

AK800 Series Programmable Logic Controller Hardware Manual Ver.1.1

Version Information

Version Number	Revision Date	Revision Person	Revision Content
1.0	2022-08-28	AT-LY	First Draft
1.1	2022-09-28	AT-LXX	Add EtherCAT

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Preface

Thank you for purchasing and using the AK800 series programmable logic controller developed and manufactured by Kinco. This manual will give you details on how to use this product properly. Please be sure to read this manual carefully before using (installation, wiring, operation, maintenance, inspection, etc.).

In addition, please understand the safety precautions of the product before using. The equipment supporting manufacturer should send this manual with the equipment to the end user for subsequent reference and use.

Additional Notes

- ◆ To illustrate the detailed part of this product, the legend section of this manual shows the state with the cover or housing removed. When actually using the product, be sure to install the cover or housing as prescribed and follow the manual strictly;
- ◆ The legends used in this manual are for illustration only and may differ from the product you order;
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Chapter1 Safety Precautions

In this chapter, "Safety Precautions" is divided into "Warning" and "Caution" two levels.

Warning: If operated incorrectly, it may lead to death or serious injury, and equipment damage, etc;

Caution: If operated incorrectly, it may lead to moderate injury or minor injury to personnel, and equipment damage, etc.

In addition, depending on different circumstances, even matters at the "Caution" level may have unpredictable and serious consequences. During the use of the equipment, please make sure to strictly observe the rules mentioned in these two levels of matters to ensure the safety of the user and the normal operation of the machine.

Please keep this guide properly to read when needed, and be sure to give this manual to the end user.

When designing control system	
Warning	<ul style="list-style-type: none"> ◆ Be sure to design a circuit safely for the application to ensure that the control system is still safe when the external power supply is down or when the controller fails; ◆ If the output circuit exceeds the rated load current or the load is short-circuited resulting in over-current for a long time, the controller may smoke or catch fire. A safety blocking device such as a fuse or circuit breaker should be set externally.
Caution	<ul style="list-style-type: none"> ◆ Be sure to install an emergency brake circuit, a protection circuit, an interlock circuit for forward and reverse operation, and position upper and lower limit interlocks prevented mechanical damage in the external circuit of the controller; ◆ To ensure safe operation of the equipment, please design external protection circuits and safety mechanisms for output signals related to major accidents; ◆ When CPU of the controller detects its own system abnormalities, all output signals may be automatically turned off. When part of the circuits of the controller fail, its output may be not controlled. A suitable external control circuit need to be designed to ensure normal operation of the equipment.; ◆ The damage of the transistor output unit of the controller may cause output state to be uncontrollable; ◆ The programmable controller is designed to be used indoors in an electrical environment with overvoltage class II, and its power system level should have lightning protection devices to ensure that the lightning overvoltage is not applied to the power input or signal input, control output and other ports of the programmable controller to avoid damage to the equipment.

When installing

Warning	<ul style="list-style-type: none"> ◆ The installation, wiring, maintenance and inspection of this product should be carried out by professional maintenance personnel who have received training related to electrical equipment and have sufficient electrical knowledge; ◆ Do not use the programmable controller in the following places: places where there is dust, oil fumes, conductive dust, corrosive gases, combustible gases; places exposed to high temperature, condensation, wind and rain; places where there is vibration and shock. Electric shock, fire, and misoperation may also cause damage to the product;
Caution	<ul style="list-style-type: none"> ◆ When processing screw holes and wiring, be careful not to let metal chips, dust and wire heads fall into the ventilation aperture of the controller, which may cause fire, malfunctions and other misoperation, etc;

When wiring

Warning	<ul style="list-style-type: none"> ◆ The installation, wiring, maintenance and inspection of this product should be carried out by professional electrical maintenance personnel who have received training related to electrical equipment and have sufficient electrical knowledge; ◆ During wiring operations, make sure that the external supply power of the system is completely disconnected. Otherwise, there is a risk of electric shock or equipment failure, equipment malfunction, etc; ◆ After the installation and wiring operation, please make sure the product is completely installed (including the product end cover, board cover, etc.) before powering on and running, otherwise there will be a risk of electric shock; ◆ The cable terminals should be well insulated to ensure that the insulation distance between the cables will not be reduced after the cables are installed to the terminal block. Otherwise, it will lead to electric shock, short circuit, or equipment damage, etc.
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<p>Caution</p>	<ul style="list-style-type: none"> ◆ When processing screw holes and wiring, be careful not to let metal chips, dust and wire heads fall into the ventilation aperture of the controller, which may cause fire, malfunctions and other misoperation, etc; ◆ The type of interface connected shall be confirmed after the relevant cable is connected.If the type of interface connection is incorrect or the wiring is wrong, it may cause malfunction or damage to the controller or external equipment; ◆ The bolts on the terminal blocks should be tightened within the specified torque range. Untightened terminal bolts may cause short circuit, disconnection, fire, and other hazards. Over tightening of bolts may damage the bolts and controller, resulting in dislodged, short circuit, fire and other hazards; ◆ When connected with connectors and external equipment, they shall be press-fitted, crimped, or proper soldered using tools specified by the manufacturer.If the connection is poor, it may lead to short circuit, fire or other malfunction; ◆ Do not bundle the control cable and communication cable with the main circuit or power supply cable together, or make them too close to each other.Make the control cable and communication cable and the main circuit power supply cable arranged in a line slot or space more than 100mm apart, otherwise it may cause misoperation due to noise; ◆ For applications with serious interference, please use special shielded cables for input or output of high-frequency signals to improve the anti-interference capability of the system.
<p>When operating and maintaining</p>	
<p>Warning</p>	<ul style="list-style-type: none"> ◆ The installation, wiring, maintenance and inspection of this product should be carried out by professional electrical maintenance personnel who have received training related to electrical equipment and have sufficient electrical knowledge; ◆ Do not touch the terminals in the energized state, there is a risk of electric shock; ◆ Make sure that the power supply to the system is completely disconnected before cleaning and retightening the bolts and connector mounting bolts on the terminal block.
<p>Caution</p>	<ul style="list-style-type: none"> ◆ When commissioning the equipment, please read the user's manual carefully before performing operations such as ONLINE MODIFICATION, FORCED OUTPUT, RUN and STOP of the program.Make sure the safety of the operation is fully confirmed before performing the operation.

Chapter2 Product Introduction

2.1 Hardware Features Overview

1. CODESYS V3.5, ARM Cortex A9 667MHZ;
2. Program Capacity (4M program storage space) , Data Storage Area (8M) ;
3. Support 2 channel CAN communication;
4. Support 1 channel Ethernet, 1 channel EtherCAT communication;
5. Support 2 channel RS485, 1 channel RS232 communication;
6. Controller body integrates 24 channel digital inputs and 24 channel digital outputs;
7. Integrated LCD display interface;
8. Support TF card.

