Contents

Part I

General Introduction

Chapter I System Overview

This chapter will briefly introduce the Kinco-K3 series micro PLC (Programmable Logic Controller) and focuses on the explanation of the terms related to Kinco-K3 with a purpose of facilitating you to understand the contents in the following part of this manual. The main content of this chapter covers: application scope of the product, explanations on relevant terms, rules for nomenclature, etc.

1.1 Application Scope of the Product

According to the accepted classification rules for PLC, Kinco-K3 series PLC falls into the range of micro PLC. Therefore, it can be used to control machines and small-scale process. Kinco-K3 series PLC can well satisfy the demands in the following application areas (including but not limited to these applications):

Packing machinery	textile machinery	building material machinery
Foodstuff machinery	plastic machinery	numerical control machine
Printing mechanism	central air conditioner	
Environmental Machinery	individual process control device	

1.2 General Designation in the Manual

1.2.1 Vocabulary of Terms

▪ Micro PLC (Programmable Logic Controller)

According to the general classification rules, micro PLC generally refers to the type of PLC with the control points below 128. This type of PLC usually adopts compact structure, that is, a certain number of I/O channels, output power supply, high-speed output/input and other accessories are integrated on the CPU module.

▪ CPU body

Namely, the CPU module, it's the core of the control system. The user program is stored in the internal storage of the CPU module after being downloaded through the programming software, and will be executed by the CPU. Meanwhile, it also executes the CPU self-test diagnostics: checks for proper operation of the CPU, for memory areas, and for the status of any expansion modules.

▪ Expansion module & expansion bus

The expansion module is used to extend the functions of the CPU body and it is divided into expansion I/O module (to increase the input/output channels of the system) and expansion functional module (to expend the functions of CPU).

The expansion bus connects the CPU and expansion modules, and the 16-core flat cable is adopted as the physical media. The data bus, address bus and the expansion module's working power supply are integrated into the expansion bus.

▪ KincoBuilder

The programming software for Kinco-K3 series PLC, accords with IEC61131-3 standard KincoBuilder, presently provides LD and IL languages for convenience and efficiency in developing the control programs for your applications. KincoBuilder provides a user-friendly environment to develop and debug the programs needed to control your applications.

▪ CPU firmware

It is the "operating system" of the CPU module, and is stored in the Flash memory. At power on, it starts operation to manage and schedule all the tasks of the CPU module.

▪ User program

It's also called user project or application program, the program written by the user to execute some specific control functions. After the user program is downloaded to the CPU module, it is stored in the FRAM. At power on, the CPU module shall read it from FRAM into RAM to execute it.

▪ Main program and Scan Cycle

The CPU module executes a series of tasks continuously and cyclically, and we call this cyclical execution of tasks as *scan*.

The main program is the execution entry of the user program. In the CPU, the main program is executed once per scan cycle. Only one main program is allowed in the user program.

▪ Free-protocol communication

The CPU body provides serial communication ports that support the special programming protocol, Modbus RTU protocol (as a slave) and free protocols. Free-protocol communication mode allows your program to fully control the communication ports of the CPU. You can use free-protocol communication mode to implement user-defined communication protocols to communicate with all kinds of intelligent devices. ASCII and binary protocols are both supported.

▪ I/O Image Area

Including input image area and output image area. At the beginning of a scan cycle, signal status are transferred from input channels to the input image area; at the end of a scan cycle, the values stored in the output image area are transferred to output channels;

In order to ensure the consistency of data and to accelerate the program execution, the CPU module only access the image area during each scan cycle.

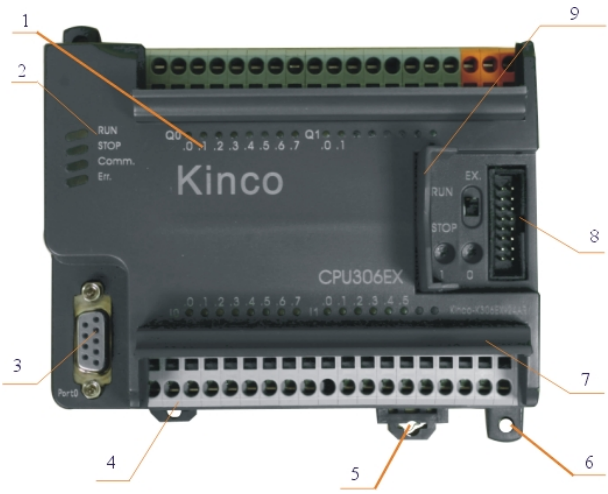
▪ Retentive Ranges

Through "Hardware" configuration in KincoBuilder, you can define four retentive ranges to select the areas of the RAM you want to retain on power loss. In the event that the CPU loses power, the instantaneous data in the RAM will be maintained by the super capacitor, and ong the retentive ranges will be left unchanged at next power on. The retaining duration is 72 hours at normal temperature.

▪ Data backup

Data backup is the activity that you write some data into E^2PROM or FRAM through relevant instruction for permanent storage. *Notice: Every type of permanent memory has its own expected life, for example, E^2PROM allows 100 thousand of times of writing and FRAM provides unlimited read/write endurance.*

1.2.2 The Module's Structure



1. I/O status LEDs
2. CPU status LEDs
3. Communication port (RS232)
   Communication port (RS485)
4. Terminal
5. 35mm DIN rail clip
6. M4 mounting hole
7. Cover plate for terminal
8. Expansion port
9. Cover plate for expansion port

Diagram 1-1 the Module's Structure

1.3 Denomination Rules for the product

1.3.1 Description of the Product Name

The "product name" of Kinco-K3 PLC is used to indicate the main functions and application purpose of the product. The "product name" is not for any individual product but the general term for a type of products. The "product name" is defined according to the following principle:

Product name: *module type + 3 + subtype + serial number*

▪ *Module type* is indicated with the following letters

CPU	CPU module
PM	expansion I/O module
FM	expansion function module
SW	Software
AS	Accessory

▪ *3* : Stands for Kinco-K3 series micro PLC

▪ *Subtype:* a one-digit number (0~9) is used to indicate the subtype of the module.

0	CPU module
1	Reserved
2	Digital Input/Output module
3	Analog Input/Output module
4	Communication module
5	Specific function module
6	Software
7	Accessory
8	Reserved
9	Reserved

▪ *Serial number*: A one-digit number (0~9) is used to indicate the sequence number of a subtype. The serial numbers of subtypes have the following implications.

▪ CPU module

4 CPU which provides 14 I/O channels on the CPU body;

6 CPU which provides 24 I/O channels on the CPU body;

8 CPU which provides 40 I/O channels on the CPU body;

Other serial numbers are reserved.

▪ Digital Input/Output module

1 DI (digital input) module;

2 DO (digital output) module;

3 DI / DO mixed module;

Other serial numbers are reserved.

▪ Analog Input/Output module

1 AI (analog input) module;

2 AO (analog output) module;

3 AI/AO mixed module;

Other serial numbers are retained.

▪ Communication Module

0 RS485 communication module;

2 Profibus-DP slave module;

3 DeviceNet module;

4 Ethernet module;

6 Modem module;

Other serial numbers are reserved.

▪ Special Function Module

0 Motion control module;

Other serial numbers are reserved.

▪ Software

0 Programming software;

Other serial numbers are reserved.

▪ Accessories

0 Programming cable;

1 Profibus-DP connector;

2 Profibus-DP Repeater;

Other serial numbers are reserved.

According to the above principle, *CPU306* indicates a CPU module with 24 I/O channels; *PM321* indicates DI expansion module; *AS360* stands for KincoBuilder programming software, etc.

1.3.2 Description of Order Number

The difference from "product name" is that each product has a unique "order No.", users are merely required to expressly inform us the order number of the demanded product when making an order. The "order number" is confirmed in accordance with the following rule:

Kinco-K + module code + feature code

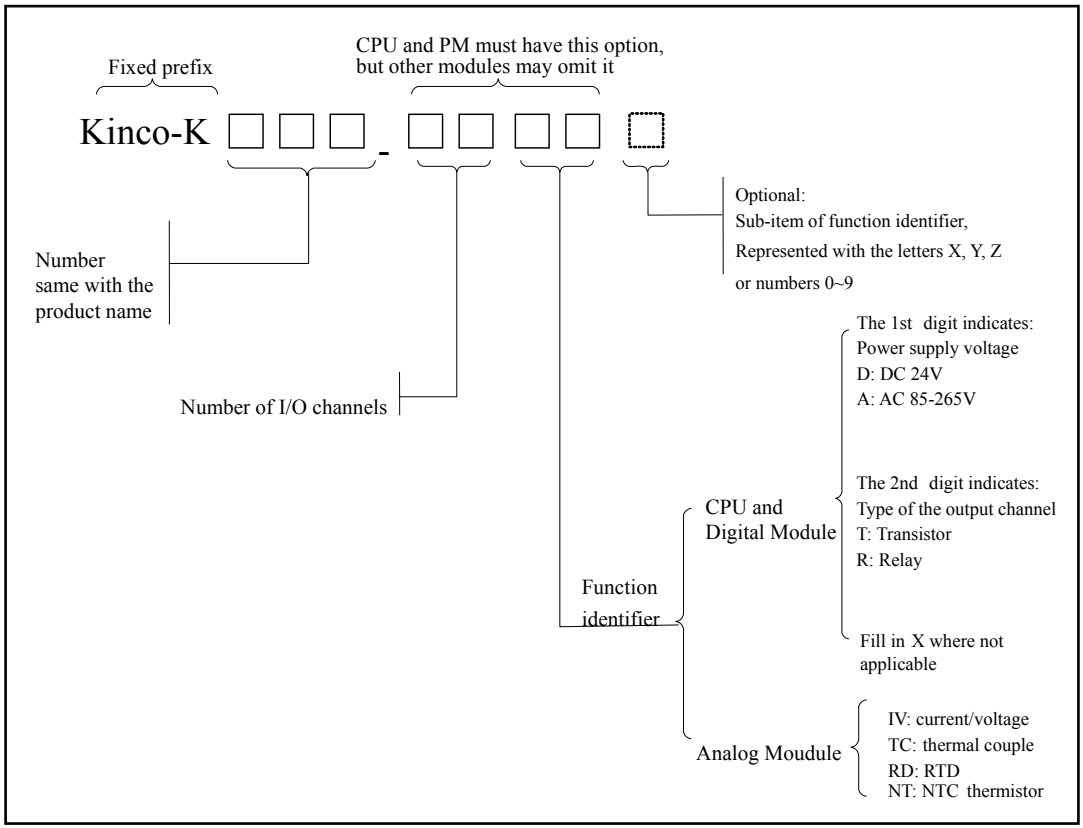


Diagram 1-2 Description of the Order Number

According to the above principle, *Kinco-K306-24DT* stands for the CPU module with 24 I/O channels (wherein the output channel is of transistor type) and DC24V power supply; *Kinco-K321-08DX* stands for the DI expansion module with 8 transistor-type input channels.

1.4 Product list of Kinco-K3 series PLC

Type	Name	Order no.	Description
CPU module	CPU304	Kinco-K304-14AT	AC85~265V power supply, with 14 I/O, DI 8*DC24V, DO 6*DC24V, max output current per channel 0.75A
		Kinco-K304-14AR	AC85~265V power supply, with 14 I/O, DI 8*DC24V, DO 6*Relay, max output current per channel 3A
		Kinco-K304-14AX	AC85~265V power supply, with 14 I/O, DI 8*DC24V, DO 3*DC24V/3*Relay, max output current per channel 0.75A/3A
	CPU306	Kinco-K306-24DT	DC24V power supply, with 24 I/O, DI 14*DC24V, DO 10*DC24V, max output current per channel 0.75A
		Kinco-K306-24DR	DC24V power supply, with 24 channels, DI 14*DC24V, DO 10*Relay, max output current per channel 3A
		Kinco-K306-24AR	AC85~265V power supply, with 24 I/O, DI 14*DC24V, DO 10*Relay, max output current per channel 3A
	CPU308	Kinco-K308-40DT	DC24V power supply, with 40 I/O, DI 24*DC24V, DO 16*DC24V, max output current per channel 0.75A
		Kinco-K308-40AR	AC85~265V power supply, with 40 I/O, DI 14*DC24V, DO 16*Relay, max output current per channel 3A
Expansion I/O module	PM321	Kinco-K321-08DX	DI 8*DC24V
		Kinco-K321-08AX	DI 8*AC220V
		Kinco-K321-16DX	DI 16*DC24V
	PM322	Kinco-K322-08DT	DO 8*DC24V, max output current per channel 0.75A
		Kinco-K322-16DT	DO 16*DC24V, max output current per channel 0.75A
		Kinco-K322-08XR	DO 8*Relay, max output current per channel 3A
		Kinco-K322-16XR	DO 16*Relay, max output current per channel 3A
	PM323	Kinco-K323-08DT	DI 4*DC24V, DO 4*DC24V, Max output current per channel 0.75A
		Kinco-K323-08DR	DI 4*DC24V, DO 4*Relay, Max output current per channel 3A
		Kinco-K323-16DT	DI 8*DC24V, DO 8*DC24V, Max output current per channel 0.75A
		Kinco-K323-16DR	DI 8*DC24V, DO 8*Relay, max output current per channel 3A

		Kinco-K323-08DTX	DIO 8*DC24V, diplex use, max output current per channel 0.75A
	PM331	Kinco-K331-04IV	4 analog input channels, 0-20mA/4-20mA/±10V/1-5V optional for each channel
		Kinco-K331-02TV	2 analog input channels, 0-20mA/4-20mA/±10V/1-5V optional for each channel
		Kinco-K331-04TC	4 Thermocouple input channels, Type J/K optional for each channel
		Kinco-K331-04RD	4 RTD input channels, Pt100/Cu50, 2/3 wire optional for each channel
		Kinco-K331-04NT	4 NTC thermistor input channels Type: mfd502-3470/E3M-42D-SD/KTM-41D-SD, 2-wire
	PM332	Kinco-K332-02TV	2 analog output channels, 0-20mA/4-20mA/±10V/1*5V optional for each channel
	PM333	Kinco-K333-05TV	4 analog input channels, 1 analog output channel, 4-20mA/1-5V/0-10V optional for each channel
Expansion function Module	FM340	Kinco-K340	RS485 communication module, max 187,5Kbps Modbus RTU protocol or user-defined protocol
	FM342	Kinco-K342	Profibus-DP Slave module, 12Mbps, max input/output 128/128 bytes
	FM343	Kinco-K343	DeviceNet module
	FM344	Kinco-K344	Ethernet module, 10/100Mbps self adapting, RJ45 connecter
	FM346	Kinco-K346	Modem module
	FM350	Kinco-K350	Positioning/motion control module, Pulse train output max 200KHz
Accessories and software	SW360	Kinco-K360-VX.X	KincoBuilder, Programming software, VX. X indicates version No.
	AS370	Kinco-K370-XXX	Programming cable, XXX indicates length of cable
	AS371	Kinco-K371	Profibus-DP connector
	AS372	Kinco-K372	Profibus-DP repeater
	AS373	Kinco-K373-XXX	Lengthened expansion bus cable, XXX indicates length of cable

	AS374	Kinco-K374	Bus terminator
	AS375	Kinco-K375-04DTX	Amplifier Module, 4 channels, max output current per channel 0.75A, max switching frequency 5KHz
		Kinco-K375-04DTY	Amplifier Module, leak, 4 channels, max output current per channel 3A, max switching frequency 20KHz

Table 1-1 Product list

Part II

Hardware Manual

Chapter I Application of Kinco-K3 Series Micro PLC

This chapter will briefly depict the architecture, expansion connection, network interface, etc and the introduction will help you understand and grasp the basics of Kinco-K3 series PLC to correctly use them.

1.1 Architecture of Kinco-K3 series PLC

1.1.1 Overview

The Kinco-K3 is a kind of high-quality micro PLC (Programmable Logic Controller). 24VDC sensor supply, communication port and a certain number of I/O channels are integrated on the CPU body. The compact design, flexible configuration and powerful instruction set make Kinco-K3 a perfect solution for a wide variety of applications. Because it adopts optimum design of software and hardware, the execution speed is less than 0.5μs per Boolean instruction, and in order to meet the demands of complicated process control and machine control, some advanced control instructions are particularly added such as PID algorithm, motion control, etc.

The Kinco-K3 series PLC provides CPU and expansion modules. The CPU is in 3 types and 7 specifications, and the expansion module is in more than 20 specs. The CPU and expansion modules can be flexibly combined into automation systems to adapt most applications. While applied, the CPU module is mounted at the left end, and the expansion modules are connected through the expansion port on the right hand. The CPU module controls the operation modes of these modules and exchanges data through the expansion bus and provides working power supply to the expansion module at the same time.

The control system established with the Kinco-K3 series PLC is open, and it provides various common network communication ports to achieve interconnection with other systems and equipments. It supports the communication methods such as serial communication, field-bus and as well as Ethernet, etc.

KincoBuilder is the programming software for Kinco-K3 series PLC. KincoBuilder accords with IEC61131-3 standard, and presently provides LD and IL languages. KincoBuilder provides you with a variety of useful functions such as programming, hardware configuration, reading diagnostic message, monitoring and forcing output, etc.

1.1.2 Allowable System Scales

The max numbers of points and expansion modules that supported by various CPUs are listed in the following table. Besides, the numer of relay-output is restricted because of the limited power supply of the expansion bus. *Notice: All the data in the table refer to the maximum limitations, and each restrictive condition must be satisfied simultaneously!*

	DI	DO		AI	AO	Number of expansion modules
		Total	Relay			
CPU304	8	6	0*	0	0	0
CPU306	64	64	32*	16	16	4
CPU308	256	256	64*	32	32	15

* : Indicates the number of relay outputs on the expansion modules, excludes those on the CPU body.

Table 1-1 Alowable system scales

1.2 DC24V Sensor Supply

In order to facilitate users, DC24V sensor supply is integrated into the CPU module, the terminal labels are *VO+* and *VO-*. It can supply 24VDC for input channels or for other requirements. Its capacity can ensure the power supply to all input channels in the circumstance that CPU connects with the max number of expansion modules.The capacity of the 24VDC sensor supply on each type of CPU is shown in the following table.

CPU304	300 mA
CPU306	300 mA
CPU308	400 mA

Table 1-2 Capacity of the 24VDC Sensor Supply

The following diagrams describe the wiring and application of the 24VDC sensor supply.

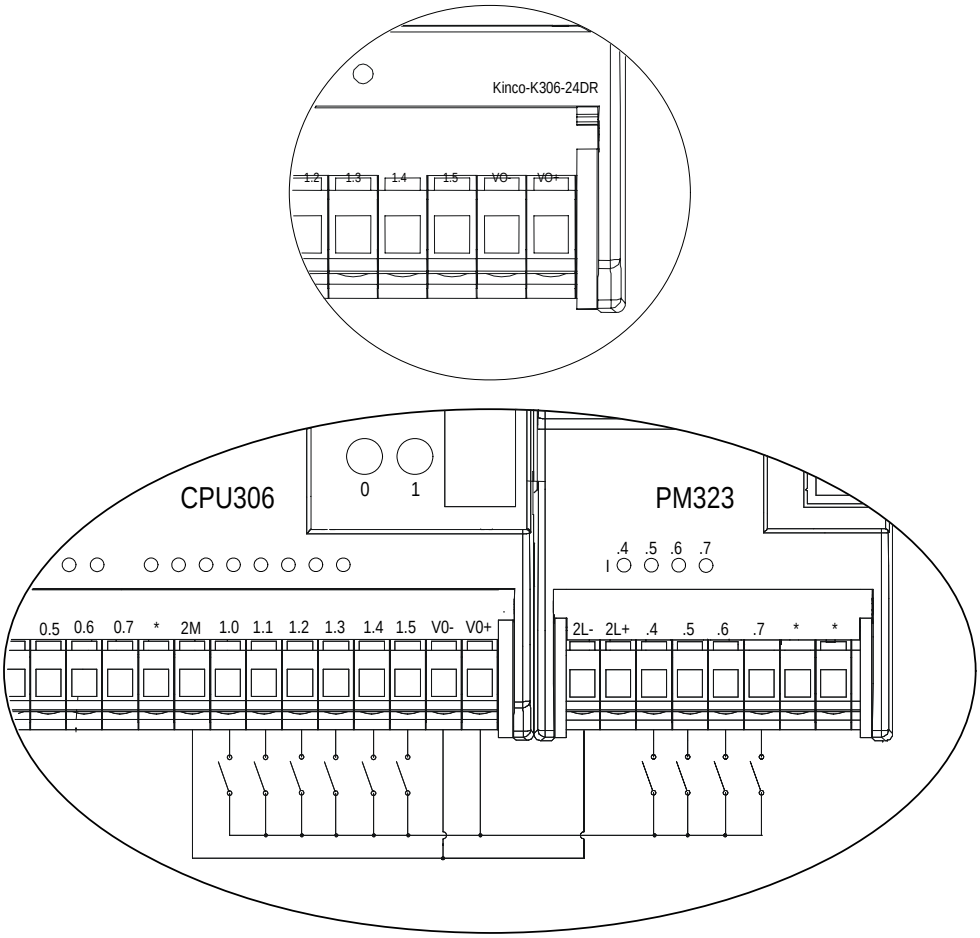


Diagram 1-1 Wiring and Application of 24VDC Sensor Supply

VO+ and VO- are recommended to supply power to the input channels only!

1.3 Interconnection between PLC modules

1.3.1 Overview of the Expansion Bus

The expansion bus is the channel between the Kinco-K3 modules and it plays the role of connecting all the modules into an integrated system electrically and mechanically. The CPU module uses the independent communication processor to scan the expansion modules via the expansion bus and only a little CPU resource is used during the scanning process. When the max 15 expansion modules are connected, the scanning time of the communication processor is shorter than 1ms.

The physical media of the expansion bus is 16-core flat cable, and high-speed data channels, address channels, 5VDC power supply, 24VDC power supply, power ground, etc are defined in the 16 cores. The expansion port is located on the right end of each module.

