Shenzhen Hi-Link Electronic co.,ltd

HLK-DIO16

16 Channels digital input output controller

USER MANUAL

CONTENT

1 **Summary**

1.1 **Introduction**

HLK-DIO16 is such a multi-interface, networked, intelligent digital IO acquisition and controller with 16 channels digital input and 16 channels relay output, built-in WiFi network module and supports Modbus. It has the remote and local and direct control channel with simple meticulous output movement control and flexible reliable manual automatic linkage control methods. And PC software and mobilephone APP are available.

It provides users with rich and free ways to use thanks to its high performance,high integration and high flexibility,which can be widely used in a variety of switching quantity acquisition and control systems, for the existing system to increase the network control and automatic control ability to enhance the system function and value.
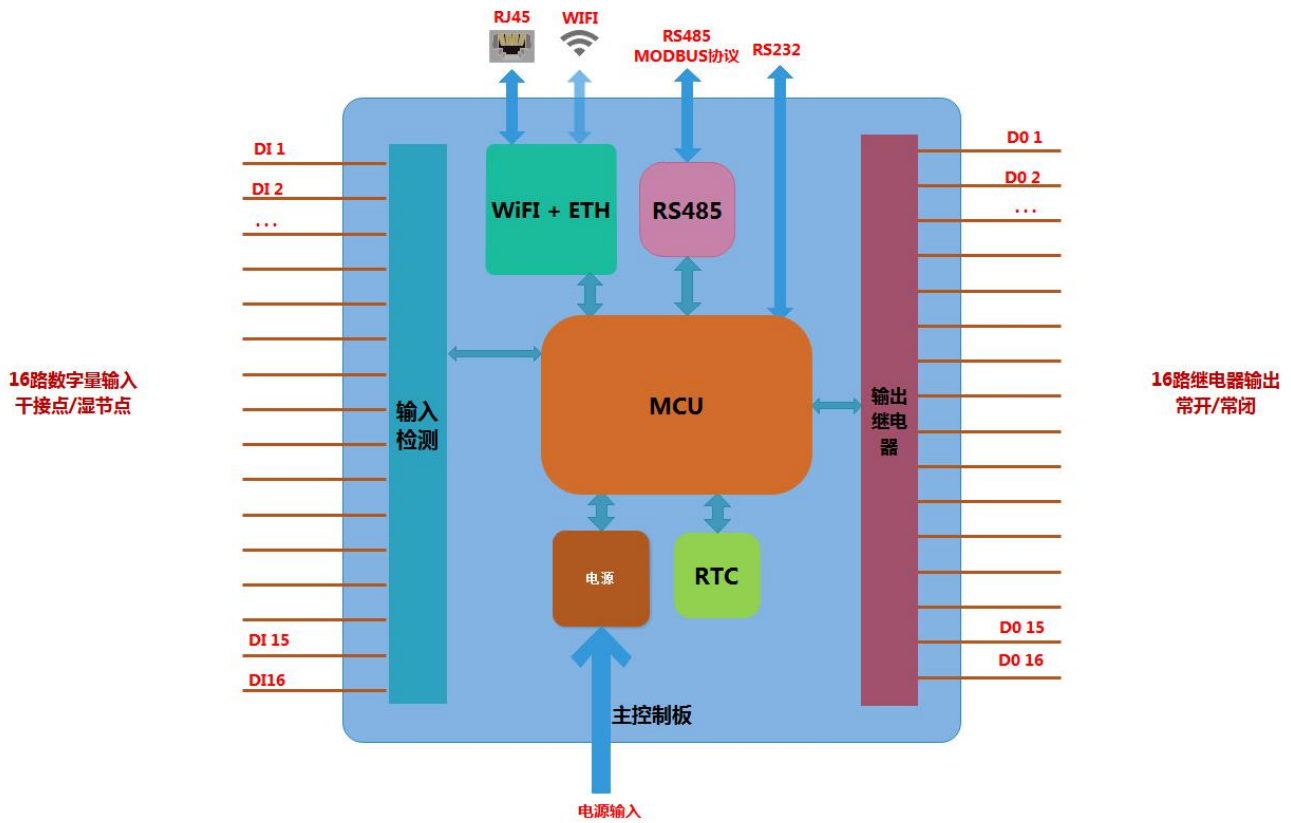
Figure 1   Product Diagram

1.2 **Product characteristics**

● Excellent hardware design and technology, complete isolation of input and output, high reliability, built-in watchdog to ensure the equipment to work for a long time stable, built-in RTC clock chip to ensure that the power clock could not stop.

