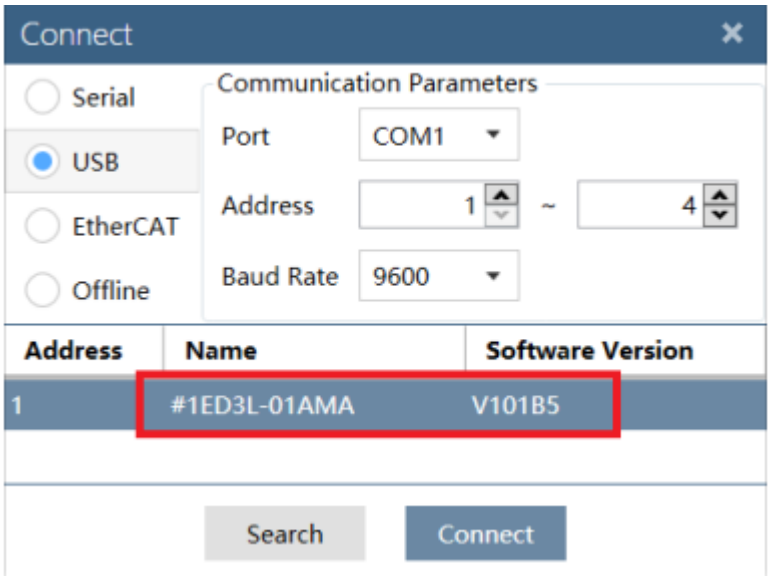


Figure 4.16 Select the found device

If the device is not found in "Search", please check the connection between the device and the PC and make sure that the software version of ESView V4 is up-to-date.

Step 7 Click Connect.

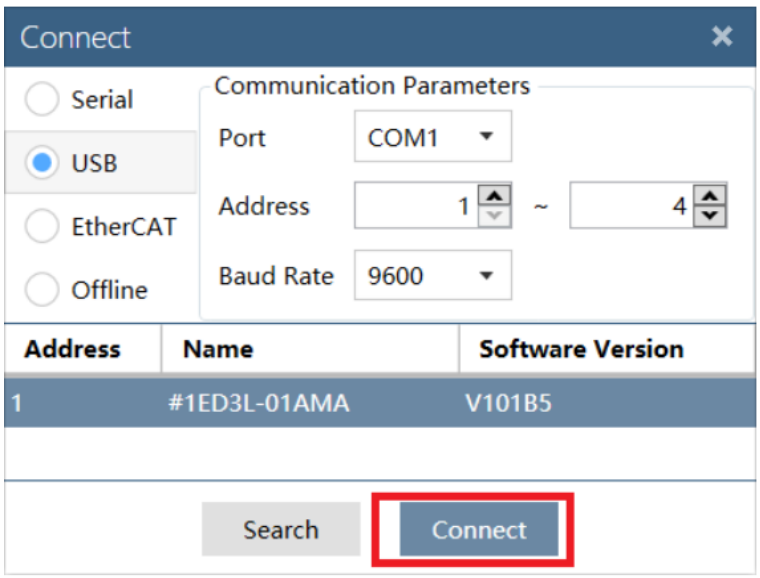


Figure 4.17 Connect device

Step 8 The connected device will be displayed in the **Device** list on the left of the *ESView V4* main windows

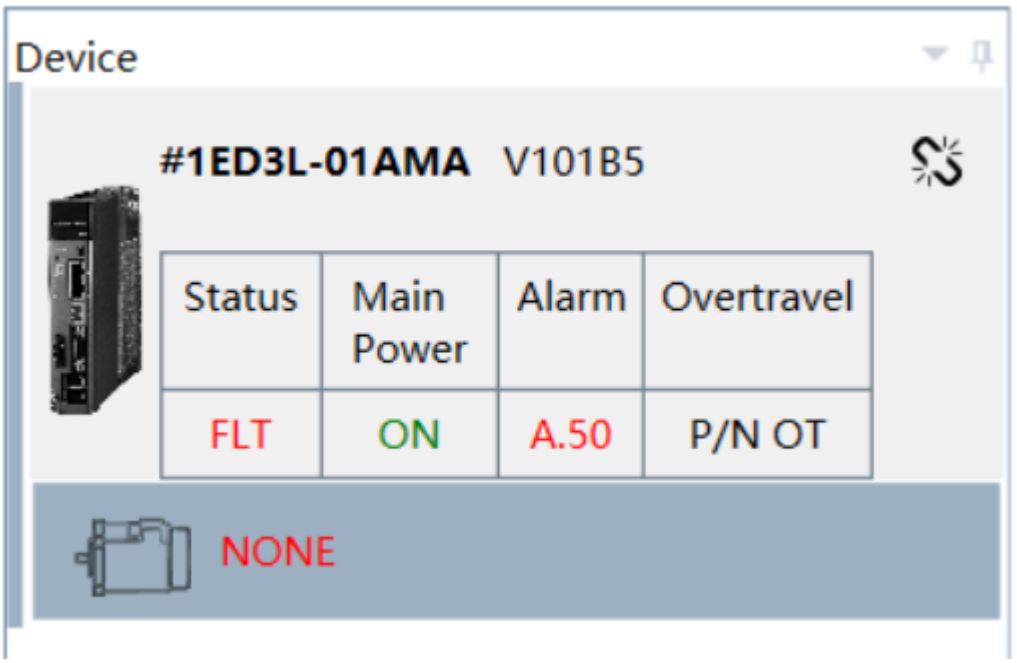


Figure 4.18 Device State

Now, you can make the necessary settings for the Drive or Motor in real time

Note

- The **Device** list can display all the device you had connected or created (including online and offline), and their basic status.
- If you want to delete a device from the **Device** list, click in the top right, and then click **OK** on the pop-up warning box.

----End

Offline Operation

In offline operation, users do not need to connect any equipment, can perform oscilloscope, FFT, mechanical analysis and other image operations.

Although it is not necessary to connect the actual drive, some functions are limited and cannot be set correctly.

Step 1 Select **Programs** > **ESView V4** > **ESView V4** from the Windows **Start** Menu.