The power circuit of the CPU module, supplies both 5VDC power and 24VDC power to the expansion bus, thereof, the 5VDC power supply serves the internal circuit of each expansion module as working power supply, and the 24VDC power supply is specially designed as the drive supply (DC24V) for the relay coil in the relay-type DO modules. The max currents of the two types of power supplies provided by each type of CPU module are shown in the following table.

	5VDC power supply	24VDC power supply
CPU304	300mA	120mA
CPU306	720mA	165mA
CPU308	1200mA	240mA

Table 1-3 The Max Currents of 5VDC and 24VDC Power Supply in the Expansion Bus

1.3.2 Interconnection between PLC Modules

In actual connections, the CPU module is always arranged at the left end, the expansion cable is led out from the CPU's expansion port and sequentially connects to the expansion modules on the right

hand, the connection procedure is: the 16-pin expansion cable plug of the first expansion module is plugged into the expansion port on the right end of the CPU module; the 16-pin expansion cable plug of the second module is plugged into the expansion port on the right end of the first module; and the rest can be handled by analogy. After connecting all the modules, push tight and the expansion cable may naturally slide into the slot on the right end of the module. The transition between them are very smooth and no interstice can be found with a front view.

Diagram 1-2 Actual Picture after Connecting the Modules

In addition, it needs our attention that CPU308 supports at most 15 expansion modules. When the expansion bus is too long (above 1 meter) or CPU connects with too many expansion modules, it is recommended that the 9th and 10th pins of the expansion port of the last module should be short-circuited by placing a jumper to enhance the stability of communication, as shown in the diagram on the right hand.

1.4 Communicating over a Network

Kinco-K3 series PLC provides various methods of network communication to conveniently connect with the 3rd-party equipments and systems. Kinco-K3 can not only meet the requirement of monitoring single equipment but also build up a complex network to satisfy all kinds of demands.

▪ Serial communication

The CPU module provides RS232 and RS485 communication ports, and supports the standard Modbus RTU protocol and free-protocol mode. Default, the CPU module uses Modbus RTU protocol and acts as a Modbus slave.

The Kinco-K3 CPU can connect any HMI that supports the standard Modbus RTU protocol. Besides, you can use free-protocol mode to implement user-defined communications with intelligent devices that use their own protocols.

In addition, you can link 32 (max) PLCs with RS485 interface into a network using the Modbus RTU protocol or user-defined protocol.

▪ Fieldbus Communication

FM342 and FM343 expansion module are respectively the slave modules of Profibus-DP and DeviceNet, and they are able to connect the Kinco-K3 PLC into a fieldbus network. In the future, Kinco Automation Co., Ltd. will develop more types of fieldbus interface modules.

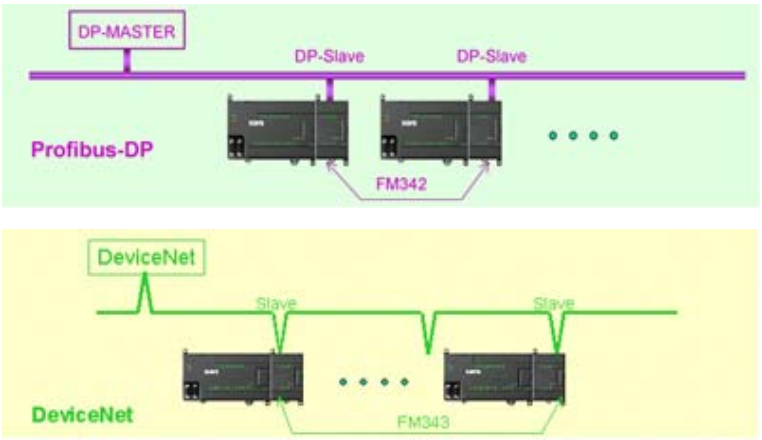


Diagram 1-3 Fieldbus Communication

▪ Ethernet Communication

The Kinco-K3 supports TCP/IP Ethernet communication (10 to 100Mbaud) through the use of an Ethernet

expansion module. In addition, OPC Server shall be provided for convenience and efficiency. Kinco will also open the Ethernet protocol to users to facilitate their 2nd development.

Diagram 1-4 Ethernet Communication

1.5 Environmental Condition

The following environmental parameters are applicable to all Kinco-K3 series PLCs.

Operating temperature	0 --- +55 °C
Allowable relative humidity	95%, no condensation
Storage temperature	-20 --- +85 °C

Chapter II CPU Principle and Application

This chapter will describe the CPU module of Kinco-K3 series PLC, taking CPU306 as an example to illustrate the principle, block diagram, special functions, technical data and other information.

2.1 Overview

The CPU module is the core of Kinco-K3 series PLC, and it can be combined into an integrated control system by connecting the expansion module via the expansion bus. The CPU module is responsible to execute the scan cycle of "reading the inputs > executing the program > processing communication requests > self-diagnosis > writing to the outputs > reading the inputs …", and meanwhile, to control the expansion bus to access all the expansion modules.

The firmware of Kinco-K3 CPU is stored in the nonvolatile FLASH memory to be used to manage and schedule all the tasks of the CPU.

After the user program is downloaded to the CPU module from the programming software (KincoBuilder), it is placed into the RAM and meanwhile stored into FRAM (ferroelectric nonvolatile memory). At power on, the CPU module restores the user program from the FRAM memory and then executes the control logic according to the requirements of the program.

Kinco-K3 series PLC can meet some users' requirements perfectly because of its advantages, such as compact structuret, flexible expansibility, abundant module types, powerful instruction set, various voltage grades of power supply and low price.

2.1.1 Super Capacitor

The CPU module provides a super capacitor that maintains the integrity of the RAM after power has been removed. At power on, the CPU will strictly verify the RAM, and if the data stored in the RAM was maintained

successfully, the retentive memory areas will be left unchanged. Through "Hardware" configuration in KincoBuilder, you can define four retentive areas to select the areas of the RAM you want to retain on power loss.

The super capacitor will maintain the RAM for 72 hours at the normal temperature; 72 hours later, all the data in the RAM may lose. Please electrify the CPU for more than 10 minutes to charge the super capacitor before using it. Please refer to software manual for details concerning the retentive areas.

2.1.2 FRAM (Ferroelectric Nonvolatile Memory)

The CPU module supplies an FRAM to store the user program and hardware configuration permanently. At power on, the CPU will restore the program and configuration data from FRAM into RAM. FRAM boasts many traits such as unlimited read/write endurance, permanent data retention, no delay write, etc.

Another function of the FRAM is that it can permanently backup 255 bytes of data in the particular range of V area under the control of the user program. The V area address for the data to be backuped is stored in SMW32, and this value is an offset from V0. When a save operation is executed, the value in this V area address is backuped to the corresponding location in the FRAM. SM31.7 is the command to save, CPU reads the real-time status of SM31.7, when it's "TRUE", a save operation is executed; Otherwise, no save operation is executed. Please refer to Appendix B for detailed introduction of SMB31 and SMW32.

2.1.3 Real-time Clock (RTC)

The real-time clock built in the CPU module can provide real-time clock/calendar indication. The real-time clock/calendar adopts BCD-format coding through second to year, automatically conducts leap-year adjustment and uses the super capacitor as backup. At normal temperature, the duration of the super capacitor is 72 hours. KincoBuilder can be used to set/read the RTC online. Besides, KincoBuilder also provides RTC setting/reading instructions to realize the applications related to the clock.

2.1.4 Other Functions

CPU306 also provides the following functions.

- · 2 analogue potentiometers with 10-bit resolution
- · 128 timers
- · 128 counters
- · 1 RS-232 serial communication port
- · Support the special programming protocol, Modbus RTU protocol and free-protocol communication
- · 6 high-speed counters which support 12 modes at most
- · 2 high-speed pulse train outputs which support PTO/PWM mode
- · Interrupts

Please refer to relevant chapters for detailed introduction of these functions.

2.2 Kinco-K3 CPU

The Kinco-K3 CPU combines a microprocessor, an integrated power supply, input circuits, and output circuits in a compact housing to create a powerful Micro PLC. Kinco-K3 provides different CPU models with a diversity of features and capabilities that help you create effective solutions for your varied applications. The CPU models include CPU304, CPU306 and CPU308, the larger the serial number is the more I/O channels the CPU body provides and the higher the performance is.

The CPU module is integrated with a certain number of DI channels and DO channels. Some DI channels can be used as not only common digital input channels but also high-speed counter input channels. If the DO is of transistor output, Q0.0 and Q0.1 can be used as not only common digital output channels but also high-speed pulse output channels.

There are two kinds of CPU according to the voltage of power supply: one requires DC24V power supply and the other requires AC85V~265V.

2.3 Structure

2.3.1 Front View

Diagram 2-1 is the front view of Kinco-K306-24DT CPU when the cover plates for the terminal and the expansion port are removed.

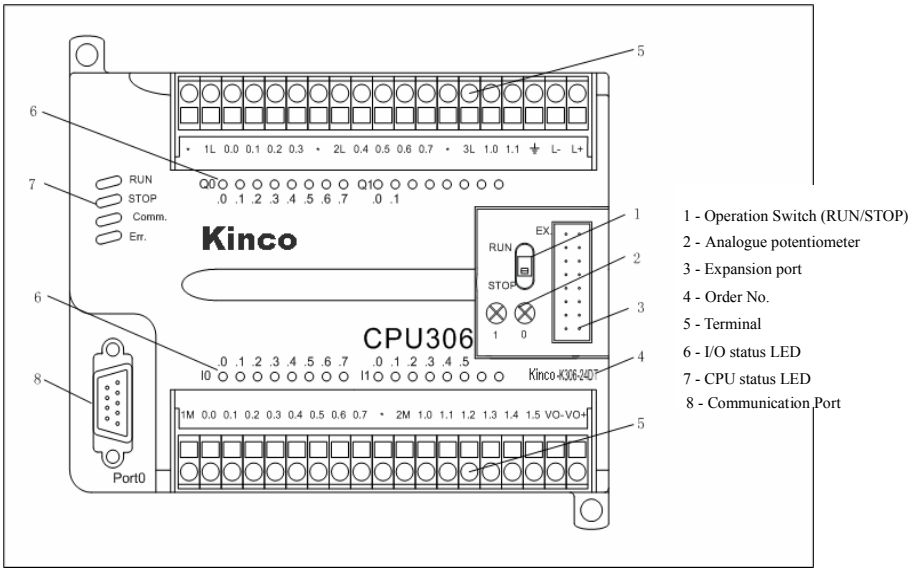
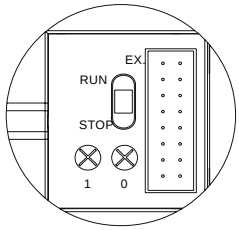


Diagram 2-1 Front View of Kinco-K306-24DT CPU

2.3.2 Operation Switch



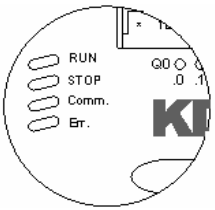
The operation switch is used to start or stop the CPU module and it has two modes: RUN and STOP. When the switch is at RUN position, the CPU excecutes the scan cycle. When the switch is at STOP position, the CPU stops the scan cycle. When STOP,

the CPU will control all the DO channels to hold the states specified in the hardware configuration through KincoBuilder.

In addition, KincoBuilder allows you to change the operating mode of the online CPU module using specific menu commands.

No matter the CPU is at RUN or STOP, KincoBuilder can communicate with it and download, monitor, debug program and so on.

2.3.3 CPU Status LED



The CPU module provides 4 status LEDs: **RUN**, **STOP**, **Comm.** and **Err.**

The **RUN** LED is green and indicates the CPU is running.

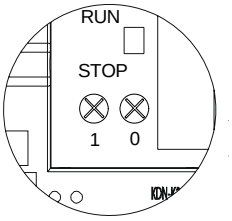
The **STOP** LED is red and indicates the CPU stops.

The **Comm.** LED is green indicates the CPU is sending communication data.

The **Err.** LED is red and plays the role to indicate that a fatal error occurred. Fatal errors cause the CPU to stop executing the user program. The objective for processing fatal errors is to bring the CPU to a safe state. The CPU changes to STOP mode and turns on both the **Err.** LED and the **STOP** LED when a fatal error is detected.

2.3.4 Analogue Potentiometer

The CPU module provides 2 analogue potentiometers of 10-bit resolution and their serial number is 0 and 1 respectively. Their adjustable range is 0~1023. You can adjust the potentiometer with a suitable screwdriver: turn clockwise to increase the numerical value of the potentiometer and clockwise to reduce the numeric value.



The numerical values of the two analogue potentiometers are sent to SMW26 and SMW28, SMW26 is for No. 1 potentiometer and SMW28 for No. 0 potentiometer.

SMW26 and SMW28 can only be read. They can be used as the preset value of timer and counter, or other intermediate values to facilitate you to debug your contrl program.

2.3.5 I/O Channels on the CPU Module

The CPU module provides a certain number of DI channels and DO channels. The address of these channels is fixed and changeless, and they are assigned automatically according to their type and the terminal position.

2.3.5.1 DI (Digital Input) channels

The DI channels are located at the underside of the CPU module. CPU306 provides 14 DI channels which are totally divided into 2 groups: the 1st group includes 8 channels and the address is I0.0~I0.7; the 2nd group includes 6 channels and the address is I1.0~I1.5. The module provides opto-electrical isolation between the input signal and the internal circuit. Each channel is equipped with a LED to indicate its status.
The DI channels can be used as not only common digital input channels but also high-speed counter input channels.

Main features

- 14 channels, divided into 2 groups, one group of 8 channels and another 6
- Fixed input address: I0.0~I0.7, I1.0~I1.5
- Source (common-cathode) / sink (common-anode) input optional for each group
- Used as both common digital input and high-speed pulse input
- Rated input voltage DC24V, effective voltage range: 15~30V
- Opto-electrical isolation between the input signal and the internal circuit
- A green LED indicates the channel status

2.3.5.2 DO (Digital Output) Channels

The DO channels are located at the upside of the CPU body. CPU306 provides 10 DO channels which are divided into 3 groups: the 1st group includes 4 DO channels and the address is Q0.0~Q0.3; the 2nd group

includes 4 DO channels and the address is Q0.4~Q0.7; the 3rd group includes 2 DO channels and the address is Q1.0~Q1.1.

There are two kinds of CPU according to the type of output: one provides transistor-type DO channels and the other provides relay-type DO channels. In case of transistor output, Q0.0 and Q0.1 can be used as not only common digital output channels but also high-speed pulse output channels.

Each channel is equipped with a LED to indicate its status.

Main features of transistor output channels

- 10 transistor output channels, divided into 3 groups
- Rated power supply voltage DC24V
- Rated output voltage DC24V, max output current of each channel is 750mA, source
- Reverse polarity protection on the power supply input
- Inductive load protection
- Short-circuit protection (when output current per group exceeds 3A)
- Allows parallel connection of outputs in the same group
- Opto-electrical isolation between the output signal and the internal circuit

Main features of relay output channels

- 10 relay output channels, divided into 3 groups.
- External load voltage (max.) DC30V/AC270V
- Output current per channel (max.) 3A (DC30V/AC270V)

2.3.5.3 Wiring Diagram

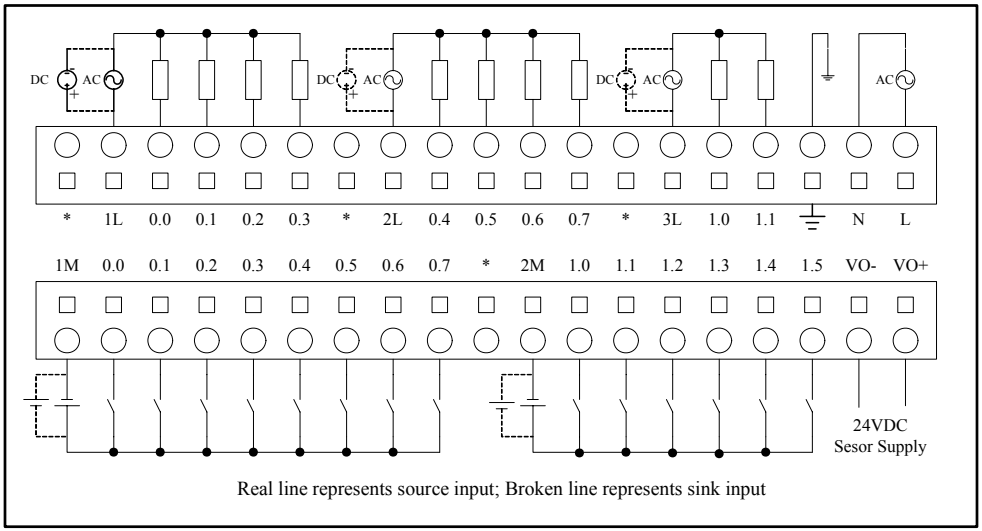


Diagram 2-2 Wiring Diagram of Kinco-K306-24AR

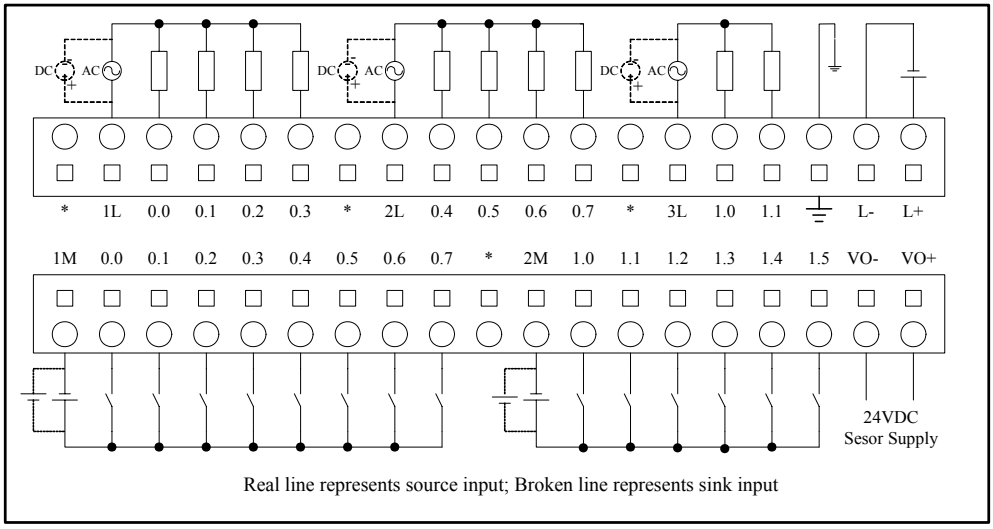


Diagram 2-3 Wiring Diagram of Kinco-K306-24DR

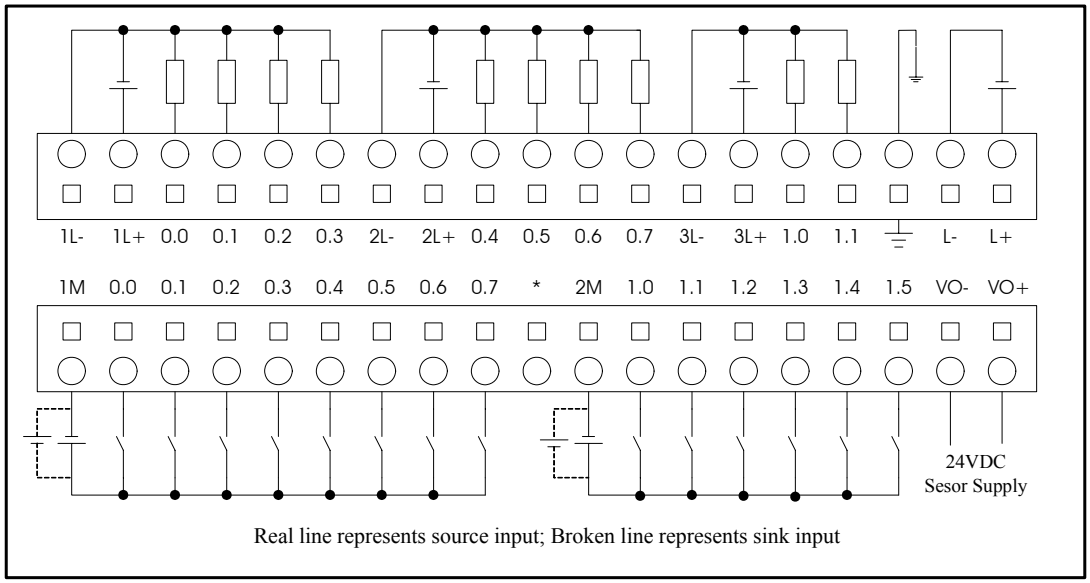


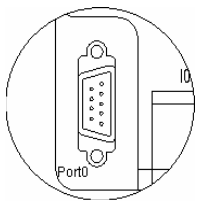
Diagram 2-4 Wiring Diagram of Kinco-K306-24DT

2.3.6 Expansion Port

On the right hand of the CPU body, a 16-pin expansion port is provided to connect with the expansion module via the expansion bus. Please see 1.3.2 Interconnection_between_PLC_Module for details.

2.3.7 Communication Port

CPU306 provides a RS232 or RS485 (optional when making an order) communication port whose connector is DB9 female as shown in the diagram on the right hand. This port supports the special programming protocol, Modbus RTU protocol (as a slave) and free-protocol communication mode.



The pin assignmen is shown in the following table:

RS232		
Signal	Description	Pin No.
GND	Signal ground	5
TxD	Transmit data	3
RxD	Receive data	2

RS485		
Signal	Description	Pin No.
A+	RS485+	7
B-	RS485-	8

Table 2-1 Defination of Communication-port Signal

2.4 Advanced Functions

The Kinco-K3 PLC can provide some advanced functions such as high-speed counter, high-speed pulse train output, interrupt and free-protocol communication.

CPU306 provides 6 high-speed counters, HSC0~HSC5, and each counter allows the input frequency up to 30kHz. HSC3 and HSC5 support 1 operating mode; HSC0 and HSC4 support 7 operating modes; and 11 modes for HSC1 and HSC2. All the high-speed counters have the same function in the same mode.

The Kinco-K3 provides two PTO/PWM pulse generators that produce high-speed pulse train output (PTO) or pulse-width modulation (PWM), and the output frequency can reach 20kHz.

