DK TECH™

Dk5080 eight-channel remote acquisition module

user's manual

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1. Module introduction

1. 1 Functions and features

1. 1. 1 DK5080 is an 8-channel analog signal acquisition module. Through Modbus transmission data, 8 analog DC voltage or current signals can be measured, using the international standard two-wire ModBus RTU communication method. The module is widely used in various industrial measurement and control systems.

1. 1. 2 Adopt high-speed signal processor, digital intelligent data acquisition module with microprocessor as the core.

1. 1. 3 It supports 8 independent inputs without common ground, and can also measure with 8 common grounds. Support DC voltage signal in the range of 0-5V; DC voltage signal in the range of 0-10V; or DC current signal in the range of 0-20mA.

1. 1. 4 Equipped with photoelectric isolation RS-485 communication interface, adopt ModBus RTU communication protocol. The circuit design uses input, power, and output isolation.

1. 2 Technical index

1. 2. 1 Main Specifications

Number of input channels: 8 channels
Input signal range: 1, 0-5V DC voltage signal;
2. 0-10V DC voltage signal;
3. 0-20MA DC current signal;
A/D conversion resolution: 24BIT
A/D conversion time: 200HZ
Communication method: RS485 interface, two-wire system
Driving distance: 1200 meters
Communication rate: 4800, 9600, 19200
Communication data format: one start bit, eight data bits, one stop bit
Communication protocol: MODBUS RTU
Power supply voltage: DC24V±10%
Isolation voltage: 2000V AC

1. 2. 2. Input and output: see the table below

Input	Isolation	Measuring range
8 signals including 1、0-5V 2、0-10V 3、0-20mA	Input, power and output are completely isolated	LCD 1、0-5V 2、0-10V 3、0-20mA

Remarks: The data read back from communication is enlarged to an integer. For example, 20.00mA displays 2000.

1.2.3. Communication: ModBus RTU communication protocol, RS485 interface; address: 1~247, baud rate: 4800, 9600, 19200bps, baud rate and address can be set by software or by key.
1.2.4. Working conditions: temperature: -20℃~+60℃, humidity: 10%~90%RH
1.2.5. Storage conditions: temperature: -40℃~+80℃, humidity: 10%~90%RH
1.2.6. Dimensions: 88mm * 72mm * 59mm
1.2.7 Installation with standard 35mm rail

