

TK6 *Series User Manual*

Analog high-precision input and output units

TK6-8HAI-V

TK6-8HAI-C

TK6-8HAI-B

TK6-8HAO-V

TK6-8HAO-C

Thank you very much for purchasing our IO units.

This manual describes the use and maintenance of the TK6 analog high-precision input/output module. Please read this manual carefully before installing, wiring, using, maintaining, and checking the product.

Please keep this manual in a safe place and deliver it to the end user

Statement

The contents of this user manual are subject to change without prior notice.

If you find any suspicion, error, or omission in the content of this user manual, please contact us to change it.

If there are any error or missing pages in this user manual, we will replace them for you.

TK6 Analog High Precision Input/Output Units User Manual

Change Log

Revision	Change Information	Originator	Date
V1.0	New version release, basic functions, and other explanations	czm	2023-04
V1.1	Modify email address; change CodeSys uniformly to CODESYS on page 25	lsw	2023-05




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Section 1 Safety Precautions




■ Safety instructions




- Please read and follow these safety precautions when installing, operating, or maintaining the product.
- For personal and equipment safety, please follow all safety precautions described in the markings and manuals on the product when installing, operating, and maintaining the product.
- The "Caution", "Warning" and "Danger" items in the manual do not represent all safety precautions to be observed, but only in addition to all other safety precautions.
- This product should be used in an environment that meets design specifications, otherwise it may cause a malfunction due to failure to comply with the relevant safety precautions.
- The product quality warranty does not cover abnormal function or damage to parts caused by the regulations.
- We will not bear any legal responsibility for personal safety accidents and property damage caused by illegal operation of the product.

Security Level Definition	
 Danger	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.
 Caution	If not used in accordance with the regulations, may cause fires, serious personal injury, or even death!
 Warning	Failure to use in accordance with the regulations may result in moderate personal injury or minor injury, as well as the occurrence of equipment damage!




When products arrive and are stored	
 Warning	<ul style="list-style-type: none"> ● If the product and product accessories are damaged when opening the box, please do not install them and contact our company or your supplier immediately. ● Check carefully whether the arriving product and the ordered product model match, and whether the product and product accessories are included.
 Caution	<ul style="list-style-type: none"> ● Do not stack multiple of this product on top of each other as this may cause injury or malfunction. ● Do not store in places exposed to direct sunlight, places where the ambient temperature exceeds the temperature conditions for storage, places where the relative humidity exceeds the humidity condition for storage, places where there is a large temperature difference, places where there is high condensation, places near corrosive gases, places where there are flammable gases, places where there is a large amount of dust, dirt, salt or metal dust, places where water, oil or medicine drip, places where vibration or shock can affect the main body of product; otherwise it can lead to fire, Electric shock or machine damage.



	<ul style="list-style-type: none"> Do not hold the cable or motor shaft for weight holding, as this may result in injury or malfunction.
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When designing the system	
 Danger	<ul style="list-style-type: none"> If the rated load of current is exceeded or the load is short-circuited for a long period of time resulting in over-current, the product may start smoking or catch fire. Safety devices such as fuses, or circuit breakers should be set externally.
 Warning	<ul style="list-style-type: none"> Be sure to design safety circuits to ensure that the product system will still work safely if the external power supply is lost, or the product fails. For safe operation of the equipment, please design external protection circuits and safety mechanisms for output signals related to major accidents.
 Caution	<ul style="list-style-type: none"> Be sure to install emergency brake circuits, protection circuits, interlock circuits for forward and reverse operation, and position upper and lower limit interlock switches to prevent damage to the machine in the external circuit of the product. The product may shut down all outputs after detecting abnormalities in its own system; when part of the controller circuit fails, it may cause its output to be uncontrolled. To ensure normal operation, a suitable external control circuit needs to be designed. If the output unit such as relay or transistor of the product is damaged, the output will not be controlled to the ON or OFF state. The product is designed to be used in indoor, overvoltage class II electrical environments, and its power system level should have lightning protection devices to ensure that lightning overvoltage is not applied to the product's power input or signal input, control output and other ports to avoid damage to equipment.


When the product is installed	
 Danger	<ul style="list-style-type: none"> Only maintenance professionals with adequate electrical knowledge and training related to electrical equipment should install this product. For the product with open equipment, please install in the control cabinet with door lock (product cabinet shell protection > IP20), only operators with sufficient electrical knowledge and training related to electrical equipment can open the product cabinet.
 Warning	<ul style="list-style-type: none"> When disassembling the product, the external power supply used for the system must be completely disconnected before performing the operation. Failure to disconnect all power supplies may result in electric shock or product failure and malfunction. While disassembling the product, the power and the power indicator must be turned off for at least 5 minutes, before disassembling the driver. Otherwise, the residual voltage may cause electric shock. Do not use the product in the following places: places with dust, oil fumes, conductive dust, corrosive gases, combustible gases; places exposed to high temperature, condensation, wind, and rain; places with vibration and shock. Electric shock, fire, and misuse can also cause damage and deterioration of the product!
 Caution	<ul style="list-style-type: none"> Avoid metal shavings and wire tips falling into the ventilation holes of the product during installation, this may cause fire, malfunction, and misoperation. After installation, ensure that there is no foreign matter on the ventilation

	<p>surfaces, otherwise it may lead to poor heat dissipation and cause fire, malfunction and misoperation.</p> <ul style="list-style-type: none"> ● When installing, make a tight connection to the respective connector and lock the product connection hook firmly. If the products are not installed properly, it may lead to misoperation, malfunction and dislodgement.
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When wiring products	
 Danger	<ul style="list-style-type: none"> ● Only maintenance professionals with adequate electrical knowledge and training related to electrical equipment should perform the wiring of this product.
 Warning	<ul style="list-style-type: none"> ● During wiring operations, the external supply power used by the system must be completely disconnected before operation. Failure to disconnect all of them may result in electric shock or equipment malfunction or misoperation. ● When powering up and running after the wiring operation, the terminal cover that comes with the product must be installed. Failure to install the terminal cover may result in electric shock. ● Check the type of interface to be connected before connecting the cable correctly. If the wrong interface is connected or the wiring is incorrect, it may cause the product or external equipment to malfunction. ● The cable terminals should be well insulated to ensure that the insulation distance between the cables is not reduced after the cables are installed to the terminal block. Otherwise, it will lead to electric shock or equipment damage. ● Avoid metal shavings and wire tips falling into the ventilation holes of the controller when wiring, which may cause fire, malfunction, and misoperation! ● The bolts on the terminal blocks should be tightened within the specified torque range. Untightened terminal bolts may result in short circuit, fire, or malfunction. Over-tightening the bolts may damage the bolts and the product, resulting in dislodgement, short circuit, fire, or false operation.
 Caution	<ul style="list-style-type: none"> ● The specification and installation method of the external wiring of the equipment should meet the requirements of local power distribution regulations. ● To ensure the safety of the equipment and the operator, the equipment needs to be reliably grounded using cables of sufficient wire size. ● For connections using connectors and external devices, press fit, crimp, or properly solder using the tool specified by the manufacturer. A poor connection may result in a short circuit, fire, or malfunction. ● If the product is labeled to prevent foreign objects from entering the product during wiring, such as the wiring head. Do not remove this label during wiring operations. Before starting system operation, be sure to remove the label to facilitate heat dissipation. ● Please do not bundle the control and communication cables with the main circuit or power supply cables, etc. The alignment should be more than 100mm apart, otherwise the noise may lead to misoperation. ● For applications with serious interference, please use shielded cables for input or output of high frequency signals to improve the system's anti-interference capability.