● Built in WIFI router ethernet module, support RJ45 ethernet connection and wireless WIFI; Both LAN and remote can communicate with the equipment and control the equipment, the LAN and the remote can operate at the same time, after the equipment is connected to the Internet, it can automatically connect to the cloud server, and can control the equipment remotely through APP.

● With RS485 interface, supporting Modbus protocol, it can be used as digital IO remote

acquisition and control equipment, convenient access to commonly used industrial control system, through the Modbus protocol to query the status of input and output, control output action;

- With a RS232 serial port and   can control the device through this serial port;
- Powerful use of flexible automatic control features:

   Flexible configuration of up to 16 automatic controls, each independent of each, can be fine and free configuration;

   Intelligent timing control to support time points and time periods;

   Input-output linkage control with timing;

- Complete function output action mode: close, break, flip, point, and optional delay execution or loop execution;
- Each input supports outlay dry contact and wet node equipment, and each relay output has regular open and close contacts;
- State change can be reported automatically
- Free to provide stable and easy-to-use mobile phone end control APP, PC control software;

1.3 **Application scene**

This product aims to provide users with flexible, efficient, reliable and easy-to-use equipment and experience, and strive to become the right hand and tool in the specific application of users. Can be widely used in all kinds of switch sensor input, relay control scene.

- Output relay up to 16 channels, each maximum 10A load capacity, can easily control the switch of various household appliances, used in smart home, intelligent power control system;

- Output relay has a rich and flexible operation mode, suitable for industrial control and other occasions requiring high reliability and high customization, controlling all kinds of motor, lamp, water pump, heating equipment, transmission device, etc.

- Powerful automatic control function, can be used in various automatic control systems, the realization of unmanned automatic control;

- Through 16 items of automatic control, combined with input and output linkage, reasonable configuration, in some of the flow of a single automatic control system, can replace PLC, to realize the flow of automatic control;

Digital input:

● Through the input of fretting switch, position sensor, travel switch and other sensors, the information of position and stroke are obtained.

● Through temperature switch, water level switch, pressure switch and so on to obtain the temperature, the water level, the pressure and so on information;