1.3 External structure

3 views of the outline of 8-channel transmitter and terminal wiring diagram

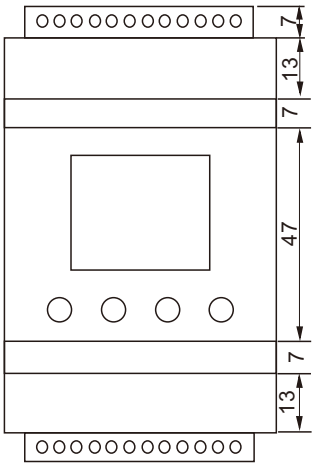


Figure 1-1 Module pin top view

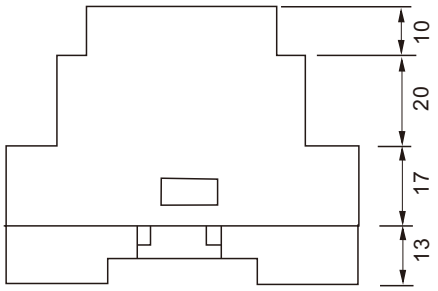


Figure 1-2 Module side view

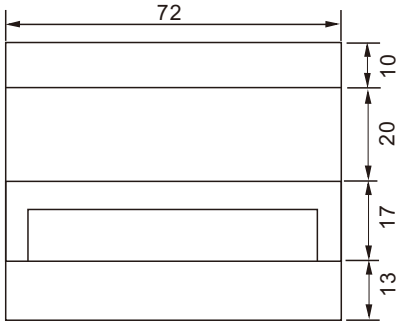


Figure 1-3 Module front view

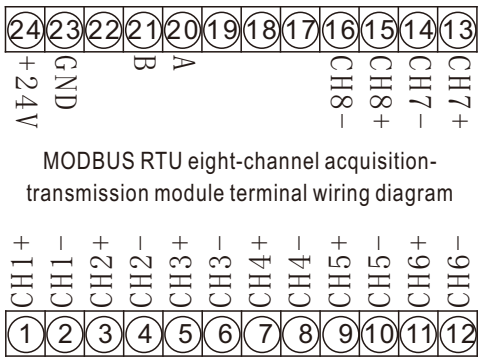


Figure 1-4 Terminal wiring diagram

1.4 Pin definition

Terminal number	Terminal name	Features
1	CH1+	The first voltage/current input is positive
2	CH1-	The first voltage/current input is negative
3	CH2+	The second voltage/current input is positive
4	CH2-	The second voltage/current input is negative
5	CH3+	The third voltage/current input is positive
6	CH3-	The third voltage/current input is negative
7	CH4+	The fourth voltage/current input is positive
8	CH4-	The fourth voltage/current input is negative
9	CH5+	The fifth voltage/current input is positive
10	CH5-	The fifth voltage/current input is negative
11	CH6+	The sixth voltage/current input is positive
12	CH6-	The sixth voltage/current input is negative
13	CH7+	The seventh voltage/current input is positive
14	CH7-	The seventh voltage/current input is negative
15	CH8+	The eighth voltage/current input is positive
16	CH8-	The eighth voltage/current input is negative
17	NC	Floating pin
18	NC	Floating pin
19	NC	Floating pin
20	RXD	RS-485 interface signal positive, A
21	TXD	RS-485 interface signal negative, B
22	NC	Floating pin
23	GND	Input power ground
24	+24V	Input 24V power terminal

2. Module Application Guide

2.1 Panel introduction

2. 1. 1 Parameter display window: displays the system's current measurement voltage, current channel and other running and setting parameters.

2. 1. 2 Running indicator: the system is powered on, the power indicator indicates that the POWER light flashes 3 times, and then stays on.When the module is in communication status, the COMM light flashes.

2. 1. 3 (SET) Key: Press this key 3S during normal operation and then enter the password to enter the parameter adjustment mode. Save the set parameters when setting the parameters. After setting the parameters, long press 5S to return to the normal operation mode.

2. 1. 4 (<) Key: It is used to switch from P0XX parameter mode to parameter modification mode when cycling left and setting parameters.

2. 1. 5 (∧) Key: Modify the parameter and increase the key.

2. 1. 6 (∨) Key: Decrease key for modifying parameters.

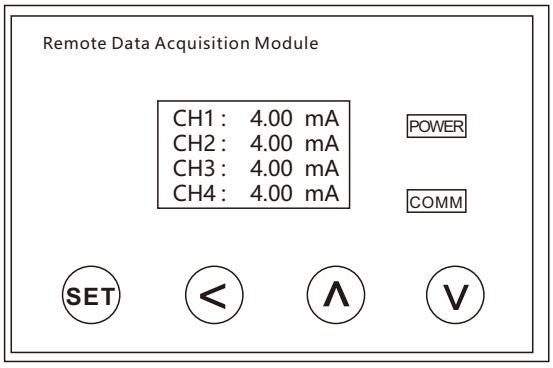
2.2 Description of operating status

2. 2. 1 When the system is powered on, the measurement values of 1-4 channels are displayed by default. Press (∨) key to switch and display the measurement values of 5-8 channels.

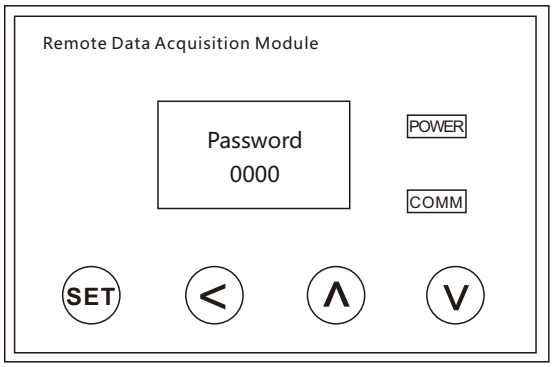
2. 2. 2 After holding down the (SET) key for 3 seconds, the system automatically switches to the menu to enter the password interface.