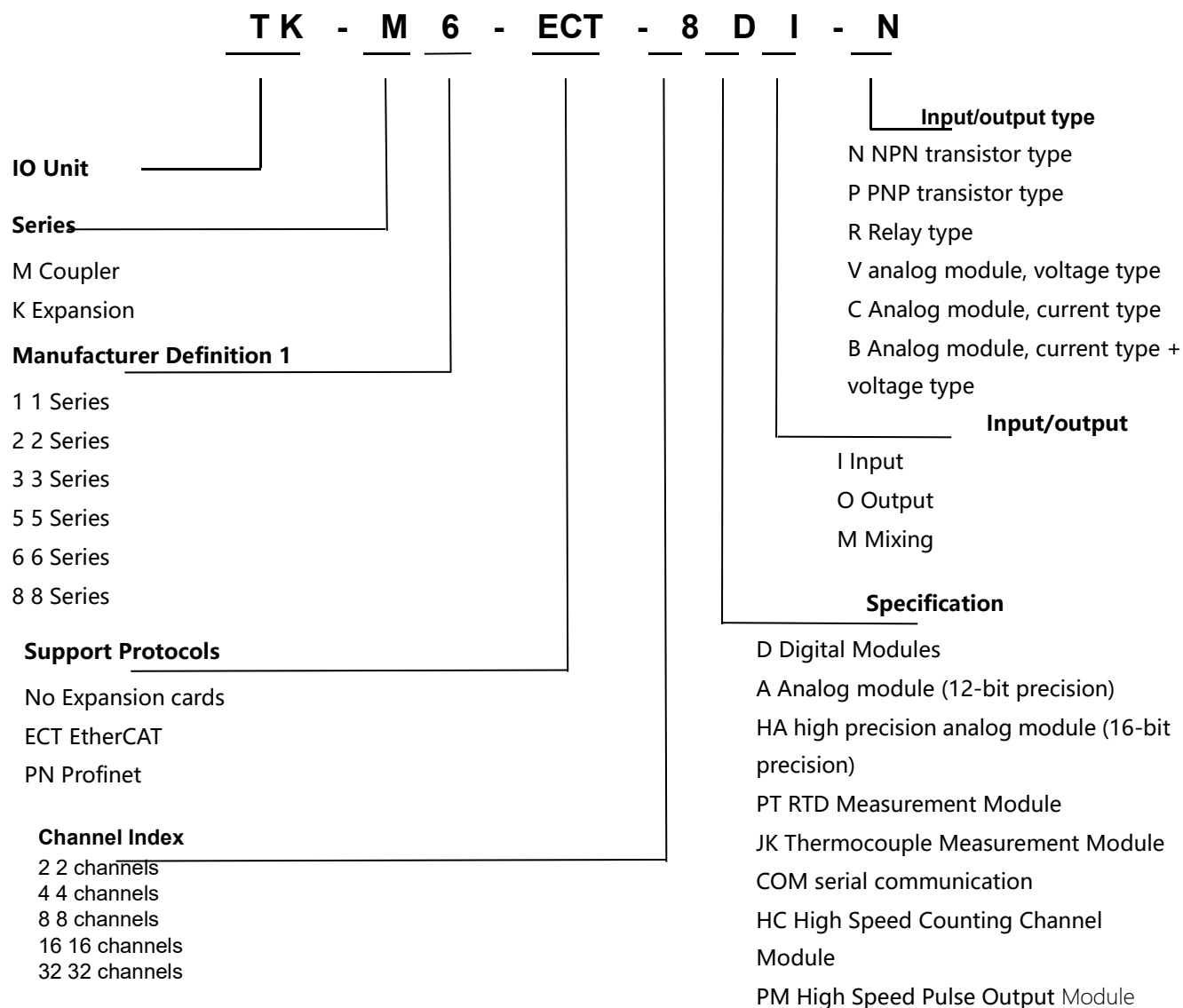
Before powering on the product	
 Danger	<ul style="list-style-type: none"> ● Before powering on, please make sure the product is well installed, wired firmly and the motor unit is allowed to restart. ● Before powering on, please confirm that the power supply meets the product requirements to avoid causing damage to the product or starting a fire. ● It is strictly forbidden to open the product cabinet door or product protective cover, touch any terminals of the product, disassemble any device or parts of the product in the energized state, otherwise there is a risk of electric shock. ● Make sure that no one is around the product, the motor, or the machinery before powering it on, as this may result in injury or death!
 Warning	<ul style="list-style-type: none"> ● After the wiring operation and parameter setting are completed, please conduct a test run of the machine to confirm that it can operate safely, otherwise it may lead to injury or equipment damage! ● Before powering on, please make sure that the rated voltage of the product is the same as the power supply voltage. If the power supply voltage is used incorrectly, there is a risk of fire!

When operating and maintaining	
 Danger	<ul style="list-style-type: none"> ● Only maintenance professionals with adequate electrical knowledge and training on electrical equipment can perform the operation and maintenance of the products. ● Do not touch the terminals when the power is on, as this may cause electric shock or malfunction. ● When the motor or equipment is running, please never touch its rotating parts, otherwise it may lead to serious personal safety accidents.
 Warning	<ul style="list-style-type: none"> ● When cleaning the product or retightening the bolts on the terminal block or the connector mounting bolts, the external supply power used by the system must be completely disconnected. Failure to do so may result in electric shock. ● When disassembling the product or connecting or removing the communication cable, the external supply power used by the system must be completely disconnected first. Failure to disconnect all of them may result in electric shock or false operation. ● While disassembling the product, the power and the power indicator must be turned off for at least 5 minutes, before disassembling the driver. Otherwise, the residual voltage may cause electric shock.
 Caution	<ul style="list-style-type: none"> ● For online modification, forced output, RUN, STOP, etc., you must read the user's manual and confirm its safety before performing the relevant operations. ● Be sure to disconnect the power before loading and unloading expansion cards, modules, and other components!

When the product is scrapped	
 Caution	<ul style="list-style-type: none"> ● Please dispose of them as industrial waste; when disposing of batteries, do so separately according to the ordinances established by each region to avoid property damage or human injury! ● End-of-life products should be treated and recycled in accordance with industrial waste treatment standards to avoid polluting the environment.

Section 2 Product Information

2.1 Naming Rules



Note: The naming rules are only for model number analysis, and cannot be used for ordering, please consult HNC before ordering.