Also, you can find and click *ESView V4* shortcut on the desktop of Windows.

Step 2 The **Connect** dialog box will be displayed.

If you had started *ESView V4*, select **Home** > **Connect** in the **Menu** Bar.

Step 3 Select **Offline**

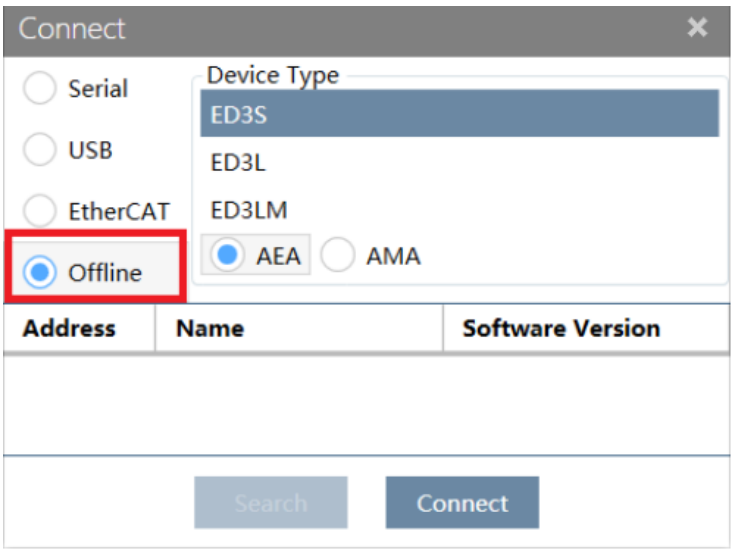


Figure 4.19 Select **Offline**

Step 4 Select the desired **Device Type**, e.g. ED3L.

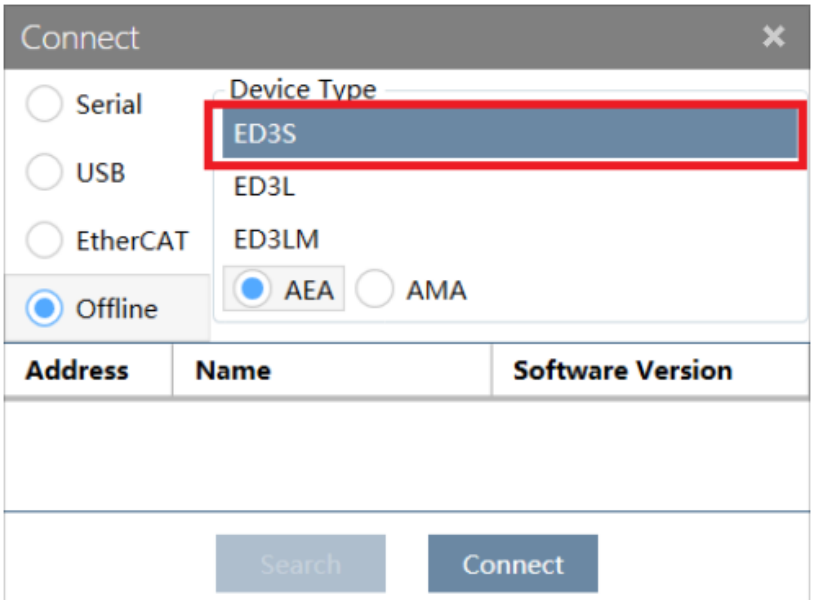


Figure 4.20 Click **Connect**.

Step 5 The created device will be displayed in the **Device** list on the left of the *ESView V4* main windows

Figure 4.21 Status of a created device

Note

- When using offline operation, some functions are restricted and cannot be set correctly.
- Connected online devices or created offline devices are displayed in the “Devices” column. To delete a device, click in the top right, and then click OK on the pop-up warning box.

4.3.4 Parameter settings

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

- Upload Parameters
- Edit Parameters
- Save Parameters
- Download Parameters
- Restore parameters

Follow the below procedure to open the **Edit Parameters** window

Step1 Select **Parameters** > **Edit Parameters** in the **Menu Bar** of the *ESView V4* main windows

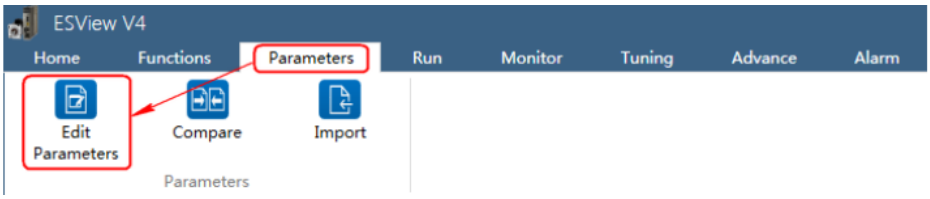


Figure 4.22 **Edit Parameters**

Step 2 The Edit Parameters window will be displayed in Function Display Area.