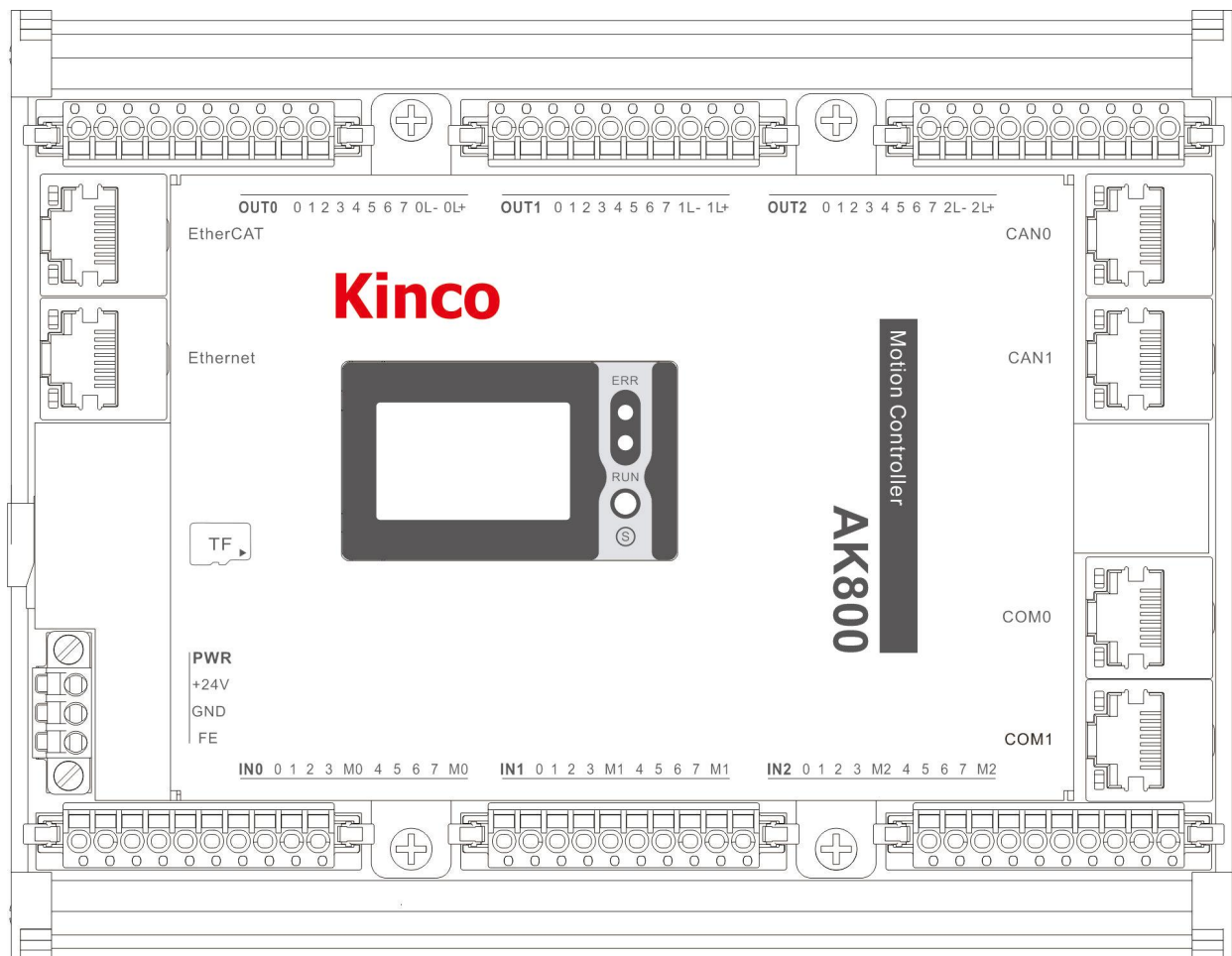


Diagram 2.1-01: AK800 Floor Plan

Chapter3 Specification

3.1 Application Environment Specification

The AK800 series controller is designed to comply with the IEC61131-3 standard and test specifications. The following table describes the normal operating conditions for the AK800 series controller. To ensure proper operation of the controller, please make sure that this controller is used in the following specified usage.

Transportation and Storage		
Climate Conditions	Ambient Temperature	-40°C ~ +70°C.
	Relative Humidity	10%~95%, no condensation.
	Atmospheric Pressure	Equivalent to 0~3000m altitude.
Mechanical Conditions	Free Fall	With transport packaging, 5 drops from a height of 1 meter are allowed on the cement floor.
Working Conditions		
Climate Conditions	Ambient Temperature	Open installation with natural ventilation, ambient temperature -10 to 55° C.
	Relative Humidity	10%~95%, no condensation.
	Atmospheric Pressure	The altitude does not exceed 2000 meters.
	Pollution Level	Applicable to pollution level 2.
Mechanical Conditions	Sinusoidal Vibration	5<f<8.4Hz, Random: 3.5mm displacement; Continuous: 1.75mm displacement. 8.4<f<150, Random: 1.0g acceleration; Continuous: 0.5g acceleration
	Impact	Half-sine wave、15g、11ms, 6 times per axis.
Electromagnetic Compatibility (EMC)	Electrostatic discharge	Air discharges 8KV; Contact discharges 4KV; Performance level B.
	Surge	AC Power Supply 2KVCM, 1KVDM; DC Power Supply 0.5KVCM, 0.5KVDM; IO and Communication port: 1KVCM. Performance level B.
	Fast Transient Burst	Power Supply Coupling 2KV, 5KHz; IO and Communication Coupling 1KV, 5KHz. Performance level B.
	Voltage Drop	AC system, at 50Hz, the voltage 0% lasts for 1 cycle, 40% lasts for 10 cycles, and 75% lasts for 20 cycles. Performance level A.
Protection Level	Waterproof and Dustproof	IP20.

3.2 Controller Specifications

Project	Specification Description			
Programming Mode	IEC61131-3 Programming Language(LD、FBD、IL、ST、SFC、CFC)			
Program Execution Mode	Compilation and Execution			
User Program Storage Space	4Mbytes			
Flash Power Down Hold Space	256KBytes			
Program Power-down Hold Mode	Flash holds			
Soft Components	Components	Designation	Number	Instruction
	I	Input Relay	32KWords	X: 1 位 B: 8 位
	Q	Output Relay	32KWords	W: 16 位 D: 32 位
	M	Auxiliary Relay	256KWords	L: 64 位