2.2 Specification parameters

2.2.1 Input Units Specifications

Model	TK6-8HAI-C	TK6-8HAI-B	TK6-8HAI-V
Number of input channels	8-channels current input	8-channels voltage/current input	8-channels voltage input
Voltage input range	-	±10V, ±5V, 0 to 10V, 0 to 5V	0~10V
Voltage input impedance	-	110KΩ	
Current input range	0 ~ 20mA	4 ~ 20mA, 0 ~ 20mA	-
Current input impedance	250Ω		-
System side power consumption	5VDC/50mA (internal self-powered)		
Live side power consumption	24VDC/20mA (internal self-powered)		
Resolution	16-bit		
Sampling time	1ms/channel		
Conversion time	2ms/channel		
Filtering time	1 to 255ms configurable		
Measurement accuracy	<0.1%F.S.@25℃		
Limit input voltage	-	±11V	
Limit input current	±22mA		
Isolation method	Non-isolated between channels, system and field side optoelectronic isolation , isolation withstand voltage ≥ 2KVrms		
Input Instructions	Operation, fault, communication indication, etc.		
Working Environment	Working temperature: 0℃~50℃, working humidity: 5%~90% (no condensation)		
Storage temperature	Storage temperature: -40℃~50℃, storage humidity: 5%~90% (no condensation)		
Certification and Testing	CE certification, GB/T 25119 vehicle regulation testing		

2.2.2 Output Units Specifications

Model	TK6-8HAO-V	TK6-8HAO-C
Number of output channels	8-channels voltage output	8-channels current output
Current output range	-	0-20mA
Current output load	-	650Ω
Voltage output range	0-10V	-
Voltage output load	1KΩ-1MΩ	-
System side power consumption	5VDC/50mA (internal self-powered)	
Site side power supply	24VDC/200mA (internal self-powered)	
Resolution	16-bit	
Conversion time	1ms/channel	
Output Accuracy	Voltage $\pm 0.1\%$ F. S	Current $\pm 0.1\%$ F. S
Output short circuit protection	Support	
Measurement accuracy	< 0.1%F.S.@25°C	
Isolation method	Non-isolated between channels, system and field side optoelectronic isolation, isolation withstand voltage $\geq 2\text{KVrms}$	
Output indication	Operation, fault, communication indication, etc.	
Working Environment	Working temperature: 0°C~50°C, working humidity: 5%~90% (no condensation)	
Storage temperature	Storage temperature: -40°C~50°C, storage humidity: 5%~90% (no condensation)	
Certification and Testing	CE certification, GB/T 25119 vehicle regulation testing	

2.3 Product Structure

2.3.1 Interface schematic

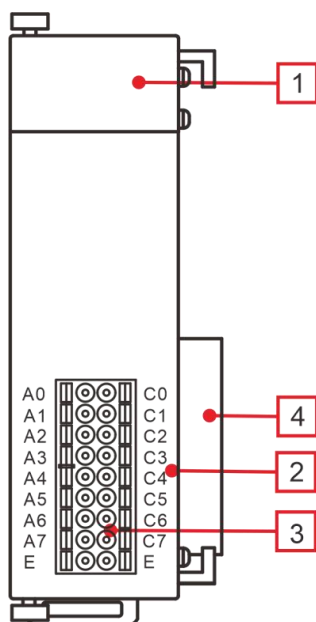


Figure 2-1: TK6-8HAI-V, TK6-8HAI-C, TK6-8HAO-V, TK6-8HAO-C unit interface schematic

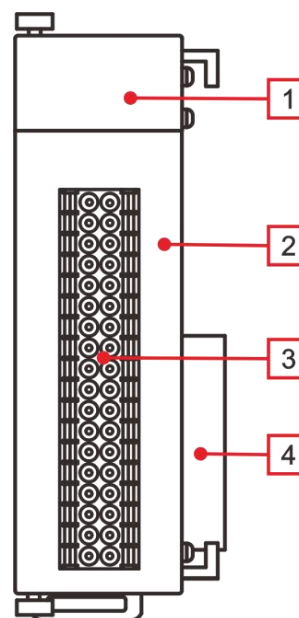


Figure 2-2: TK6-8HAI-B unit interface schematic

2.3.2 Interface Definition

● TK6-8HAI-V

Number	Interface Name	Function Definition
1	Wiring terminals	8-channels analog voltage input (refer to 3.1 terminals definition for detailed terminals definition and Figure 2-1 for wiring)
2	LED indicator	Channel input and channel status indication (refer to 2.3.3 description for details)
3	Backplane bus interface	Located on the left and right side of the IO unit, the left interface connects to the front unit and the right interface connects to the rear unit
4	Terminal number	Corresponds to the terminal block

- **TK6-8HAI-C**

Number	Interface Name	Function Definition
1	Wiring terminals	8-channel analog current input (refer to 3.1 terminal definition for detailed terminal definition and Figure 2-1 for wiring)
2	LED indicator	Channel input and channel status indication (refer to 2.3.3 description for details)
3	Backplane bus interface	Located on the left and right side of the IO module, the left interface connects to the front module and the right interface connects to the rear module
4	Terminal number	Corresponds to the terminal block

- **TK6-8HAI-B**

Number	Interface Name	Function Definition
1	Wiring terminals	8 analog signal input terminals (refer to 3.1 terminal definition for detailed terminal definition and Figure 2-2 for wiring)
2	LED indicator	Channel input and channel mode indication (refer to 2.3.3 description for details)
3	Backplane bus interface	Located on the left and right side of the IO module, the left interface connects to the front module and the right interface connects to the rear module
4	Terminal number	Corresponds to the terminal block

- **TK6-8HAO-V**

Number	Interface Name	Function Definition
1	Wiring terminals	8 analog voltage inputs (refer to 3.1 terminal definition for detailed terminal definition and Figure 2-1 for wiring)
2	LED indicator	Channel input and channel status indication (refer to 2.3.3 description for details)
3	Backplane bus interface	Located on the left and right side of the IO module, the left interface connects to the front module and the right interface connects to the rear module
4	Terminal number	Corresponds to the terminal block

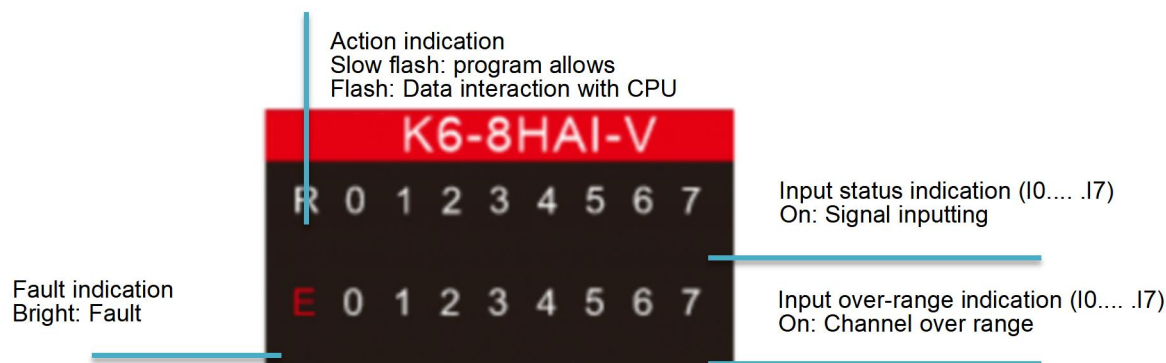
- **TK6-8HAO-C**

Number	Interface Name	Function Definition
1	Wiring terminals	8 analog signal output terminals (refer to 3.1 terminal definition for detailed terminal definition and Figure 2-1 for wiring)
2	LED indicator	Channel output and channel status indication (refer to 2.3.3 description for details)
3	Backplane bus interface	Located on the left and right side of the IO module, the left interface connects to the front module and the right interface connects to the rear module
4	Terminal number	Corresponds to the terminal block