● Through the magnetic switch, optoelectronic switch, human body induction switch and other information about the entry of objects;
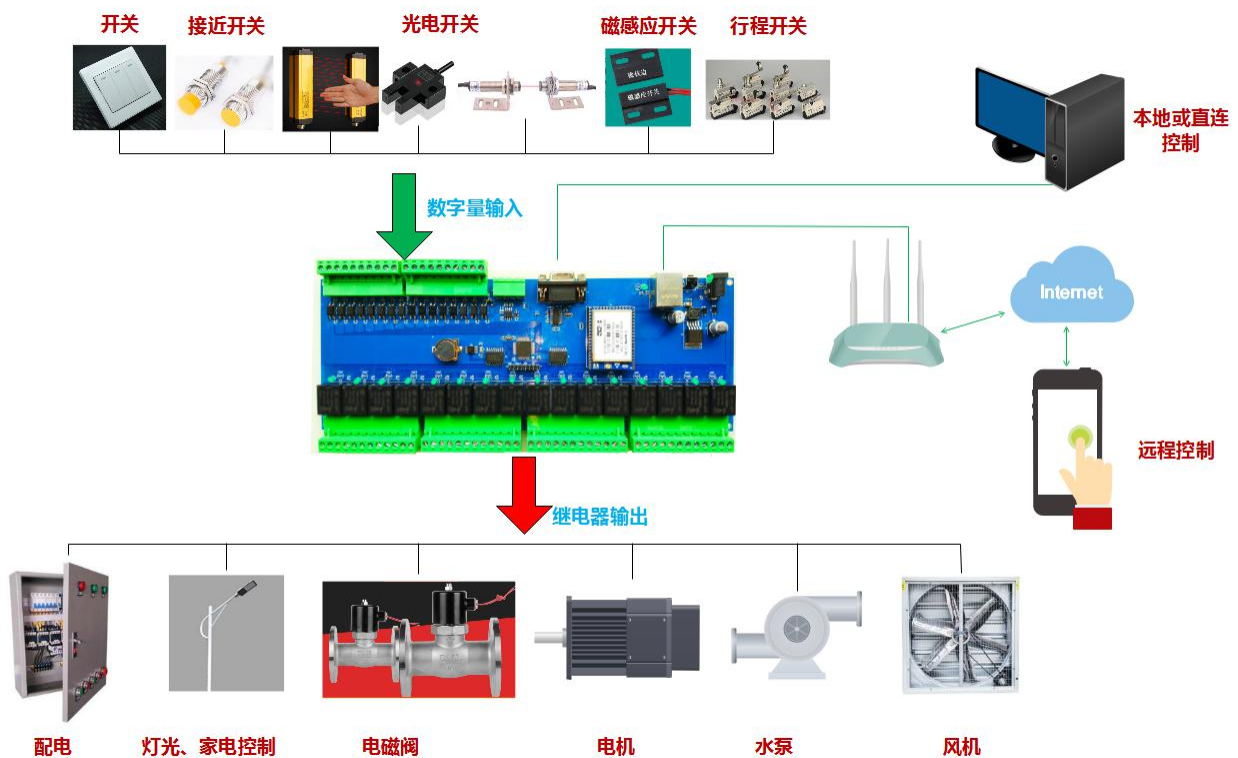
Figure 2
Application of scene effect diagram

2 Hardware interface specification

2.1 Product appearance and hardware

DC 12V输入

电源指示灯

功能按键

RJ45网口

通信指示灯

RS232串口

12V
GND
RS485 A
RS485 B
COM
DI 16
...
DI 9
GND
COM
DI 8
...
DI 1
GND

DO16 NC
DO16 COM
DO16 NO
...
DO13 NC
DO13 COM
DO13 NO
...
DO9 NC
DO9 COM
DO9 NO
...
DO5 NC
DO5 COM
DO5 NO
...
DO1 NC
DO1 COM
DO1 NO
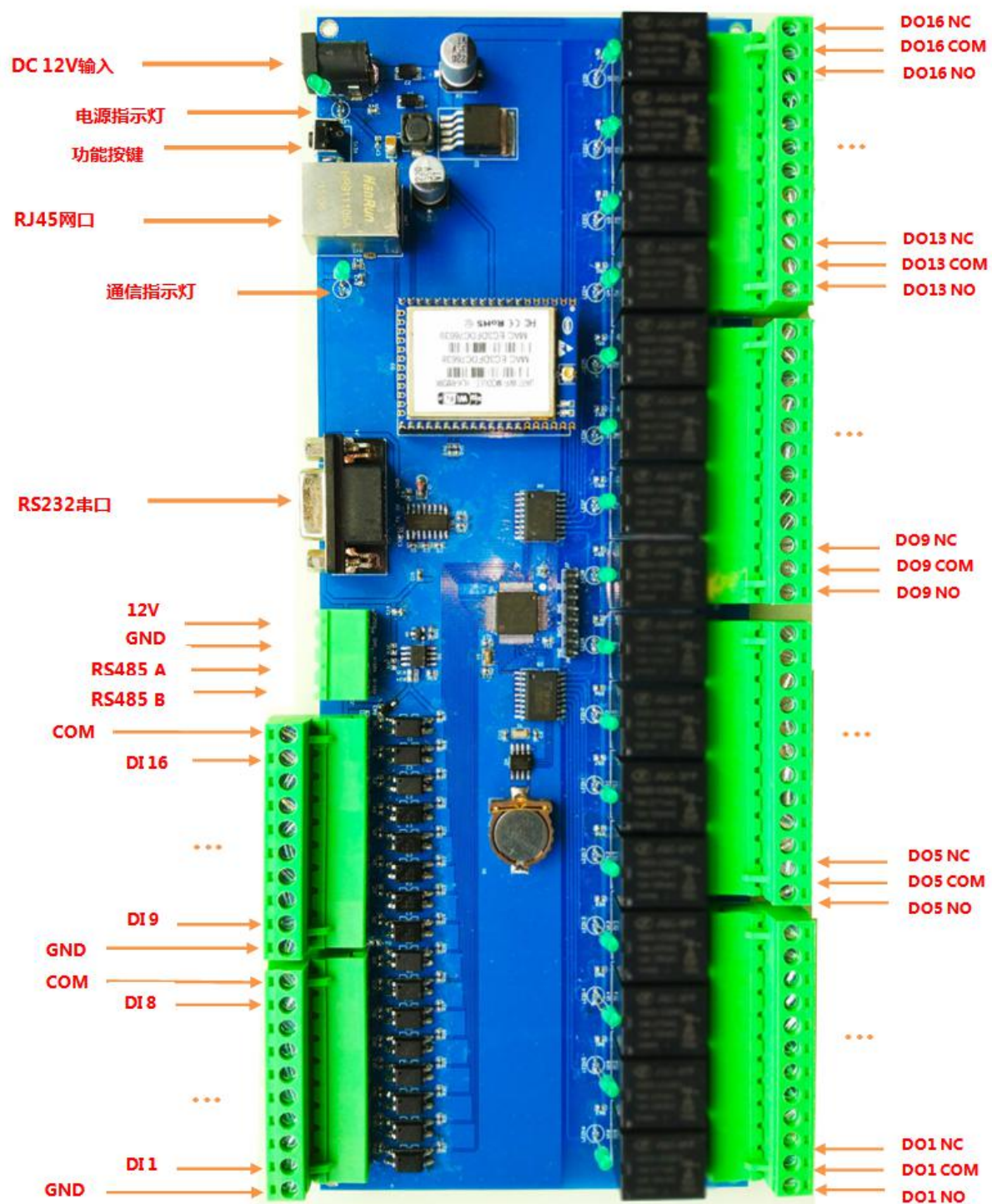
Figure 3   outline and hardware interface diagram