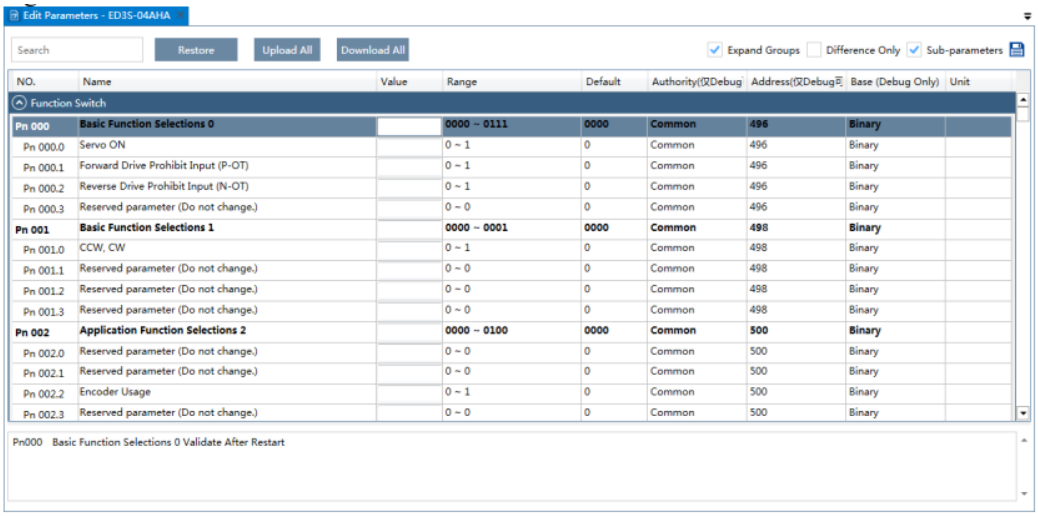


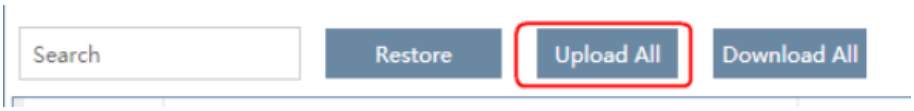
Figure 4.23 **Edit Parameters**

Upload Parameters

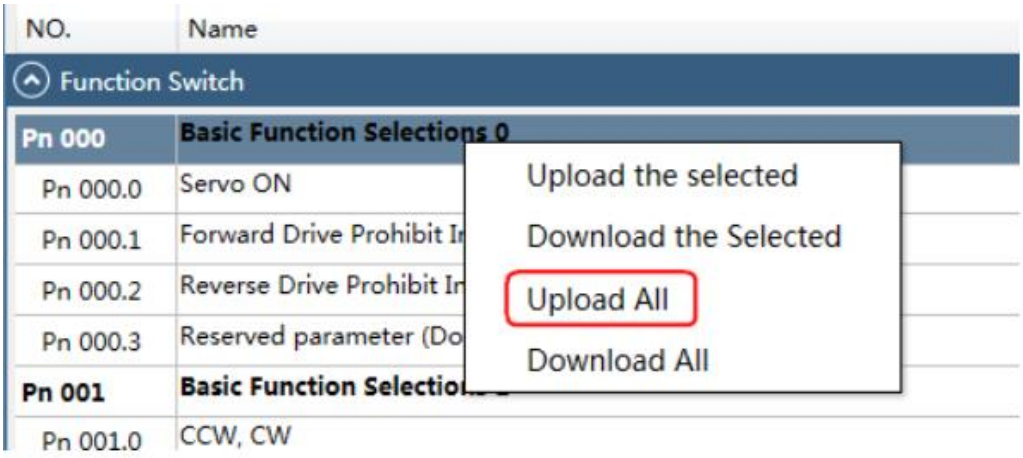
There are two ways to upload parameters: "Upload All" and "Upload Selected Items".

- Upload All

  – In the "Parameter Edit" window, click on "Upload All". Wait for a moment, and ESView V4 will read and retrieve all parameter settings from the drive. The retrieved parameters will be displayed in the "Device Values" column.

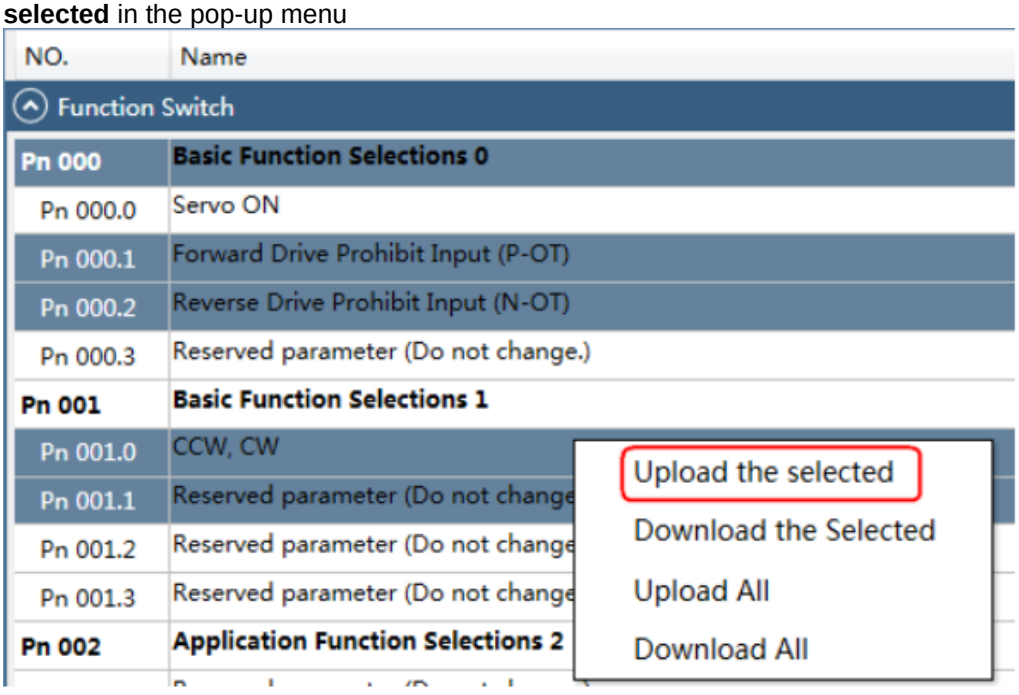


  – Right-click the parameters list where cannot be edited, and select **Upload All** in the pop-up menu.



- Upload the Select

Drag the mouse to select the desired parameters, or you can hold **Ctrl** key and click the desired parameter, and then right-click a selected parameter, and select **Upload the selected** in the pop-up menu



Note

You can only fulfill the Upload Parameter function in Online operation. If a warning dialog box Unable to upload the parameters is displayed, check the connection between PC and the Drive.

Modify Parameters

When the parameters have been uploaded from the device, you can modify them on the **Value** column. If a value has been modified, the background of the textbox can be changed.