2.3.3 Indicator light function description

- **TK6-8HAI-V indicator function**

- 1) Indicator panel



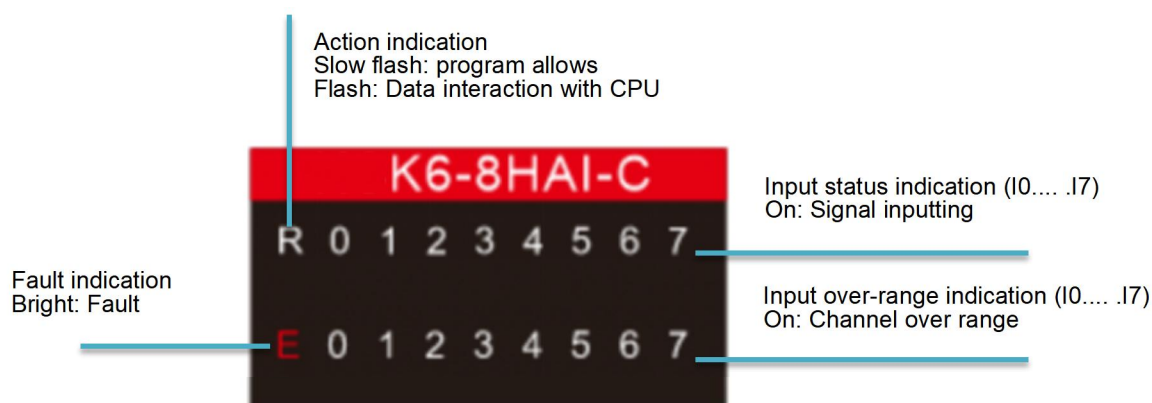
Note: The upper half numbers 0...7 identify the input status indicators of I0...I7 channels. When there is voltage input, the corresponding x indicator lights up. The lower half numbers 0.... 7 identify the over-voltage indicator of I0.... I7 channel, when a channel input voltage exceeds the range, the corresponding indicator lights up.

2) Indicator panel

Indicator status		Measurement range	Corresponding digital quantity
Operating Instructions	Fault Indicator		
R	E	0~10V	0 ~ 10000

● TK6-8HAI-C indicator function

1) Indicator panel



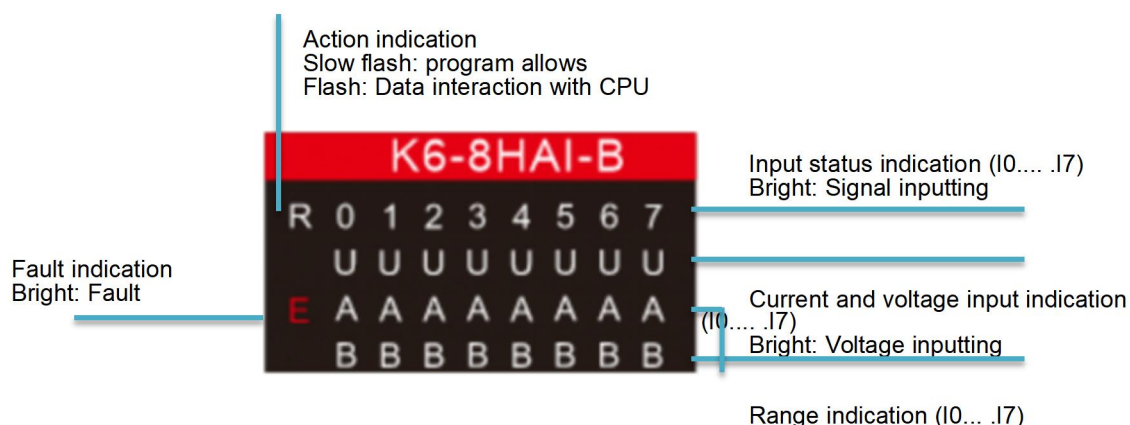
Note: The upper half numbers 0...7 identify the input status indicators of I0...I7 channels. When there is current input, the corresponding x indicator lights up. The lower part numbered 0.... 7 identify the I0.... I7 channel over-range indicator, when a channel input current exceeds the range, the corresponding indicator lights up.

2) Range digital quantity

Indicator status		Measurement range	Corresponding digital quantity
Operating Instructions	Fault Indicator		
R	E	0 ~ 20mA	0 ~ 20,000

● TK6-8HAI-B indicator function

1) Indicator panel



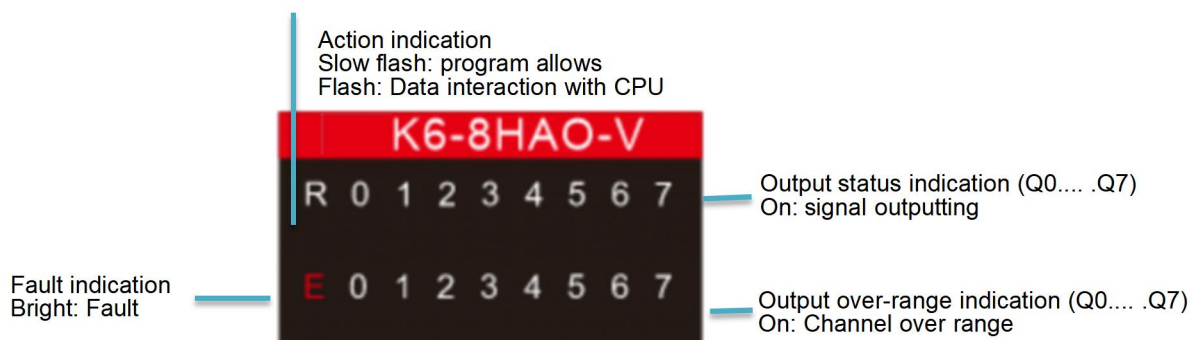
Note: The 8 channels of TK6-8HAI-B unit use X(0..7), U, A and B to indicate the current channel status respectively. X(0..7) indicates whether the channel has signal input, X(0..7) lights up when there is signal input, U indicates the working mode of the current channel, bright indicates voltage input mode, off indicates current input mode. Identified by the combination of A and B, the actual range of the current channel, the range of various voltage and current modes are indicated in the following table.

2) Range digital quantity

Indicator status				Measurement range	Corresponding digital quantity
U	Mode	A	B		
Bright	Voltage	extinguish	Bright	0~5V	0 ~ 5000
		Bright	extinguish	0~10V	0 ~ 10000
		Bright	Bright	-10 to 10V	-10000 ~ 10000
		extinguish	extinguish	-5 to 5V	-5000 to 5000
extinguish	Current	extinguish	Bright	0 ~ 20mA	0 ~ 20,000
		Bright	extinguish	4 ~ 20mA	4000 ~ 20,000

