

FC

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Peristaltic pump communication protocol

一、 explanation:

1 、 This protocol complies with the standard MODBUS protocol specification RTU module;

2、 Hardware interface: asynchronous half-duplex RS485;

3、 Data bits: 1 start bit, 8 data bits, 1 stop bit, no parity bit;

4、 The initial factory values of Chuangrui products:

(1)The broadcast address is 0, and the initial address of the device is 1;

(2)Communication baud rate 9600b/s;

5、 Chuangrui's FC peristaltic pump series products provide three control methods:

①Manual control mode

② Manual and external control combination control mode

③ 485 control mode.

The pump has two operating modes under each control mode:

①Transmission mode (the motor runs all the time)

② Distribution mode (convenient to set the motor running time, stop time, and number of runs)

6、 This agreement is divided into 5 parts:

(1) Description; Page number1

(2)This agreement uses various MODBUS data models to arrange

addresses and page numbers.2;

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(3)Application examples of each instruction, page 2-11;

(4) MODBUS protocol specification RTU module introduction, page 12-19;

(5)Hardware interface definition, pages 19-20;

Note:1 、 This agreement only applies to Chuangrui's FC peristaltic pump series products 485 Communication;

2、 No return from sending data, check the hardware connection (refer to the interface definition), data bit configuration, device address! Whether it complies with the modbus format (please learn more about the MODBUS protocol, you can use the MODBUS general debugging software); the device address can be viewed through the menu.

二、 This agreement uses various MODBUS data models to arrange addresses.

address	function name	Physical meaning and scope unit	type of data
0	Start and stop	Control the start and stop status of the pump. 1 means start, 0 means stop.	USHORT
1 2	Filling volume	Filling volume = flow rate * filling time range 0.001ml -9999l	FLOAT

3 4	stop time	0.1s-9999m (set stop time greater than back suction time)	FLOAT 3
5 6	filling time	Filling volume = flow rate * filling time range 0.1s-9999m	FLOAT
7	Filling times	0-9999 times, 0 means infinite loop	USHORT
8 9	flow rate	Flow rate = pump speed * flow rate coefficient 0.001ml/min-9999l/min	FLOAT
10	Pump head	8000-YZ1515x,8001-YZ15M,8002-313D, 8003-TX315,8004-YZ2515x, 8005-YZ25M,8006-BZ25, 8007-KZ25, 8008-DG,8009-LP15,800A-BZ15,800B-YZ25L, 800C-LP25, 800D-YZ35,800E-KZ50	USHORT
11	pump tube	See the table for corresponding pump heads 1	USHORT
12	Operation mode	0x8000 traffic mode, 0x8001 allocation mode	USHORT
13	Running direction	0 counterclockwise 1 clockwise	USHORT
14	full speed	Control the full speed status of the pump: 1 starts full speed 0 stops full speed	USHORT
15	Back suction speed	Pump speed 10-300rpm resolution 1rpm	USHORT

16	Back suction angle	Back suction angle adjustment range: 0-3600° with a resolution of 1 degree	USHORT 4
19	External control output	Among them: the high eight bits represent the signal type: 0 represents the level type, 1 represents the pulse type. Digits 4-7 represent control items. 0x01 means control start and stop; 0x02 means control direction; 0x08 means control speed. Bits 0-3 represent speed control: 0x01 represents 0-5V control; 0x02 represents 0-10V control; 0x04 represents 4-20mA control; 0x08 represents 0-10KHz control	USHORT
20 21	Calibration quantity	Select an appropriate value based on the current flow rate. If it is too large or too small, it will affect the calibration effect.	FLOAT
22 23	Actual measurement	Actual measured liquid volume after calibration of a single run	FLOAT
252 253	Current K value	Current flow rate coefficient K, the default value is detailed in the following table	FLOAT
254	485 status	3 enable 0 disable	USHORT

Note : Function code: 0x03 reads the holding register; 0x06 writes a single holding register; 0x10 writes multiple holding registers.