High-speed counter and high-speed pulse train output functions can help you to build up a entirely closed-loop motion control system easily: The CPU controls the stepping motor or servosystem using high-speed pulse train output and receives feedback through the high-speed counter.

The CPU supports I/O interrupts. The CPU generates events for different changes of state for various I/O. These events allow the user program to respond to the high-speed counters, the high-speed outputs, or to rising or falling states of the inputs.

Free-protocol communication mode is supported. You can use this mode to implement user-defined communications protocols to communicate with many types of intelligent devices. ASCII and binary protocols are both supported.

2.5 Hardware Overview

The CPU module combines a powerful 16-bit microprocessor, RAM, FLASH memory for storing the system firmware, FRAM for storing the user program, an integrated power supply, input circuits, output circuits, watchdog, real-time clock, etc in a compact housing to create a powerful Micro PLC. After you have downloaded your program, the CPU executes your logic and controls the input and output devices in your application.

The following is the CPU hardware block diagram.

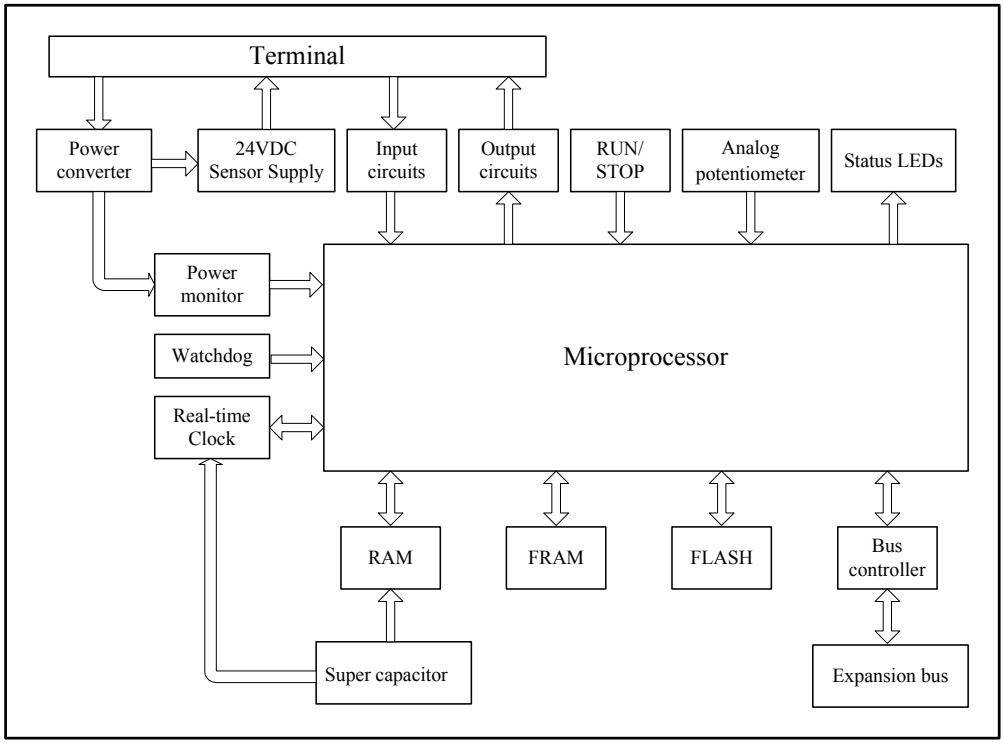


Diagram 2-5 CPU Hardware Blcok Diagram

2.6 Installation Dimension

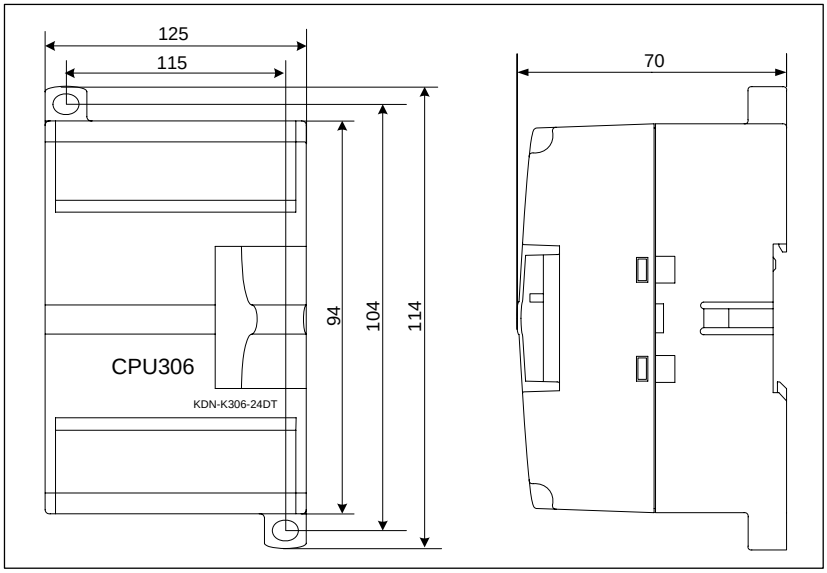


Diagram 2-6 Installation Dimension of CPU306

2.7 Specifications

2.7.1 CPU Specifications

Feature	CPU304	CPU306
Memory		
User program memory	E^2PROM, 8KB	FRAM, 8KB
RAM	64KB	64KB
Data retention	Super capacitor, 72 hours typical	Super capacitor, 72 hours typical
I/O		
Built-in I/O channels	8*DI / 6*DO	14*DI / 10*DO
DI image area	1 byte (8*DI)	8 bytes (64*DI)
DO image area	1 byte (8*DO)	8 bytes (64*DO)

AI image area	0	32 bytes (16*AI)
AO image area	0	32 bytes (16*AO)
Max.expansion modules	0	4
Anolog potentiometer	0	2, 10-bit resolution
High-speed counters Single phase Two phase	2 counters total 2 at 20KHz 2 at 10KHz	6 counters total 6 at 30KHz 4 at 20KHz.
High-speed pulse output	2 at 20KHz	2 at 20KHz
General		
Execution speed	Boolean instruction: 0.48μS Word instruction: <48μS Integer arithmetic instruction: <65μS Floating number arithmetic instruction: <150μS	
Timers	64 totally 1ms time-base: 4 10ms time-base: 16 100ms time-base: 44	128 totally 1ms time-base: 4 10ms time-base: 16 100ms time-base: 108
Counters	64	128
Real-time clock	No	Yes, deviation less than 2 min/month@25°C

2.6.2 DI Specifications

Input type	Source/Sink
Rated input voltage	DC 24V ("1", when DC15~30V)
Rated input current	4.1mA@24VDC
Max input voltage of logic 0	5V@0.7mA
Minimum input voltage of logic 1	15V@2.5mA
Input filter time delay	5ms
Isolation between input and internal circuit · Mode · Voltage	 Opto-electrical isolation 1500VAC/1 min
Status indicator	Green LED

2.6.3 DC24V Output Specifications

Output type	Source
Rated power supply voltage · Reverse polarity protection	DC 24V Yes
Rated output voltage	DC 24V
Output current per channel	Max 750mA@24VDC
Output leakage current	Max 0.5цA
Output impedance	Max 0.2Ω
Output delay · off-to-on · on-to-off	 0.3--5μs 5μs
Isolation between output and internal circuit · Mode · Voltage	 Opto-electrical isolation 1,500VAC/1 min
Inductive load protection	Yes
Short-circuit protection	Yes (When output current per group exceeds 3A)
Parallel connection of outputs	Yes (in the same group)
Status indication	Green LED

2.6.4 Relay Output Specifications

Output type	Relay
Load voltage	DC30V/AC250V
Output current per channel	3A (DC30V/AC250V)
Output current per group	Max 10A
Output off-to-on delay	Max 10ms
Output on-to-off delay	Max 5ms
Max. switching rate · No load · Rated load	 12,000 times/min 100 times/min

Expected life of the contacts	
· Mechanical life (no-load)	20,000,000 times (1,200 tims/min)
· Electrical life (rated load)	100,000 times (6 times/min)
Isolation	
· Mode	Relay
· Between coil and contact	2000Vrms
· Between contacts	1000Vrms
Status indication	Green LED

Chapter III DI (Digital Input) Modules

This chapter will detailedly introduce the DI modules in Kinco-K3 series PLC. Hardware diagram, wiring diagram, technical data and other information of each module are to be described respectively.

All types of DI module are uniformly called PM321.

3.1 DI 8*DC24V

Order No.: Kinco-K321-08DX.

The module has 8 channels, and each channel is equipped with a LED to indicate the input status. It accepts digital input signals from the field and writes their status to the CPU's I area through the expansion bus. It provides opto-electrical isolation between the input signal and the internal circuit.

3.1.1 Main Features

- 8 input channels, divided into 2 groups, each group with 4 channels
- Source (common-cathode) / sink (common-anode) input optional for each group
- Rated input voltage DC24V, effective voltage range: 15~30V
- Opto-electrical isolation between the input signal and the internal circuit
- A green LED indicates for the channel status
- Module width 50mm

3.1.2 Front View

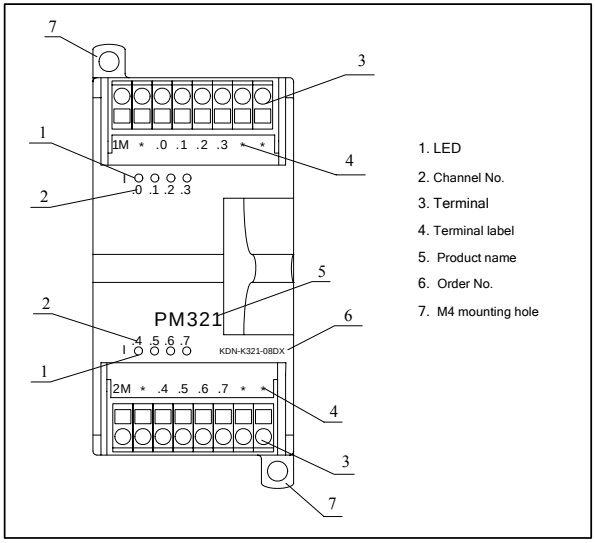


Diagram 3-1 Front View

3.1.3 Wiring Diagram & Block Diagram

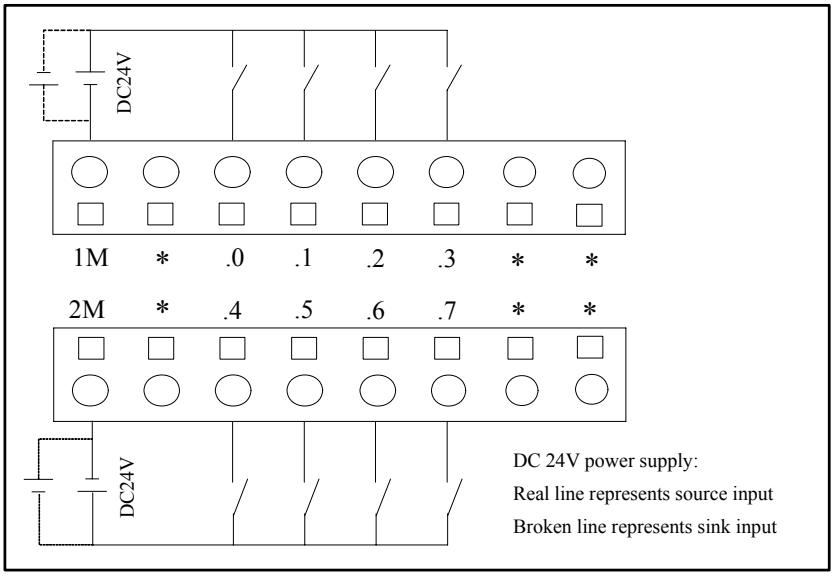


Diagram 3-2 Wiring Diagram

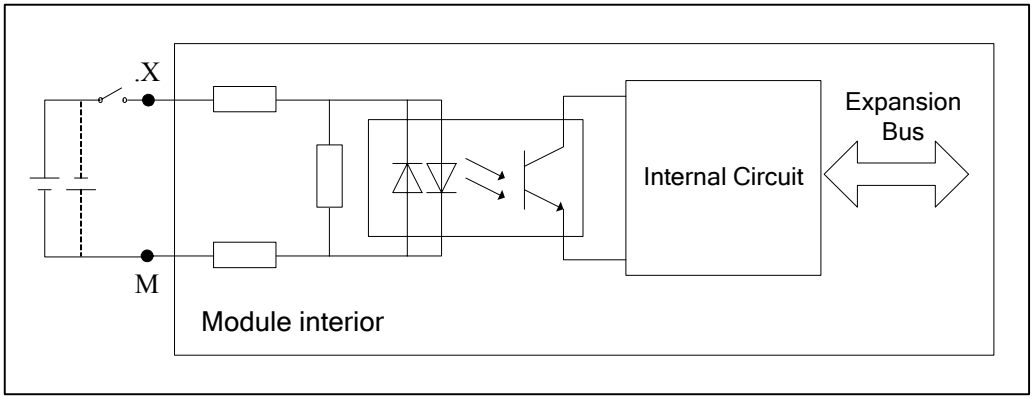


Diagram 3-3 Block Diagram

3.1.4 Installation Dimension

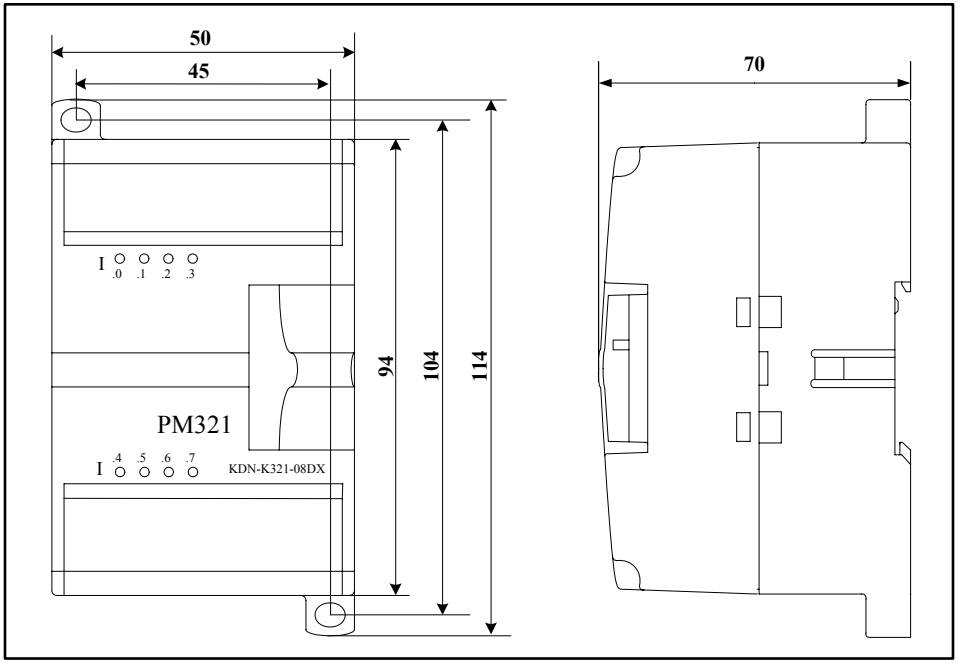


Diagram 3-4 Installation Dimension

3.1.5 Technical Data

Electrical Data		
Number of channels	8 (4 channels/group)	
Input type	Source/Sink	
Rated input voltage	DC 24V ("1", when DC15~30V)	
Rated input current	4.1mA@24VDC	
Max input voltage of logic 0	5V@0.7mA	
Minimum input voltage of logic 1	15V@2.5mA	
Input filter time delay	5ms	
Current consumption via expansion bus	5V	< 60mA
	24V	-
Isolation between input and internal circuit · Mode · Voltage	 Opto-electrical isolation 1500VAC/1 min	
Status indicator	Green LED	
Address occupied		
DI image area	1 byte	
DO image area	-	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	125g	

3.2 DI 16*DC24V

Order No.: Kinco-K321-16DX

The module has 16 channels, and each channel is equipped with a LED to indicate the input status. It accepts digital input signals from the field and writes their status to the CPU's I area through the expansion bus. It provides opto-electrical isolation between the input signal and the internal circuit.

3.2.1 Main Features

- 16 input channels, divided into 2 groups, each group with 8 channels
- Source (common-cathode) / sink (common-anode) input optional for each group
- Rated input voltage DC24V, effective voltage range: 15~30V
- Opto-electrical isolation between the input signal and the internal circuit
- A green LED indicates for the channel status
- Module width 75mm

3.2.2 Front View

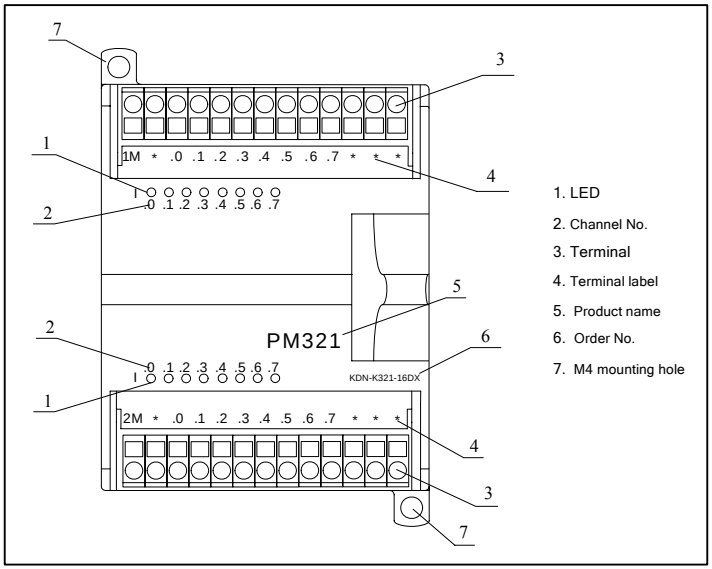


Diagram 3-5 Front View

3.2.3 Wiring Diagram & Block Diagram

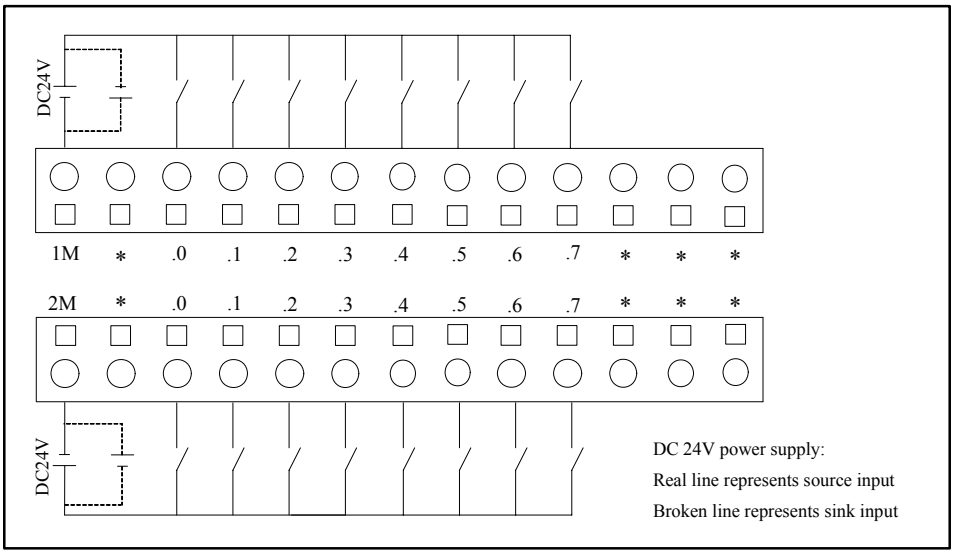


Diagram 3-6 Wiring Diagram

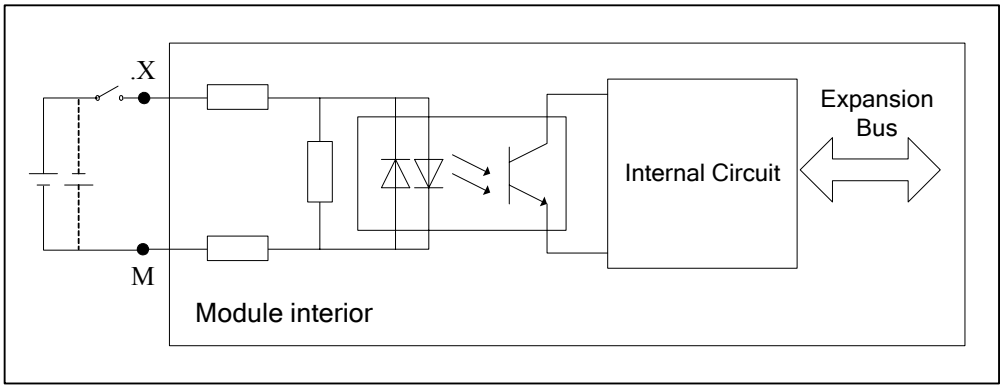


Diagram 3-7 Block Diagram

3.2.4 Installation Dimension

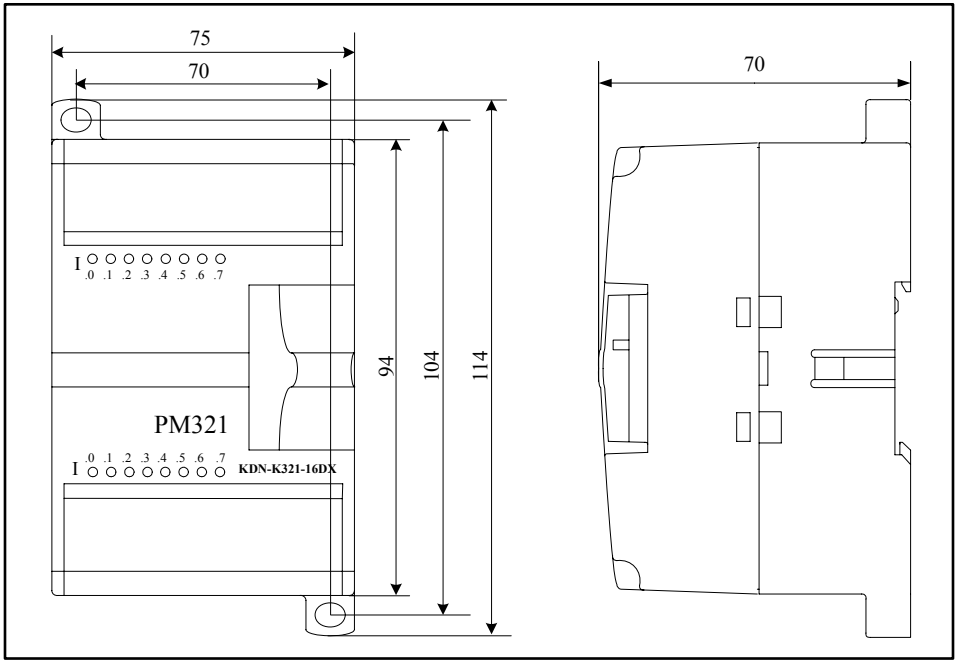


Diagram 3-8 Installation Dimension

3.2.5 Technical Data

Electrical data		
Number of channels	16 (8 channels/group)	
Input type	Source/sink	
Rated input voltage	DC 24V ("1", when DC15~30V)	
Rated input current	4.1mA@24VDC	
Max input voltage of "0"	5V@0.7mA	
Minimum input voltage of "1"	15V@2.5mA	
Input filter time delay	5ms	
Current consumption via expansion bus	5V	< 84mA
	24V	-
Isolation between input and internal circuit · Mode · Voltage	 Opto-electrical isolation 1500VAC/1 min	
Status indication	Green LED	
Address occupied		
DI image area	2 bytes	
DO image area	-	
Dimension and weight		
Dimension (L×W×H)	114×75×70mm	
Net weight	150g	

Chapter IV DO (Digital Output) Modules

This chapter will detailedly introduce the DO modules in Kinco-K3 series PLC. Hardware diagram, wiring diagram, technical data and other information of each module are to be described respectively.