2.2 **Interface definition description**

Power supply interface	
Power	Power positive，DC12V
GND	Ground
Internet interface	
RJ45	RJ45 connection
DI input interface	
DI1 ~ DI16	Digital signal input
COM	The public end of digital signal input when the input device as dry node
DO output interface	
DO. NC	Normally closed contact of relay output
DO. COM	Common contacts for relay output
DO. NO	Normally open contact of relay output
RS232	
DB9 female	RS232 connection
RS485	
RS485 A	RS485 +
RS485 B	RS485 -

2.3 **Indicator and key**

PWR	power light
LED	Communications and equipment status indicator, with communication data on
Output state indicator lamp	16 digital output corresponding state indicator light, corresponding relay closed on or off

Function key	Restore the factory settings button, press for 6 to 10 seconds and release	

3 Equipment parameters and performance

3.1 Hardware parameters

Power supply requirement	Input voltage	DC 12V
	Power capacity	>500mA
Digital input interface DI	Channels quantity	16-channel digital input
	Supported input device types	Dry and wet nodes
	Input voltage and current range	The wet node voltage Max 12V, the recommended value is 3.3 V; Current Max 50mA
	Protection form	All-optical coupling isolation
Relay output interface DO	Number of channels	16-channel C-type relay output
	Output type	Each path has open and closed contacts, all optical coupling isolation
	load capacity	10A/220V
	Electrical life	1×10^5 times
RS23 serial parameters	Interface form	DB9 female
	Baud rate	115200
	protocol type	HEX instruction Protocol defined
	protocol type	Modbus RTU
Ethernet parameters	interface type	RJ45 interface, 100m adaptive ETH
	Support function	DHCP client, static IP, supports Wireless routing
WiFi parameters	Wireless parameter	2.4 GHz ,150 Mbps , 802.11b/g/n
	Support mode	AP , STA , AP+STA
	Encryption type	WPA-PSK/WPA2-PSK、 WPA/WPA2 DHCP client, static IP, supports Wireless routing