3.3 Controller Interface Specifications

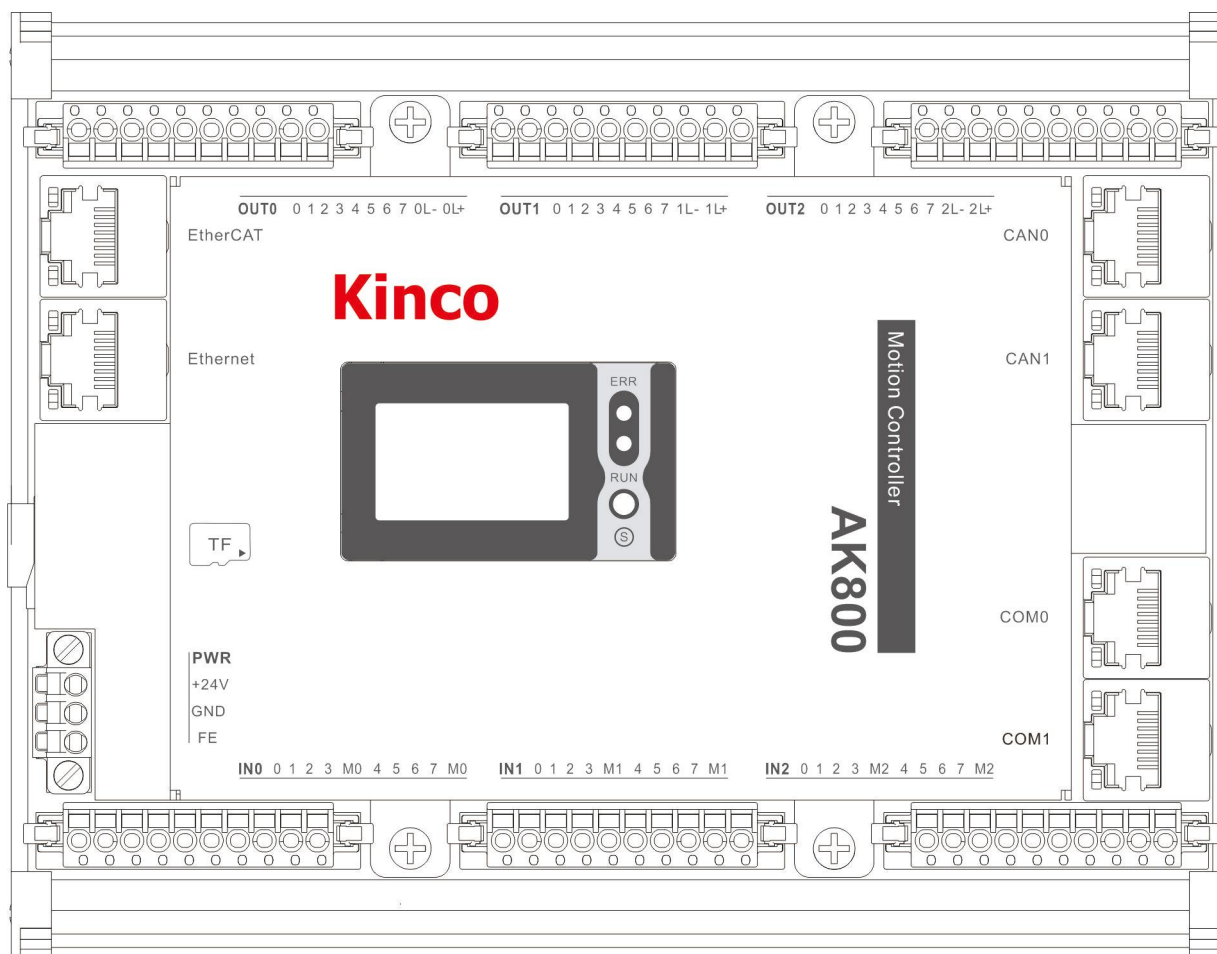



Diagram 3.3-01: AK800 Hardware Floor Plan

Interface Name	Function Definition
Ethernet Port (EtherCAT)	EtherCAT Agreement
Ethernet Port (Ethernet)	<ul style="list-style-type: none"> ● User program download and debugging ● MODBUS TCP Agreement ● MODBUS UDP Agreement
TF Slot	TF Card
PWR	DC20.4V—28.8V
Ethernet Port (CAN0)	CANopen Agreement
Ethernet Port (CAN1)	CANopen Agreement
Ethernet Port (COM0)	<ul style="list-style-type: none"> ● Channel 1 RS232 ● Channel 1 RS485
Ethernet Port	<ul style="list-style-type: none"> ● Channel 1 RS485

(COM1)	
Indicator Light	<ul style="list-style-type: none"> ● Operation Indicator Light RUN (Green light always on) ● Stop Indicator Light ERR (Red light always on) ● Fault Indicator Light ERR (Red light flashing)
DI	24-point Digital Input
DO	24-point Digital Output

3.4 Power Supply Specification

Controller power terminal (POWER) must meet the 24V DC power supply. If the voltage is too low, controller will not work properly. If the voltage is too high, controller will be burned. Support voltage reverse protection. Power terminal interface is defined as follows:

Interface Name	Function Definition
24V	Input 24V DC
0V	Input 0V DC
	Grounding Symbol

All PELV circuit equipment connected to this controller shall be safely isolated when supplied by following the IEC / EN60204-1. The controller does not have overvoltage protection. Therefore, the power supply must strictly comply with the limited range DC20.4V-28.8V.

3.5 DI Digital Input Interface Specifications

Project	Specification Description
Number of Input Channels	24 points
Input Connection Mode	Crimp Terminals
Input Type	Digital Input
Input Mode	Source Type /Leakage Type
Input Voltage Level	DC20.4V – 28.8V
Rated Input Current	3.5mA@24VDC
ON Voltage	>8.1Vdc
OFF Voltage	<7.3Vdc
Port Filtering Time	10ms
Input Impedance	4.3K Ω
Input Signal Type	Voltage DC Input Type
Isolation Mode	Photocoupler
Public Mode	Shared Public End

3.6 DO Digital Output Interface Specifications

Project	Specification Description	
Number of Output Channels	24 points	
Output Connection Mode	Crimp Terminals	
Output Type	Transistor Output	
Output Mode	Source Type	
Rated Output Voltage	DC20.4V – 28.8V	
Output Current Per Channel	Rated 200mA@24VDC	
ON Response Time	15 μ S below (Hardware Response Time)	
OFF Response Time	35 μ S below (Hardware Response Time)	
Protection Function	Protection of Power Access Polarity	None
	Protection of Induction Load Output	Have
	Protection of Short Circuit	Have
	Reverse Protection of Output Polarity	Have, it is allowed to apply a reverse polarity signal at the output for no more than 10S.

Isolation Mode	Photocoupler
Public Mode	Shared Public End

3.7 Serial Communication Port Specifications

AK800 series controller provides 3 serial communication channels (2 actual hardware interfaces), including 1 RS232 & RS485 interface (2 serial communication channels built into COM0, can be used simultaneously) and 1 RS485 interface (COM1), interface specifications are as follows:

Project	Project Description	
Interface Name	COM0	COM1
Communication Type	RS232&RS485	RS485
Communication Agreement	Modbus RTU Master Station and Slave Station、Free Communication	
Baud Rate (Recommended)	4800kbps、9600kbps、19200kbps、38400kbps、115200kbps	
Terminal Resistance	RS485 Built-in 120 ohm termination resistor	

Note: Both Modbus RTU master station and free communication functions will exclusively occupy the communication port. When using the RS485 interface for communication, a bus-type topology is recommended.

3.8 CANopen Interface Specifications

The CAN0 and CAN1 communication ports support the CANopen master station and free communication functions. The free communication function can be used in conjunction with any of the other protocols. However, except for free communication, none of the other protocols can be used at the same time. Only one of them can be selected.

1. CANopen Interface Communication Specifications

Project	CAN0	CAN1
CANopen Communication Rate	10kbps、20kbps、50kbps、125kbps、250kbps、500kbps、800kbps、1Mbps	
CANopen Maximum Number of Sites Supported by the Network	16	16
Station Number Range	Slave Station Node Station Number Support 1-127	
Terminal Resistance	Default comes with 120 ohm termination resistor	
CANopen Network Interface Form	RJ45 Ethernet Port	RJ45 Ethernet Port

2. CANopen Topological Structure

When using the CANopen interface for communication, a bus-type topology is recommended. In addition, it is necessary to connect 120 Ω termination resistors at the first and last ends of the bus to eliminate signal reflections on the communication cable. the CAN interface of the AK800 series controllers already has a 120 Ω termination resistor built in each.

3.9 EtherCAT Interface Specifications

1. EtherCAT Communication Specifications

Project	Description
Communication Protocol	EtherCAT Protocol
Support Services	CoE (PDO、SDO)
Synchronous Mode	DC-distributed Clock (with servo), Input/Output Synchronization (with I/O)
Baud Rate	100Mbit/s (100Base-TX)
Topological Structure	Circular Topology
Transmission Media	Standard Network Cable
Minimum Synchronization Period	2000μs

2. Network Form

EtherCAT is connected in the form of a network system with a linear connection of a master station (FA controller) and several slave stations. The number of nodes that can be connected to a slave station depends on the master station processing, communication cycle or the number of bytes transferred, etc.