All types of DO module are uniformly called PM322.

4.1 DO 8*DC24V

Order No: Kinco-K322-08DT

The module has 8 channels, and each channel is equipped with a LED to indicate the output status. It accepts control data from the expansion bus and converts to electrical signals by isolation and amplification to control the connected devices. The module requires a power supply of DC24V via the appropriate terminals.

4.1.1 Main Features

- 8 output channels, divided into 2 groups, each group with 4 channels
- Rated power supply voltage DC24V
- Rated output voltage DC24V, max output current of each channel is 750mA, source
- Reverse polarity protection on the power supply input
- Inductive load protection
- Short-circuit protection (when output current per group exceeds 3A)
- Allows parallel connection of outputs in the same group
- Opto-electrical isolation between the output signal and the internal circuit
- Module width 50mm

4.1.2 Front View

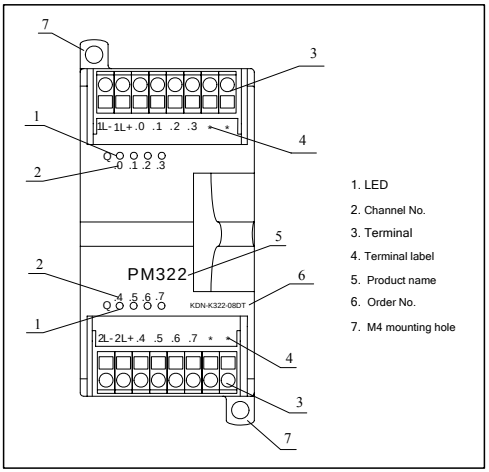


Diagram 4-1 Front View

4.1.3 Wiring Diagram & Block Diagram

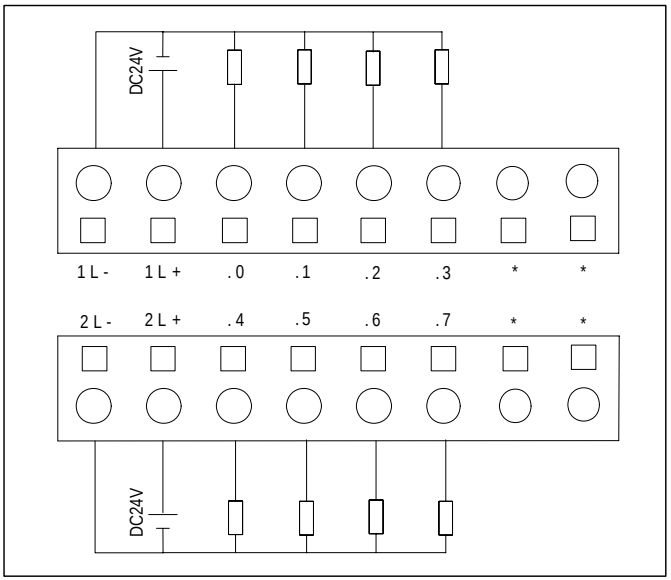


Diagram 4-2 Wiring Diagram

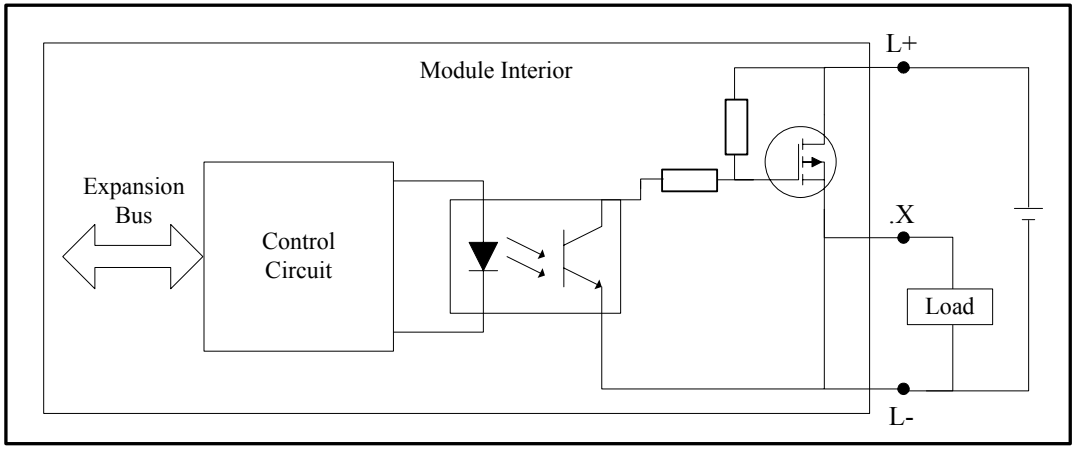


Diagram 4-3 Block Diagram

4.1.4 Installation Dimension

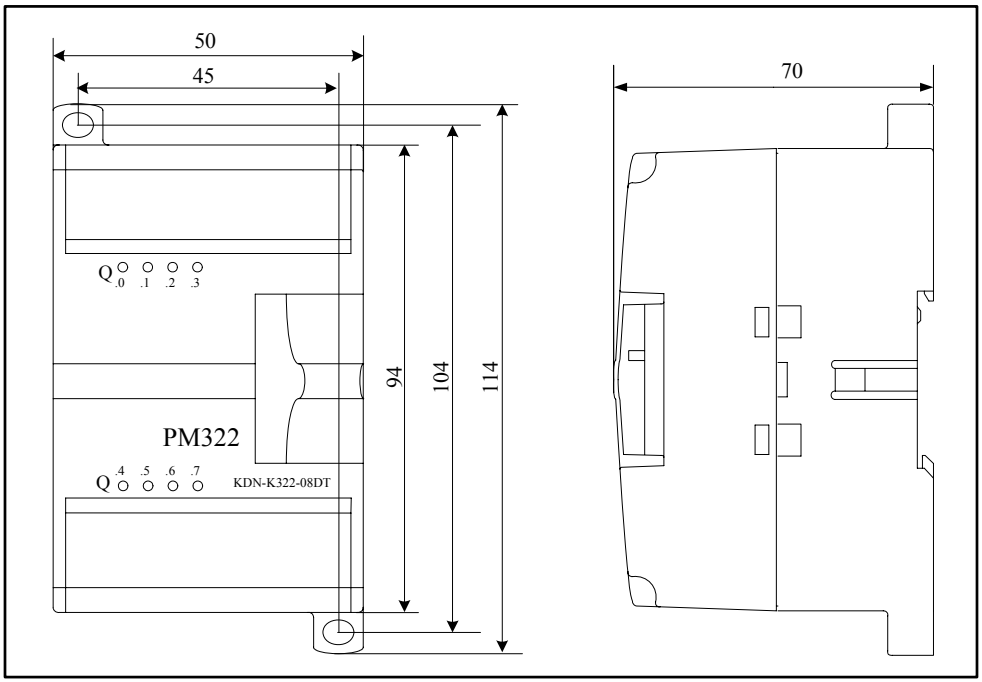


Diagram 4-4 Installation Dimension

4.1.5 Technical Data

Electrical data		
Number of output channels	8 (4 channels/group)	
Output type	Source	
Rated power supply voltage · Reverse polarity protection	DC 24V Yes	
Rated output voltage	DC 24V	
Output current per channel	Max 750mA@24VDC	
Output leakage current	Max 0.5μA	
Output impedance	Max 0.2Ω	
Output delay · off-to-on · on-to-off	 0.3--5μs 5μs	
Current consumption via expansion bus	5V	<62.6mA
	24V	-
Isolation between output and internal circuit · Mode · Voltage	 Opto-electrical isolation 1,500VAC/1 min	
Inductive load protection	Yes	
Short-circuit protection	Yes (when output current per group exceeds 3A)	
Parallel connection of outputs	Yes (in the same group)	
Status indication	Green LED	
Address occupied		
DI image area	-	
DO image area	1 byte	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	125g	

4.2 DO 8*relay

Order No.: Kinco-K322-08XR

The module has 8 relay-output channels, and each channel is equipped with a LED to indicate the output status. It accepts control data from the expansion bus and converts to electrical signals to control the connected devices via relay outputs. The module derives working power from the expansion bus. The load voltage must be connected to the appropriate terminals.

4.2.1 Main Features

- 8 relay-output channels, divided into 2 groups, each group with 4 channels
- External load voltage (max.) DC30V/AC250V
- Output current per channel (max.) 3A (DC30V/AC250V)
- Module width 50mm

4.2.2 Front View

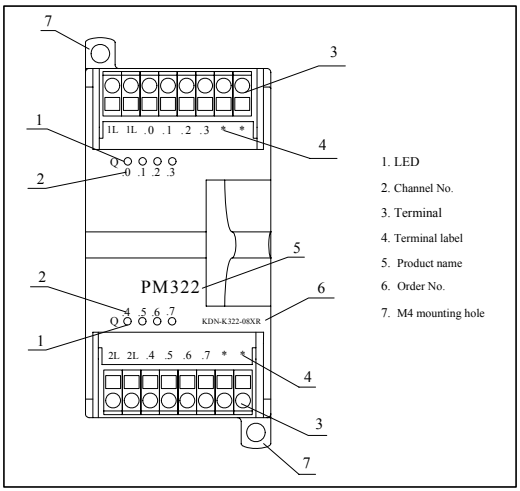


Diagram 4-5 Front View

4.2.3 Wiring Diagram & Block Diagram

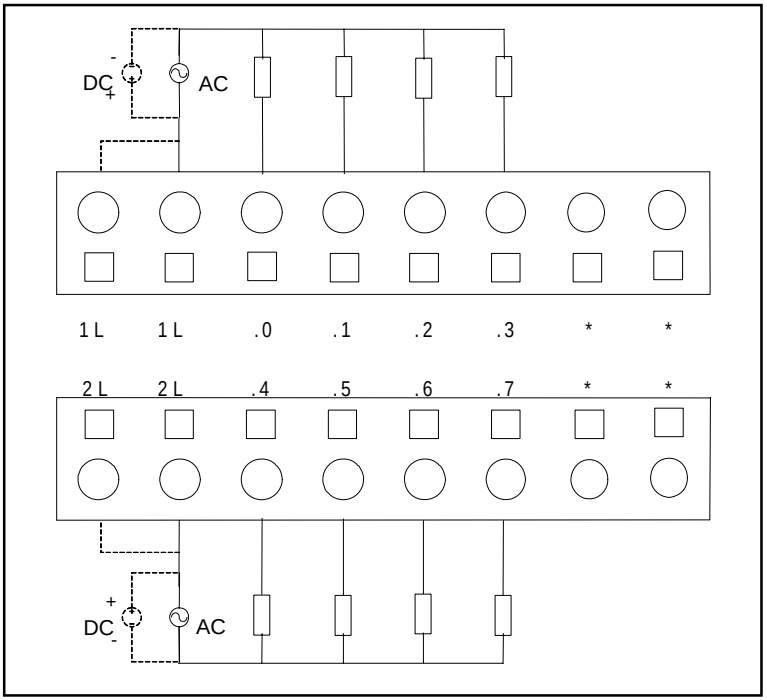


Diagram 4-6 Wiring Diagram

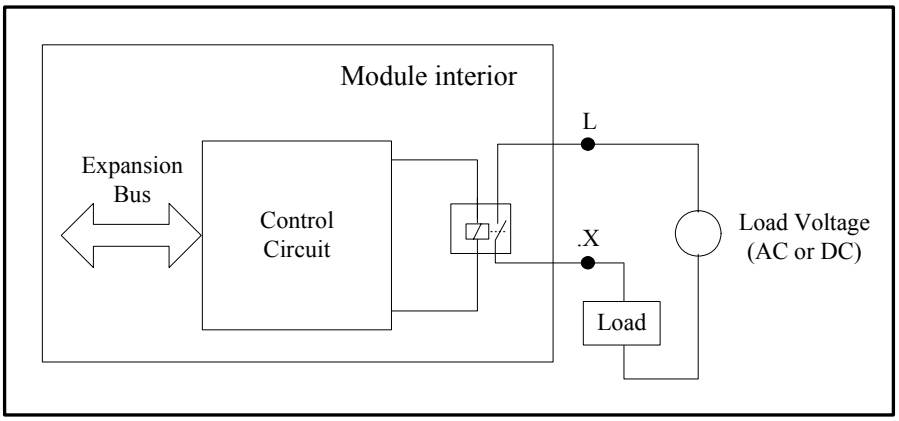


Diagram 4-7 Block Diagram

4.2.4 Installation Dimension

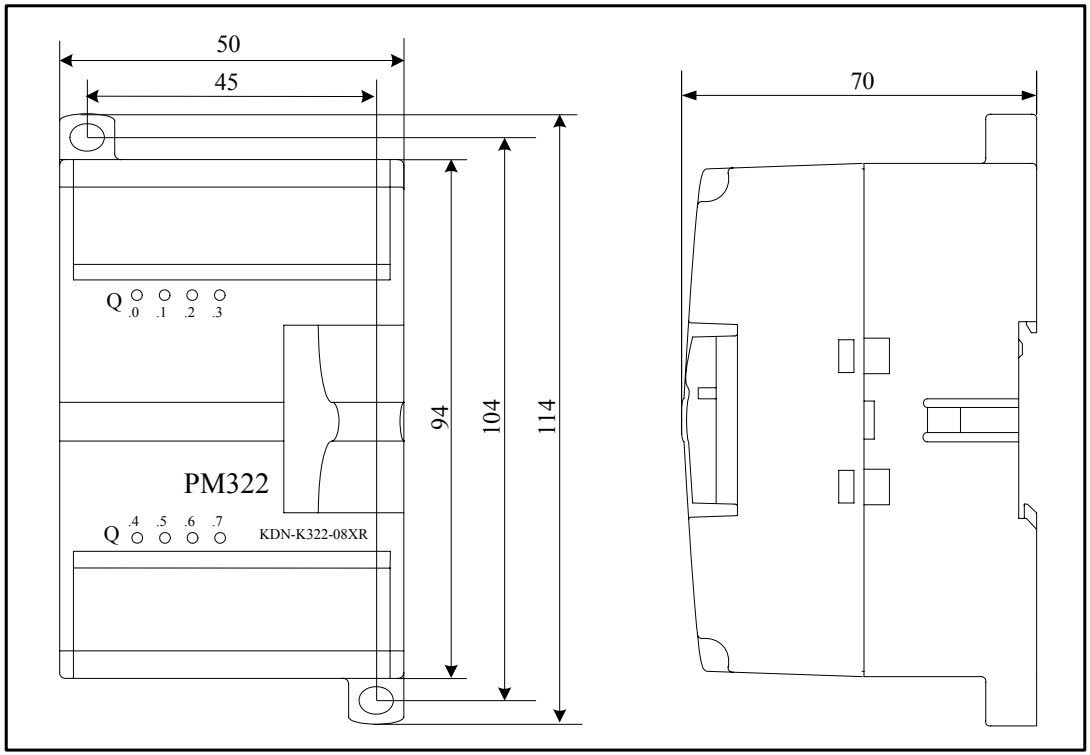


Diagram 4-8 Installation Dimension

4.2.5 Technical Data

Electrical data		
Number of relay outputs	8 (4 channels/group)	
Load voltage	Max DC 30V/AC250V	
Output current per channel	Max 3A (DC 30V/AC250V)	
Output current per group	Max 10A	
Output off-to-on delay	Max 10ms	
Output on-to-off delay	Max 5ms	
Current consumption via expansion bus	5V	< 67.6mA
	24V	< 42mA
Max. switching rate · No load · Rated load	 12,000 times/min 100 times/min	
Expected life of the contacts · Mechanical life (no-load) · Eectrical life (rated load)	 20,000,000 times (1200 times/min) 100,000 times (6 times/min)	
Isolation · Mode · Between coil and contact · Between contacts	 Relay 2000Vrms 1000Vrms	
Status indication	Green LED	
Address occupied		
DI image area	-	
DO image area	1 byte	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	150g	

4.3 DO 16*DC24V

Order No.: Kinco-K322-16DT

The module has 16 channels, and each channel is equipped with a LED to indicate the output status. It accepts control data from the expansion bus and converts to electrical signal by isolation and amplification to control the connected devices. The module requires a power supply of DC24V via the appropriate terminals.

4.3.1 Main Features

- 16 output channels, divided into 4 groups, each group with 4 channels
- Rated power supply voltage DC24V
- Rated output voltage DC24V, max output current of each channel is 750mA, source
- Reverse polarity protection on the power supply input
- Inductive load protection
- Short-circuit protection (when output current of each group exceeds 3A)
- Allows parallel connection of outputs in the same group
- Opto-electrical isolation between the output signal and the internal circuit
- Module width 75mm