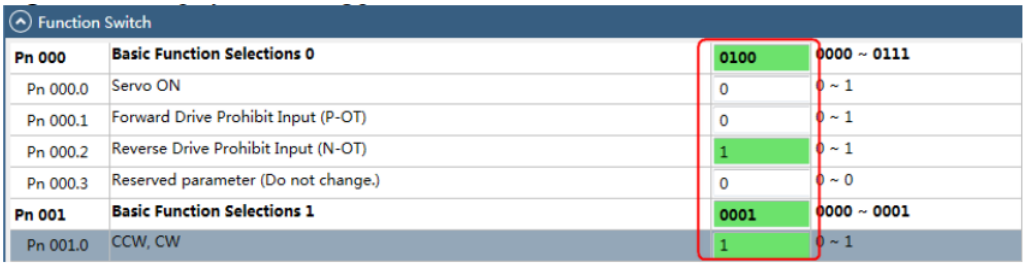


Figure 4.24 Display after editing parameters

You can refer to the description displayed on the underside of the parameter list for the parameter
modification.

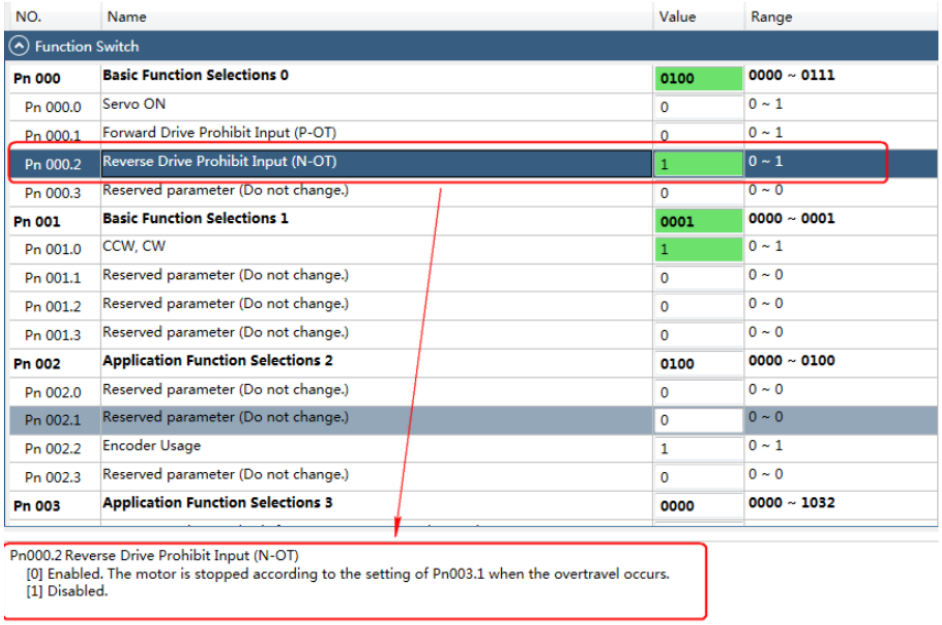


Figure 4.25 Details description of the parameter

Note

Click **Search** input box on the **Edit Parameters** window, and type the keyword you want to search. The keyword, including **NO**, **Name**, **Value**, **Range**, **Default**, **Unit**, as well as description of each parameter. If you want to search multiple items at once, add one or more space between keywords that lists all the parameters that match any of the keywords.

Save Parameters

Operating steps

Follow the below procedure to save the current settings as an offline file into the PC

Step 1 Click  in the **Edit Parameters** window.

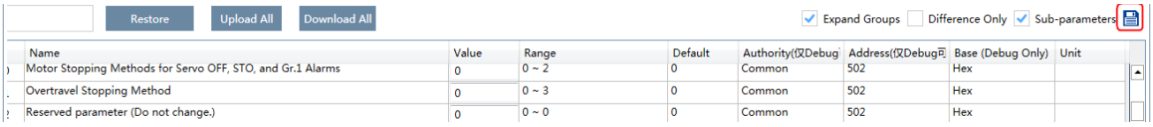


Figure 4.26 Save the parameters

Step 2 Choose the desired files in the **Save As** dialog box.

Step 3 Click **Save**.

----End

Import Parameters

You can fulfill Import function, importing the offline parameters file into the online Drive.

Step 1 Select **Parameters** > **Import** in the **Menu Bar** of the ESView V4 main windows

Figure 4.27 Select parameters to import

Step 2 Select a proper offline parameter file (*.*esvpa*) in the pop-up **Open** dialog box.

Step 3 The **Import** window will be displayed in **Function Display Area.**

And, the **Local Value** in the offline parameters file are filled into the parameter list