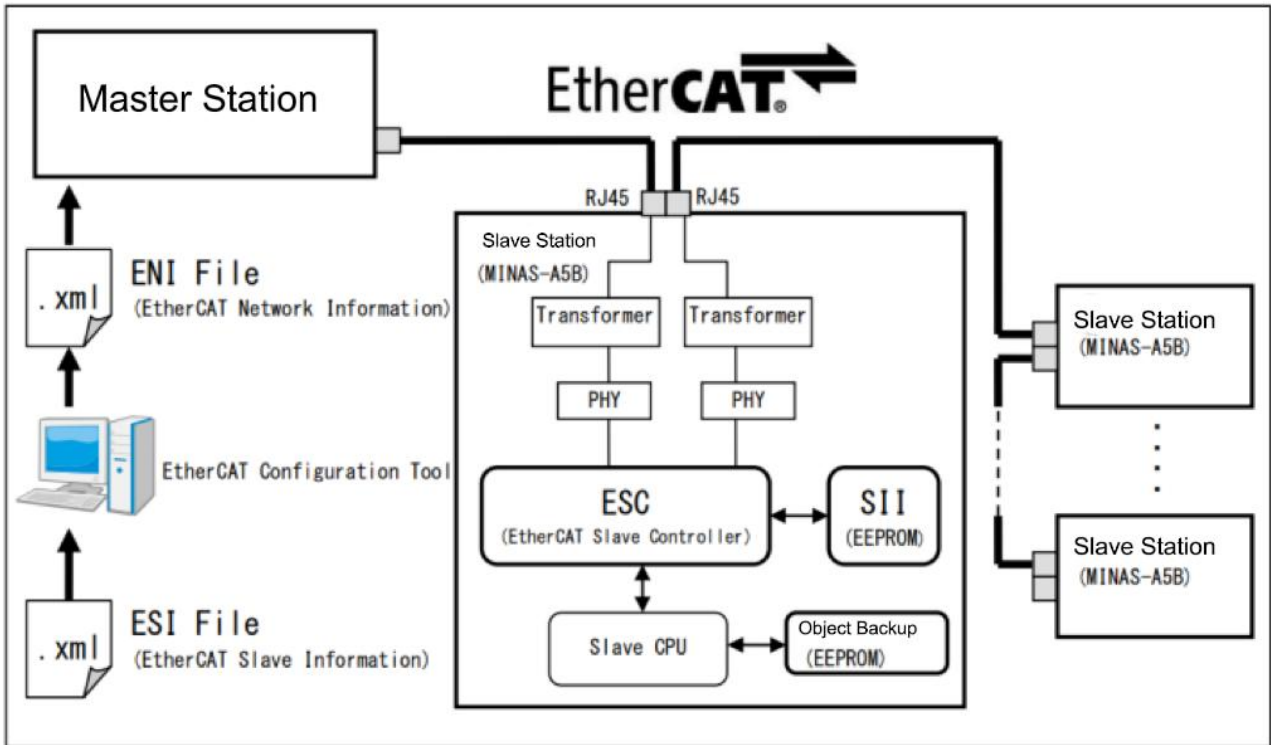


Diagram 3.9-01: EtherCAT Network Schematic

3.10 Appearance Size

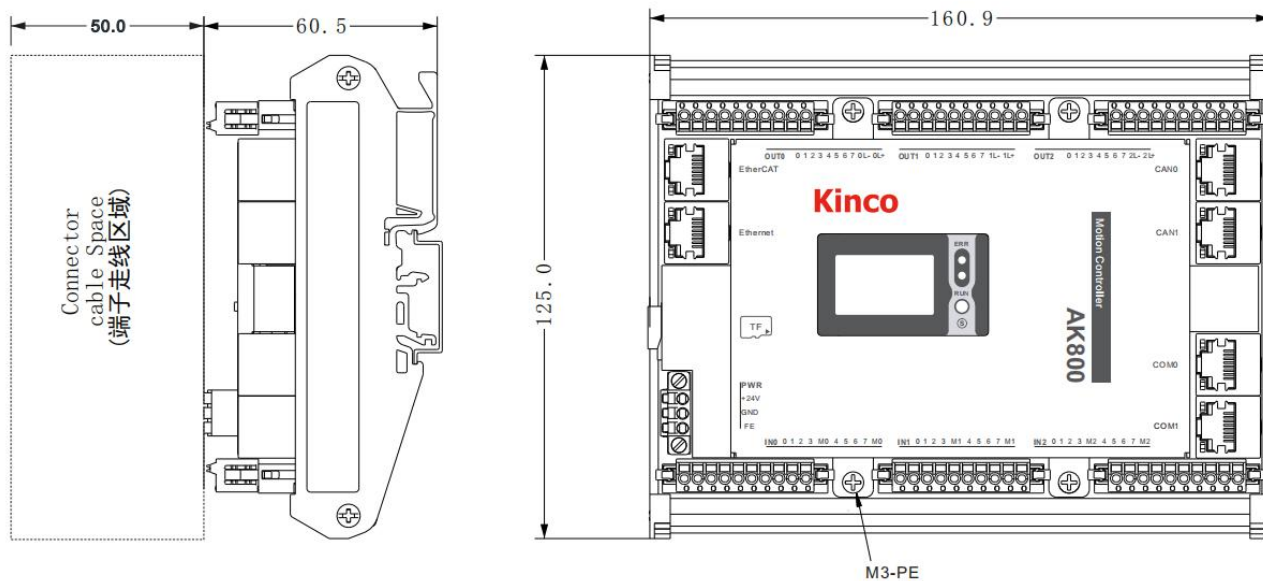


Diagram 3.10-01: AK800 Schematic Diagram of the Appearance Dimensions of the Series controller (mm)

3.11 LCD Panel Specifications

1. Hardware specifications

Project	Description	Unit
Contour Dimensions	28(H) × 31.4(V) × 3.0MAX	mm
Resolution	135(H)RGB × 240(V)	dots
LCD Effective Area	14.866(H) × 24.912(V)	mm
Pixel Size	0.1101(H) × 0.1038(V)	mm

2. Display Content



Diagram 3.11-01: LCD Panel Display

Project	Description
①	Display the running time
②	Display the CPU utilization rate
③	Display the memory usage rate
④	Display the current controller IP address
⑤	Display the current EtherNet communication situation
⑥	Display the current EtherNet communication situation
⑦	Icon dark/light: Displays the current CAN0 communication situation
⑧	Icon dark / light: Displays the current CAN1 communication situation
⑨	The upper light is always red: Indicates communication abnormalities or program errors The lower light is always green: Indicates communication is normal and there is no error
⑩	Press down to activate the controller

Chapter 4 Installation and Fixing

4.1 Installation Environment Requirements, Installation Recommendations

4.1.1 Insatallation Environment

When installing a programmable controller into a machine, give due consideration to relevant operability, maintainability, and environmental resistance. Do not install the programmable controller in the following locations.:

- Places where the ambient temperature exceeds the range of -5°C to 55°C ;
- Places where the ambient humidity exceeds the range of 5% to 95% RH;
- Places where temperature changes drastically and condensation can form;
- Places with corrosive gases and combustible gases;
- Places have more dust, iron powder and other conductive powder, oil mist, salt and organic solvents;
- Places exposed to direct sunlight;
- Places where the strong electric field and strong magnetic field occur;
- Places that will make the engine body produce direct vibration and be subjected to conductive shock.

4.1.2 Installation Space

In order to facilitate ventilation and the disassembly and replacement of the controller, the distance between the upper and lower parts of the controller and the building or other components should be left at least as shown in the diagram below (Diagram 4.1-01).