4.3.2 Front View

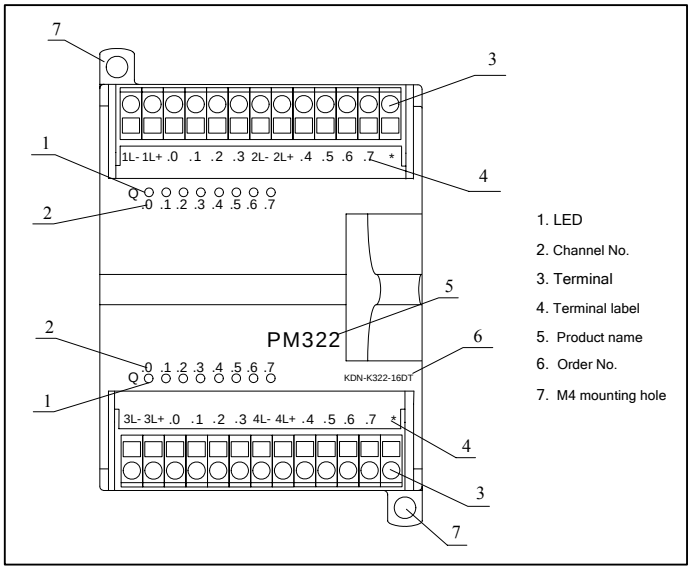


Diagram 4-9 Front View

4.3.3 Wiring Diagram & Block Diagram

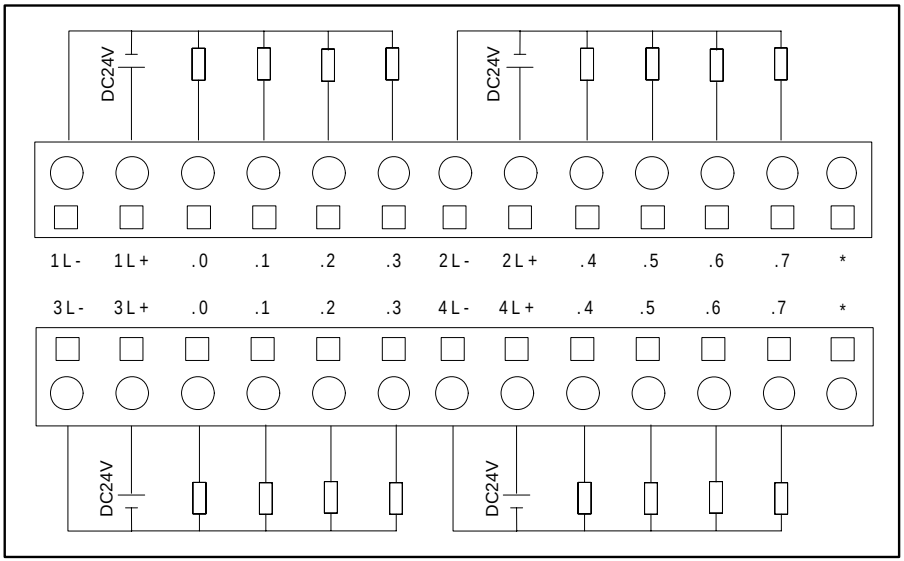


Diagram 4-10 Wiring Diagram

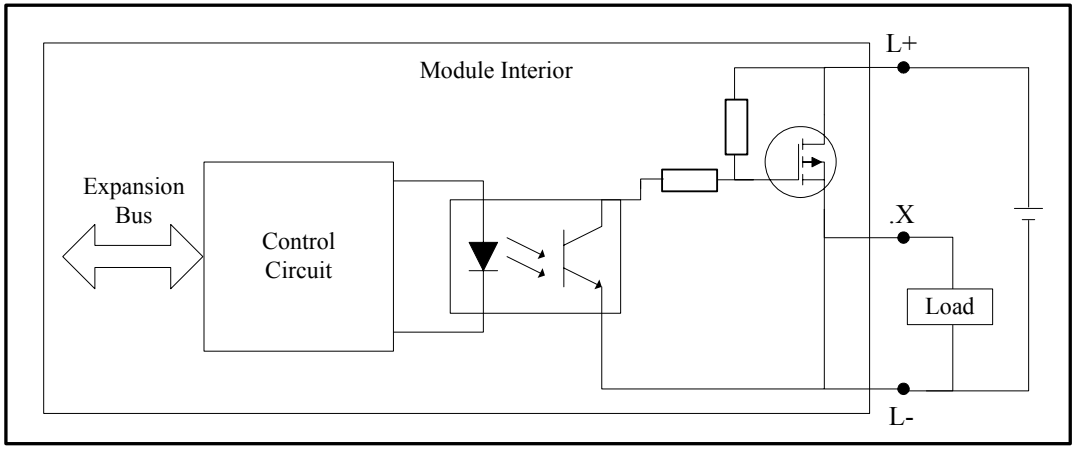


Diagram 4-11 Block Diagram

4.3.4 Installation Dimension

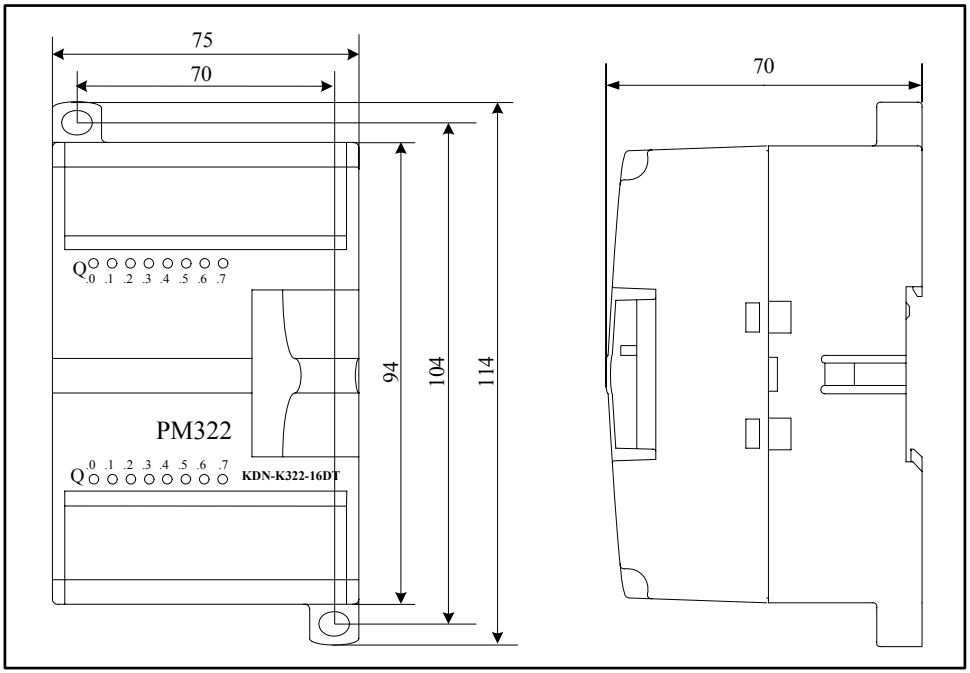


Diagram 4-12 Installation Dimension

4.3.5 Technical Data

Electrical data		
Number of output channels	8 (4 channels/group)	
Output type	Source	
Rated power supply voltage · Reverse polarity protection	DC 24V Yes	
Rated output voltage	DC 24V	
Output current per channel	Max 750mA@24VDC	
Output leakage current	Max 0.5цA	
Output impedance	Max 0.2Ω	
Output delay · off-to-on · on-to-off	 0.3--5μs 5μs	
Current consumption via expansion bus	5V	< 93.6mA
	24V	-
Isolation between output and internal circuit · Mode · Voltage	 Opto-electrical isolation 1,500VAC/1 min	
Inductive load protection	Yes	
Short-circuit protection	Yes (when output current per group exceeds 3A)	
Parallel connection of outputs	Yes (in the same group)	
Status indication	Green LED	
Address occupied		
DI image area	-	
DO image area	2 bytes	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	125g	

4.4 DO 16*Relay

Order No.: Kinco-K322-16XR

The module has 16 relay-output channels, and each channel is equipped with a LED to indicate the output status. It accepts control data from the expansion bus and converts to electrical signal to control the connected devices via relay outputs. The module derives working power from the expansion bus. The load voltage must be connected to the appropriate terminals.

4.4.1 Main Features

- 16 relay-output channels, divided into 4 groups, each group with 4 channels
- External load voltage (max.) DC30V/AC250V
- Output current per channel (max.) 3A (DC30V/AC250V)
- Module width 75mm

4.4.2 Front View

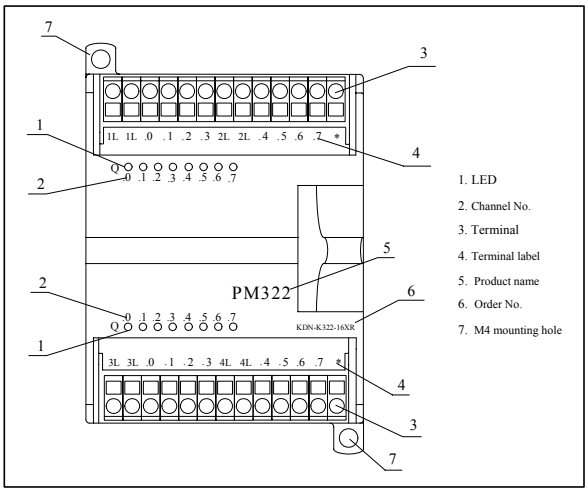


Diagram 4-13 Front View

4.4.3 Wiring Diagram & Block Diagram

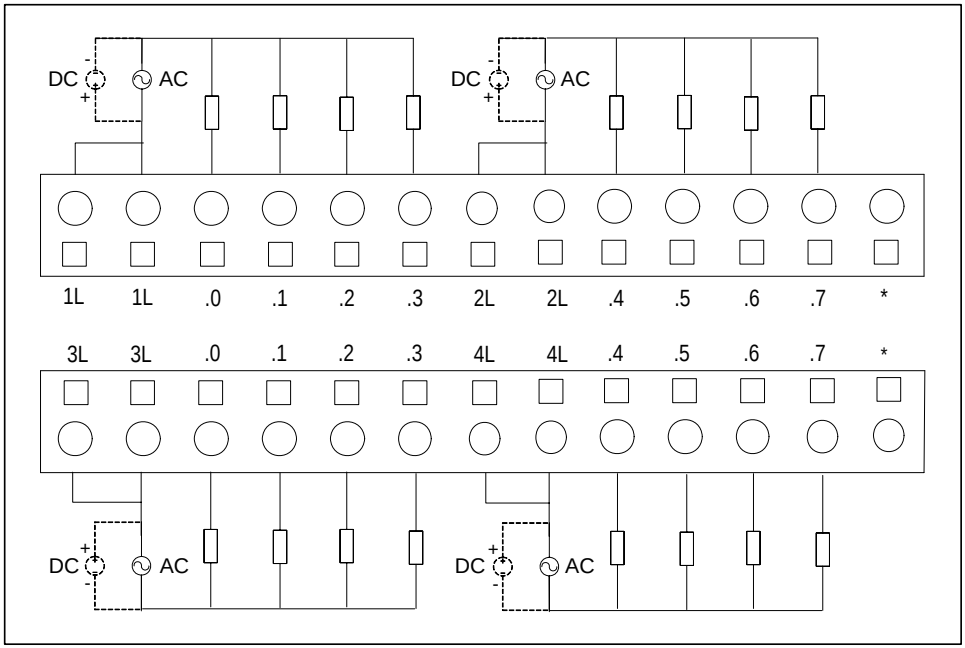


Diagram 4-14 Wiring Diagram

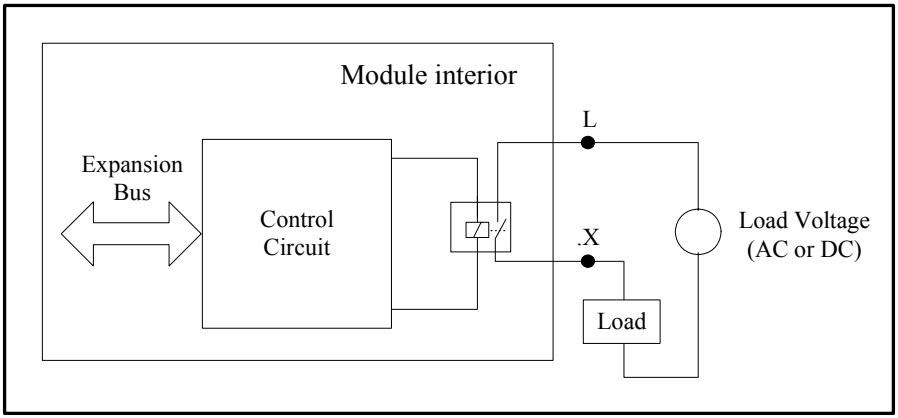


Diagram 4-15 Block Diagram

4.4.4 Installation Dimension

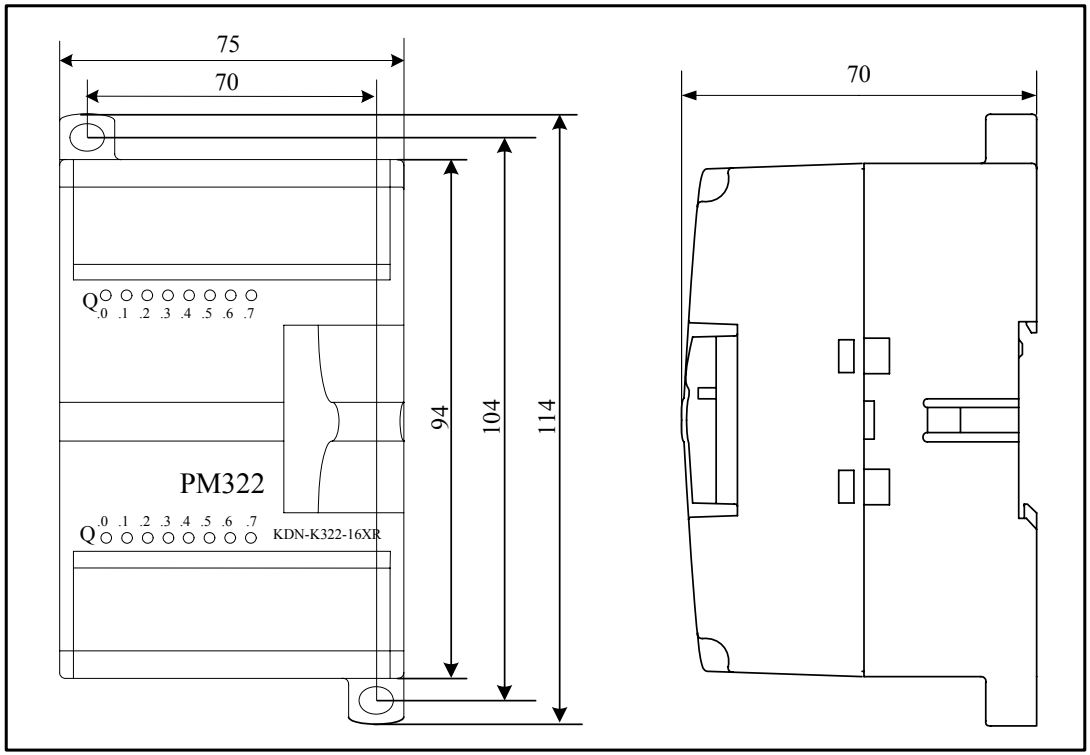


Diagram 4-16 Installation Dimension

4.4.5 Technical Data

Electrical data		
Number of relay outputs	16 (4 channels/group)	
Load voltage	Max DC 30V/AC250V	
Output current per channel	Max 3A (DC 30V/AC250V)	
Output current per group	Max 10A	
Output off-to-on delay	Max 10ms	
Output on-to-off delay	Max 5ms	
Current consumption via expansion bus	5V	<100mA
	24V	< 82mA
Max. switching rate · No load · Rated load	 12,000 times/min 100 times/min	
Expected life of the contacts · Mechanical life (no-load) · Electrical life (rated load)	 20,000,000 times (1200 times/min) 100,000 times (6 times/min)	
Isolation · Mode · Between coil and contact · Between contacts	 Relay 2000Vrms 1000Vrms	
Status indication	Green LED	
Address space occupied		
DI image area	-	
DO image area	2 bytes	
Dimension and weight		
Dimension (L×W×H)	114×75×70mm	
Net weight	235g	

Chapter V DIO, DI/O Modules

This chapter will detailedly introduce the DIO and DI/O modules in Kinco-K3 series PLC. Hardware diagram, wiring diagram, technical data and other information of each module are to be described respectively.

In the chapter, DIO module refers to the combination module on which all the channels can be used as DI or DO. Each channel on the module has both DI and DO characteristics, occupies two addresses in DI image area and DO image area. DI/O module refers to the module on which a certain number of DI and DO channels are provided. Each channel has the unique function and cannot be used for other purposes. These two types of modules are uniformly called PM323.

5.1 DIO 8*DC24V

Order No.: Kinco-K323-08DTX.

This module is a combination module. It has 8 channels each of which can be used as DI or DO (source) channel. The input voltage and the supply voltage are all DC24V. Each channel occupies 1 bit in the I area and 1 bit in the Q area, i.e. each channel has 2 addresses: a DI address and a DO address, the addresses are configured in KincoBuilder and then downloaded into the PLC. Each channel is provided with a diagnostic function, i.e. when an output is active the respective input is set to "1".

As for whether a channel is used as DI or DO, It does not need any additional configuration or operation and needs only to change the external wiring according to actual demands. But attention shall be paid to the user program: provided a channel is actually used as DI, access to the channel's DO address should be avoided; and vice versa, if a channel is actually used as DO, access to the channel's DI address should be avoided.

Each channel is equipped with a LED to indicate its status.

5.1.1 Main Features

- 8 channels, divided into 2 groups, each group with 4 channels, and each channel can be used as DI or DO

- Rated power supply voltage DC24V
- Rated input voltage DC24V, source
- Rated output voltage DC24V, max output current of each channel 750mA, source
- Reverse polarity protection on the power supply input
- Inductive load protection
- Short-circuit protection (when output current of each group exceeds 3A)
- Allows parallel connection of outputs in the same group
- Opto-electrical isolation between the output signal and the internal circuit
- Module width 50mm

5.1.2 Front View

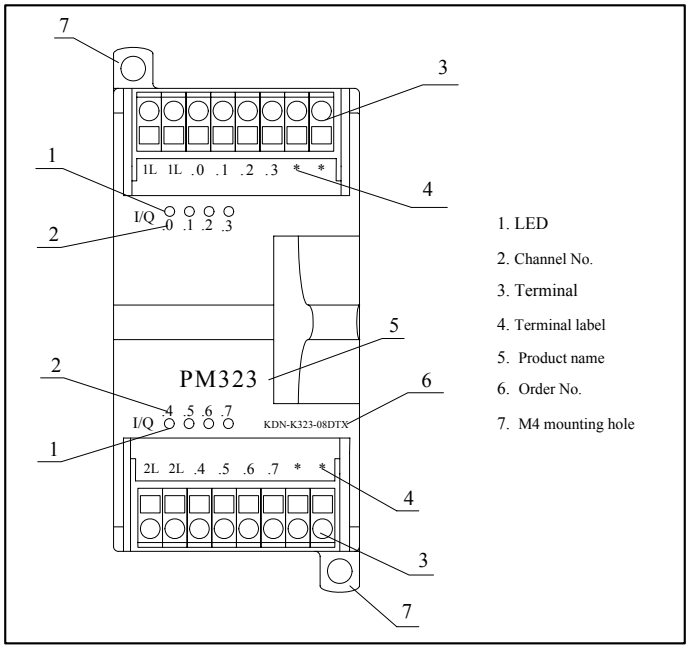


Diagram 5-1 Front View

5.1.3 Wiring Diagram & Block Diagram

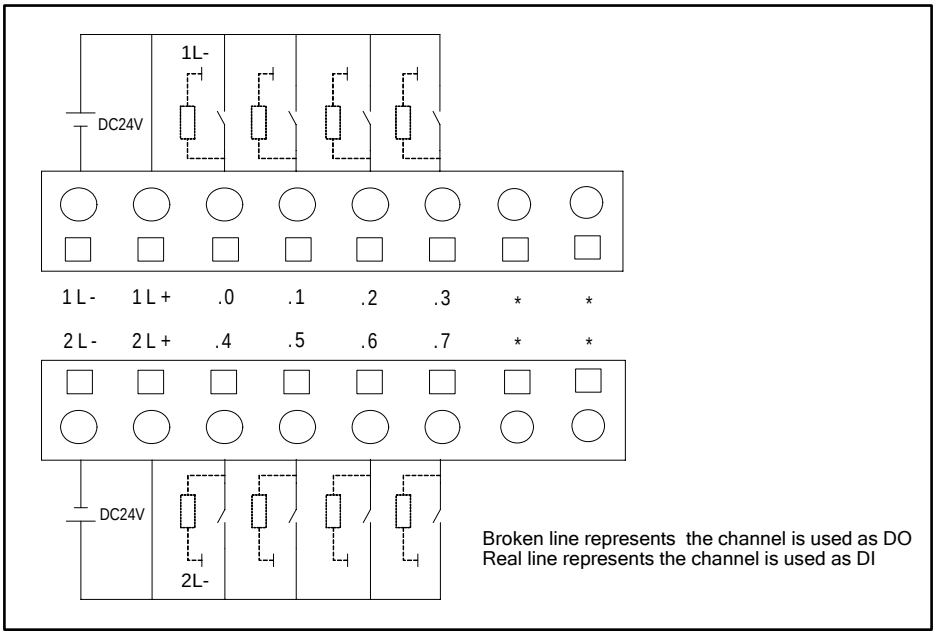


Diagram 5-2 Wiring Diagram

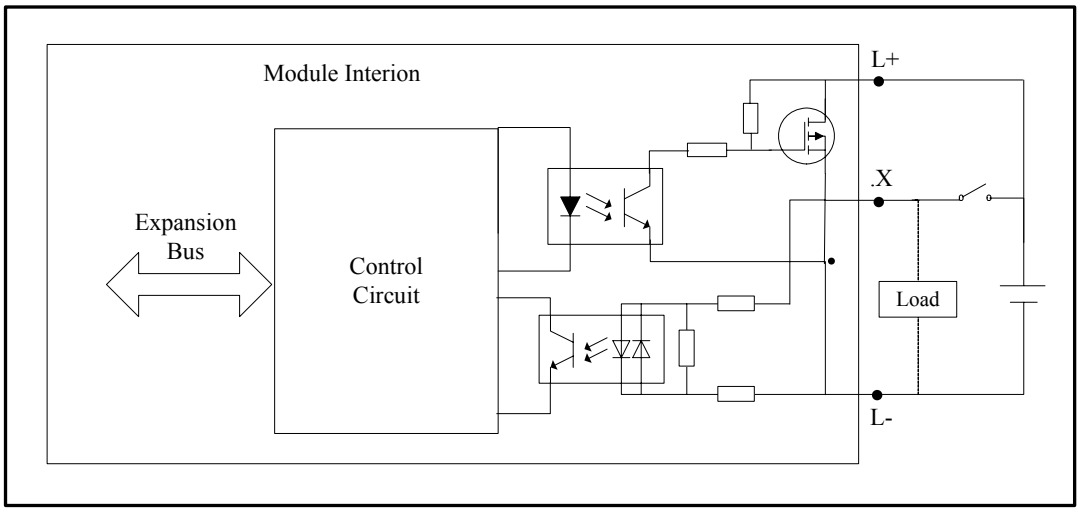


Diagram 5-3 Block Diagram

5.1.4 Installation Dimension

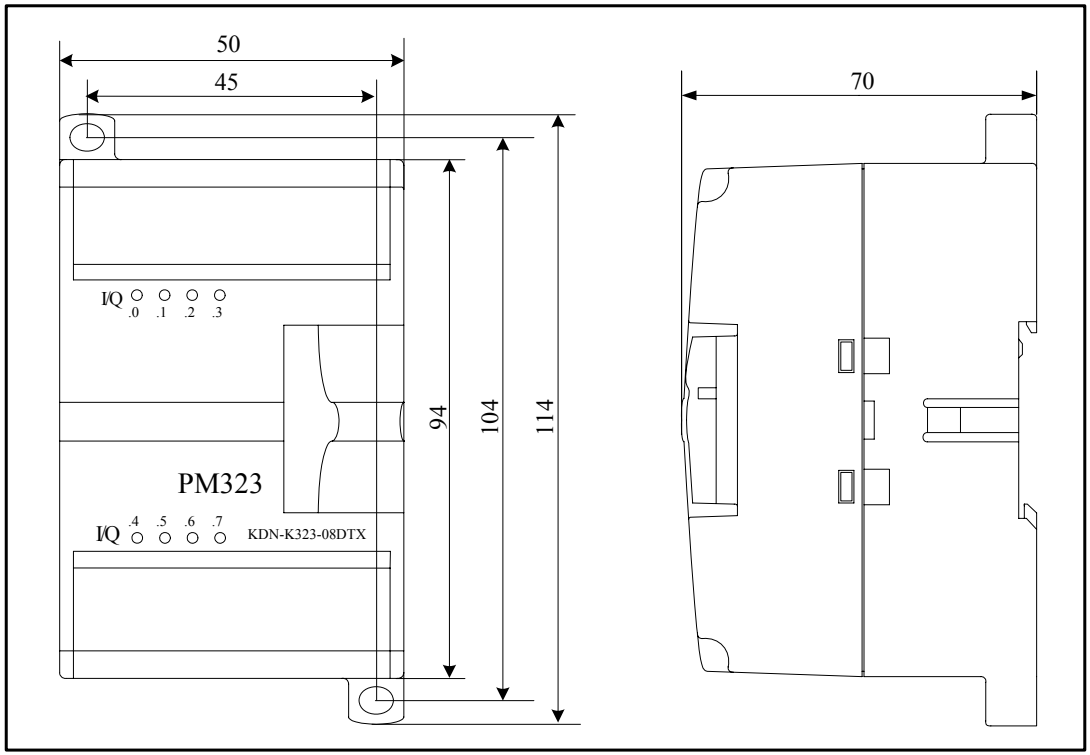


Diagram 5-4 Installation Dimension of Kinco-K323-08DTX

5.1.5 Technical Data

Electrical data	
Channel number	8 (4 channels/group) Each can be used as DI or DO
Intput/output type	Source
Rated power supply voltage · Reverse polarity protection	DC 24V Yes

Rated output voltage	DC 24V	
Output current	Max 750mA@24VDC	
Output impedance	Max 0.2Ω	
Output delay · off-to-on · on-to-off	 0.3--5μs 5μs	
Rated input voltage	DC 24V ("1", when DC15~30V)	
Rated input current	4.1mA@24VDC	
Max input voltage of Logic "0"	5V@0.7mA	
Minimum input voltage of Logic "1"	15V@2.5mA	
Input filter time delay	5ms	
Current consumption via expansion bus	5V	< 95.8mA
	24V	-
Isolation between output and internal circuit · Mode · Voltage	 Opto-electrical isolation 1,500VAC/1 min	
Inductive load protection	Yes	
Short-circuit protection	Yes (when output current per group exceeds 3A)	
Parallel connection of outputs	Yes (in the same group)	
Status indication	Green LED	
Address occupied		
DI image area	1 byte	
DO image area	1 byte	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	130g	

5.2 DI/O, DI4*DC24V DO4*DC24V

Order No.: Kinco-K323-08DT

This module has 8 channels. 4 channels operate as inputs and 4 as outputs.