≡ 、 Application examples and descriptions of each

instruction (the order corresponds to the above register address table): 5

Note: 1、 The protocol uses 'big-Endian' representation of addresses and data items. This means that when sending multiple bytes, the most significant bit is sent first;

2、 All the following write commands are only valid when the 485 control mode is enabled and in the non-calibration state, and can be read at any time.

254 Set the 485 enable status. 3 is enabled and 0 is disabled. It will not be stored when power is off.

example: Setting parameters

Tx: 01 06 00 FE 00 03 A8 3B //Set 485 enable status

Rx: 01 06 00 FE 00 03 A8 3B //Return setting successful

Tx:01 06 00 FE 00 00 E8 3A //Set 485 disabled status

Rx:01 06 00 FE 00 00 E8 3A/Return setting successful

Read parameters

Tx:01 03 00 FE 00 01 E5 FA //Read 485 status

Rx: 01 03 02 00 03 F8 45 //Return to 485 enable status

Tx:01 03 00 FE 00 01 E5 FA//Read 485 status

Rx:01 03 02 00 01 79 84// Return to 485 disabled status

Note: When reading the 485 enable status, 0x03 indicates that the 485 is enabled, and 0x01 indicates that the 485 is disabled.

- **00 Start and stop Set the start and stop status of the pump. 1**

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means start, 0 means stop.

example: Setting parameters

Tx: 01 06 00 00 00 01 48 0A //Set startup status

Rx: 01 06 00 00 00 01 48 0A//Return setting successful

Tx:01 06 00 00 00 00 89 CA//Set stop status

Rx:01 06 00 00 00 00 89 CA//Return setting successful

read status

Tx:01 03 00 00 00 01 84 0A //read status command

Rx:01 03 02 00 01 79 84 //Return to operating status

Tx:01 03 00 00 00 01 84 0A//read status command

Rx:01 03 02 00 00 B8 44//stop state return

- **01 02 Set filling volume range: 0.001ml-9999l Power-off storage**

example: Setting parameters

Tx: 01 10 00 01 00 02 04 3D 8F 5C 29 F6 FA//Set the filling volume to
0.07ml

Rx:01 10 00 01 00 02 10 08//Return setting successful

Read parameters

Tx:01 03 00 01 00 02 95 CB //Read filling quantity

Rx:01 03 04 3D 8F 5C 29 3E AA//Return filling volume is 0.07ml

Note:Filling volume = pump speed * flow rate coefficient K * filling time

- **03 04 Set stop time range: 0.1s-9999m Power-off storage**

example: Setting parameters

Tx: 01 10 00 03 00 02 04 40 A0 00 00 A6 58//Set the stop time to 5s

Rx:01 10 00 03 00 02 B1 C8//Return setting successful

Read parameters

Tx:01 03 00 03 00 02 34 0B//Read stop time

Rx:01 03 04 40 A0 00 00 EF D1//Return stop time is 5s

- **05 06 Set filling time range: 0.1s-9999m Power-off storage**

example: Setting parameters

Tx:01 10 00 05 00 02 04 40 A0 00 00 26 72//Set filling time to 5s

Rx:01 10 00 05 00 02 51 C9//Return setting successful

Read parameters

Tx:01 03 00 05 00 02 D4 0A//Read filling time

Rx:01 03 04 40 A0 00 00 EF D1//Return filling time is 5s

Note: The filling time is calculated according to the following formula:

filling time = filling amount/(flow rate constant K*motor speed)

- **07 Set filling times Range: 0 -9999 times Storage after power failure**

example: Setting parameters

Tx:01 06 00 07 00 14 38 04 //Set the number of fillings to 20 times

Rx:01 06 00 07 00 14 38 04 //Return setting successful

Read parameters

Tx:01 03 00 07 00 01 35 CB//Read filling times

Rx:01 03 02 00 14 B8 4B //The number of fillings is 20 times

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- **08 09 Set the flow rate in ml/min. It will not be stored when power is off.**

example: Setting parameters

Tx:01 10 00 08 00 02 04 40 C0 00 00 E7 F5//Set the flow rate to 6ml/min

Rx:01 10 00 08 00 02 C0 0A//Return setting successful

Read parameters

Tx:01 03 00 08 00 02 45 C9//Read flow rate

Rx:01 03 04 40 C0 00 00 EF CF//Return reading flow rate is 6ml/min

Note: Dispense mode cannot set flow rate.