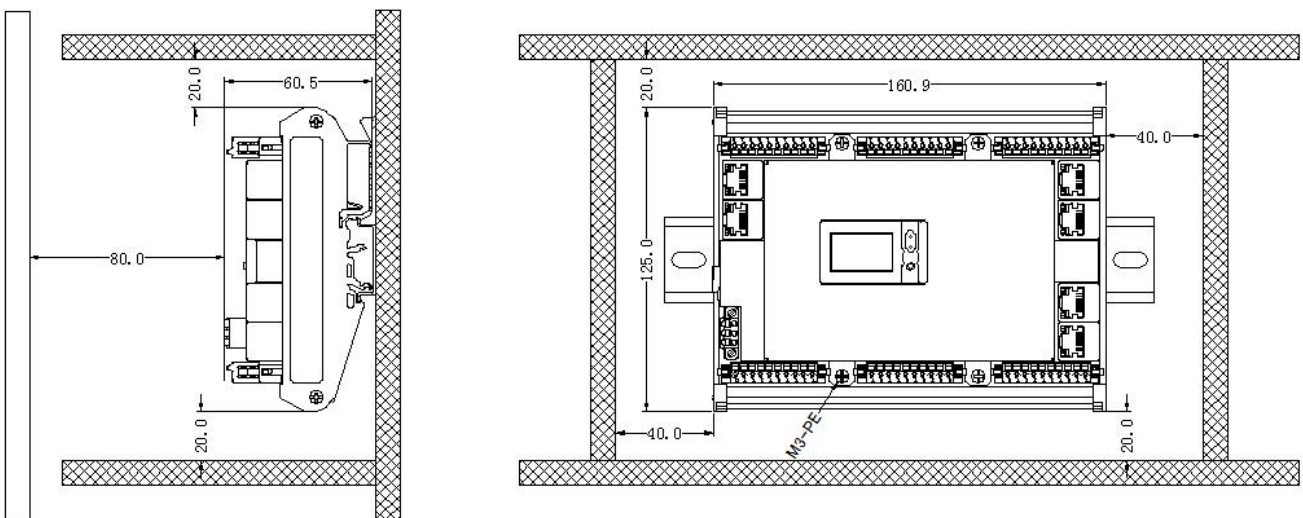


Diagram 4.1-01: The controller should be installed at a certain distance from other components (mm)

4.1.3 Installation Notes

Attention should be paid when installing the controller:

- Please ensure that the product and system power are in a safe disconnected state before installation.;
- Do not let the controller housing, terminal block, connectors, etc. fall or be impacted to avoid damage to the controller;
- Do not disassemble the controller, otherwise the product may be damaged;
- Do not over tighten the controller screws to avoid damaging the terminals.

4.2 Controller Installation and Disassembly

For DIN rail mounting, prepare the required mounting rails yourself. The applicable DIN rail models (IEC 60715) are as follows:

Model	Width×Depth (Unit mm)	Fixed Screw Specifications
TH35-7.5Fe	35 × 7.5	M4
TH35-7.5Al	35 × 7.5	M4
TH35-15Fe	35 × 15	M4