Each channel is equipped with a LED to indicate its status.

5.2.1 Main Features

- 8 channels, therein DI 4*DC24V (divided into 1 group), DO 4*DC24V (divided into 1 group)
- Source (common-cathode) / sink (common-anode) input optional for each DI group
- Rated input voltage DC24V, effective voltage range: 15~30V
- Opto-electrical isolation between the input signal and the internal circuit
- Rated power supply voltage DC24V for outputs
- Rated output voltage DC24V, max output current of each channel is 750mA, source
- Reverse polarity protection on the power supply input
- Inductive load protection for DO channel
- Short-circuit protection for DO channel (when output current of each group exceeds 3A)
- Allows parallel connection of outputs in the same group
- Opto-electrical isolation between the output signal and the internal circuit
- Module width 50mm

5.2.2 Front View

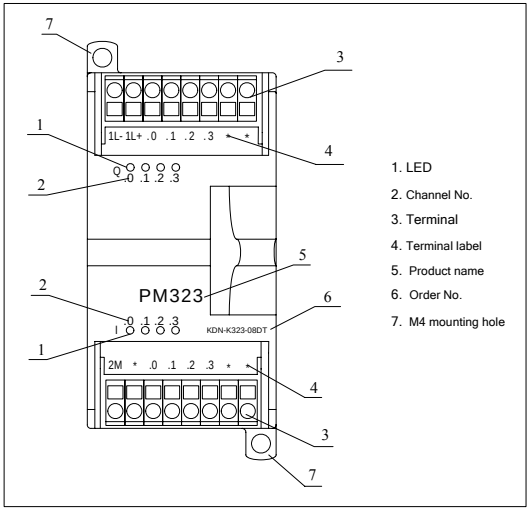


Diagram 5-5 Front View

5.2.3 Wiring Diagram

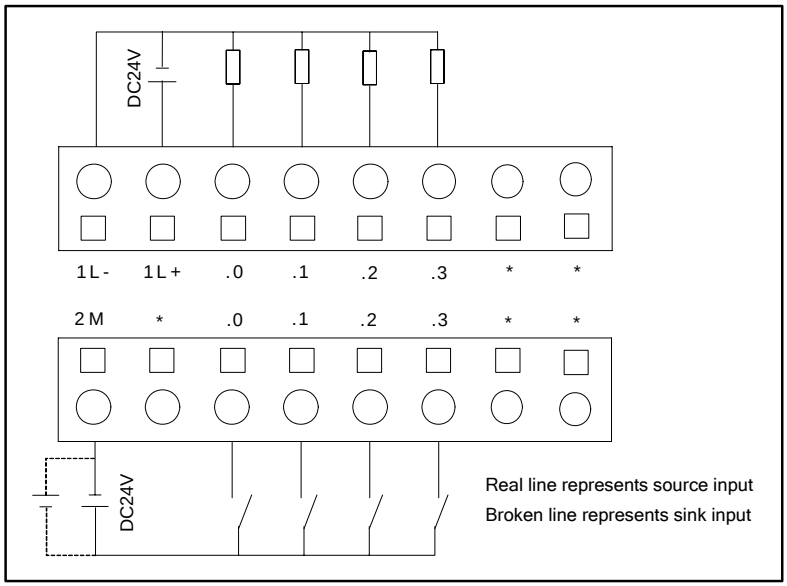


Diagram 5-6 Wiring Diagram

5.2.4 Installation Dimension

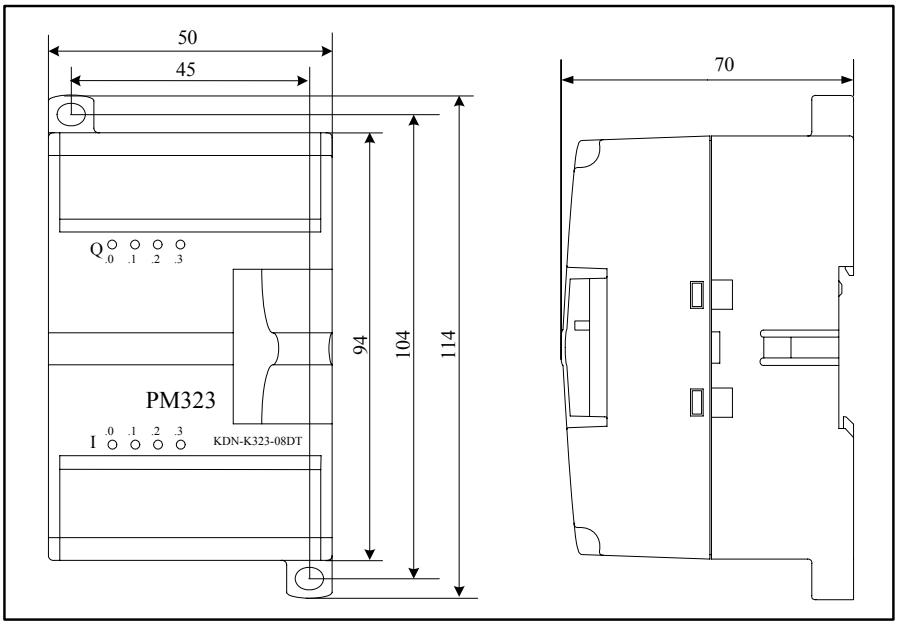


Diagram 5-7 Installation Dimension

5.2.5 Technical Data

Electrical data	
Number of inputs	4 (4 channels/group)
Input type	Source/Sink
Rated input voltage	DC 24V ("1", when DC15~30V)
Rated input current	4.1mA@24VDC
Max input voltage of logic 0	5V@0.7mA
Minimum input voltage of logic 1	15V@2.5mA
Input filter time delay	5ms
Isolation between input and internal circuit · Mode · Voltage	 Opto-electrical isolation 1500VAC/1 min

Number of output channels	4 (4 channels/group)	
Output type	Source	
Rated power supply voltage · Reverse polarity protection	DC 24V Yes	
Rated output voltage	DC 24V	
Output current per channel	Max 750mA@24VDC	
Output leakage current	Max 0.5μA	
Output impedance	Max 0.2Ω	
Output delay · off-to-on · on-to-off	 0.3--5μs 5μs	
Isolation between output and internal circuit · Mode · Voltage	 Opto-electrical isolation 1,500VAC/1 min	
Inductive load protection	Yes	
Short-circuit protection	Yes (when output current per group exceeds 3A)	
Parallel connection of outputs	Yes (in the same group)	
Current consumption via expansion bus	5V	< 65.8mA
	24V	-
Status indication	Green LED	
Address occupied		
DI image area	1 byte	
DO image area	1 byte	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	125g	

5.3 DI/O, DI 4*DC24V DO 4*Relay

Order No.: Kinco-K323-08DR

This module has 8 channels. 4 channels operate as inputs and 4 as relay outputs.

Each channel is equipped with a LED to indicate its status.

5.3.1 Main Features

- 8 channels, therein DI 4*DC24V (divided into 1 group), DO 4*Relay (divided into 1 group)
- Source (common-cathode) / sink (common-anode) input optional for each DI group
- Rated input voltage DC24V, effective voltage range: 15~30V
- Opto-electrical isolation between the input signal and the internal circuit
- External load voltage (max.) DC30V/AC250V
- Output current per channel (max.) 3A (DC30V/AC250V)
- Module width 50mm

5.3.2 Front View

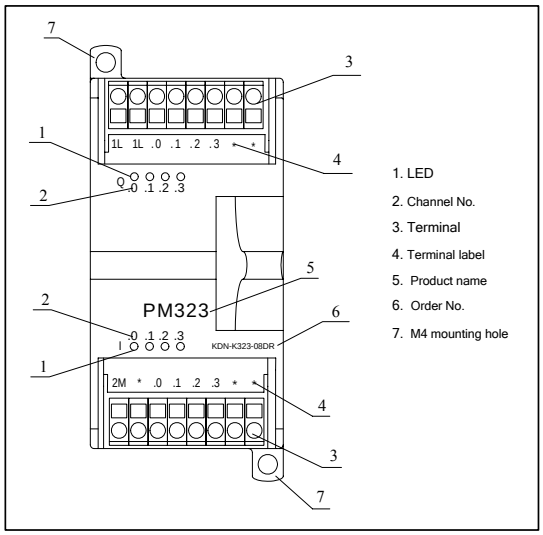


Diagram 5-8 Front View

5.3.3 Wiring Diagram

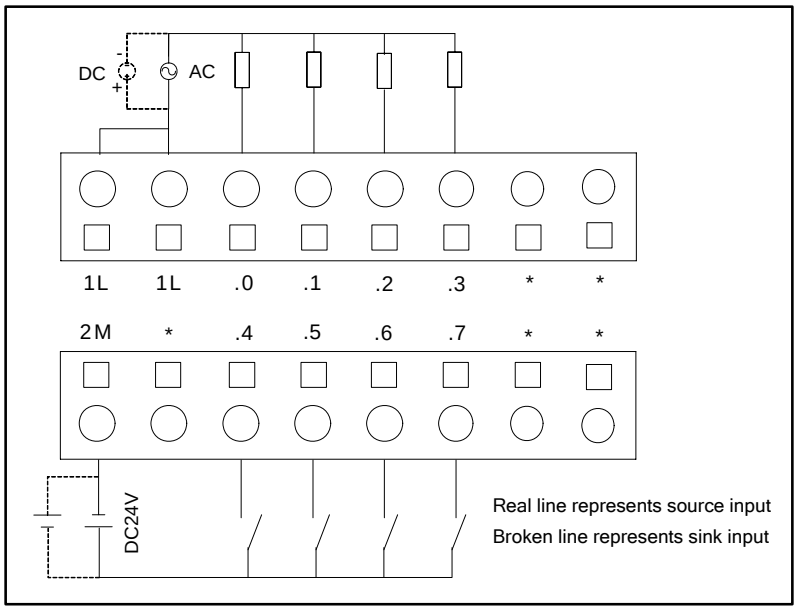


Diagram 5-9 Wiring Diagram

5.3.4 Installation Dimension

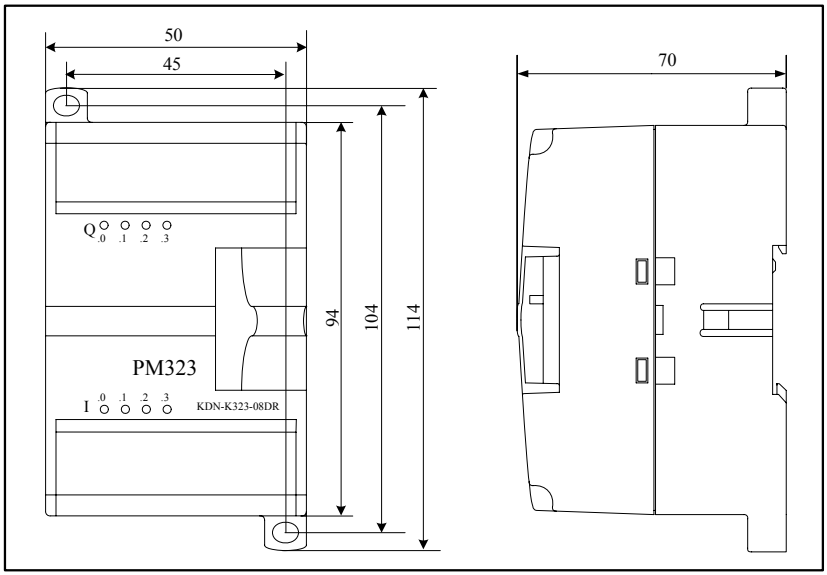


Diagram 5-10 Installation Dimension

5.3.5 Technical Data

Electrical Parameter	
Number of inputs	4 (4 channels/group)
Input type	Source/Sink
Rated input voltage	DC 24V ("1", when DC15~30V)
Rated input current	4.1mA@24VDC
Max input voltage of logic 0	5V@0.7mA
Minimum input voltage of logic 1	15V@2.5mA
Input filter time delay	5ms
Isolation between input and internal circuit · Mode · Voltage	 Opto-electrical isolation 1500VAC/1 min

Number of relay outputs	4 (4 channels/group)	
Load voltage	Max DC 30V/AC250V	
Output current per channel	Max 3A (DC 30V/AC250V)	
Output current per group	Max 10A	
Output off-to-on delay	Max 10ms	
Output on-to-off delay	Max 5ms	
Max. switching rate · No load · Rated load	 12,000 times/min 100 times/min	
Expected life of the contacts · Mechanical life (no-load) · Electrical life (rated load)	 20,000,000 times (1200 times/min) 100,000 times (6 times/min)	
Isolation · Mode · Between coil and contact · Between contacts	 Relay 2000Vrms 1000Vrms	
Current consumption via expansion bus	5V	< 67.4mA
	24V	< 22.0mA
Status indication	Green LED	
Address occupied		
DI image area	1 byte	
DO image area	1 byte	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	145g	

5.4 DI/O, DI 8*DC24V DO 8*DC24V

Order No.: Kinco-K323-16DT

This module has 16 channels. 8 channels operate as inputs and 8 as outputs.

Each channel is equipped with a LED to indicate its status.

5.4.1 Main Features

- 16 channels, therein DI 8*DC24V (divided into 1 group), DO 8*DC24V (divided into 2 group)
- Source (common-cathode) / sink (common-anode) input optional for each DI group
- Rated input voltage DC24V, effective voltage range: 15~30V
- Opto-electrical isolation between the input signal and the internal circuit
- Rated power supply voltage DC24V for outputs
- Rated output voltage DC24V, max output current of each channel is 750mA, source
- Reverse polarity protection on the power supply input
- Inductive load protection for DO channel;
- Short-circuit protection for DO channel (when output current of each group exceeds 3A)
- Allows parallel connection of outputs in the same group
- Opto-electrical isolation between the output signal and the internal circuit
- Module width 75mm

5.4.2 Front View

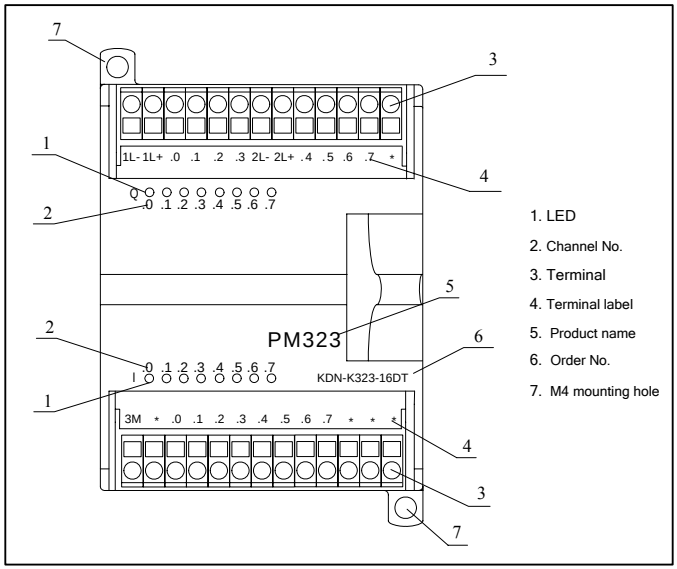


Diagram 5-11 Front View

5.4.3 Wiring Diagram

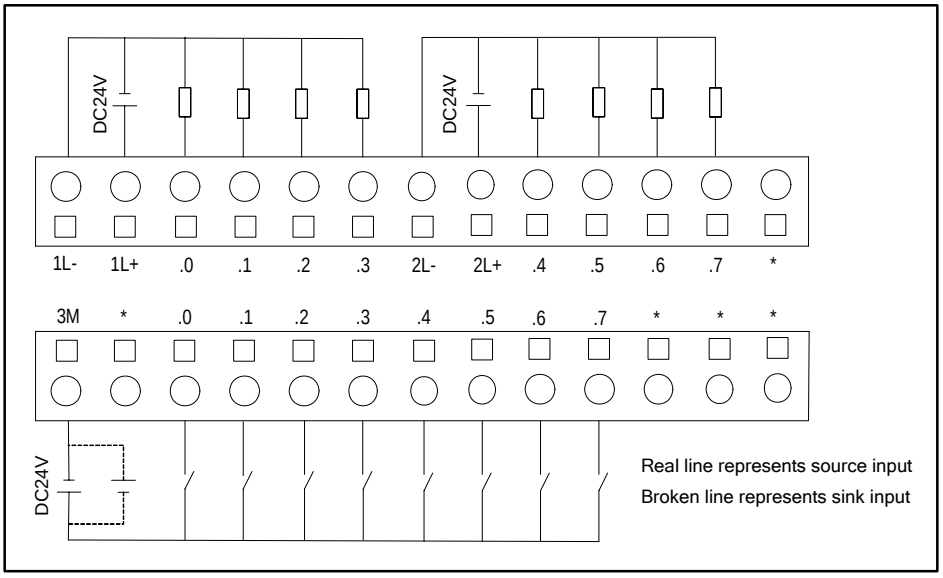


Diagram 5-12 Wiring Diagram

5.4.4 Installation Dimension

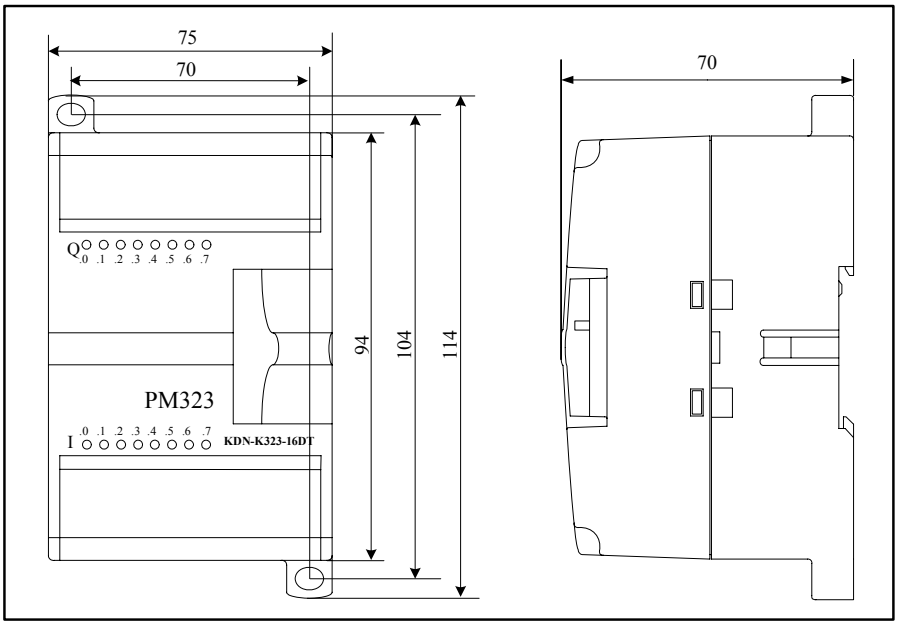


Diagram 5-13 Installation Dimension

5.4.5 Technical Data

Electrical data	
Number of inputs	8 (8 channels/group)
Input type	Source/Sink
Rated input voltage	DC 24V ("1", when DC15~30V)
Rated input current	4.1mA@24VDC
Max input voltage of logic 0	5V@0.7mA
Minimum input voltage of logic 1	15V@2.5mA
Input filter time delay	5ms
Isolation between input and internal circuit · Mode · Voltage	 Opto-electrical isolation 1500VAC/1 min

Number of output channels	8 (4 channels/group)	
Output type	Source	
Rated power supply voltage · Reverse polarity protection	DC 24V Yes	
Rated output voltage	DC 24V	
Output current per channel	Max 750mA@24VDC	
Output leakage current	Max 0.5μA	
Output impedance	Max 0.2Ω	
Output delay · off-to-on · on-to-off	 0.3--5μs 5μs	
Isolation between output and internal circuit · Mode · Voltage	 Opto-electrical isolation 1,500VAC/1 min	
Inductive load protection	Yes	
Short-circuit protection	Yes (when output current per group exceeds 3A)	
Parallel connection of outputs	Yes (in the same group)	
Status indication	Green LED	
Current consumption via expansion bus	5V	< 95.8mA
	24V	-
Address occupied		
DI image area	1 byte	
DO image area	1 byte	
Dimension and weight		
Dimension (L×W×H)	114×75×70mm	
Net weight	160g	

5.5 DI/O, DI 8*DC24V DO 8*Relay

Order No.: Kinco-K323-16DR

This module has 16 channels. 8 channels operate as inputs and 8 as relay outputs.

Each channel is equipped with a LED to indicate its status.