2. 2. 3 Corresponding display interface under various states of the module.

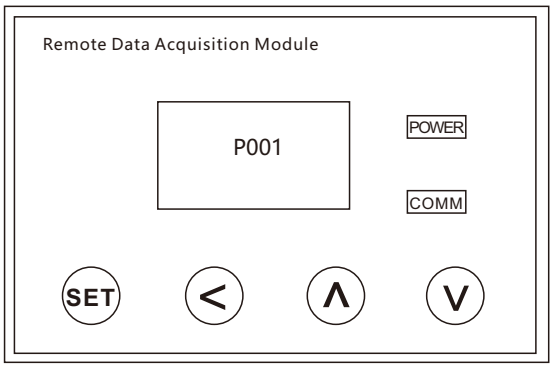
(Figure 2-1 Display channel measurement value)



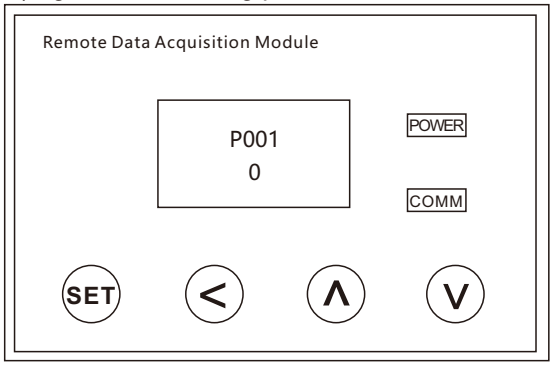
(Figure 2-2 Press the (SET) button for 3s and the password input interface is displayed)



(Figure 2-3 Select parameter interface)



(Figure 2-4 Setting parameter value interface)



2.2.4 The parameters of the module are set by the key to set detailed operation steps.

a. In the normal display mode, press and hold the SET key for 3s to enter the password input interface.

b. Enter the password interface, press the ◁ key, △ key, ▽ key to enter the password. The initial value of the password is "1111",
Press SET key, if the password is correct, then enter the parameter selection interface, "wrong password will return to the measured value interface.