Working environments	Working temperature, humidity	-30~70℃，10~90%RH（No condensation）
	Storage temperature, humidity	-40~80℃，5~95%RH（No condensation）
Size	Installation mode	Screw hole or guide
	outline dimension	L 27cm× W 98cm×H 2cm

Table 2　Hardware parameters

3.2 **Performance and design accuracy**

Digital input signal acquisition frequency	100Hz
Relay output minimum switching time	<10ms
Time accuracy (point, delay, cycle time)	10ms
Time range (point, delay, cycle time)	1～60000，unit 10ms，or 10ms～10min
Clock error	<5 s/d
Timing accuracy	1min
Timing range	Month: day: hour: minutes Support monthly, weekly, daily, hourly, hourly
Timing type	Time points and time periods
Number of automatic controls	16 items, each can be opened or closed independently
Automatic control optional type	Time point linkage
Output action number	Close, break, flip, click Optional delay or loop execution

Table 3　　Product performance and precision parameter table

4   Product function and usage

4.1 Communication interface and communication protocol

The device provides a variety of communication interfaces such as RS232 serial port, RS485,RJ45H port, wireless WiFi ,etc.. Through these interfaces, according to the corresponding communication protocol, the device can send control commands to the device and inquire the status information. Query and modify the device configuration parameters and other functions.

It Can communicate with the device through any communication interface, and multiple interfaces can be used at the same time.

Connection mode	Interface	communicating protocol	protocol function
Protocol function	RS232 serial	HEX instruction Protocol defined	Control output, query input and output status, configure device parameters, automatically report state changes
	RS485	MODBUS Protocol	Control output, query input and output status, configure device parameters (not all)
Local LAN TCP/IP connection	RJ45 port or wireless WiFi	HEX instruction Protocol defined	Control output, query input and output status, configure device parameters, automatically report state changes
Remote network TCP/IP connection	RJ45 port or wireless WiFi	HEX instruction Protocol defined	Control output, query input and output status, configure device parameters, automatically report state changes

Table 4 Communication interfaces and protocol tables

MODBUS protocol can be used to realize the real-time control of the output and the input-output current value query, please refer to the description of the HLK-DIO16 Modbus protocol.

4.2   Relay output control

The device supports 16 relay outputs, and the user can control the device to perform different output actions;

Each channels　can be controlled separately or simultaneously.

Output action type	Explanation
Close	Output relay closed, often open contact through, normally closed contact broken
Disconnect	Output relay disconnected, often open and closed contact through
overturn	The output relay is currently closed and closed; the current one is closed
Inching	The output relay is closed and then automatically disconnected after a delay of some time

Table 5 output action types

It can be controlled in real time by sending instructions to the device or by configuring the timing function or the input and output linkage function of the device, so that the device can automatically control the output according to the time or the input state.

Each output action can also be executed with the following execution options to achieve richer and more flexible operations;

These execution options are optional and can be chosen arbitrarily or not according to specific needs;

Execution options (optional)	Explanation
Delayed execution	If this option is selected, the output action is executed immediately after the delay in the set delay; otherwise, the output action is executed immediately
Loop execution	If this option is selected, the output action will be executed again after the output action is executed, after a delay in the set cycle time, and so continuously; otherwise, the output action will be executed only once