5.5.1 Main Features

- 8 channels, therein DI 8*DC24V (divided into 1 group), DO 8*Relay (divided into 1 group)
- Source (common-cathode) / sink (common-anode) input optional for each DI group
- Rated input voltage DC24V, effective voltage range: 15~30V
- Opto-electrical isolation between the input signal and the internal circuit
- External load voltage (max.) DC30V/AC250V
- Output current per channel (max.) 3A (DC30V/AC250V)
- Module width 75mm

5.5.2 Front View

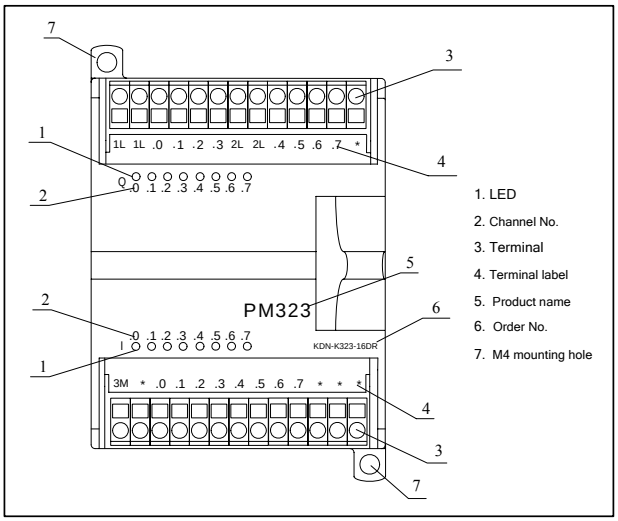


Diagram 5-14 Front View

5.5.3 Wiring Diagram

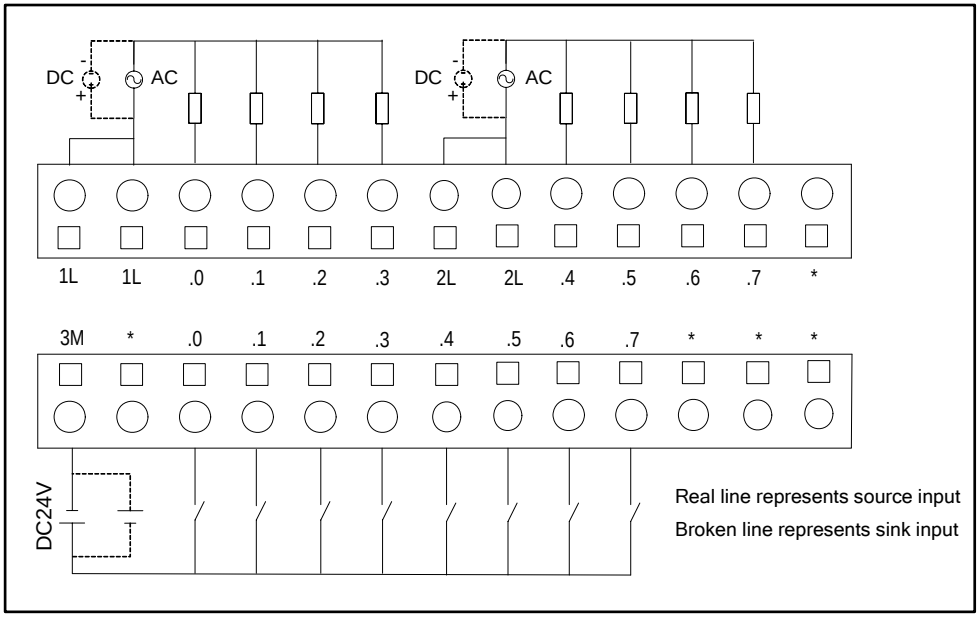


Diagram 5-15 Wiring Diagram

5.5.4 Installation Dimension

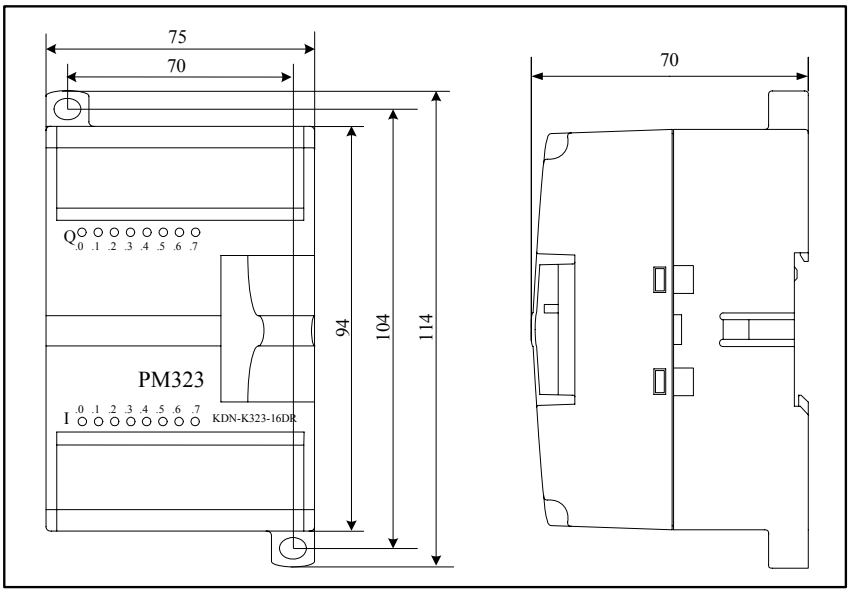


Diagram 5-16 Installation Dimension

5.5.5 Technical Data

Electrical data	
Number of inputs	8 (8 channels/group)
Input type	Source/Sink
Rated input voltage	DC 24V ("1", when DC15~30V)
Rated input current	4.1mA@24VDC
Max input voltage of logic 0	5V@0.7mA
Minimum input voltage of logic 1	15V@2.5mA
Input filter time delay	5ms
Isolation between input and internal circuit · Mode · Voltage	 Opto-electrical isolation 1500VAC/1 min

Number of relay outputs	8 (4 channels/group)	
Load voltage	Max DC 30V/AC250V	
Output current per channel	Max 3A(DC 30V/AC250V)	
Output current per group	Max 10A	
Output off-to-on delay	Max ms	
Output on-to-off delay	Max 5ms	
Max. switching rate · No load · Rated load	 12,000 times/min 100 times/min	
Expected life of the contacts · Mechanical life (no-load) · Electrical life (rated load)	 20,000,000 times (1200 times/min) 100,000 times (6 times/min)	
Isolation · Mode · Between coil and contact · Between contacts	 Relay 2000Vrms 1000Vrms	
Status indication	Green LED	
Current consumption via expansion bus	5V	< 97.8mA
	24V	< 42.0mA
Address occupied		
DI image area	1 byte	
DO image area	1 byte	
Dimension and weight		
Dimension (L×W×H)	114×75×70mm	
Net weight	160g	

Chapter VI AI (Analog input) Modules

This chapter will detailedly introduce the AI modules in Kinco-K3 series PLC. Hardware diagram, wiring diagram, technical data and other information of each module are to be described respectively.

All types of AI module are uniformly called PM331.

6.1 AI 4*IV, Multi-signal Input

Order No.: Kinco-K331-04IV

This module has 4 channels for current and voltage measurement, and the measurement type (4-20mA, 1-5V, 0-20mA, ±10V) is optional for each channel. 16-bit high-performance A/D converter is adopted in the module.

The module requires 8 bytes (2 bytes per channel) in the AI image area. The parameters of each channel, such as address, function, filter, etc, can be configured through KincoBuilder individually.

Each channel is equipped with a red LED, which indicates the input signal over-range if the channel's measuring method is configured to 4-20mA or 1-5V

Notice: *Unused channel should be shor- circuited between the positive pole and the negative pole!*

6.1.1 Main Features

- 4 channels, multi-signal input (4-20mA, 1-5V, 0-20mA or ±10V)
- Measurement accuracy: 0.2% F.S.
- The parameters of each channel are configured through KincoBuilder individually
- Red LED for alarm
- Module width 50mm

6.1.2 Front View

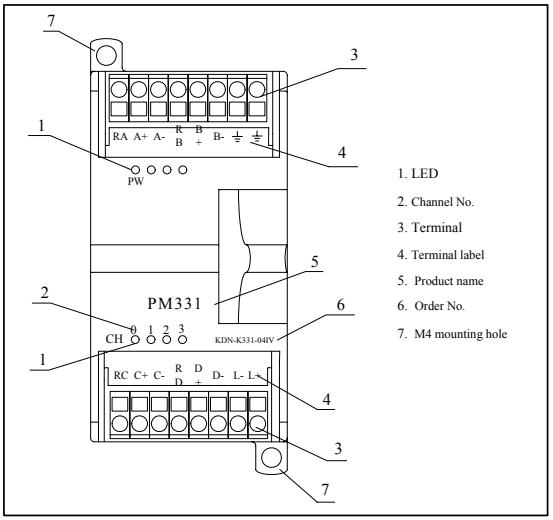


Diagram 6-1 Front View

6.1.3 Wiring Diagram

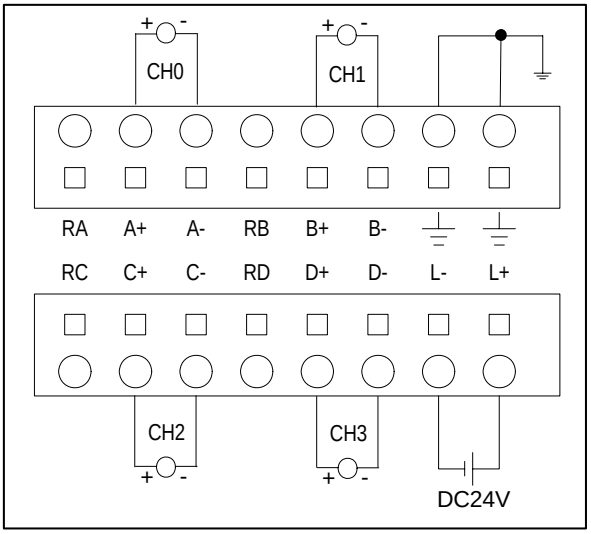


Diagram 6-2 Voltage Measurement

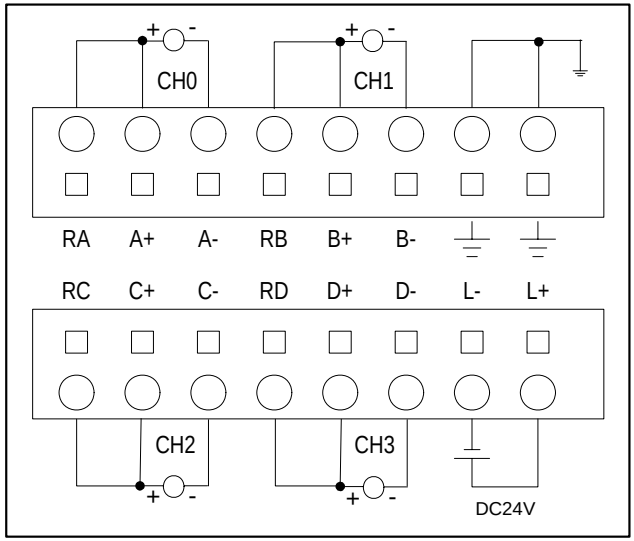


Diagram 6-3 Current Measurement (4-wire transducer)

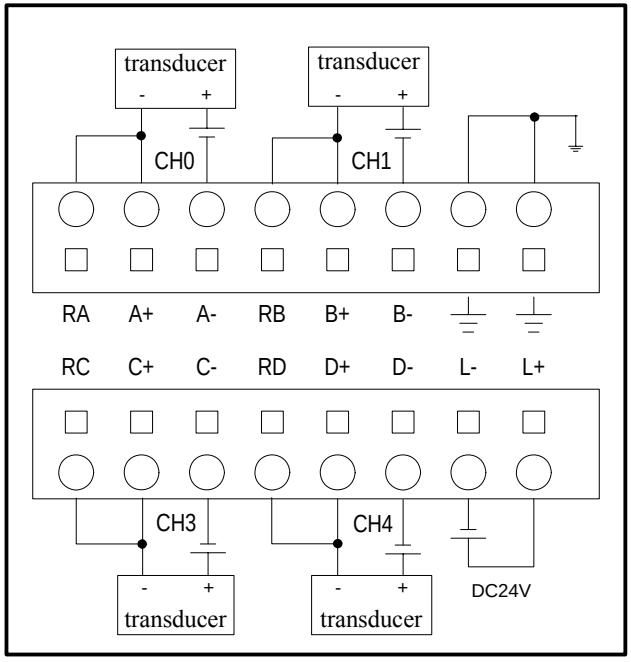


Diagram 6-4 Current Measurement (2-wire transducer)

6.1.4 Measurement Ranges and The measured value Representation

In the following table, I represents input current value, unit mA; V represents input voltage value, unit V.

Measurement Type	Measurement Range	Measured value	Remark
4~20mA(1)	0~20.4mA(3)	I×1000	If input signal exceeds the upper limit of measuring range, the measured value will be kept at 32767. If input signal exceeds the lower limit of measuring range, the measured value will be kept at -32767.
1~5V(2)	-10.2~10.2V(3)	V×1000	
0~20mA	0~20.4mA(3)	I×1000	
-10~10V	-10.2~10.2V(3)	V×1000	

Table 6-1 Measurement Range and The measured value Representation

Notice:

(1) If input signal is less than 4mA or greater than 20mA, then the red LED of this channel lights.

(2) If input signal is less than 1V or greater than 5V, then the red LED of this channel lights.

(3) If the input signal is beyond the measuring range, the module may be damaged.

6.1.5 Installation Dimension

Its installation dimension is completely the same with that of Kinco-K323-08DTX.

Please see Diagram 5-4.

6.1.6 Technical Data

Electrical data		
Number of channels	4	
Measurement types	4~20mA, 1~5V, 0~20mA, ±10V	
Rated power supply	DC 24V, >=75mA	
Resolution (including sign)	16 bits	
Measurement accuracy	0.2% F.S.	
Conversion rate (per channel)	About 15 times/s	
Input impedance	Current mode: <250Ω Voltage mode: >4MΩ	
Current consumption via expansion bus	5V	< 44.2mA
	24V	-
Status indication	Red LED	
Address occupied		
AI image area	8 bytes (2 bytes per channel)	
AO image area	-	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	136g	

6.2 AI 4*RD, RTD Input

Order No.: Kinco-K331-04RD

This module has 4 channels for temperature measurement using RTD, and the measurement type (Pt100, Cu50) is optional for each channel. 16-bit high-performance A/D converter is adopted in the module.

The module requires 8 bytes (2 bytes per channel) in the AI image area. The parameters of each channel, such as address, function, filter, etc, can be configured through KincoBuilder individually.

Each channel is equipped with a red LED that indicates the input signal overruns the measuring range.

Notice: Unused channel should be short-circuited between its terminals!

6.2.1 Main Features

- 4 channels, RTD (Pt100, Cu50) input, 2-wire or 3-wire
- Measurement range: Pt100 -150~800°C, Cu50 -50~150°C
- Measurement accuracy: 0.1% F.S.
- The parameters of each channel are configured through KincoBuilder individually;
- Red LED for indicating the input signal overruns the measuring range
- Module width 50mm

6.2.2 Front View

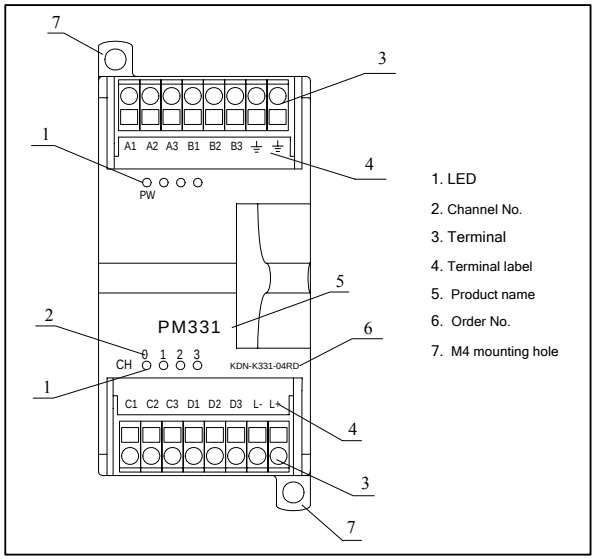


Diagram 6-5 Front View

6.2.3 Wiring Diagram

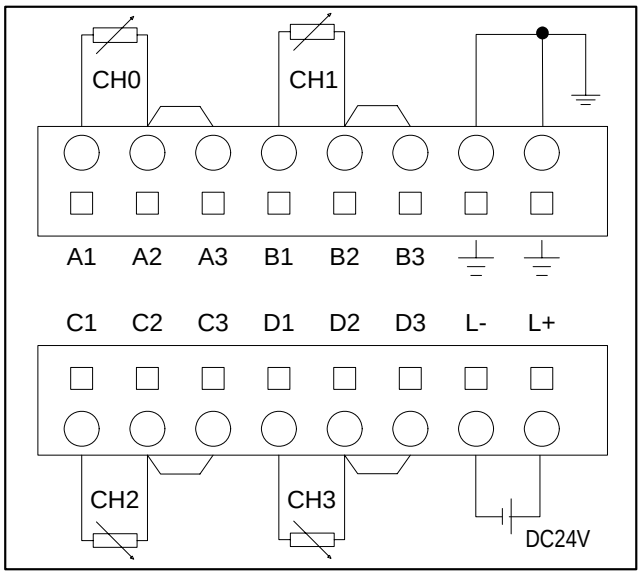


Diagram 6-6 2-wire Connection

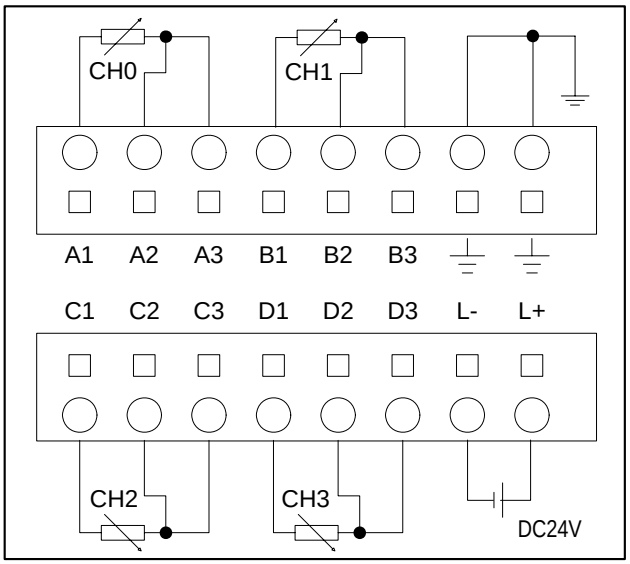


Diagram 6-7 3-wire Connection

6.2.4 Measurement Ranges and The measured value Representation

In the following table, T represents measured temperature, unit: °C.

Measurement Type	Measurement Range	Measured value	Remark
Pt100	-150~800°C	T×10	If input signal exceeds the upper limit of measuring range, the measured value will be kept at 32767. If input signal exceeds the lower limit of measuring range, the measured value will be kept at -32767. As long as the input signal overruns the measuring range, the red LED will light.
Cu50	-50~150°C	T×10	

Table 6-2 Measurement Range and The measured value Representation

6.2.5 Installation Dimension

Its installation dimension is completely the same with that of Kinco-K323-08DTX.

Please see Diagram 5-4.

6.2.6 Technical Data

Electrical data		
Number of channels	4	
Measurement types	Pt100: -150~800°C Cu50: -50~150°C	
Connection	2-wire or 3-wire	
Rated power supply	DC 24V, >=75mA	
Resolution (including sign)	16 bits	
Measurement accuracy	0.1% F.S.	
Conversion rate (per channel)	About 15 times/s	
Input impedance	>1MΩ	
Current consumption via expansion bus	5V	< 49.4mA
	24V	-
Status indication	Red LED	
Address occupied		
AI image area	8 bytes (2 bytes per channel)	
AO image area	-	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	132g	

6.3 AI 4*Thermistor, thermistor input

Order No.: Kinco-K331-04NT

This module has 4 channels for temperature measurement using NTC thermistor (type mfd502-3470, 2-wire). 16-bit high-performance A/D converter is adopted in the module. Notice: NTC is the abbreviation of Negative Temperature Coefficient.

The module requires 8 bytes (2 bytes per channel) in the AI image area. The parameters of each channel, such as address, function, filter, etc, can be configured through KincoBuilder individually.

Each channel is equipped with a red LED that indicates the input signal overruns the measuring range.

Notice: Unused channel should be short-circuited between its terminals!

6.3.1 Main Features

- 4 channels, NTC thermistor (type mfd502-3470) input, 2-wire
- Measurement range: mfd502-3470 -10~50°C
- Measurement accuracy of 3-wire input: 0.1% F.S.
- The parameters of each channel are configured through KincoBuilder individually
- The red LED to indicate the input signal overruns the measuring range
- Module width 50mm

6.3.2 Front View

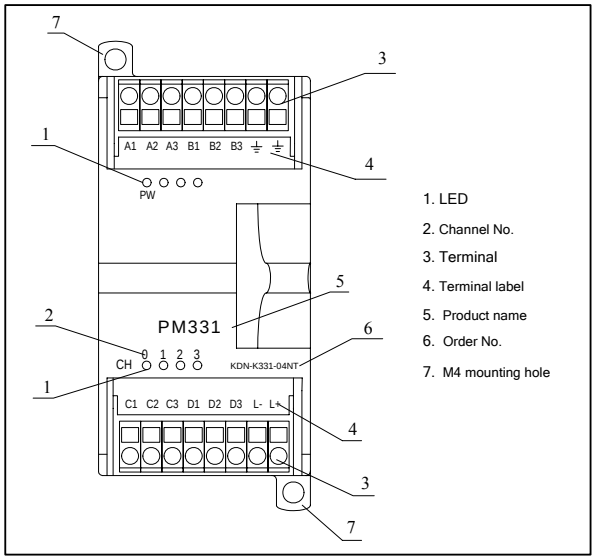


Diagram 6-8 Front View

6.3.3 Wiring Diagram

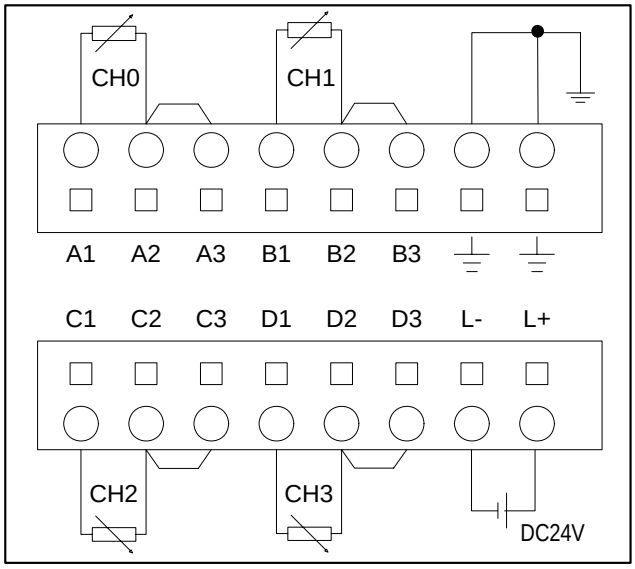


Diagram 6-9 Wiring Diagram

6.3.4 Measurement Ranges and The measured value Representation

In the following table, T represents measured temperature, unit: °C.