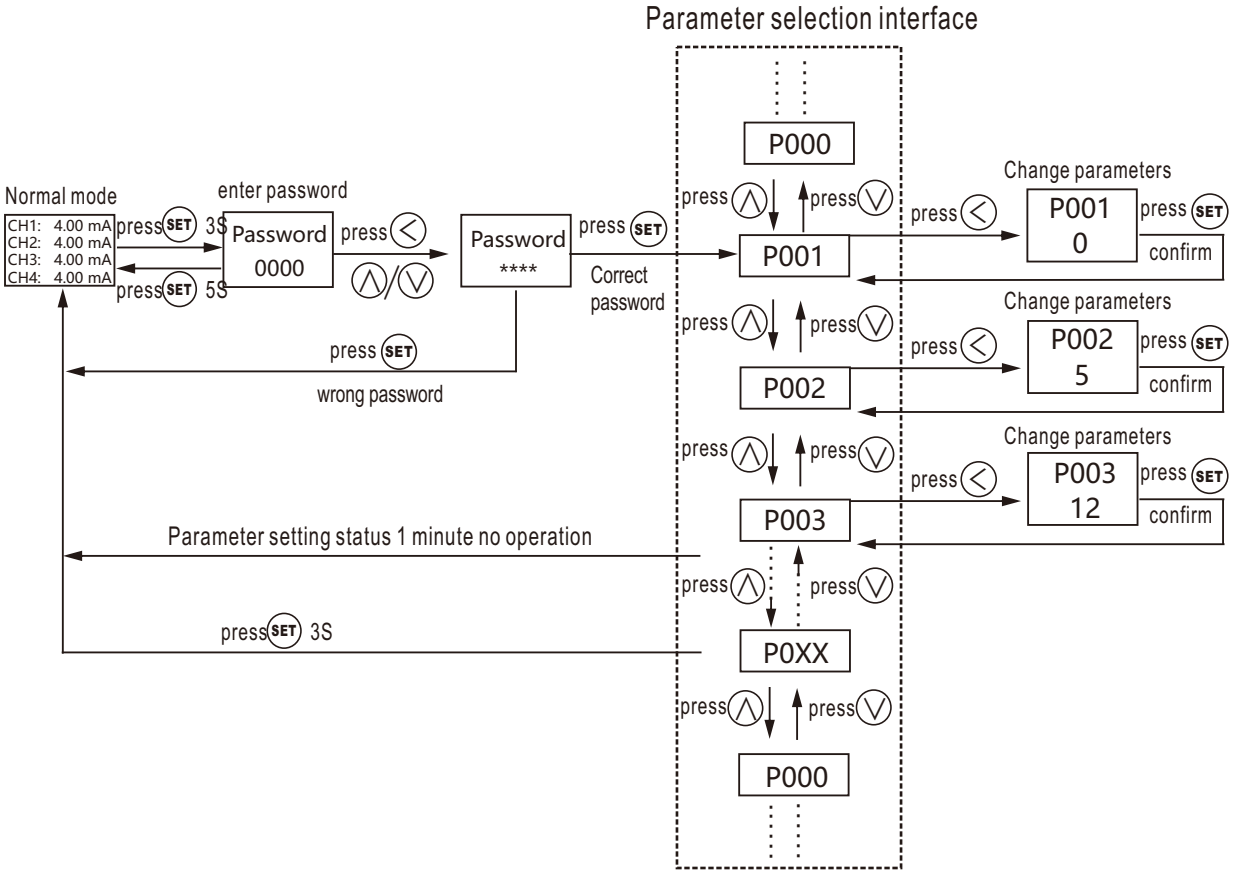
c. In the parameter selection interface, P0XX will be displayed.

(1) Press the " △ or ▽ " key "P0XX" will increase or decrease by 1.

(2) Press the ◁ key to enter the parameter modification interface.

(3) Press SET key 5S to return to normal display mode.

e. Parameter modification interface, press △ key and ▽ key to modify the parameter value. Press SET to save and return to the parameter selection interface.



2.3 System parameter code table

parameter	name	Parameter range	Explanation	Defaults
P000	Reserved resources			
P001	Reserved resources			
P002	Reserved resources			
P003	Channel range	0-2	0:（0-5V）1:（0-10V） 2:（0-20mA）	0
P004	change Password	0-9999	Password can be modified	1111
P005	Set aside			
P006	Digital filter series	0-9	The higher the filter level, the more stable the display	2
P007	Reserved resources			
P008	Reserved resources			
P009	Reserved resources			
P010	Reserved resources			
P011	mailing address	1-247	Module address	1
P012	Communication baud rate	0-2	Module communication baud rate 0:4800 1:9600 2:19200	1
P013	Verification method	0-2	Communication check mode 0: no check 1: odd check 2: even check	2
P014	Communication delay time	0-60ms	Communication delay time	0
P015	Reserved resources			
P016	Reserved resources			
P017	Reserved resources			
P018	Reserved resources			