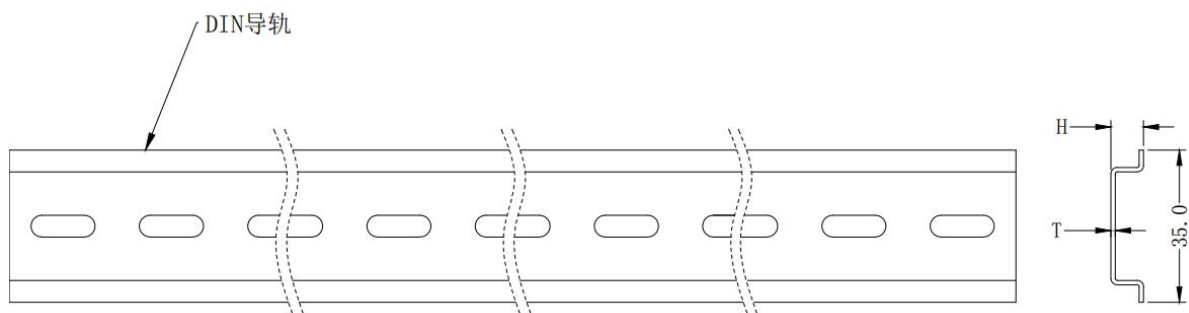


Diagram 4.2-01: DIN Guide Rail Specification

4.2.1 Installation Instructions

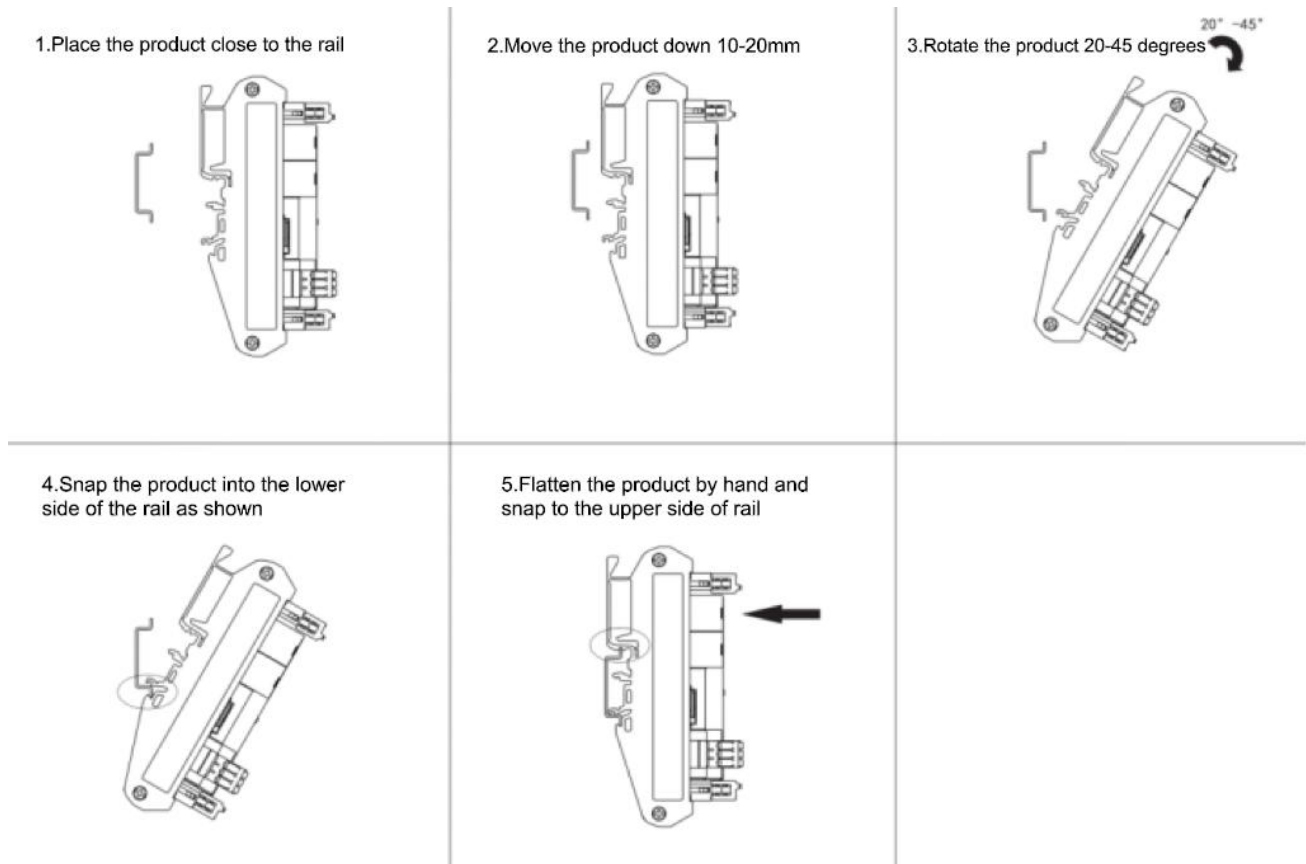


Diagram 4.2-02: Product Installation Steps

4.2.2 Disassembly Instructions

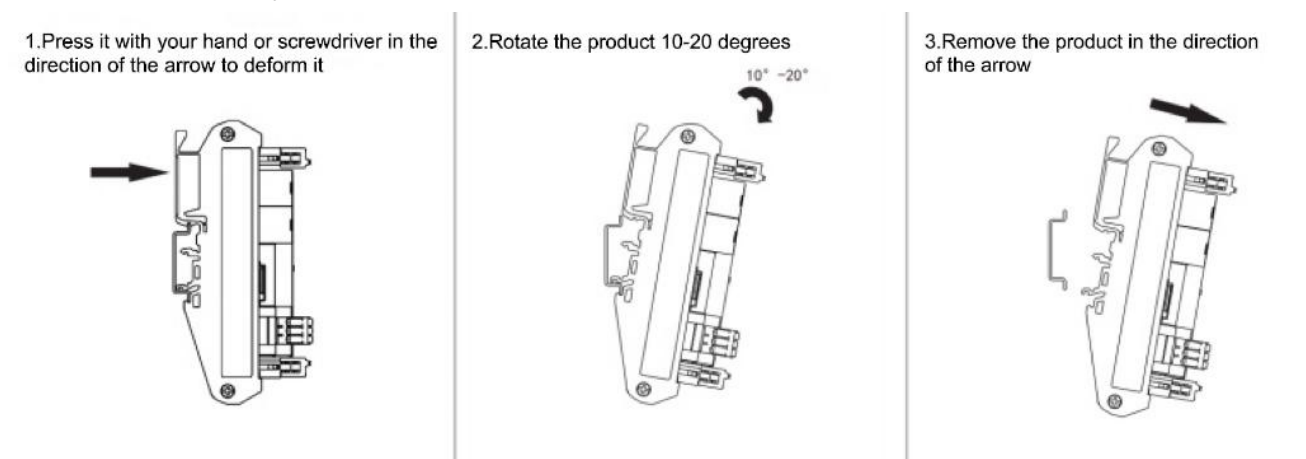
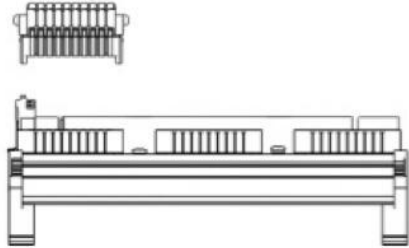


Diagram 4.2-03: Product Disassembly Steps

4.3 Terminal Blocks Installation and Disassembly

4.3.1 Terminal Blocks Installation Instructions

1. Place the terminal base directly above the terminal



2. Press down firmly

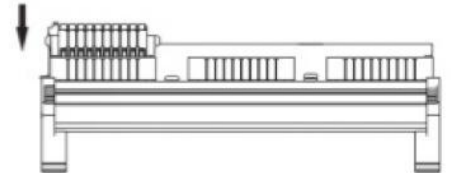
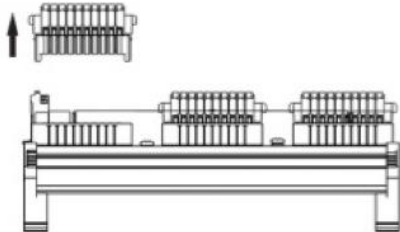


Diagram 4.3-01: Terminal Block Installation Steps

4.3.2 Terminal Blocks Disassembly Instructions

1. Pinch the terminal block clasp by hand in the direction of the arrow



2. Pull the terminal upward after pinching the snap of the terminal block with force

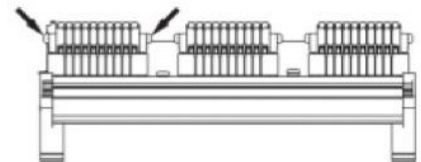


Diagram 4.3-02: Terminal Blocks Disassembly Steps

Chapter5 Wiring

5.1 Grounding Requirement

1.Power grounding: The controller is screwed to the cabinet. Please make the grounding terminal of the controller be benignly grounded.

2.Shielded cable grounding: Shielded cables must be used for field bus and communication signals. And ground as close as possible to the controller so that the grounded cable is not affected by the electromagnetic induction of the cable before grounding.

5.2 Cabling Suggestion

The following are precautions for wiring power cords and input/output devices.

Low-voltage cables (<1KV) are generally divided into four categories.Only cables of the same category can be put together to form a cable bundle.Cables of different categories should be separated when wiring, and generally cannot be crossed and overlapped.When crossover is unavoidable, they should be crossed at right angles.

Different types of cables need to have a certain spacing between them.For the cable length less than 30m, the minimum spacing allowed is shown in the diagram below (Diagram 5.2-01). When the cable parallel alignment length increases, the spacing should also be increased appropriately. In addition to maintaining the spacing, you can also install multiple pieces of shielding plates put together between different types of cables to achieve shielding. To reduce cross interference, all cables should be wired as closely as possible for (grounded) structural components connected to cabinet grounding, such as the assembly panels or rack components of the cabinet.

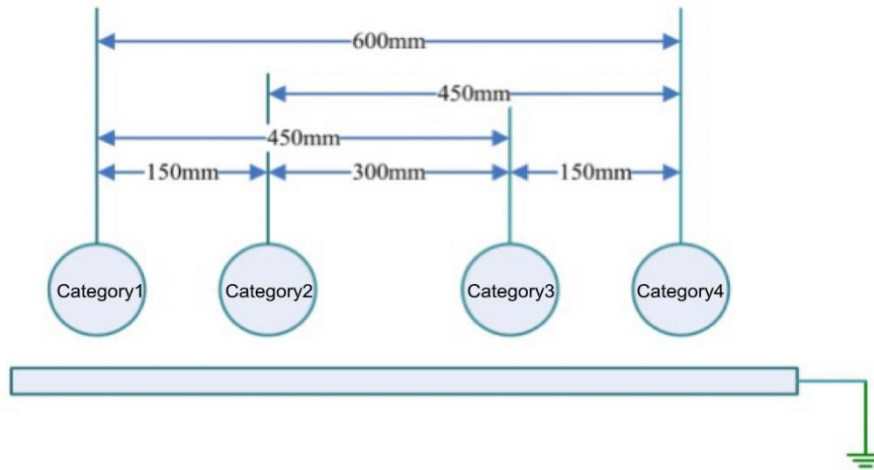


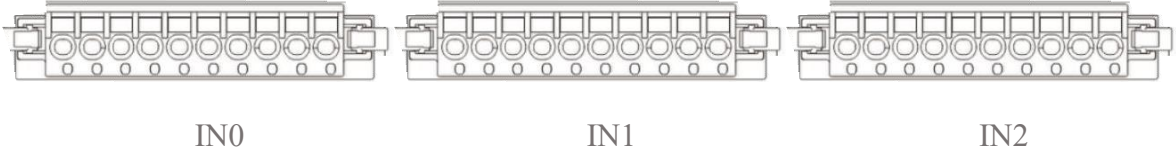
Diagram 5.2-01: Line spacing requirements for a line length of <30m

Diagram 5.2-01 Description	
Category1	Ethernet;
Category2	Low-speed digital communication signals (RS232, RS485, CAN, etc.) and digital I/O signals;
Category3	Low-voltage AC power distribution cord (eg. PLC 220V AC power cord) or DC power cord (eg. DC24V power cord of switching power supply output);
Category4	Input and output cables, welding machine cables, power converter power cables.

5.3 IO Wiring

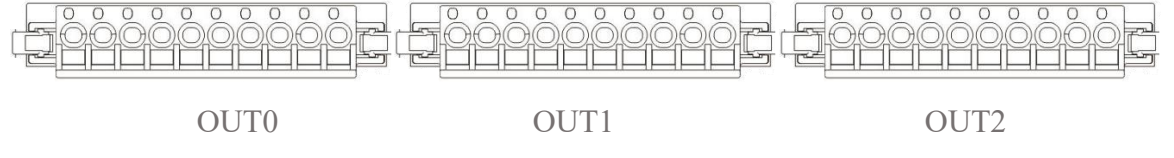
5.3.1 Digital Input

The controller has a 24-point digital input terminal, and the input signal terminals are arranged as follows:

DI Terminal Block											
Network Name	IN0	0	1	2	3	M0	4	5	6	7	M0
		IX0.0	IX0.1	IX0.2	IX0.3		IX0.4	IX0.5	IX0.6	IX0.7	
	IN1	0	1	2	3	M1	4	5	6	7	M1
		IX1.0	IX1.1	IX1.2	IX1.3		IX1.4	IX1.5	IX1.6	IX1.7	
	IN2	0	1	2	3	M2	4	5	6	7	M2
		IX2.0	IX2.1	IX2.2	IX2.3		IX2.4	IX2.5	IX2.6	IX2.7	