- **10 Set the pump head number. The pump head number corresponds to the pump head name: 0-YZ1515x,1-313D,2-BZ15, 3-YZ2515x,4-BZ25, 5-KZ25, 6-DG(6),7-DG(10) Power off storage**

example: Setting parameters

Tx:01 06 00 0A 80 02 49 C9//Set the pump number to 2

Rx:01 06 00 0A 80 02 49 C9//Return setting successful

Read parameters

Tx:01 03 00 0A 00 01 A4 08//Read pump number

Rx:01 03 02 00 03 F8 45//Return pump number 2

Note: 1 、 When setting the pump number, it should be sent in hexadecimal format;

2、 When setting the pump number, you need to set the highest position to 1, that is, add 0x8000 and send it. For example, when setting the pump number to 1, you need to set the parameter 0x8001 to set it successfully;

3、 When reading the pump number, the return value is the pump number plus 1.

- **11 Set the pump tube number. See Figure 1 for the pump tube number. Store when power fails.**

example: Setting parameters

Tx:01 06 00 0B 80 01 58 08//Set the pump tube number to 1

Rx:01 06 00 0B 80 01 58 08//Return setting successful

Read parameters

Tx:01 03 00 0B 00 01 F5 C8//Read pump tube number

Rx:01 03 02 00 02 39 85//Return pump tube number 1

Note: 1、 When setting the pump tube number, hexadecimal should be used to send it;

2、 When setting the pump tube number, set the highest position to 1, that is, add 0x8000 and send it, for example, set the pump tube number. When it is 1, parameter 0x8001 must be set to set it successfully;

3、 When reading the pump tube number, the return value is the pump tube number plus 1.

- **12 Setting mode no storage when power off**

Note: Setting parameters

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Tx:01 06 00 0C 80 01 E9 C9//Set mode to distribution mode

Rx:01 06 00 0C 80 01 E9 C9//Return setting successful

Read parameters

Tx:01 03 00 0C 00 01 44 09 //Read communication mode

Rx:01 03 02 00 02 39 85 //Return communication mode to distribution mode

Note: 1、 Set mode should be sent in hexadecimal;

2、 When setting parameters, you must set the highest bit to 1, that is, add 0x8000 to send, then you can set it successfully. The traffic mode is 0x8000; the allocation mode is 0x8001;

3、 When reading parameters, the traffic mode is 0x00; the allocation mode is 0x01;

- **13 Set the running direction of the pump 0 counterclockwise 1 clockwise It will not be stored when power is off**