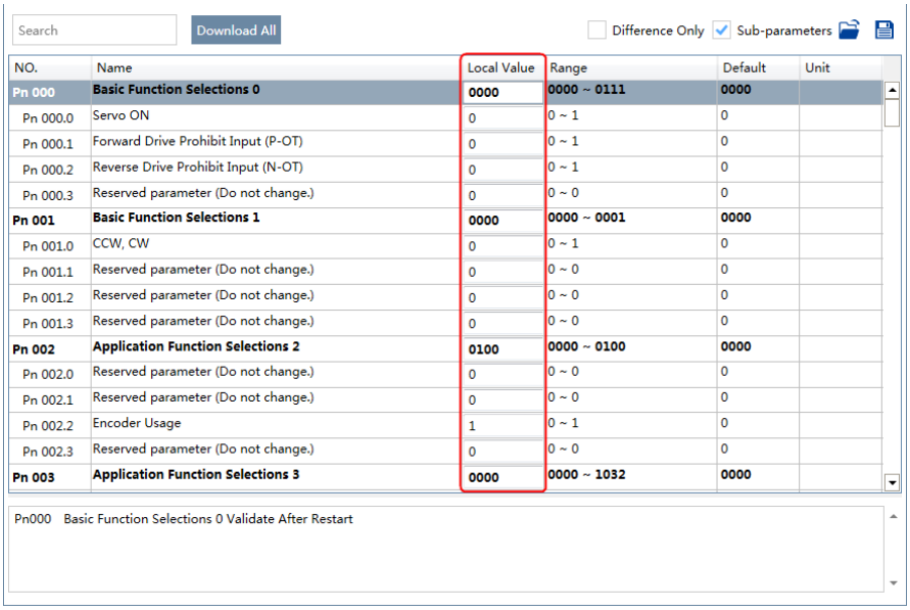


Figure 4.28 Local Value displayed in Import window

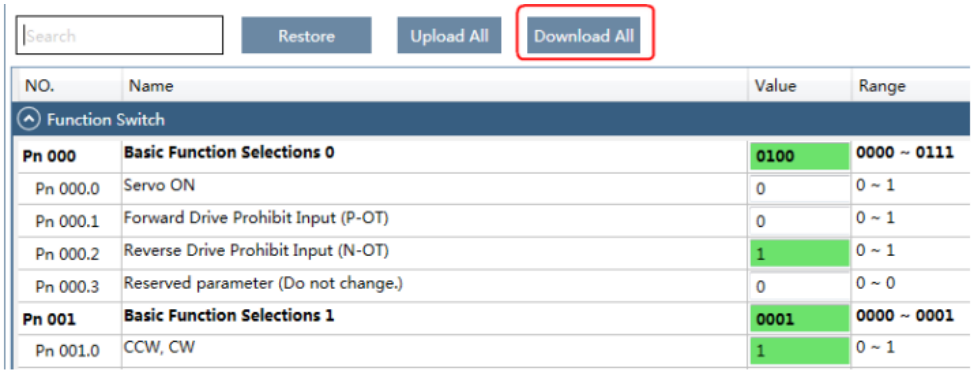
Step 4 Before importing parameters into the Drive, you can edit and download the parameters.

----End

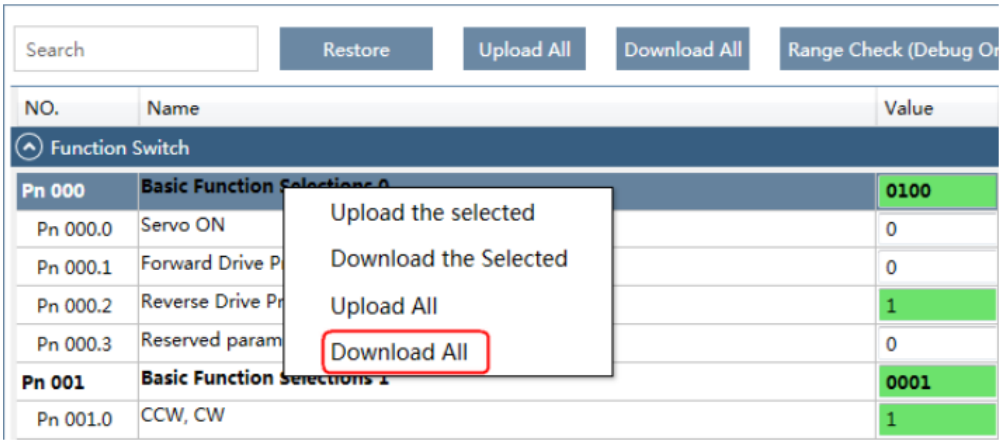
Download Parameters

- Download All

– Click Download All in the Edit Parameters window. After waiting for a moment, write the edited parameters to the drive.

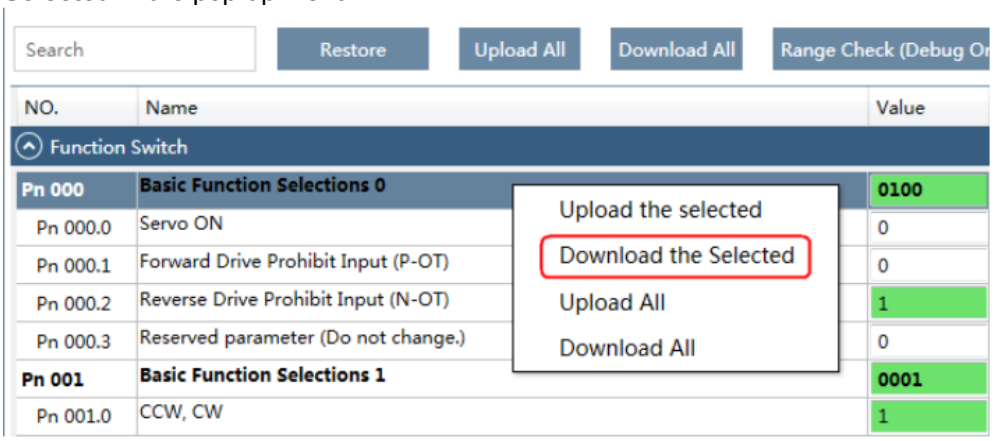


– Right-click the parameters list where cannot be edited, and select **Download All** in the pop-up menu



- Download the Selected

Drag the mouse to select the desired parameters, or you can hold **Ctrl** key and click the desired parameter, and then right-click a selected parameter, and select **Download the Selected** in the pop-up menu.



Note

You can only fulfill the Download Parameter function in Online Operation. If a warning dialog box Unable to download the parameters is displayed, check the connection between PC and the Drive.

Restore parameters

Caution

Executing "Restore Factory Settings" will revert the parameters within the drive unit (except for specific designated parameters) back to their default settings. Please proceed with caution when performing this action.

Step 1 Click Restore in the Edit Parameters window.

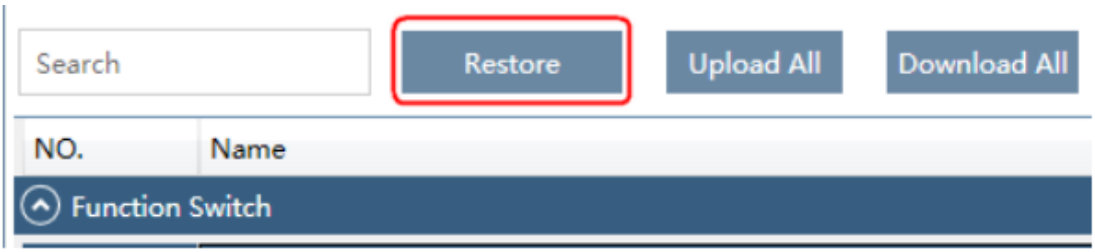


Figure 4.29 Restore parameters

Step 2 Read the content on the warning dialog box and click **OK**.