3.Communication section

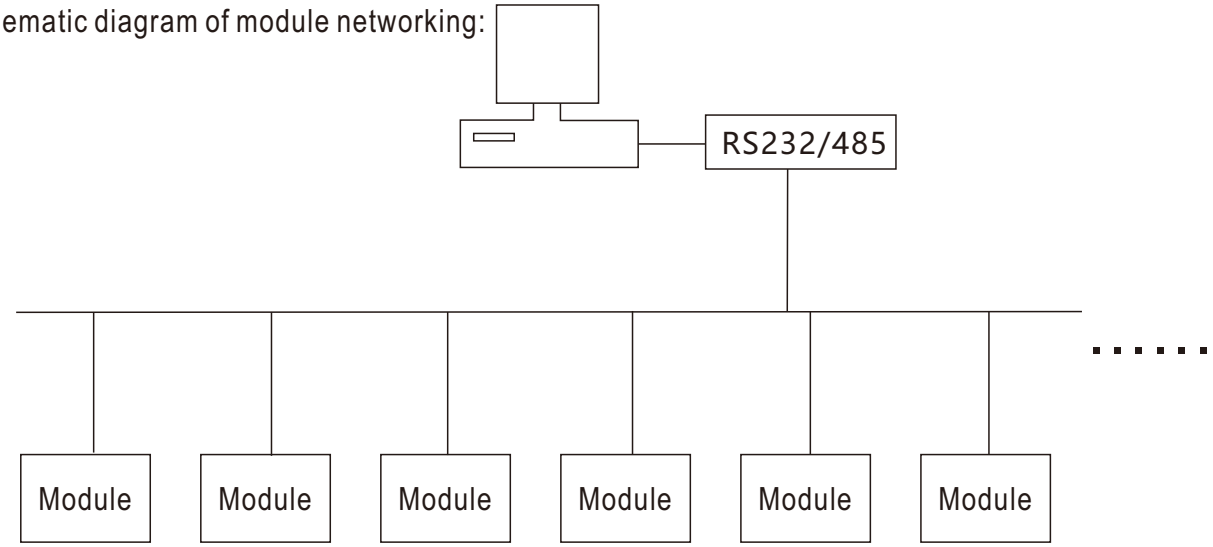
3.1 Communication connection

The RS485 communication port of the module uses shielded twisted pair connection. When networking, 32 modules can be hung on the same RS485 network, and 256 modules can be connected together through a 485 repeater. When connecting with DCS, the layout of the entire network should be considered. Factors such as: the length and direction of the communication cable, the location of the master station, the matching resistance at the end of the network, the communication adapter, the scalability of the network, the network coverage, and the electromagnetic interference of the environment must all be considered.

In general, the stand-alone communication in the laboratory is relatively simple. Because of the short distance and good electromagnetic environment, there is no need to consider too many factors. Even if you can't find the twisted pair, you can casually find two wires of appropriate length to temporarily replace it. of. However, in engineering, construction should be carried out in strict accordance with requirements to avoid future trouble. The communication master station can be a computer (PC), PLC, data collector, RTU, etc. This chapter takes PC as an example, and so on.

The PC does not have an RS485 interface, but all have an RS232 serial interface. Therefore, to connect to the module, a conversion device is required. It is recommended to use a multi-serial card. RS232 serial interface can be directly converted into RS485 interface, and connected to the module. To effectively ground at one end of the cable shield connected to the host computer (protective ground: earth, screen cabinet, chassis, etc.), two or more points of grounding should be avoided. The module has no protective ground terminal, and the housing is plastic, so there is no need to ground. However, if there are metal screen cabinets and boxes, they should be installed inside as much as possible, and the effect will be better.
When connecting RS485 cable, try to use double-color twisted pair, all "+" terminals are connected with the same color, and "-" terminals are connected with another color.

Schematic diagram of module networking:



3.2 Parameter settings

The factory default address is 01 and the baud rate is 9600bps. The address and baud rate can be set by pressing the button, or by the communication protocol. When multiple modules are used, the addresses cannot be repeated, and the baud rate must be the same.

3.3 Communication protocol

This instrument adopts ModBus RTU communication protocol (ModBus is a registered trademark of Modicon) details as follows;

3.3.1 Communication transmission method:

Communication transmission is divided into independent information header and sent encoded data. The following communication transmission method definition is also compatible with the RTU communication protocol.