● TK6-8HAO-V indicator function

1) Indicator panel



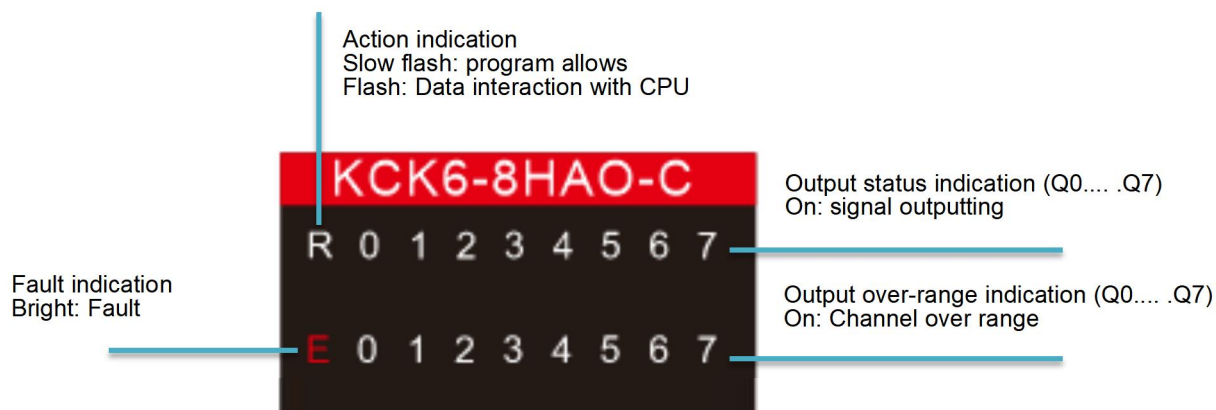
Note: The upper half of the number 0...7 identifies Q0.... Q7 channel output status indicator, when there is voltage output, the corresponding x indicator lights up. The lower part number 0.... 7 identify the Q0.... Q7 channel over-range indicator, when a channel output voltage over-range, the corresponding indicator lights up.

2) Range digital quantity

Indicator status		Measurement range	Corresponding digital quantity
Operating Instructions	Fault Indicator		
R	E	0~10V	0 ~ 10000

● TK6-8HAO-C indicator function

1) Indicator panel



Note: The upper part number 0...7 identifies the output status indicator of Q0...Q7 channel respectively. When there is current output, the corresponding x indicator lights up. The lower part number 0.... 7 identify the Q0.... Q7 channel over-range indicator, when a channel output current over-range, the corresponding indicator lights up.

2) Range digital quantity

Indicator status		Measurement range	Corresponding digital quantity
Operating Instructions	Fault Indicator		
R	E	0 ~ 20mA	0 ~ 20,000

2.4 External dimensional drawing

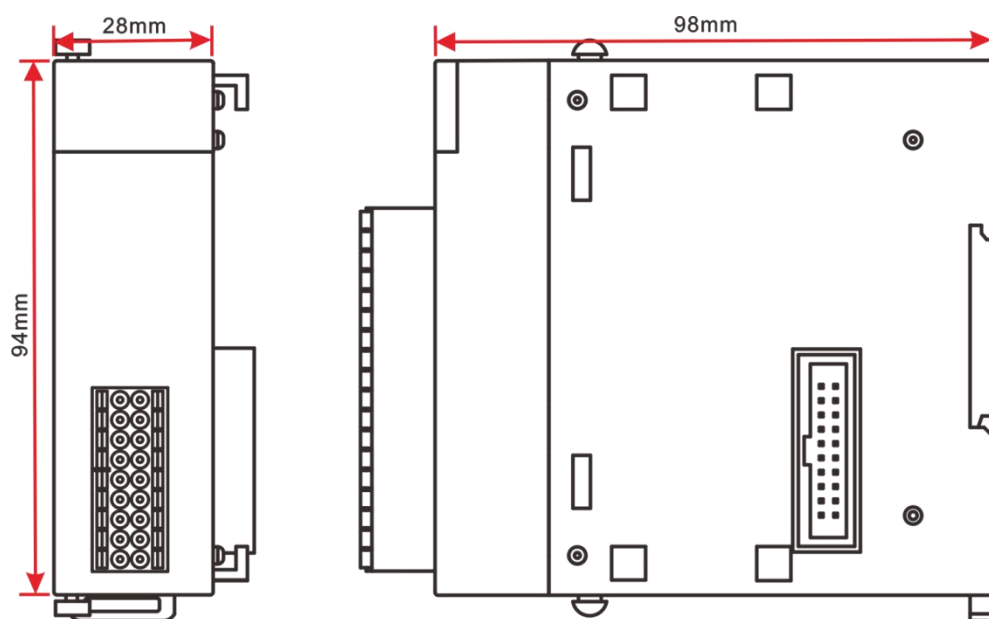


Figure 2-8: TK6-8HAI-V, TK6-8HAI-C, TK6-8HAO-V, TK6-8HAO-C external dimensional drawings (unit: mm)

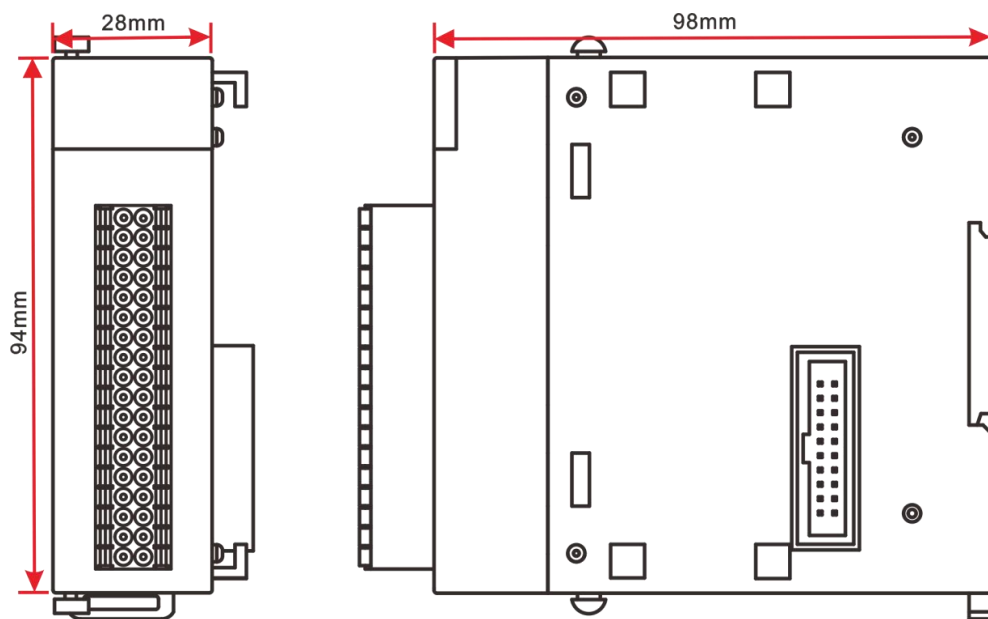


Figure 2-9: TK6-8HAI-B external dimensional drawing (unit: mm)

Section 3 Electrical Design Reference

3.1 Terminal arrangement and definition

● TK6-8HAI-V terminals definition

Serial number	Terminal number	Type	Function
0	A0	Input	Channel 0 V+
1	C0	Input	Channel 0 V-
2	A1	Input	Channel 1 V+
3	C1	Input	Channel 1 V-
4	A2	Input type	Channel 2 V+
5	C2	Input	Channel 2 V-
6	A3	Input	Channel 3 V+
7	C3	Input	Channel 3 V-
8	A4	Input	Channel 4 V+
9	C4	Input	Channel 4 V-
10	A5	Input	Channel 5 V+
11	C5	Input	Channel 5 V-
12	A6	Input	Channel 6 V+
13	C6	Input	Channel 6 V-
14	A7	Input	Channel 7 V+
15	C7	Input	Channel 7 V-
16	E	Shielded Ground	Shielded Ground
17	E	Shielded Ground	Shielded Ground