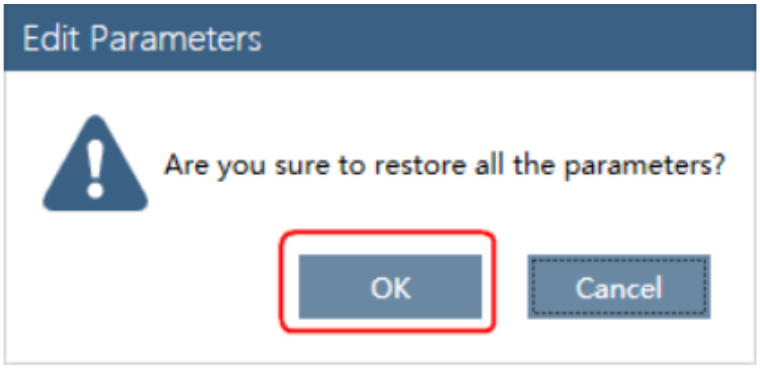


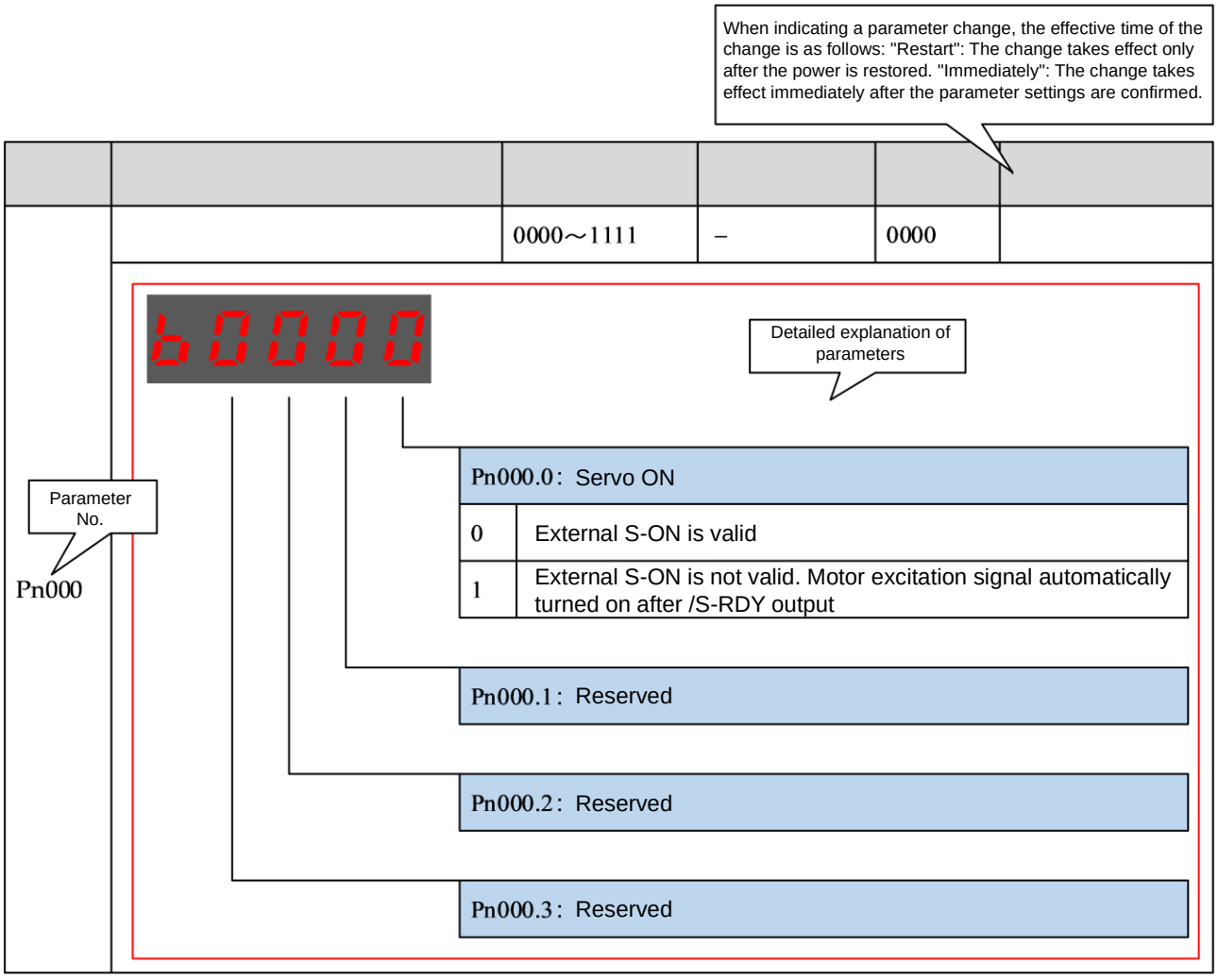
Figure 4.30 Confirm the parameter restored

Step 3 *ESView V4* will send the **Restore Parameters** command to the Drive, and then the Drive will execute the **Restore Parameters**.