Data frame format:

Start bit
8 data bits, the least significant bit is sent first
No check, odd check, even check
1 stop bit

Error detection domain:

CRC (cyclic lengthy detection)

Information frame format:
Initial structure =>= 4 bytes of time
Address code = 1 byte
Function code = 1 byte
Data area = N bytes
Error check = 16-bit CRC code
End structure =>=4 bytes of time Information frame format:
Address code: The address code is the first byte transmitted by the communication. This byte indicates that the slave whose address code is set by the user will receive the information sent by the master. And each slave has a unique address code, and the response loopback starts with its own address code. The address code sent by the master indicates the address of the slave to be sent, and the address code sent by the slave indicates the address of the slave sent back.
Function code: the second byte transmitted by communication. The ModBus communication protocol defines function numbers from 1 to 127. The module uses part of the function codes. Send as a host request, tell the slave through the function code
What actions the machine performs. In response to the slave, the function code sent by the slave and the one sent from the master
The function codes are the same, indicating that the slave has responded to the master's operation.
Data area: The data area is different according to different function codes. The data area can be actual values,
Setpoint, address sent from the master to the slave or from the slave to the master.
CRC code: Two-byte error detection code. The low byte is first and the high byte is next....

3.3.2 Communication protocol:

When the communication command is sent to the instrument, the device corresponding to the corresponding address code receives the communication command, removes the address code, reads the information, and if there is no error, executes the corresponding task; then returns the execution result to the sender. The returned information includes the address code, the function code to perform the action, the data after the execution of the action, and the error check code. If there is an error, no information is sent.

1. structure:

address code	function code	Data area	Check code
8 bit	8 bit	N * 8	16 bit

2. Information frame format:

(1) Address code:

The address code is the first byte (8 bits) of the information frame, from 0 to 255. This byte indicates that the slave set by the user will receive the information sent by the master. Each slave must have a unique address code, and only slaves that match the address code can respond to the loopback. When the slave returns information, the corresponding address code indicates where the information came from.

(2) Function code:

The function code sent by the master tells the slave what tasks to perform. The function codes listed below have specific meanings and operations.

Code	meaning	operating
03	Batch read data	Read single or multiple consecutive binary values in the current register range
04	Batch read data	Read single or multiple consecutive binary values in the current register range
06	Write single register	Write the set binary value to a single register
10	Batch write multiple registers	Write the set binary value to multiple consecutive registers

(3) Data area: The data area contains what actions need to be performed by the slave or return information collected by the slave. This information can be numeric values, reference addresses, and so on. For example, the function code tells the slave to read the value of the register, then the data area must contain the starting address and read length of the register to be read. For different slaves, the address and data information are different.

(4) Error check code: The master or slave can use the check code to judge whether the received information is wrong. Sometimes, due to electronic noise or other interference, the information will change slightly during transmission. The error check code ensures that the master or slave does not work on the information that is wrong during the transmission. This increases the safety and efficiency of the system. Error check uses CRC-16 check method. The low byte of the CRC code is first.

Note: The format of the information frame is basically the same: address code, function code, data area and error check code.

3. Error checking

The redundant cyclic code (CRC) contains 2 bytes, that is, 16-bit binary. The CRC code is calculated by the sending device and placed at the end of the sent information. The device receiving the information recalculates the CRC code of the received information, and compares the calculated CRC code with the received one. If the two do not match, it indicates an error.

The calculation method of the CRC code is to first preset all 16-bit registers to 1. Then process each 8-bit data information step by step. When calculating the CRC code, only 8 data bits, start bit and stop bit are used. If there is a parity bit, it also includes the parity bit, and does not participate in the CRC code calculation.

When calculating the CRC code, the 8-bit data is XORed with the data of the register, and the result is shifted one byte lower, and the highest bit is filled with 0. Check the lowest bit again. If the lowest bit is 1, XOR the contents of the register with the preset number. If the lowest bit is 0, no XOR operation is performed.