● TK6-8HAI-C terminals definition

Serial number	Terminal number	Type	Function
0	A0	Input	Channel 0 I+
1	C0	Input	Channel 0 I-
2	A1	Input	Channel 1 I+
3	C1	Input	Channel 1 I-
4	A2	Input type	Channel 2 I+
5	C2	Input	Channel 2 I-
6	A3	Input	Channel 3 I+

7	C3	Input	Channel 3 I-
8	A4	Input	Channel 4 I+
9	C4	Input	Channel 4 I-
10	A5	Input	Channel 5 I+
11	C5	Input	Channel 5 I-
12	A6	Input	Channel 6 I+
13	C6	Input	Channel 6 I-
14	A7	Input	Channel 7 I+
15	C7	Input	Channel 7 I-
16	E	Shielded Ground	Shielded Ground
17	E	Shielded Ground	Shielded Ground

● **TK6-8HAI-B terminals definition**

Terminal number	Name	Type	Function
0	U0	Input	Channel 0 V/I+
1	C0	Input	Channel 0 V/I-
2	IC0	Input	Channel 0 current shorting point
3	IN0	Input	Channel 0 current shorting point
4	U1	Input	Channel 1 V/I+
5	C1	Input	Channel 1 V/I-
6	IC1	Input	Channel 1 current shorting point
7	IN1	Input	Channel 1 current shorting point
8	U2	Input	Channel 2 V/I+
9	C2	Input	Channel 2 V/I-
10	IC2	Input	Channel 2 current shorting point
11	IN2	Input	Channel 2 current shorting point
12	U3	Input	Channel 3 V/I+
13	C3	Input	Channel 3 V/I-
14	IC3	Input	Channel 3 current shorting point
15	IN3	Input	Channel 3 current shorting point
16	U4	Input	Channel 4 V/I+
17	C4	Input	Channel 4 V/I-
18	IC4	Input	Channel 4 current shorting point
19	IN4	Input	Channel 4 current shorting point
20	U5	Input	Channel 5 V/I+
21	C5	Input	Channel 5 V/I-
22	IC5	Input	Channel 5 current shorting point
23	IN5	Input	Channel 5 current shorting point
24	U6	Input	Channel 6 V/I+
25	C6	Input	Channel 6 V/I-
26	IC6	Input	Channel 6 current shorting point
27	IN6	Input	Channel 6 current shorting point

28	U7	Input	Channel 7 V/I+
29	C7	Input	Channel 7 V/I-
30	IC7	Input	Channel 7 current shorting point
31	IN7	Input	Channel 7 current shorting point
32			Reserved
33			Reserved
34	E	-	Shielded Ground
35	E	-	Shielded Ground

● **TK6-8HAO-V terminals definition**

Serial number	Terminal number	Type	Function
0	A0	Output	Channel 0 V+
1	C0	Output	Channel 0 V-
2	A1	Output	Channel 1 V+
3	C1	Output	Channel 1 V-
4	A2	Output	Channel 2 V+
5	C2	Output	Channel 2 V-
6	A3	Output	Channel 3 V+
7	C3	Output	Channel 3 V-
8	A4	Output	Channel 4 V+
9	C4	Output	Channel 4 V-
10	A5	Output	Channel 5 V+
11	C5	Output	Channel 5 V-
12	A6	Output	Channel 6 V+
13	C6	Output	Channel 6 V-
14	A7	Output	Channel 7 V+
15	C7	Output	Channel 7 V-
16	E	Shielded Ground	Shielded Ground
17	E	Shielded Ground	Shielded Ground

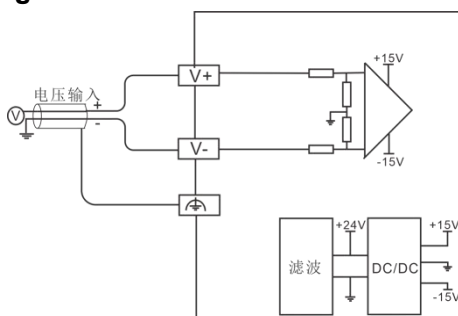
● **TK6-8HAO-C terminals definition**

Serial number	Terminal number	Type	Function
0	A0	Output	Channel 0 I+
1	C0	Output	Channel 0 I-
2	A1	Output	Channel 1 I+
3	C1	Output	Channel 1 I-
4	A2	Output	Channel 2 I+
5	C2	Output	Channel 2 I-

6	A3	Output	Channel 3 I+
7	C3	Output	Channel 3 I-
8	A4	Output	Channel 4 I+
9	C4	Output	Channel 4 I-
10	A5	Output	Channel 5 I+
11	C5	Output	Channel 5 I-
12	A6	Output	Channel 6 I+
13	C6	Output	Channel 6 I-
14	A7	Output	Channel 7 I+
15	C7	Output	Channel 7 I-
16	E	Shielded Ground	Shielded Ground
17	E	Shielded Ground	Shielded Ground

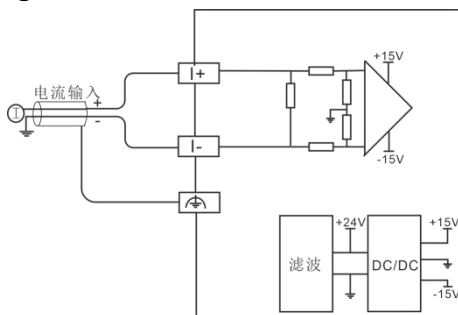
3.2 Function Principle

● TK6-8HAI-V schematic diagram



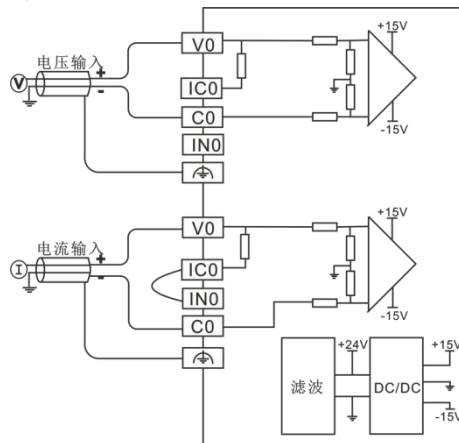
Special Note: Please strictly follow the voltage signal wiring method, otherwise the data cannot be collected normally.

● TK6-8HAI-C schematic diagram



Special Note: Please strictly follow the current signal wiring method, otherwise the data cannot be collected normally.

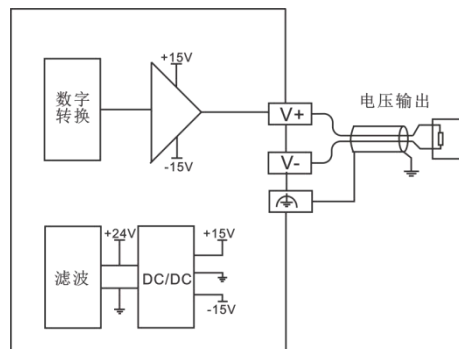
● **TK6-8HAI-B schematic diagram**



Special Note: Please strictly follow the voltage and current signal wiring, otherwise the data cannot be collected normally.