5.3.2 Digital Output

The controller has a 24-point output terminal, and the input signal terminals are arranged as follows:

DO Terminal Block											
Network Name	OUT 0	0	1	2	3	4	5	6	7	0L-	0L+
		QX0.0	QX0.1	QX0.2	QX0.3	QX0.4	QX0.5	QX0.6	QX0.7		
	OUT 1	0	1	2	3	4	5	6	7	1L-	1L+
		QX1.0	QX1.1	QX1.2	QX1.3	QX1.4	QX1.5	QX1.6	QX1.7		
	OUT 2	0	1	2	3	4	5	6	7	2L-	2L+
		QX2.0	QX2.1	QX2.2	QX2.3	QX2.4	QX2.5	QX2.6	QX2.7		

5.3.3 Hardware Wiring

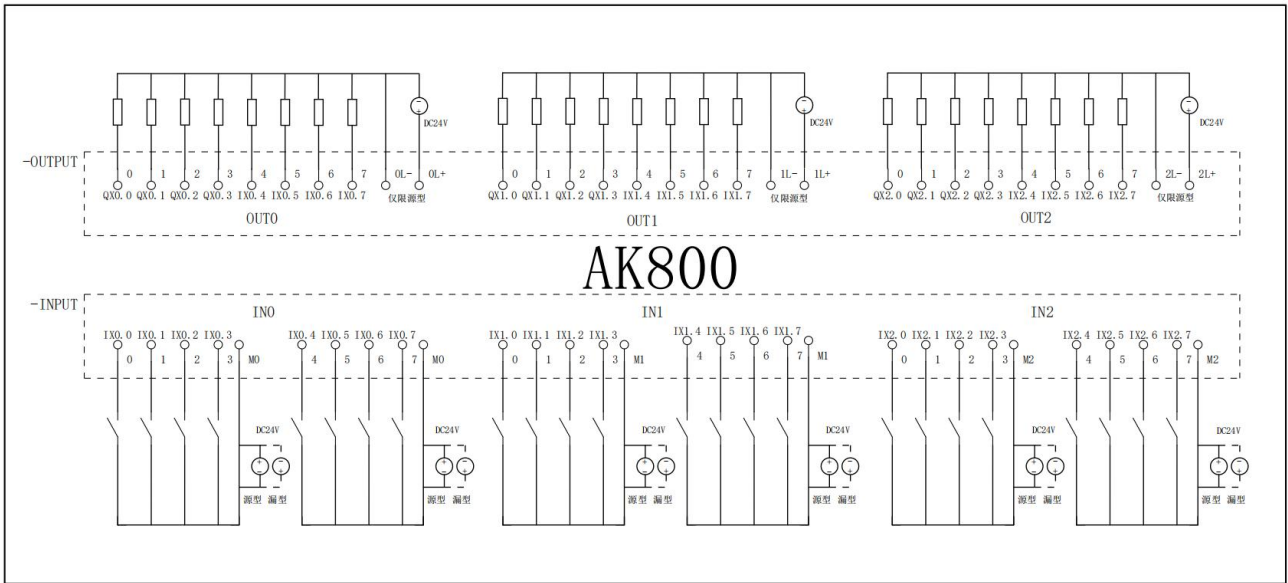


Diagram 5.3-01: AK800 I/O Wiring Diagram

5.4 Communication Connection

5.4.1 Connection via CANopen Bus

1. CANopen Schematic Diagram of the Bus Network (For reference only) :

The CAN interface recommends networking with shielded twisted pair. Two 120 Ω termination matching resistors are connected at each end of the bus to prevent signal reflection interference.

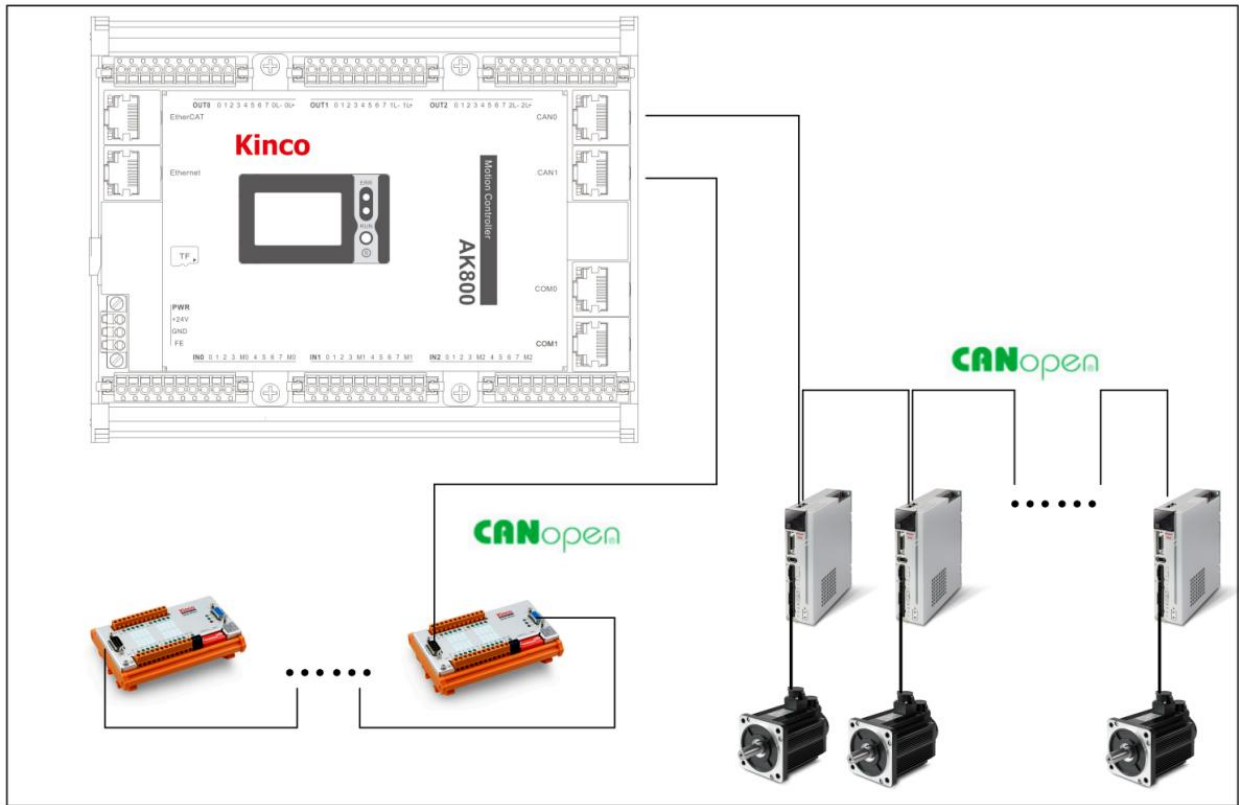


Diagram 5.4-01: CANopen Networking Sample

2. CANopen Communication Port Introduction

CAN0 and CAN1 of the controller are CANopen communication interfaces.

3. CANopen Wiring

CAN0 and CAN1 both adopt RJ45 interface form, with pin definition as shown in the following diagram:

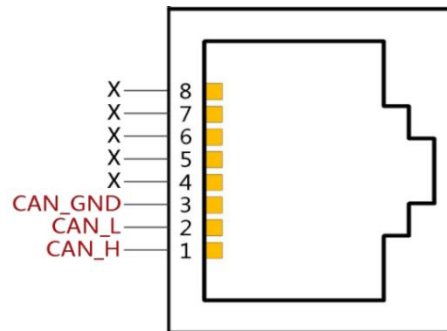


Diagram 5.4-02: CANopen Communication Pin Definition (RJ45)

The CAN bus is recommended to be connected with a shielded twisted pair cable, and two 120 Ω terminal matching resistors are connected at each end of the bus (built-in in the CAN port at the control side) to prevent signal reflection. The shielding layer generally uses a single point of reliable grounding. When fixing cables, do not tie together or stay too close to AC power cables and high voltage cables to avoid interference of communication signals.