Measurement Method	Measurement Range	Measured value	Remark
mfd502-3470	-10~50°C	T×10	If input signal exceeds the upper limit of measuring range, the measured value will be kept at 32767. If input signal exceeds the lower limit of measuring range, the measured value will be kept at -32767. As long as the input signal overruns the measuring range, the red LED will light.

Table 6-3 Measurement Range and The measured value Representation

6.3.5 Installation Dimension

Its installation dimension is completely the same with that of Kinco-K323-08DTX.

Please see Diagram 5-4.

6.3.6 Technical Data

Electrical data		
Number of channels	4	
Measurement types	mfd502-3470: -10~50°C	
Connection	2-wire	
Rated power supply	DC 24V, >=75mA	
Resolution (including sign)	16 bits	
Measurement accuracy	0.5% F.S.	
Conversion rate (per channel)	About 15 times/s	
Input impedance	>1MΩ	
Current consumption via expansion bus	5V	< 46.7mA
	24V	-
Status indication	Red LED	
Address occupied		
AI image area	8 bytes (2 bytes per channel)	
AO image area	-	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	132g	

6.4 AI 4*TC, thermocouple Input

Order No.: Kinco-K331-04TC

This module has 4 channels for temperature measurement using thermocouples, and the measurement type (Type J, Type K) is optional for each channel, additionally cold junction internal compensation or external compensation is optional.16-bit high-performance A/D converter is adopted in the module. *Notice: if internal compensation is adopted, the internal temperature sensor will acquire the temperature of the module interior and supply a compensation voltage, so the heat generated by the module will affect the measured value. Generally speaking, measured temperature with internal compensation will be 2~4°C higher than the actual temperature.*

The module requires 8 bytes (2 bytes per channel) in the AI image area. The parameters of each channel, such as address, function, filter, etc, can be configured through KincoBuilder individually.

Each channel is equipped with a red LED to indicate wire break.

Notice: Unused channel should be short-circuited between the positive pole and the negative pole!

6.4.1 Main Features

• 4 channels, thermocouple (Type J, Type K) input, cold junction internal/external compensation optional

• Measurement range: Type J -200~1200°C, Type K -200~1300°C

• Measurement accuracy: 0.1% F.S.

• The parameters of each channel are configured through KincoBuilder individually;

• The red LED to indicate wire break

6.4.2 Front View

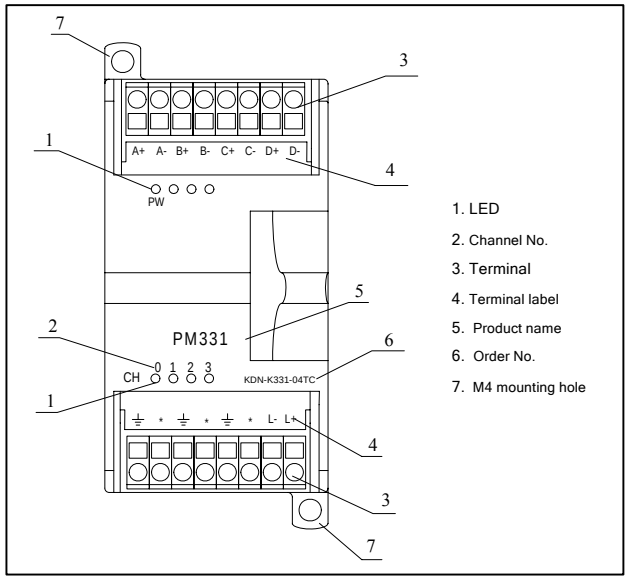


Diagram 6-10 Front View

6.4.3 Wiring Diagram

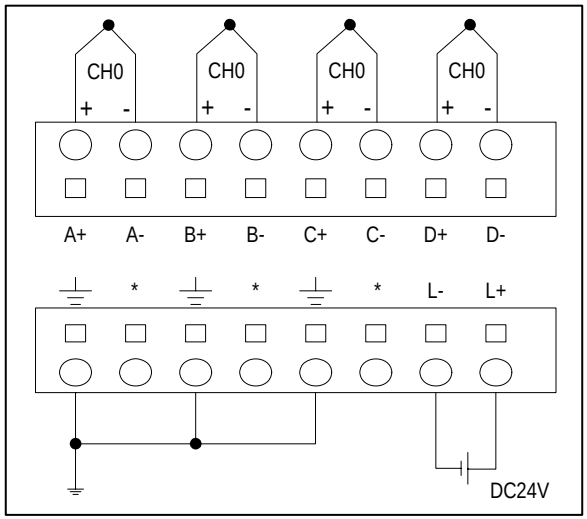


Diagram 6-11 Wiring Diagram

6.4.4 Measurement Ranges and The measured value Representation

In the following table, T represents measured temperature, unit: °C.

Measurement Method	Measurement Range	Measured value	Remark
Type J	-200~1200°C	T×10	If input signal exceeds the upper limit of measuring range, the measured value will be kept at 32767. If input signal exceeds the lower limit of measuring range, the measured value will be kept at -32767. If wire break is detected, the red LED will light and the measured value will be kept at -32768.
Type K	-200~1300°C		

Table 6-4 Measurement Range and The measured value Representation

6.4.5 Installation Dimension

Its installation dimension is completely the same with that of Kinco-K323-08DTX.

Please see Diagram 5-4.

6.4.6 Technical Data

Electrical data		
Number of channels	4	
Measurement types	Type J: -200~1200°C Type K: -200~1300°C	
Cold junction compensation	Internal/external compensation optional	
Rated power supply	DC 24V, >=75mA	
Resolution (including sign)	16 bits	
Measurement accuracy	0.1% F.S.	
Conversion rate (per channel)	About 15 times/s	
Input impedance	>20kΩ	
Current consumption via expansion bus	5V	< 57.4mA
	24V	-
Status indication	Red LED to indicate wire break	
Address occupied		
AI image area	8 bytes (2 bytes per channel)	
AO image area	-	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	132g	

Chapter VII AO (Analog Output) Modules

This chapter will detailedly introduce the AO modules in Kinco-K3 series PLC. Hardware diagram, wiring diagram, technical data and other information of each module are to be described respectively.

All types of AO module are uniformly called PM331.

7.1 AO 2*IV, Multi-signal Output

Order No.: Kinco-K332-02IV

This module has 2 channels, suitable for connecting with actuators requiring standard voltage or current signals (4-20mA, 1-5V, 0-20mA, ±10V). The module has corresponding output ranges for different outputs, and if the output value specified in the user program exceeds the upper/lower limit of the output range, the actual output value will be kept at the upper/lower limit to prevent the connected equipment from damage. 12-bit high-performance D/A converter is adopted in the module.

The module requires 4 bytes (2 bytes per channel) in the AQ image area. The parameters of each channel, such as address, function, etc, can be configured through KincoBuilder individually.

7.1.1 Main Features

- 2 channels, multi-signal output (4-20mA, 1-5V, 0-20mA, ±10V)
- Output accuracy: 0.5% F.S.
- The parameters of each channel are configured through KincoBuilder individually
- Module width 50mm

7.1.2 Front View

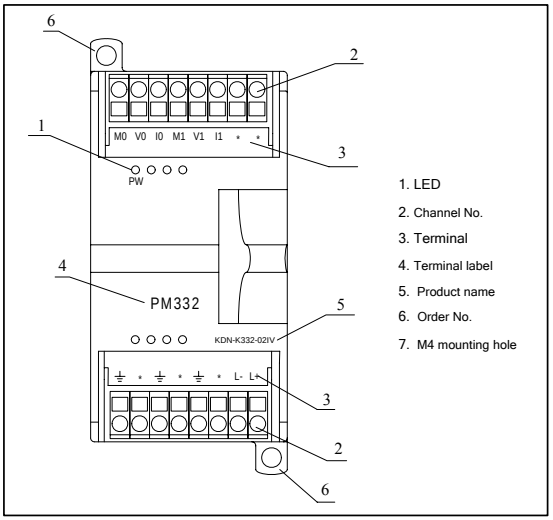


Diagram 7-1 Front View

7.1.3 Wiring Diagram

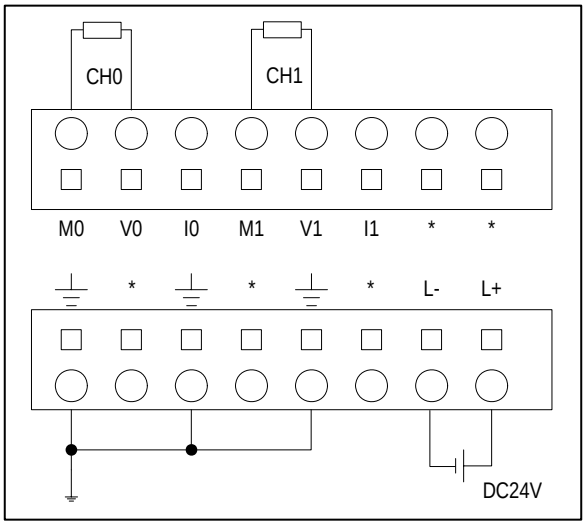


Diagram 7-2 Wiring Diagram: Voltage output

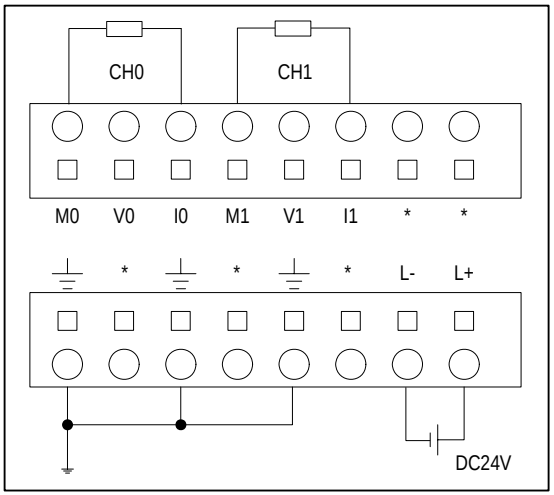


Diagram 7-3 Wiring Diagram: Current output

7.1.4 Output Ranges and the Output Value Representation

In the following table, I represents actual output current value, unit mA; V represents actual output voltage value, unit V.

Output Signal	Output Range	Output Value Representation	Remark
4~20mA	0~20.0mA	I×1000	If the output value specified in the user program exceeds the upper/lower limit of the output range, the actual output value will be kept at the upper/lower limit.
1~5V	0~5.1V	V×1000	
0~20mA	0~20.0mA	I×1000	
-10~10V	-10.2~10.2V	V×1000	

Table 7-1 Output Range and the Output Value Representation

7.1.5 Installation Dimension

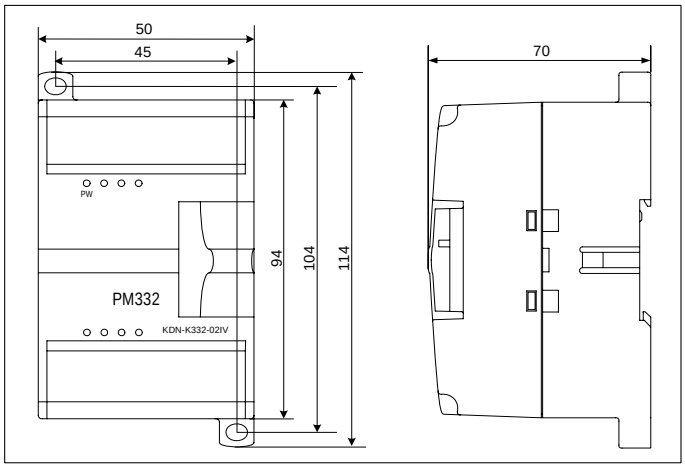


Diagram 7-5 Installation Dimension

7.1.6 Technical Data

Electrical data		
Number of outputs	2	
Output signal	4~20mA, 1~5V, 0~20mA, ±10V	
Rated power supply	DC 24V	
Resolution (including sign)	12 bits	
Output Accuracy	0.5% F.S.	
Resistance load	Current mode: max. 500Ω Voltage mode: min. 1kΩ	
Current consumption via expansion bus	5V	< 41.9mA
	24V	-
Address occupied		
AI image area	-	
AO image area	4 bytes (2 bytes per channel)	
Dimension and weight		
Dimension (L×W×H)	114×50×70mm	
Net weight	125g	

Chapter VIII Installation & Wiring Guidelines

This chapter contains the information required to install and wire the Kinco-K3 modules.

8.1 Plastic Case Dimension

There are 5 different types of plastic cases for Kinco-K3 modules with the same length and height; the widths (expansion direction) are 200, 125, 97, 75 and 50mm respectively. The plastic cases of 200mm, 125mm and 97mm width are used for the CPU modules; 75mm and 50mm width are used for the expansion modules. Professional design of the case ensures the system surface flat and exquisite appearance when you combine modules.

Please refer to installation dimension diagrams in the above chapters for details.

8.2 Installaton Guidlines

8.2.1 Lengthen the Expansion Bus

In order to make the installation more flexible, lengthened (up to 1 meter) expansion bus is provided in the accessories. *Notice:Only one lengthened expansion bus is allowed in a CPU/expansion module chain! When the expansion bus is too long (above 1 meter) or CPU connects with too many expansion modules, it's recommended that the 9th and 10th pins of the expansion port of the last module should be short-circuited by placing a jumper!*

Order No. Of lengthened expansion bus is listed as the following:

Kinco-K373-005	Lengthened expansion bus cable, 0.5m
Kinco-K373-010	Lengthened expansion bus cable, 1m

8.2.2 Installing the Kinco-K3 modules

You can install the Kinco-K3 modules either on a panel or on a DIN rail; also, you can arrange the modules either horizontally or vertically. For horizontal mounting, the CPU module shall be located at the leftmost side; for vertical mounting, the CPU shall be at the uppermost side. If the modules need to be installed dispersively because of the limited space, lengthened expansion bus shall be useful. The horizontal installation effect is shown in the following diagram.

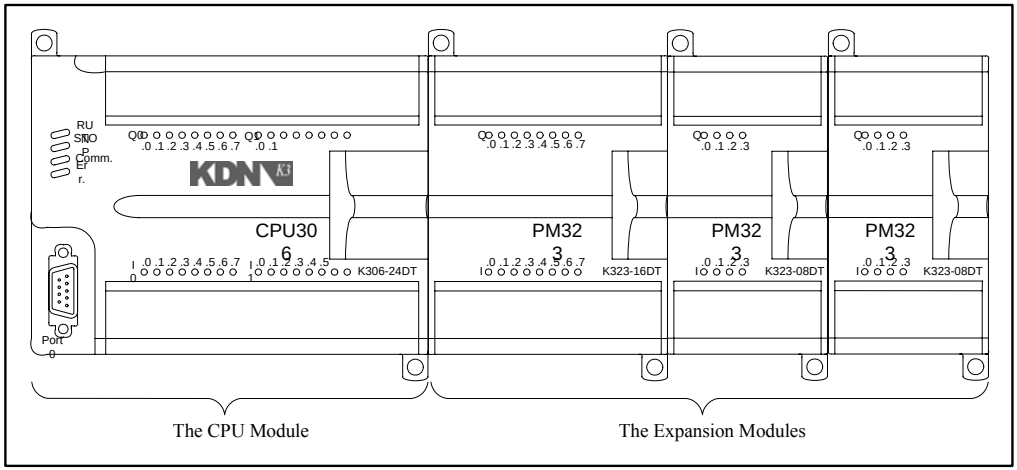


Diagram 8-1 Installation Effect

Notice:

(1) For appropriate cooling, make sure that a clearance of at least 60mm above and below the modules. In addition, at least 100mm of depth should be provided.

(2) For vertical mounting, the maximum ambient temperature in the operating environment is reduced by 10°C.

8.2.2.1 Panel Mounting

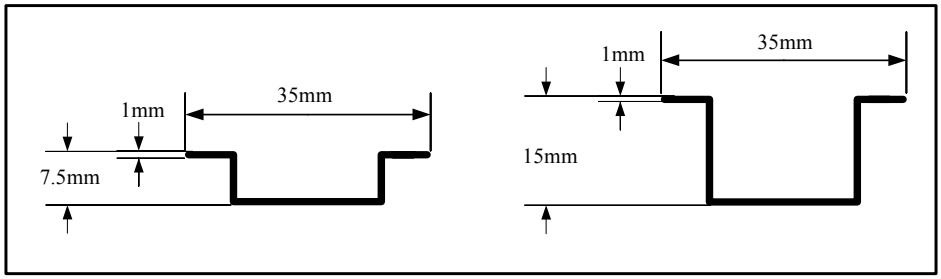
(1) Each module has 2 M4 mounting holes, which are respectively located on the top-left corner and the bottom-right corner. Both of the two mounting holes should be secured with bolts.

(2) Locate and drill the M4 mounting holes according to the module's dimension.

(3) Mount the module securely to the panel using M4 bolts. If you are using an expansion module, connect the expansion bus cable into the expansion port of the prior module. Before securing each expansion module, make some adjustments to make the expansion bus slide into the slot on the right side of the module with a purpose to achieve a more exquisite appearance.

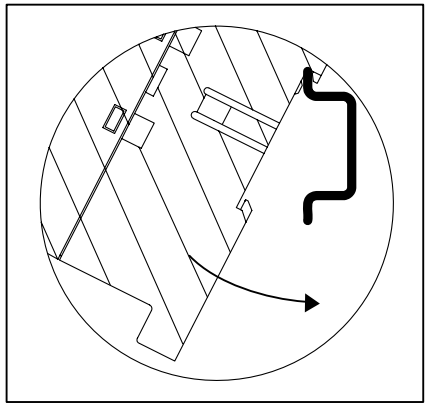
8.2.2.2 DIN Rail Mounting

(1) Prepare a standard 35mm DIN rail. There are 2 specifications as shown in the following diagram.



(2) Mount the rail securely to the appropriate positon of the mounting panel.

(3) Snap down the DIN clip and hook the back of the module onto the DIN rail; Rotate the module forward until it clings to the rail and then snap the DIN clip back to its original position. Make sure that the clip has fastened the module securely onto the rail, as shown in the following diagram.



(4) If an expansion module is used, connect its expansion bus cable into the expansion port of the prior

module; make some adjustments to make the expansion cable slide into the slot on the right side of the module; push tight all the modules after connection.

8.3 Wiring

8.3.1 CAGE CLAMP Terminal

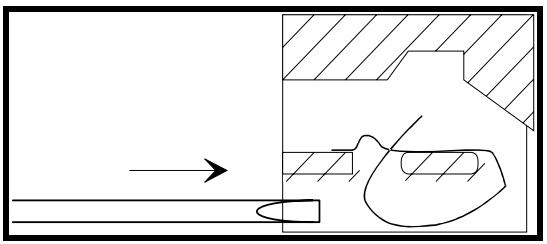
Kinco-K3 series PLC uses CAGE CLAMP connection terminal from WAGO to connect wires. The terminal has the following advantages:

- Eliminate human factors, the spring leaf clamps automatically
- Auto-locking mechanism ensures not dropout.
- 75% wiring time can be saved by the help of presented tools.

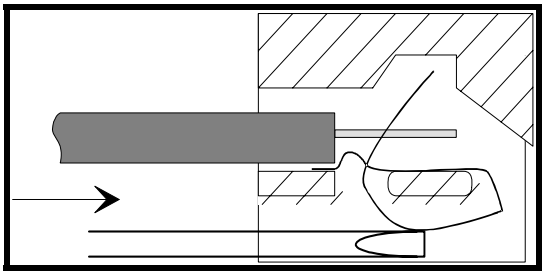
You may connect wires with a size from 0.08 mm^2 up to 2.5 mm^2.

8.3.2 Wiring Procedure

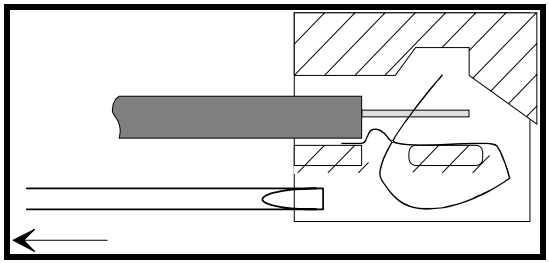
(1) Vertically insert an appropriate screwdriver into the square hole of the terminal to open the contact spring.



(2) Insert the stripped end of the wire into the round hole of the terminal:

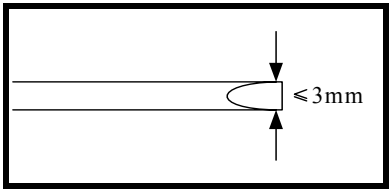


(3) When you pull out the screwdriver, the wire shall be clipped securely.



Notice:

(1) Screwdriver in proper dimension:



(2) Make sure that you only insert the screwdriver into the square hole of the terminal!

(3) In order to fully open the contact spring, the screwdriver should be inserted into the square hole vertically.