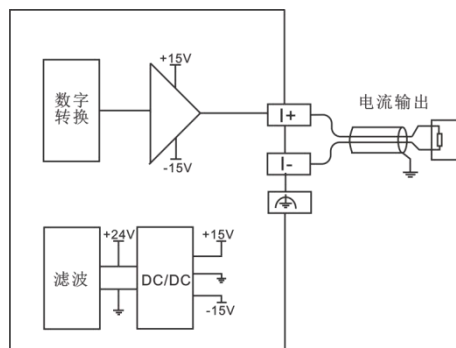
- 1) TK6-8HAI-B unit is provided with 24V power supply from the system internal, and the power consumption is less than 2W. The 24V power supply is converted to $\pm 15\text{V}$ for the field interface part through isolated DC/DC, and the field interface part is isolated from the system side by ISO devices to realize the system isolation between the field circuit and the system circuit.
- 2) Voltage signals are converted to digital signals through voltage conversion, filtering, and AC conversion, and are read by the controller after passing through ISO isolation devices such as optocouplers and are transmitted to the CPU controller through the backplane bus.

● **TK6-8HAO-V schematic diagram**



Special Note: Please strictly follow the voltage signal wiring method, otherwise the data will not be output properly.

● **TK6-8HAO-C schematic diagram**



Special Note: Please strictly follow the current signal wiring method, otherwise the data will not be output properly.

3.3 Cable selection and wiring

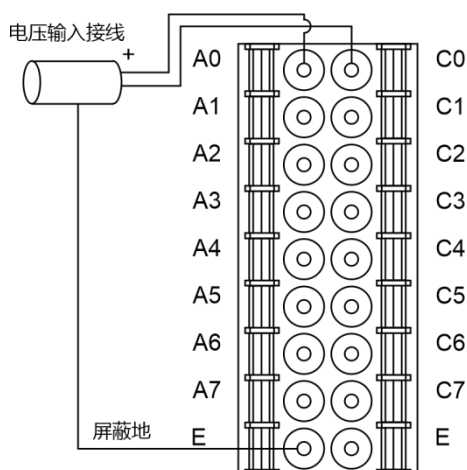
3.3.1 Cable Selection

Matching material name	Model	Parameters
Forked wire ears	SV1.25-3	Suitable for 0.5-0.75mm ² cable
Twisted pair with shield		

Table TK6-8HAI-V, TK6-8HAI-C, TK6-8HAI-B, TK6-8HAO-V, TK6-8HAO-C Wiring Cable Selection

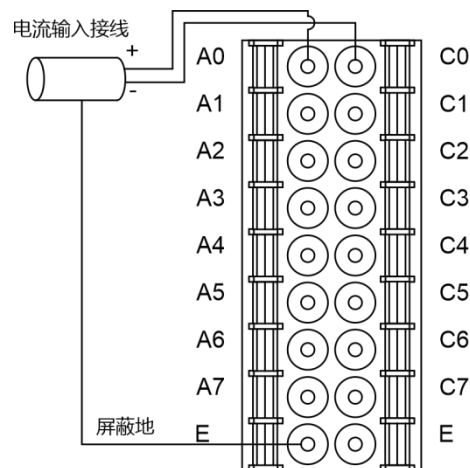
3.3.2 Wiring

● TK6-8HAI-V terminal wiring diagram



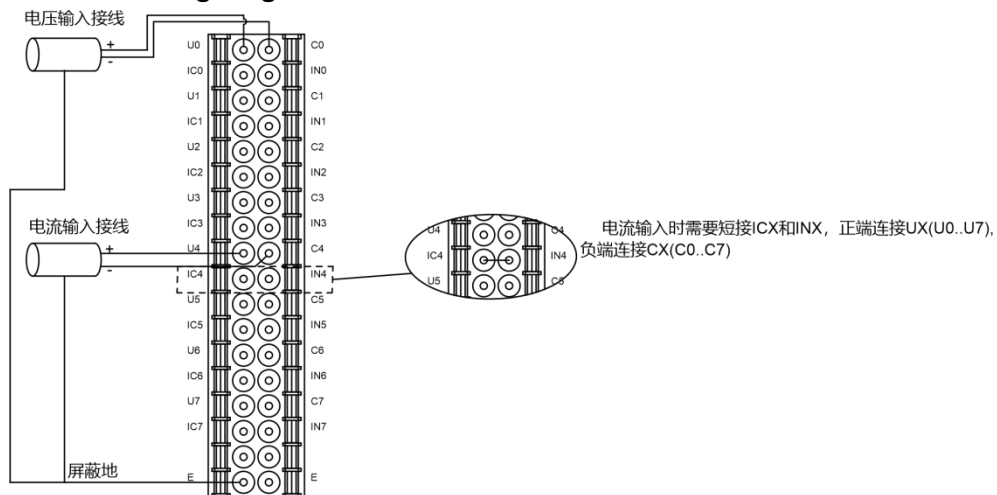
Note: Wiring reference TK6-8HAI-V terminals definition and wiring diagram connection, such as the 0th channel, the positive end of the connection V0 + (connected to the A0 terminal), the negative end of the connection V0 - (C0 terminal)

● TK6-8HAI-C terminal wiring diagram



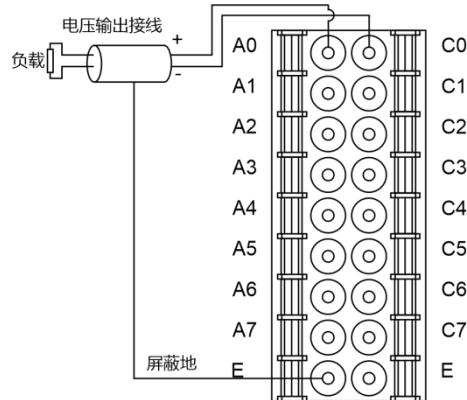
Note: Wiring reference TK6-8HAI-C terminals definition and wiring diagram connection, such as the 0th channel when the positive end of the connection I0 + (connected to the A0 terminal), the negative end of the connection I0- (C0 terminal)

● TK6-8HAI-B terminal wiring diagram



Note: Wiring reference TK6-8HAI-B terminals definition and wiring diagram on the voltage input and current input part of the connection, need to pay attention to the voltage input connected to UX (U0...U7) and CX (C0...C7), current input need to short ICX and INX, the positive end connected to UX (U0...U7), the negative end connected to CX (C0...C7).

● TK6-8HAO-V, TK6-8HAO-C terminal wiring diagram



Note: 1. Wiring reference TK6-8HAO-V terminal definition and wiring diagram connection, voltage output connection V+ and V-
 2. Wiring reference TK6-8HAO-C terminal definition and wiring diagram connection, voltage output connection I+ and I-

3.3.3 Wiring Precautions

- 1) Selection of recommended cables for connection, with shielded twisted-pair cables recommended to improve immunity to interference and shielded ends connected to shielded terminals.
- 2) ICX and INX terminals are not connected for voltage input, and ICX and INX terminals need to be shorted for current input.
- 3) The unit is mounted on a well-grounded metal bracket and ensures good contact between the shrapnel at the bottom of the unit and the bracket.
- 4) Avoid bundling with power lines (high voltage, high current) and other cables that transmit strong interference, they should be separated and avoid parallel alignment.

Section 4 Programming Examples

4.1 HMC-S3-22N00+TK6-8HAI-C+TM8-ECT+TK8-4AO

Programming Example

The hardware devices in this programming example are a HMC-S3-22N00 controller, a TK6-8HAI-C analog current input unit, a KCM8-ECT coupler, and a TK8-4AO analog output unit. The realized function is a HMC-S3-22N00 as the control master module, with a TK6-8HAI-C input unit, sampling TK8-4AO analog output unit 0-3 channel current value assigned to the variable.