CANopen relationship between transmission rate and transmission distance is shown in the following table:

Baud Rate(bit/s)	Bus Maximum Length (m)
1M	30
500k	80
250k	150
125k	300
50k	1000

CANopen The relationship among the number of nodes, cable impedance and transmission distance is shown in the following table:

Communication Cable Resistance	Maximum Number of Nodes		
	16	32	64
330hm / km	575m	530m	460m
700hm / km	270m	250m	215m
880hm / km	215m	200m	170m
930hm / km	205m	185m	160m
1570hm / km	120m	110m	95m

5.4.2 Connection via Serial Communication

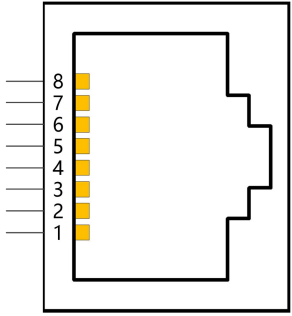
1.Introduction of Communication Port

The AK800 has three serial ports, located on the two RJ45 (COM) connectors in the PLC:

Interface Name	Interface	Serial Port Number
COM0	1xRS232	0
	1XRS485	1
COM1	1XRS485	2

Since the electrical standard of RS232 does not support plugging in and out with power, it is necessary to cut off the power supply of the controller before inserting the cable, otherwise it is easy to damage the communication port.

2.Definition of Communication Port Pin:

Pin	COM0(RS232)	COM0(RS485)	COM1(RS485)	COM0/COM1
1		A	A	
2		B	B	
3	TxD			
4				
5				
6	RxD			
7				
8	GND			

3.RS485Communication Wiring

1) RS485 Bus Connection Topology

- RS485 Shielded twisted pair connections are recommended for the bus;
- If the communication speed is low or the communication distance is close, it is recommended not to add terminal resistors; if the communication distance is long, the communication speed has certain requirements and the signal quality is high, 120 Ω terminal resistors can be connected at each end of the bus to prevent signal reflection.;
- The reference ground of all nodes is connected together;
- Up to 128 nodes can be connected.The distance of each node branch should be less than 3m.

2) Multi-node Connection Mode

- When the number of nodes is large, the RS485 bus is recommended to be daisy-connected.
- If branch line connection is required, the branch length between the bus and the node is recommended to be as short as possible. It is recommended to be more than 3m.
- Resolutely eliminate star connections.

The schematic diagram of common bus structure is as follows:

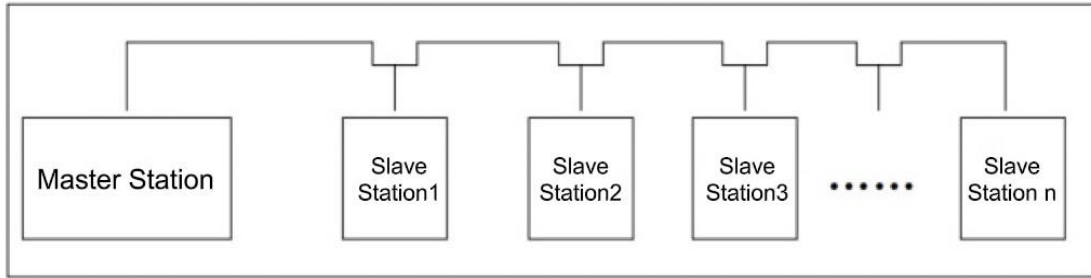


Diagram 5.4-01: General Bus Topology

5.4.3 Connection via Ethnet Monitoring

1. Networking

Controller can be connected point-to-point with computers, HMI (Human Machine Interface), etc. via Ethernet ports with standard Ethernet cables, or it can be connected to a hub or switch via Ethernet cables and connected to other network devices via the hub or switch for multi-point connectivity.

Network Port	Default IP
Ethernet	192.168.0.250

2. Wiring

To improve the reliability of equipment communication, Ethernet cables require the use of super Category 5 shielded twisted-pair cables with iron-clad injection molded wires.

5.4.4 Connection via EtherCAT Bus

1. Wiring

- Use Ethernet cables that meet at least Category 5 (CAT5) requirements as specified in EN 50173 or ISO/IEC 11801 (Super Category 5 Ethernet cables are recommended).
- The cable length between two EtherCAT devices shall not exceed 100 meters.
- 100% conduction test; no short circuit, disconnection, misalignment and poor contact.
- EtRJ45 connectors are used for EtherCAT communication cables. The pin assignment is compatible with the Ethernet standard (ISO/IEC 8802-3).

2. Definition

Pin	Core coloring	Signal	Description
1	yellow	TD +	Transmission Data +
2	orange	TD -	Transmission Data -
3	white	RD +	Receiver Data +
4	blue	RD -	Receiver Data -

Chapter6 Programming Tools&Downloads

6.1 Programming Software and Related Materials Access Channels

The programming software for Kinco AK800 series controllers is: CodeSys V3.5.

- Obtain software from Kinco distributors at all levels for installation;
- On CodeSys official website: <http://www.codesys.cn> can download the software and install it from the information download page;
- On Kinco official website: <https://www.kinco.cn> can download AK800 series controller application references.

As Kinco is constantly improving its products and materials, users are advised to update the software and consult the updated published reference materials when needed, which is conducive to users' application design and user experience.

6.2 Programming Environment

PC recommended hardware configuration:

- Computer: IPC or PC;
- Operating System: Windows7/Windows8/Windows10;
- CPU Main Frequency: 2GHz and above;
- Computer Memory: 4GB and above;
- Hard Disk: 128GB and above.

Between PC and AK800 controller, LAN network cable can be used to connect. It is recommended to use AK800 through the router and LAN network connection, so that long-distance communication can work between the PC and controller. It is convenient for the remote debugging of workshop equipment in the office. (Remote communication requires a free LAN network port and a network cable.)

Chapter7 Operation and Maintenance

7.1 Indicator Light Description

Name of Indicator Light	State	Function Descriptions
RUN Indicator Light	Always bright	Controller is running
ERR Indicator Light	Always bright	Controller is stopped
	Flicker	Controller is in a fault state

7.2 Routine Maintenance

7.2.1 Daily Inspection Items

Installation status and connection status.:

Inspection Item	Inspection Method	Processing Method
Appearance inspection	Visual inspection for dirt buildup	Clean dirty dust
Whether the controller is firmly installed	Whether the controller is firmly installed on the cabinet	Confirm that the installation is secure
Check for loose terminals	No loosening of terminal screws	Tighten the screws
Check the cable and the connection terminals	Whether the connecting cables and terminals are loose	Install the cables and terminals

7.2.2 Regular Inspection

The following is a description of the content of the project for about 1 or 2 spot checks when used for 6 months to 1 year:

Inspection Item	Inspection Method	Processing Method
Supply Voltage	Measure whether the system input AC power supply meets the specifications required by the product	Confirm reliability of power supply system
Ambient temperature and humidity	Use a thermometer and a hygrometer to measure whether the ambient temperature and humidity of the system meet the specifications required by the product	Confirm the causes of environmental changes and deal with them in a timely manner to ensure that the use environment meets the specifications
Air	Detect the presence of corrosive	Eliminate corrosive gases to

		gases	ensure that the system operates in a reliable environment
Appearance cleanliness	of	Check for dirt accumulation	Clean up the dirt accumulation
Installation reliability		Check if the controller is firmly installed	Make sure the installation is solid

In addition, equipment relocation, modification or wiring changes, etc. should be routinely inspected during this period.