example: Setting parameters

Tx:01 06 00 0D 00 01 D9 C9 //Set direction to 1 clockwise

Rx:01 06 00 0D 00 01 D9 C9 //Return setting successful

Read parameters

Tx:01 03 00 0D 00 01 15 C9 //Read the running direction

Rx:01 03 02 00 01 79 84 //Return pump running direction is 1 clockwise

- **14 Set full speed, 1 means start full speed, 0 means stop full speed** 11

example: Setting parameters

Tx:01 06 00 0E 00 01 29 C9//Set full speed status

Rx:01 06 00 0E 00 01 29 C9 //Return setting successful

Tx:01 06 00 0E 00 00 E8 09//Set stop full speed state

Rx:01 06 00 0E 00 00 E8 09//Return setting successful

Read parameters

Tx:01 03 00 0E 00 01 E5 C9 //read status command

Rx:01 03 02 00 01 79 84 //Return to full speed state

Tx:01 03 00 0E 00 01 E5 C9 //read status command

Rx:01 03 02 00 00 B8 44 //Return to non-full speed status

- **15 Set the suction speed range: 10-300rpm Storage when power off**

example: Setting parameters

Tx: 01 06 00 0F 00 5A 39 F2 //Set the suction speed to 90rpm

Rx: 01 06 00 0F 00 5A 39 F2//Return setting successful

Read parameters

Tx: 01 03 00 0F 00 01 B4 09//Read the suction speed

Rx: 01 03 02 00 5A 38 7F//Return suction speed is 90rpm

- **16 Set the suction angle range: 0-3600° Storage when power off**

example: Setting parameters

Tx:01 06 00 10 00 B4 88 78//Set the suction angle to 180 degrees

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Rx:01 06 00 10 00 B4 88 78//Return setting successful

Read parameters

Tx:01 03 00 10 00 01 85 CF//Read the suction angle

Rx:01 03 02 00 B4 B8 33//The return suction angle is 180 degrees

● 19 Read external control output parameters

example: Read parameters

Tx:01 03 00 13 00 01 75 CF //Read external control output parameters

Rx:01 03 02 01 82 39 B5 //Return to external control output status

Note: Data 0x0182 is the read external control output status, in which the upper eight bits represent the signal type: 0 represents the level type, and 1 represents the pulse type. Digits 4-7 represent control items: 1 represents control of start and stop; 2 represents control direction; 8 represents control of speed. Bits 0-3 indicate speed control: 1 indicates 0-5V control; 2 indicates 0-10V control; 4 indicates 4-20mA control; 8 indicates 0-10KHz control;

● 20 21 Set the calibration liquid volume. Range: 0.001ml -9999l.

The initial value is 1234ml. It will not be stored when the power is off.

example: Setting parameters

Tx:01 10 00 14 00 02 04 40 E0 00 00 E7 66//Set the calibration volume to 7ml

Rx:01 10 00 14 00 02 01 CC//Return setting successful

13

Read parameters

Tx:01 03 00 14 00 02 84 0F//Read the calibration quantity

Rx:01 03 04 40 E0 00 00 EE 05//The returned calibration volume is 7ml

- **22 23 Set the actual measured liquid volume. Range: 0.001ml -9999l. It will not be stored when the power is off.**

example: Setting parameters

Tx:01 10 00 16 00 02 04 40 E0 00 00 66 BF//Set the calibration actual measurement to 7ml

Rx:01 10 00 16 00 02 A0 0C//Return calibration successful

Read parameters

Tx:01 03 00 16 00 02 25 CF//Read actual measurement

Rx:01 03 04 40 E0 00 00 EE 05//The actual measurement returned is 7ml

Note: The calculation formula of flow rate constant K is: flow rate constant K after calibration = (actual measured liquid volume/calibrated liquid volume) * flow rate constant K' before calibration, motor speed after calibration = flow rate/flow rate constant K after calibration, and the motor speed range is 0.1rpm- Maximum speed;

- Use the above formula to calculate the calculated motor speed. If it exceeds the speed range and is less than the minimum value, the

motor speed is equal to the minimum value. If it is greater than the maximum value, the motor speed is equal to the maximum value. In this way, the flow rate will change after the calibration is returned;

● **252 253 Flow rate coefficient K unit ml/(min*rpm)**

Note: Read parameters

Tx:01 03 00 FC 00 02 04 3B //Read flow coefficient

Rx:01 03 04 41 20 00 00 EF C5//Returns the current pump tube flow rate coefficient K to be 10.0

Note:The factory values of the pump tubes corresponding to each pump head and the flow rate coefficient K corresponding to each pump tube are shown in the table below.;

Pump head	pump tube	flow coefficient
YZ1515X/313D/BZ15 /YZ15M/LP15-6	13#	0.07
	14#	0.27
	19#	0.51
	16#	0.82
	25#	1.70
	17#	2.90
	18#	3.80