- 1) Create a new project on CODESYS and enter the programming interface.
- 2) The local backplane bus "STDIOBus (STDIOBus)" is added by default on the left side of the programming interface, right click "STDIOBus (STDIOBus)", select "Update Device" and update to "STDIOBus (STDIOBus)", as in Figure 4-1.

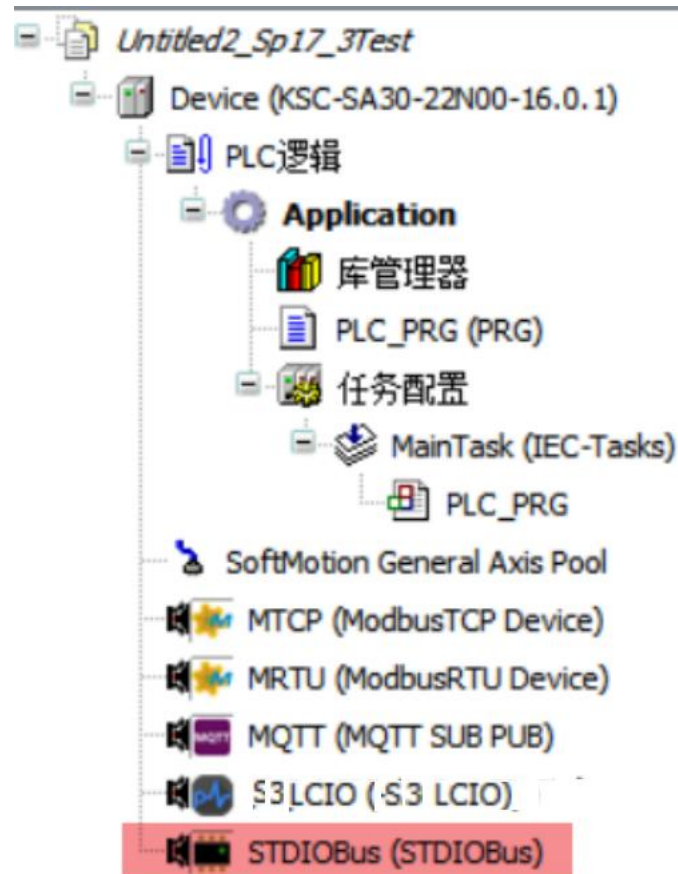


Figure 4-1 Backplane Bus

- 3) Right-click the "STDIOPBus (STDIOPBus)" item on the left side of the programming interface, select "Scan Devices" in the pop-up menu, the interface shows TK6-8HAI-C, click Copy all devices to the project, as shown in Figure 4-2.



Figure 4-2 Scanning device

- 4) Configure the channel parameters, double-click the "TK-8HAI-C" item on the left side of the programming interface, enter the "AI8U parameters" configuration interface, configure the mode of channel 0 as "4~20mA ", as shown in Figure 4-3.

AI8I 参数 AI8I/O映射 AI8IIEC对象 状态 信息	参数					
	通道-0	模式	Enumeration of USINT	4~20mA	4~20mA	输出类型及量程
		滤波时间	USINT	10	10 ms	1~255ms
	通道-1	模式	Enumeration of USINT	4~20mA	4~20mA	输出类型及量程
		滤波时间	USINT	10	10 ms	1~255ms
	通道-2	模式	Enumeration of USINT	4~20mA	4~20mA	输出类型及量程
		滤波时间	USINT	10	10 ms	1~255ms

Figure 4-3 AI8U parameter configuration

- 5) Using ST programming language, define the mapping variable aInAnalog and variable aOutAnalog in the "PLC_PRG" file, the code is shown in Figure 4-4.

```

1 PROGRAM PLC_PRG
2 VAR
3   aInAnalog          : ARRAY[0..7] OF INT;
4   aOutAnalog         : ARRAY[0..7] OF INT;
5   icounter : INT;
6 END_VAR

1 FOR icounter := 0 TO 7 BY 1 DO
2   aOutAnalog[icounter] := aOutAnalog[icounter] + 1;
3
4   IF aOutAnalog[icounter] > 1000 THEN
5     aOutAnalog[icounter] := 0;
6   END_IF
7 END_FOR

```

Figure 4-4 Program Code

- 6) Double click the "TK6-8HAI-C" item on the left side of the programming interface to enter the "AI8U I/O mapping" interface and map the mapping variable aInAnalog defined in the program to channels 0-3 of the TK6-8HAI-C unit, as shown in Figure 4-5. As shown in Figure 4-5.

AI8I 参数		查找	过滤器	显示所有				
AI8I I/O映射		变量	映射	通道	地址	类型	单元	描述
AI8IEC对象	状态	信息	Application.aInAnalog[4]	AI8I[0]	%IW10	ARRAY [0..7] OF INT		
			Application.aInAnalog[5]	AI8I[1]	%IW11	INT		
			Application.aInAnalog[6]	AI8I[2]	%IW12	INT		
			Application.aInAnalog[7]	AI8I[3]	%IW13	INT		
				AI8I[4]	%IW14	INT		
				AI8I[5]	%IW15	INT		
				AI8I[6]	%IW16	INT		
				AI8I[7]	%IW17	INT		

Figure 4-5 IO Mapping

- 7) After compiling passed, login to download and run.
8) Tracing, as shown in Figure 4-6.

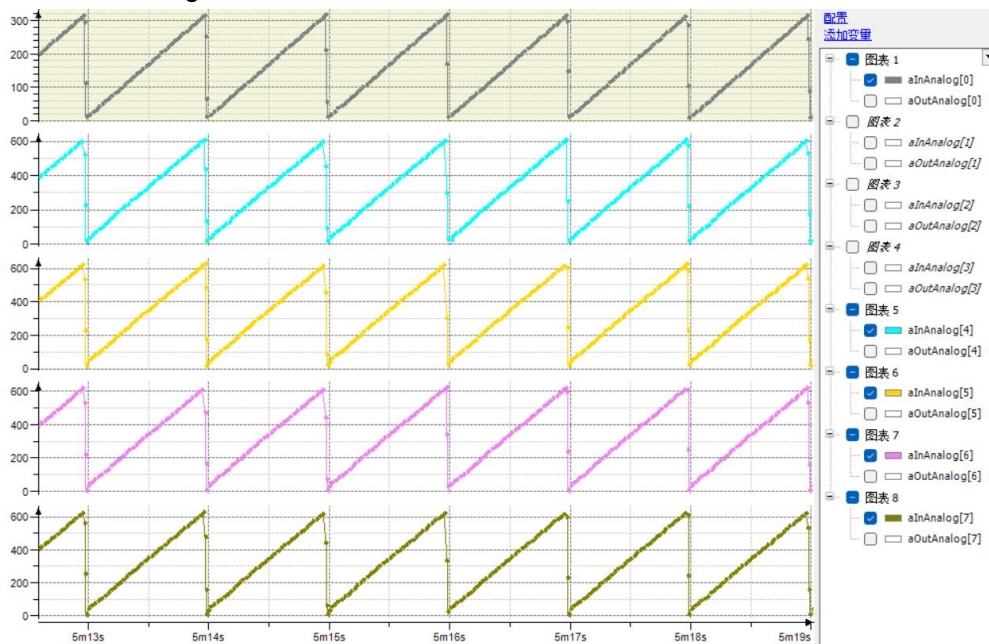


Figure 4-6 Trace tracking