This process has been repeated 8 times. After the 8th shift, the next 8 bits are XORed with the contents of the current register again. This process is repeated 8 times as above. When all the data information is processed, the content of the last register is the CRC code value. When sending and receiving data in the CRC code, the low byte is first.

The steps to calculate the CRC code are:

1) The preset 16-bit register is hexadecimal FFFF (that is, all 1s). Call this register a CRC register;
2) XOR the first 8-bit data with the lower bits of the 16-bit CRC register, and put the result in the CRC register;
3) Move the contents of the register one bit to the right (toward the low bit), fill the highest bit with 0, and check the lowest bit (shift out bit);
4) If the lowest bit is 0: repeat step 3 (shift again); if the lowest bit is 1: CRC register XOR with polynomial A001 (1010 0000 0000 0001);
5) Repeat steps 3 and 4 until the right shift 8 times, so that the entire 8-bit data has been processed;
6) Repeat steps 2 to 5 for the next 8-bit data processing;
7) The resulting CRC register is the CRC code. The low byte is first and the high byte is next.

4. Function code 03H, reading point and return value:

The module adopts the Modbus communication protocol, and can use the communication commands to read points ("hold registers") or return values ("input registers"). Both the holding and input registers are 16-bit (2-byte) values, with the high-order bits first. In this way, the read point and return value for the module are 2 bytes. The maximum number of registers that can be read at one time is 16. Since some programmable controllers do not use the function code 04, the function code 04 is used as a reading point and a return value. The command format of slave response is slave address, function code, data area and CRC code. The data in the data area is the high order of every two bytes.

Examples of information frame formats:

address	data
0000	0101

Suppose we want to read: 1 register with slave address 01 and start address 0000.

The data sent by the host is:

Host sends	Bytes	Examples	
Slave address	1	01	Send to slave 01
function code	1	03	Read register
starting address	2	00 00	The starting address is 00 00
Number of read registers	2	00 01	Read 1 register (2 bytes in total)
CRC code	2	84 0A	Calculated by the host (lower 8 bits first)

The slave response data is:

Slave response	Bytes	Examples	
Slave address	1	01	From the slave 01
function code	1	03	Read register
Number of bytes read	1	02	2 register bytes total
Register data 1	2	01	The upper 8 bits of address 0000 (module address)
Register data 2	2	01	The lower 8 bits of address 0000 (communication baud rate code)
CRC code	2	78 14	Calculated by the slave (lower 8 bits first)

Function code 03H (batch read data command) data and address range:

MODBUS Register address	content	Explanation
100	Reserved resources	
101	Reserved resources	
102	Reserved resources	
103	Reserved resources	
104	Input signal type selection	0: (0-5V) 1: (0-10V) 2: (0-20mA)
105	address	Module communication address 1-247
106	Baud rate	0: 4800bps, 1: 9600bps, 2: 19200bps
107	Verification method	0:no check, 1:odd check, 2:even check
108	Communication delay time	0-60ms
109	Digital filtering	0-9

5. Function code 04H, read point and return value:

The module adopts the Modbus communication protocol, and can use the communication commands to read points ("hold registers") or return values ("input registers"). Both the holding and input registers are 16-bit (2-byte) values, with the high-order bits first. In this way, the read point and return value for the module are 2 bytes. The maximum number of registers that can be read at one time is 16. Since some programmable controllers do not use the function code 04, the function code 04 is used as a reading point and a return value. The command format of slave response is slave address, function code, data area and CRC code. The data in the data area is the high order of every two bytes.

Examples of information frame formats:

address	data
0000	0101

Suppose we want to read: 1 register with slave address 01 and start address 0000.