LP15-6	13#	0.14
	14#	0.54
	19#	1.02
	16#	1.64
	25#	3.40
	17#	5.80
	18#	7.60
TX315	13#	0.07
	14#	0.24
	19#	0.52
	16#	0.96
	25#	2.08
	17#	3.40
	18#	4.80
YZ2515X	15#	1.70
	24#	2.90
YZ25M	15#	1.70
	24#	2.90
	35#	3.80
	36#	5.00
BZ25	15#	1.70

	24#	2.90
KZ25	15#	3.00
	24#	5.80
	35#	8.30
	36#	10.00
DG	0.5*0.8	0.15
	1*1	0.06
	2*1	0.20
	2.4*0.8	0.30
	3*1	0.40
YZ35-13	73#	12.33
	82#	20
LP25	2.4*2.4	1.2
	3.2*2.4	2
	15#	4.80
	24#	7.45
	35#	9.25
	36#	12.00
KZ25	15#	3.00
	24#	5.80
	35#	8.30

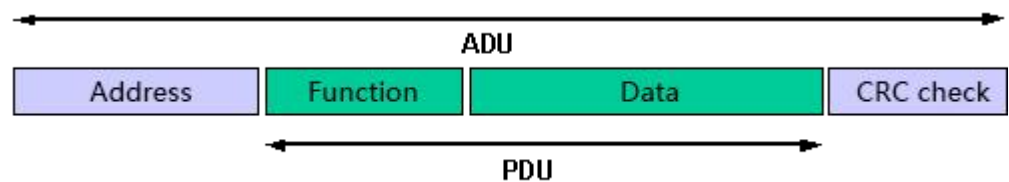
	36#	10.00
KZ15	25#	3.30
	17#	5.00
	18#	6.80
KZ50	92#	100.00

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Picture 1

四、MODBUS protocol specification RTU module introduction:

1、Universal MODBUS frame:



2、MODBUS data model

basic form	Object type	access type	content
Discrete input	single bit	read only	The I/O system provides this type of data
coil register	single bit	Read and write	Change this type of data through the application
input register	16-bit word	read only	The I/O system provides this type of data
holding register	16-bit word	Read and write	Change this type of data through the application

Note : MODBUS uses a 'big-Endian' representation of addresses and data items. 18

This means that when transmitting multiple bytes, the most significant bit is sent first; each function code typically has several register addresses.

3. Commonly used MODBUS function codes in this protocol Function code description:

- **03 (0x03) Read holding register**

request:

function code	1 byte	0x03
initial address	2 bytes	0x0000 to 0xFFFF
Number of registers	2 bytes	1 to 125 (0x7D)

take over:

function code	1 byte	0x03
Number of bytes	2 bytes	2×N*
Register value	N*×2 bytes	

N=Number of registers

error return:

error code	1 byte	0x83
Exception code	1 byte	01 or 02 or 03 or 04

Example:

request		response	
domain name	(hexadecimal)	domain name	(hexadecimal)
Function	03	Function	03

high starting address	00	Number of bytes	06	19
low starting address	6B	Register value Hi (108)	02	
High register number	00	Register value Lo (108)	2B	
Low register number	03	Register value Hi (109)	00	
		Register value Lo (109)	00	
		Register value Hi (110)	00	
		Register value Lo (110)	64	

- **06 (0x06) Write a single register**

request

function code	1 byte	0x06
Register address	2 bytes	0x0000 to 0xFFFF
Register value	2 bytes	0x0000 to 0xFFFF

response

function code	1 byte	0x06
Register address	2 bytes	0x0000 to 0xFFFF
Register value	2 bytes	0x0000 to 0xFFFF

error

error code	1 byte	0x86
Exception code	1 byte	01 or 02 or 03 or 04

This is an instance of a request to write hex 00 03 to register 2:

request		response	
domain name	(hexadecimal)	domain name	(hexadecimal)

Function	06	Function	06	20
Register address Hi	00	Output address Hi	00	
Register address Lo	01	Output address Lo	01	
Register value Hi	00	output value Hi	00	
Register value Lo	03	output value Lo	03	