----End

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

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:

- The motor's maximum speed is less than 100 rpm
- The motor's acceleration and deceleration rate is less than 5,000 rpm/s
- Significant mechanical clearance exists during motion
- 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. 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. 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.
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"> 

<table>
<tr><td colspan="2">Pn511.0: Assign signals for CN13-20, 21/CN13-45, 46/CN13-3, 4/CN13-28, 29/CN13-12, 13/CN13-37, 38</td></tr>
<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
Pn511.2: Reserved
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

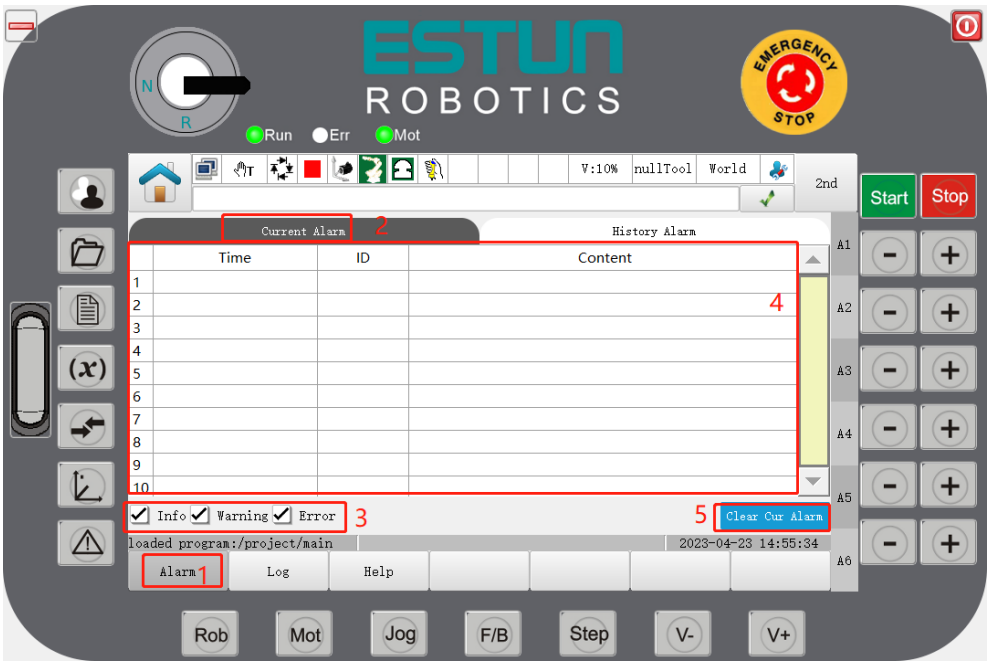
During the operation of the robot, alarms that occur can be viewed using the teach pendant or ESView.

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.

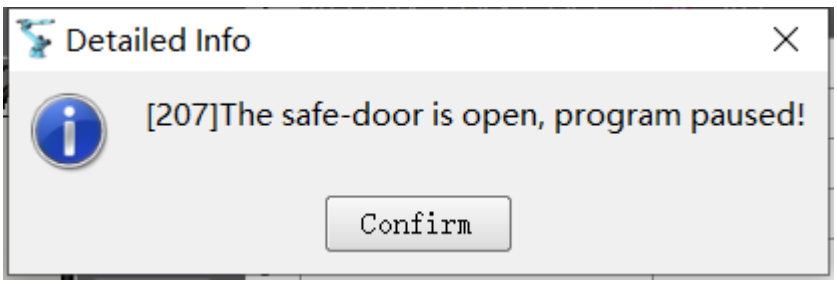
In the case of multiple alarms, only the information of the last alarm will be displayed in the message prompt bar.

When an alarm occurs during the robot's movement, it will stop immediately. The alarm icon will be displayed on the demonstrator, and the user can enter the "log management" interface to view the details of the alarm.

- Press  o Click "Log Management" or the button on the Home page to enter the "Log Management" page, and then click the "Alarms" button at the bottom to view the "Current Alarms" information. Click "Alarms" button to view the "Current Alarms" information.

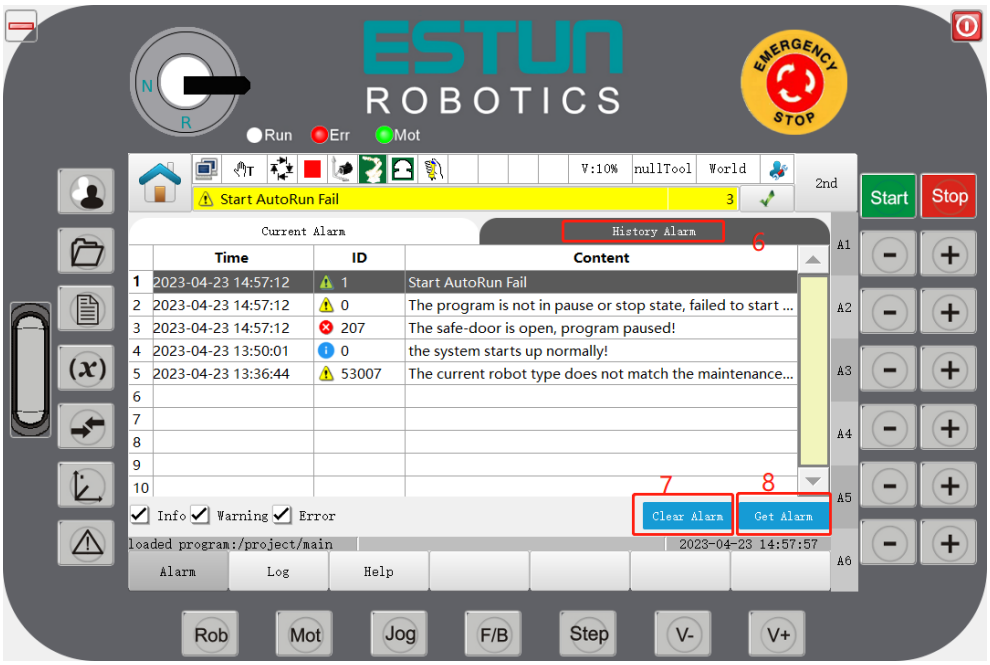


- Click on the "content" of the current alarm, you can view the "detailed information" of the current alarm, such as: specific phenomena, cause analysis, treatment.