Table 6　　　output action execution options

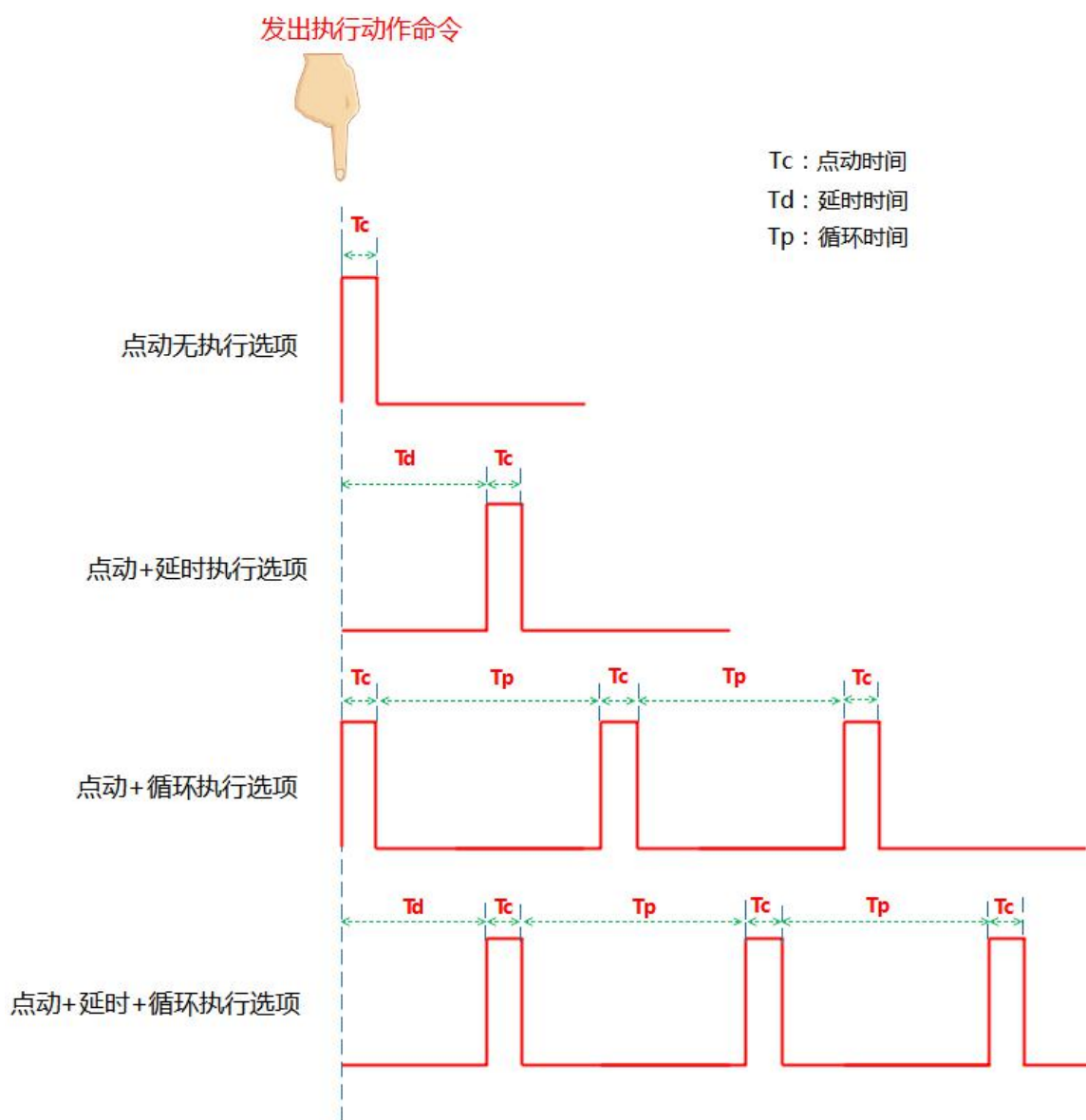Take the inching　action as an example, the effects of the specific action and execution options are as follows:

发出执行动作命令

Tc：点动时间
Td：延时时间
Tp：循环时间

点动无执行选项

Tc

点动+延时执行选项

Td　Tc

点动+循环执行选项

Tc　Tp　Tc　Tp　Tc

点动+延时+循环执行选项

Td　Tc　Tp　Tc　Tp　Tc

Figure 4　　Legend of delay and loop execution

4.3　Input Inspection

　　　This product supports 16 road digital input, each input channel supports dry contact and wet node type input equipment.
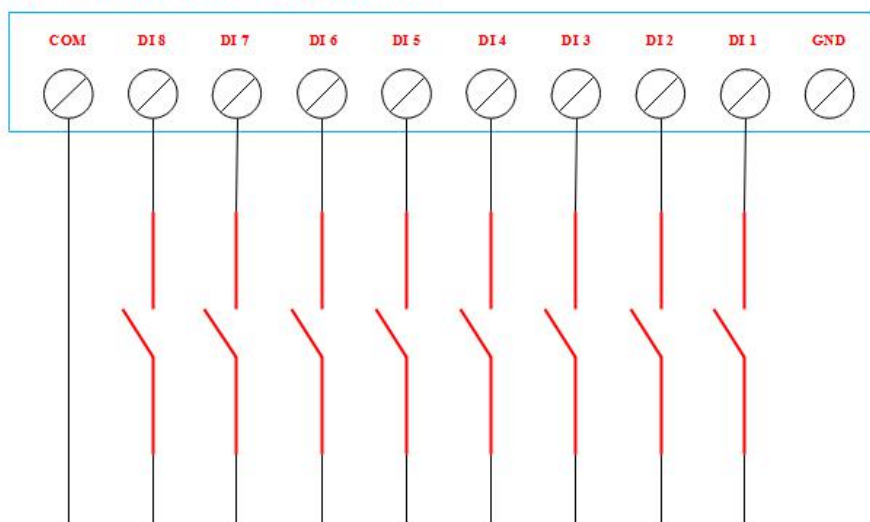　　Specific input devices are used and defined as follows:

Input device type	Explanation	Methods	Input value define
Dry node	Passive switching quantity, such as keys, switches, etc.	Need to connect DI and COM pins, no polarity, Detect on and off of input	1 connect ， 0 off

Wet node	Voltage input, such as other devices capable of voltage output, etc.	Need to connect DI and GND pins, polarity, Detect the level of input	1 high level, 0 low level

干节点输入设备接法：连接COM和DI

| COM | DI 8 | DI 7 | DI 6 | DI 5 | DI 4 | DI 3 | DI 2 | DI 1 | GND |

湿节点输入设备接法：连接GND和DI

| COM | DI 8 | DI 7 | DI 6 | DI 5 | DI 4 | DI 3 | DI 2 | DI 1 | GND |
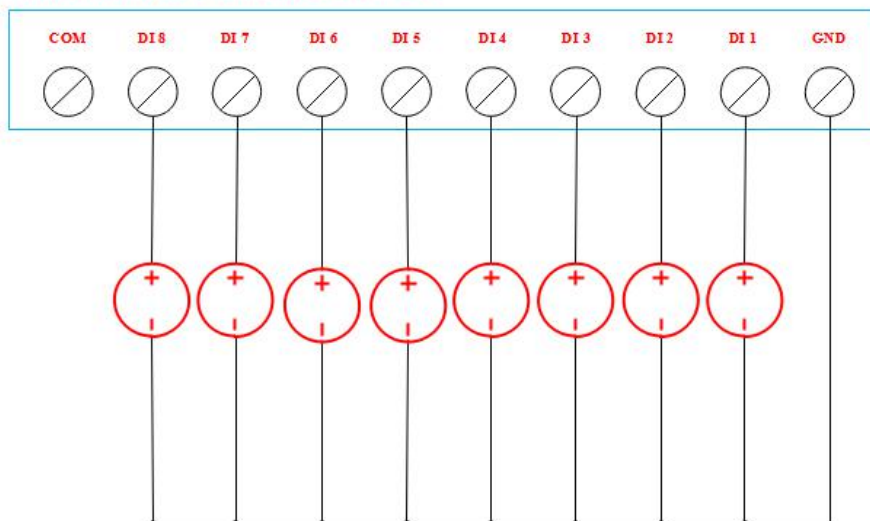
Fig. 5 connection legend of different types of input devices

4.4 Automatic control output

This product supports the definition of up to 16 items of automatic control output,it can be arbitrarily configured as timing control output or according to the input automatic linkage control

output, linkage control can be accompanied by timing, each automatic control can be separately set to enable or close.

The automatic control logic is to check whether the set trigger condition is satisfied and perform the set action on the specified output channel.

According to different trigger conditions can be divided into: time, linkage, time-point linkage, time-time linkage.

4.4.1 Time point timing control

Setting a time point and controlling the output selection and corresponding output action, when reaching the time point, automatically executing the set output action on the selected output channel;

It means to perform the specified output action at the specified point in time.

Timing format support month: day: time: minutes, also support monthly, weekly, daily, every hour, every minute.