- **16 (0x10) Write multiple registers**

request PDU

function code	1 byte	0x10
initial address	2 bytes	0x0000 to 0xFFFF
Number of registers	2 bytes	0x0001 to 0x0078
Number of bytes	1 byte	2×N*
Register value	N*×2 bytes	value

*N = Number of registers

Response PDU

function code	1 byte	0x10
initial address	2 bytes	0x0000 to 0xFFFF
Number of registers	2 bytes	1 to 123 (0x7B)

error

error code	1 byte	0x90
Exception code	1 byte	01 or 02 or 03 or 04

This is an instance of a request to write hexadecimal 00 0A and 01 02 to two registers starting with 2:

request		response	
domain name	(hexadecimal)	domain name	(hexadecimal)
function	10	function	10
initial address Hi	00	initial address Hi	00
initial address Lo	01	initial address Lo	01
Number of registers Hi	00	Number of registers Hi	00
Number of registers Lo	02	Number of registers Lo	02
Number of bytes	04		
Register value Hi	00		
Register value Lo	0A		
Register value Hi	01		
Register value Lo	02		

MODBUS Exception response

The exception response message has two fields that are different from the normal response:

Function code field: In a normal response, the server uses the response function code field to respond to the originally requested function code. The most significant bit (MSB) of all function codes is 0 (their values are less than hex 80). In the exception response, the server sets the MSB of the function code to 1. This makes the function code value in the exception response higher by hex 80 than the function code value in the normal response. By setting the MSB of the function code, the client application can identify the exception response and detect the data

field of the exception code.

data field: In a normal response, the server can return data or statistics in the data field (any message requested in the request). In the exception response, the server returns the exception code in the data field. This defines the server state that generates the exception.

Examples of client requests and server exception responses :

request		response	
domain name	(hexadecimal)	domain name	(hexadecimal)
Function	01	Function	81
initial address Hi	04	Exception code	02
initial address Lo	A1		
Output quantity Hi	00		
Output quantity Lo	01		

In this example, the client addresses the request to the server device. Function code (01) is used to read output status operations. It will request the output status at address 1245 (hex 04A1). It is worth noting that, as the output field (0001) number indicates, only one output is read.

If the output address does not exist in the server device, the server will return an exception response with exception code (02). This indicates the illegal data address of the slave station. List of exception codes starting on the next page.

MODBUS Exception code

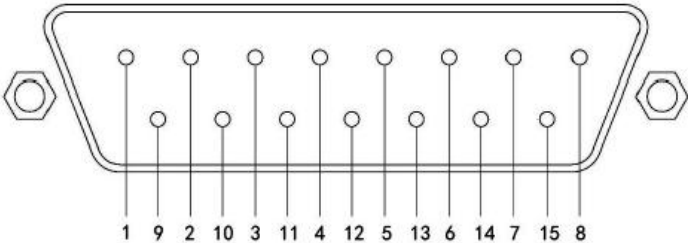
code	name	meaning	23
01	illegal function	For the server (or slave), the function code received in the query is an impermissible operation. This may be because the function code only applies to new equipment and is not available in the selected unit. At the same time, it is also pointed out that the server (or slave) handles this kind of request in an error state, for example: because it is unconfigured and requires a register value to be returned.	
02	Illegal data address	The data address received in the query is not a permissible address for the server (or slave). In particular, the combination of reference number and transmission length is invalid. For a controller with 100 registers, a request with offset 96 and length 4 will succeed, a request with offset 96 and length 5 will generate exception code 02.	
03	illegal data value	The value included in the query is not allowed for the server (or slave). This value indicates a failure in the remaining structure of the combined request, for example: the implicit length is incorrect. It does not mean that, because the MODBUS protocol is not aware of the significance of any special value of any special	