The data sent by the host is:

Host sends	Bytes	Examples	
Slave address	1	01	Send to slave 01
function code	1	04	Read register
starting address	2	00 00	The starting address is 00 00
Number of read registers	2	00 01	Read 1 register (2 bytes in total)
CRC code	2	31 CA	Calculated by the host (lower 8 bits first)

The slave response data is:

Slave response	Bytes	Examples	
Slave address	1	01	From the slave 01
function code	1	04	Read register
Number of bytes read	1	02	2 register bytes total
Register data 1	2	01	The upper 8 bits of address 0000 (module address)
Register data 2	2	01	The lower 8 bits of address 0000 (communication baud rate code)
CRC code	2	79 60	Calculated by the slave (lower 8 bits first)

Function code 04H (batch read data command) data and address range:

1	CH1	First measurement
2	CH2	Second measurement
3	CH3	Third measurement
4	CH4	Fourth measurement
5	CH5	Fifth measurement
6	CH6	Sixth measurement
7	CH7	Seventh measurement
8	CH8	Eighth measurement

Note: The above 16 register values are all double-byte data. The high byte is in front of the low byte.
Calculation of measured values CH1--CH8
Range 5V: It is the actual measured value in mV.
Range 10V: It is the actual measured value in mV.
Range 20mA: the actual measured value, unit uA.
CH9: read back the actual value of the corresponding transmitter output in mV or uA.

6. Function code 06H, single point save:
The host uses this command to save single-point data to the module's memory. The slave also uses this function
The code returns information to the host.
Examples of information frame formats:
The slave address is 01, and the value of address 0000 is saved. In this example, after the data is saved, the content in the slave address 0000 is 0001.
The data sent by the host is:

Host sends	Bytes	Examples	
Slave address	1	01	Send to slave 01
function code	1	06	Read register
Write single register address high	1	00	Address high bit is 00
Write the low bit of a single register address	1	00	Address low bit is 00
Write high data of single register	1	00	Save data as 01
Write high data of single register	1	01	Save data as 01
CRC code	2	48 0A	Calculated by the host (lower 8 bits first)

The slave response data is:

Slave response	Bytes	Examples	
Slave address	1	01	From the slave 01
function code	1	06	Read register
Single register address high	1	00	Address high bit is 00
Single register address low	1	00	Address low bit is 00
Single register data high	1	00	Save data as 01
Single register data high	1	01	Save data as 01
CRC code	2	48 0A	Calculated by the host (lower 8 bits first)

When the data responded from the slave is written incorrectly:

Slave response	Bytes	Examples	
Slave address	1	01	From the slave 01
Function code plus 0x80	1	86	Read register
error code	1	02	Register start address and number out of range
CRC code	1	A1 C3	CRC code calculated by the host

Slave response	Bytes	Examples	
Slave address	1	01	From the slave 01
Function code plus 0x80	1	86	Read register
error code	1	03	The value written in the register is out of range
CRC code	1	61 02	CRC code calculated by the host

Function code 06H (single byte write data command) saved data and address range:

MODBUS Register address	content	Explanation
100	Reserved resources	
101	Reserved resources	
102	Reserved resources	
103	Reserved resources	
104	Input signal type selection	0：（0-5V）1：（0-10V）2：(0-20mA)
105	address	Module communication address 1-247
106	Baud rate	0: 4800bps, 1: 9600bps, 2: 19200bps
107	Verification method	0:no check, 1:odd check, 2:even check
108	Communication delay time	0-60ms
109	Digital filtering	0-9

4. Selection instructions:

DK5080-XX-XX-XX-XX-XX-XX-XX-XX

Product number: DK5080

Eight inputs, followed by 1-8 channel types

A. AD input code

1.0-5V code is: 0V5

The 2.0-10V code is: 0V10

The 3.0-20MA signal code is: 0MA20

Selection example: The customer needs to measure the 8-channel signal is 0-5V

Can be selected as follows: DK5080-8*0V5

5. Technical Support

caveat:

Parameter modification may cause unnecessary failures and losses. Non-engineering technicians should not modify the system parameters without authorization. Unnecessary losses caused by modifying parameters that exceed the order specifications are not covered by the warranty. The company does not assume any responsibility and obligation. If customers need to modify the parameters themselves, please call for consultation first, our company will provide you with technical guidance.

The product is repaired free of charge for one year (except for man-made damage) and maintained for life.