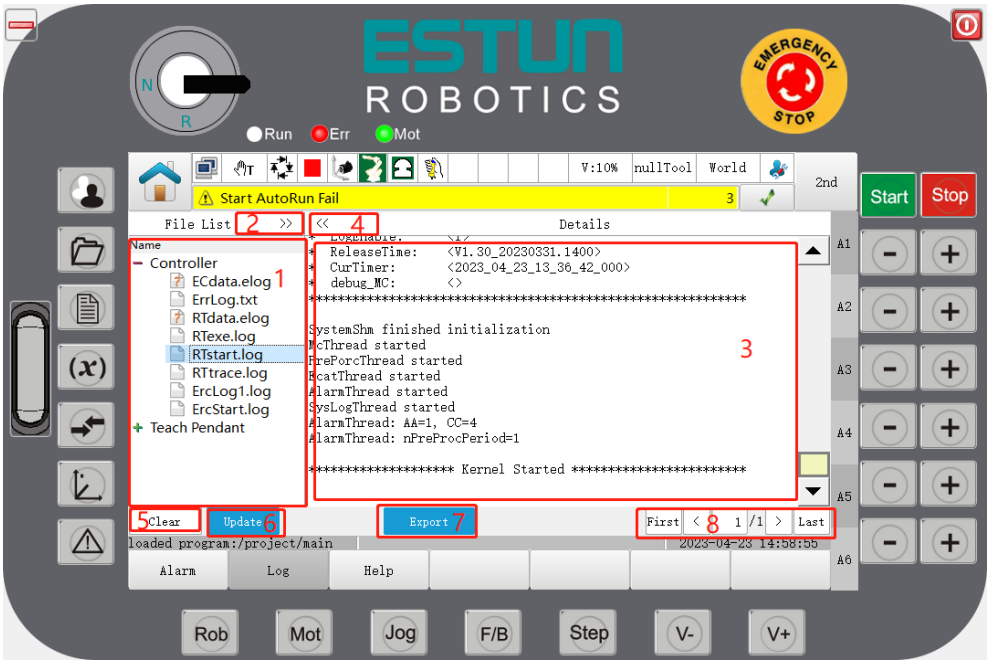
- If the current alarm has been cancelled, click "Clear Cur Alarm" button below to clear the current alarm.

- Click on "Historical Alarms" above to go to the "Historical Alarms" tab and click on the "Get Alarms" button to get historical alarm information.



5.2 Log

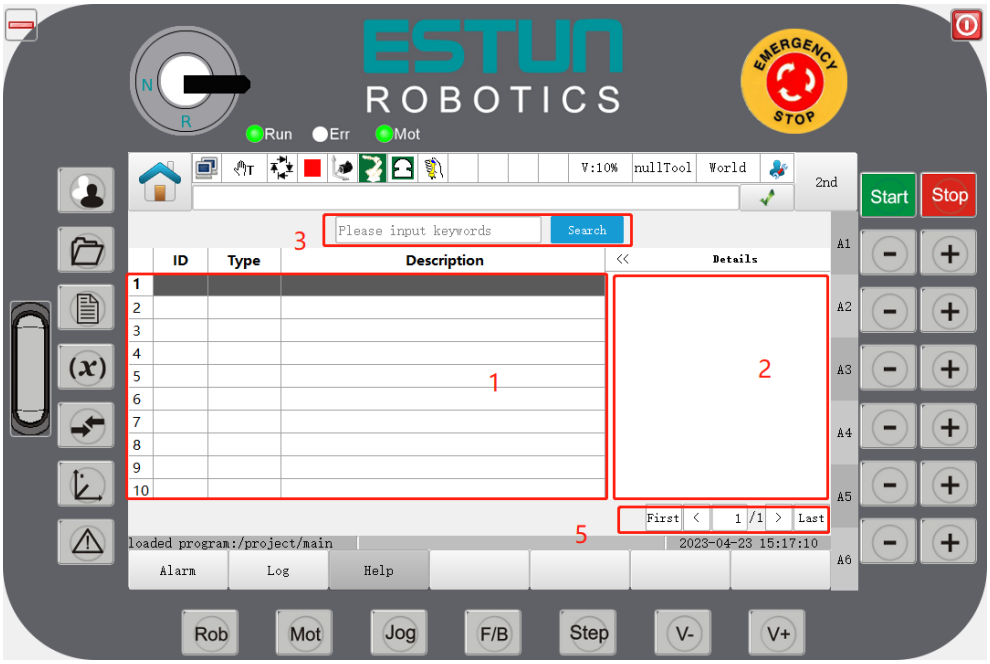
- Click on the "Log" button in the "System Log" interface to switch to the logging interface.
- Users can view the contents of the log on the controller or demonstrator side as appropriate.



5.3 Help

On the Log management screen, you can check whether there are any alarm details on the Help screen.

- On the "Log management" screen, click the "Help" button at the bottom to switch to the "Help" tab.



- Click "Search box", enter "Alarm number" or "Keyword" and click "Confirm". "Press the "Search" button to find out the detailed information of the alarm.

5.4 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 • If > 500kHz, reduce the set speed (system command value)
		Incorrect phase sequence of the motor power cables	• Check the motor power cables • 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 Incorrect phase sequence of the motor power cables 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 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 • 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 • 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 Incorrect phase sequence of the motor power cables 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 • 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. • 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 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: • 200V drive unit power supply range: 200~230VAC +10%~-15% • 400V drive unit power supply range: 380~440VAC +10%~-15%
		Excessive DC bus voltage	• Increase acceleration and deceleration time • 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 A.26 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 • Check if Pn8400 parameter corresponds to the drive unit encoder resolution • 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 • 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 • 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) • Try connecting one wire from the shield layer of the encoder cable to the motor body • 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 • 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) • Try connecting a wire from the shield layer of the encoder cable to the motor body • 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) • Try connecting a wire from the shield layer of the encoder cable to the motor body • 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) • Try connecting a wire from the shield layer of the encoder cable to the motor body • 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) • Try connecting a wire from the shield layer of the encoder cable to the motor body • 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) • Try connecting a wire from the shield layer of the encoder cable to the motor body • 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) • Try connecting a wire from the shield layer of the encoder cable to the motor body • 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) • Try connecting a wire from the shield layer of the encoder cable to the motor body • 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 • 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. ● Check for loose or corroded connections at cable terminals.
Input voltage	Input power voltage	● Confirm if the input voltage is within the allowable range. ● 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 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 6-10 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 6-11 List of spare parts of ER20B-1760-HI 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 6-12 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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