4.4.2 Time period timing control

Sets a time period (start time and end time) and controls the output selection and corresponding output actions, automatically performing the set output action on the selected output channel when the start time is reached, Automatically disconnect on the selected output channel when the end time is reached.

Timing format support month: day: time: minutes, also support monthly, weekly, daily, every hour, every minute;

Namely, the specified action can be performed within a specified period of time and the selected relay is disconnected from the time period.

4.4.3 Linkage control

Setting input selection and controlling output selection and corresponding output action, when all selected input conditions are satisfied, the set output action is automatically executed on the selected output channel.

Namely, according to the input signal to control the output automatically, according to the different types of input signal have different actions.

4.4.4 Linkage Control with time Point timing

Setting a time point, input selecting and controlling output selection and corresponding output action, automatically executing the set output action when the time point is reached and the input condition is satisfied.

That is, when the time point is set and the input condition is satisfied, the specified output action is executed.

4.4.5 Linkage Control with time interval

Set a time period (start time and end time), input select and control output selection and corresponding output action, when the start time is reached and the input condition is satisfied, the output action set is automatically performed on the selected output channel, When the end time is reached or the input condition is not met, the disconnect action is automatically performed on the selected output channel.

## 4.4.6 Input signal types in Linkage Control

The linkage control can be divided into two types according to the input signal:

Input signal type	Description	Linkage logic
Short touch (pulse) input	A brief pulse, such as a button without a self-lock, that is pressed only for a moment, release and immediately resume disconnection.	Perform an output action when each input pulse arrives
Long touch (level) input	A relatively stable level input, such as a turntable switch, that remains in a state after being pushed	When the input is high (from low to high), the output action is performed. The input turns off the relay when the input is high to low, that is, the output follows the input, the input 1 performs the action, and the input closes at 0

Table 8 types of input signals in linkage control

The concrete effect of implementation is shown in the following figure:

联动控制：
输入类型=短触（脉冲），
输出动作=点动无执行选项
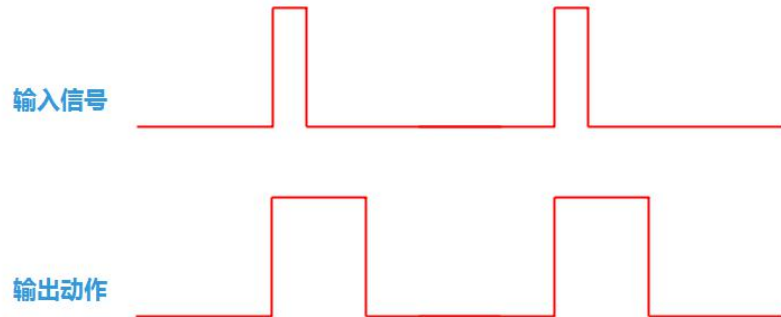
输入信号

输出动作
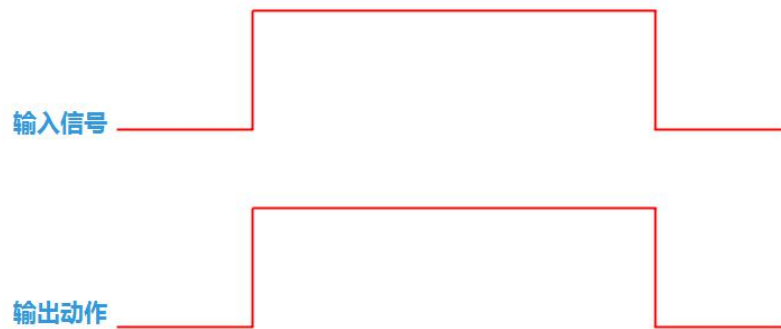
联动控制：
输入类型=长触（电平），
输出动作=闭合无执行选项

输入信号

输出动作

图 6联动控制中的输入信号类型的图例

5 Tool software

We provide PC configuration tool software and mobile phone APP, through these software, users can quickly and easily use the connection and control equipment and control relay output action and query the status of input and output, configure automatic control and other equipment parameters;

PC software supports connecting devices via serial port and network, while APP supports connecting devices via network.

Please refer to the manual *HLK-DIO16 user manual configuration tool & APP* .

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