		register, the data item submitted for storage in the register has a value other than that expected by the application.	24
04	Slave device failure	An unrecoverable error occurs when the server (or slave) is trying to perform the requested operation.	
05	affirmance	Used with programming commands. The server (or slave) has accepted the request and is processing it, but requires a long duration to perform these operations. Returning this response prevents timeout errors from occurring in the client (or master). The client (or master) can continue to send polling program completion messages to determine whether processing is complete.	
06	slave device busy	Used with programming commands. The server (or slave) is processing a long duration program command. When the server (or slave station) is idle, the user (or master station) should retransmit the message later.	
08	storage parity error	Used with function codes 20 and 21 and reference type 6 to indicate that the extended file area cannot pass the consistency check. The server (or slave) tried to read the log file, but found a parity error in memory. The client (or master) can resend the request, but can request service on the server	

	(or slave) device.
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五、Hardware interface definition:

- **BT100、300、600LC/FC** The external control of the driver needs to connect the following pins.



Schematic diagram of external control port

FC/LC series products (touch screen), the input and output of the external control line are defined as follows:

pin	External control input interface definition	External control output interface definition
1pin	external control place	hanging in the air
2pin	485 interface A	External control output enable output B
3pin	external control place	Start and stop output B
4pin	Start/Stop 2	Direction output B
5pin	direction	external control place
6pin	external control place	4 ~ 20mA output negative pole
7pin	0 ~ 10kHz input	external control place
8pin	0~5V input	external control place
9pin	485 interface B	External control output enable output A
10pin	external control place	Start and stop output A
11pin	Start and stop 1	Direction output A
12pin	External control enable	0 ~ 10kHz output
13pin	external control place	4 ~ 20mA output positive pole
14pin	4 ~ 20mA input	0 ~ 10V output
15pin	0 ~ 10V input	0 ~ 5V output

Commonly used external control input lines are as follows::

When the "start/stop" function is selected, the corresponding color is:
start/stop/ground=brown/blue.

& When selecting the "485 communication" function, the corresponding color is: 485A/485B=brown/blue.

- When the "start/stop, direction" function is selected, the corresponding color is: enable/start/stop/direction/ground=brown/grey/blue/black.
- When the "Start/Stop, Analog Input (0-10kHz/0-5V/0-10V/4-20mA)" function is selected, the corresponding color is: Enable/Start/Stop/Analog Input/Ground=Brown/Gray/Blue/ black.
- When the "Start/Stop, Direction, Analog Input (0-10kHz/0-5V/0-10V/4-20mA)" function is selected, the corresponding color is: Enable/Start/Stop/Direction/Analog Input/Ground=Brown/ Gray/blue/double/black.
- When selecting the "start/stop, direction, analog input (0-10kHz/0-5V/0-10V/4-20mA), 485 communication" functions, the corresponding color is: enable/start/stop/direction/analog input/485A /485B/Ground: brown/grey/blue/yellow/green/red/black.
- When the "start/stop, 485 communication" function is selected, the corresponding color is: enable/start/stop/485A/485B/ground=brown/double/blue/grey/black.
- ⑧ When the "start/stop, direction, 485 communication" function is selected, the corresponding color is: enable/start/stop/direction/485A/485B/ground=yellow/green/red/blue/grey/black.

Commonly used external control output lines are as follows:

er When the "start/stop" function is selected, the corresponding color is: start/stop A/start/stop B=brown/blue.

& When the "Analog Output" function is selected, the corresponding colors are: 4~20mA positive/4~20mA negative: (brown/blue) || 0~5V/ground: (brown/blue) || 0~10V/ground: (brown/blue)) || 0~10kHz/ground: (brown/blue).

- When the "start/stop, analog output" function is selected, the corresponding colors are: start/stop A/start/stop B: (brown/blue), 4~20mA positive/4~20mA negative: (grey/black) || 0~5V/ground : (grey/black) || 0~10V/ground: (gray/black) || 0~10kHz/ground: (gray/black).
- When the "Direction" function is selected, the corresponding color is: Direction A/Direction B=brown/blue.
- When the "enable output" function is selected, the corresponding color is: external control enable output A/external control enable output B=brown/blue.