

## Function code 03: (Software Version V1.2)

Use the 03 function code of the Modbus communication protocol to read the value of the sensor or display (1 value). The command format of the host is slave address, function code, start address, number of bytes and CRC code. The command format of the slave response is slave address, function code, start address, data area and CRC code. The data in the data area is binary code, four bytes, high order first. The CRC code is two bytes, the low order is first, the baud rate is 9600, the data bit is 8, the check bit is not, and the stop bit is 1.

### Calculation rules of CRC code:

1. The preset 16-bit register is hexadecimal FFFF (all 1s), which can be called a CRC register.
2. XOR the first 8-bit data with the low-order bits of the 16-bit CRC register, and place the result in the CRC register.
3. Check whether the lowest bit is 0. If it is 0, move the contents of the register one bit to the right (toward the lower bit), and fill the highest bit with 0. If it is 1, shift the contents of the register one bit to the right (toward the lower bit), fill the highest bit with 0, and then XOR the CRC register with the polynomial A001 (1010 0000 0000 0001).
4. Repeat step 3 until the right shift 8 times, so that the entire 8-bit data has been processed.
5. Repeat steps 2 to 4 to process the next 8-bit data.
6. The final CRC register is the CRC code. When the CRC result is put into the information frame, the high and low bits are exchanged, and the low bits are first.

## Protocol Settings

The following description shows that the Modbus slave station number is all 3. The station number setting is changed under 4-6HART working mode MODBUS MODE in the service.

## Write Function

### Adjustment of sensor low position (Address: 106)

Host write information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low byte	Number of bytes					CRCH	CRCL
XX	0x10	00	6a	00	02	04	xx	xx	Xx	xx	xx	xx

Explanation: 1 means 1mm, ≤80000, ≥0, >high-order adjustment, occupying 4 bytes.

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low bytes	CRCH	CRCL
XX	0x10	00	6a	00	02	xx	xx

Host send: 03 10 00 6a 00 02 04 00 00 00 01 bf 80

Slave response: 03 10 00 6a 00 02 60 36

## Adjustment of sensor high position (Address: 165)

Host write information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low byte	Number of bytes					CRCH	CRCL
XX	0x10	00	A5	00	02	04	xx	xx	Xx	xx	xx	xx

Explanation: 1 means 1mm, ≤80000, ≥0, >high-order adjustment, occupying 4 bytes.

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low bytes	CRCH	CRCL
XX	0x10	00	A5	00	02	xx	xx

Host send: 03 10 00 a5 00 02 04 00 00 00 01 f3 90

Slave response: 03 10 00 a5 00 02 50 09

## Material Properties (Address: 128)

Host write information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low byte	Number of bytes			CRCH	CRCL
XX	0x10	00	80	00	01	02	Xx	xx	xx	xx

Explanation: ≥1, ≤3, occupy 2 bytes. 1: Liquid; 2: Solid; 3: Micro DK

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low bytes	CRCH	CRCL
XX	0x10	00	80	00	02	xx	xx

Host send: 03 10 00 80 00 01 02 00 02 21 31

Slave response: 03 10 00 80 00 02 01 c3

## Modify the maximum test distance of the sensor (Address: 129)

Host write information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low byte	Number of bytes					CRCH	CRCL
XX	0x10	00	81	00	02	04	xx	xx	Xx	xx	xx	xx

Explanation: The maximum test distance, in mm, occupies 4 bytes.

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low bytes	CRCH	CRCL
XX	0x10	00	81	00	02	xx	xx

Example: Set the measurement distance to 6.3 and the hexadecimal to be 00 00 18 9c

Host send: 03 10 00 81 00 02 04 00 00 18 9c 3b d2

Slave response: 03 10 00 81 00 02 10 02

## Modify the damping time of the sensor (Address: 153)

Host write information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low byte	Number of bytes	...	...	CRCH	CRCL
XX	0x10	00	99	00	02	4	Xx	xx	xx	xx

Explanation: The two time setting parameters must be less than 50, and each time parameter occupies two bytes.

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low bytes	CRCH	CRCL
XX	0x10	00	99	00	02	xx	xx

Example:

Host sends information frame: 03 10 00 99 00 02 04 00 06 00 0a 51 17

Slave corresponding information frame: 03 10 00 99 00 02 90 05

## Modify the damping time of the sensor (Address: 155)

Host write information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low byte	Number of bytes	...	...	CRCH	CRCL
XX	0x10	00	9B	00	02	4	Xx	xx	xx	xx

Explanation: The input number 1 represents 1mm(d), <80000, ≥100.

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low bytes	CRCH	CRCL
XX	0x10	00	9B	00	02	xx	xx

Example:

Host sends information frame: 03 10 00 9B 00 02 04 xx xx xx xx xx xx

Slave corresponding information frame: 03 10 00 9B 00 02 xx xx

## Modification and confirmation of sensor information

The host must send a modification confirmation frame before the slave can save the modified data.

Host write information frame format (hexadecimal):

Station number	Function code	Subfunction	Confirm password 1	Confirm password 2	Confirm password 3	Confirm password 4	CRCH	CRCL
XX	6A	4a	28	46	64	82	xx	xx

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low bytes	CRCH	CRCL
XX	6A	00	96	00	01	xx	xx

Example:

Host sends information frame: 03 6a 4a 28 46 64 82 fa 10

Slave response information frame: 03 6A 4A 2E 97

# Read function

## Read distance cm (Address: 00)

Host write information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low byte	CRCH	CRCL
XX	0x03	00	00	00	02	xx	xx

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Number of bytes	High byte	...	...	Low byte	CRCH	CRCL
XX	0x03	04	9B	xx	xx	02	xx	xx

Explanation: The slave responds to the distance information, which is expressed in four bytes, in cm units. When the range is exceeded or the signal at the bottom of the sand and gravel is weak, the returned data is 0x00000000.

Host sends information frame: 03 03 00 00 00 02 c5 e9

Slave response information frame: 03 03 04 00 00 01 54 d9 9c

## Read distance mm (Address: 01)

Host write information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low byte	CRCH	CRCL
XX	0x03	00	01	00	02	xx	xx

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Number of bytes	High byte	...	...	Low byte	CRCH	CRCL
XX	0x03	04	Xx	xx	xx	xx	xx	xx

Explanation: The slave responds to the distance information, which is expressed in four bytes, in cm units. When the range is exceeded or the signal at the bottom of the sand and gravel is weak, the returned data is 0x00000000.

Host sends information frame: 03 03 00 01 00 02 94 29

Slave response information frame: 03 03 04 00 00 0d 48 dd 55

## Read the height of the material cm (Address: 02)

Host write information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low byte	CRCH	CRCL
XX	0x03	00	02	00	02	xx	xx

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Number of bytes	High byte	...	...	Low byte	CRCH	CRCL
XX	0x03	04	Xx	xx	xx	xx	xx	xx

Explanation: The slave responds to the distance information, which is expressed in four bytes, in cm units. When the range is exceeded or the signal at the bottom of the sand and gravel is weak, the returned data is 0x00000000.

Host sends information frame: 03 03 00 02 00 02 64 29

Slave response information frame: 03 03 04 xx xx xx xx xx xx

## Read the height of the material mm (Address: 03)

Host write information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low byte	CRCH	CRCL
XX	0x03	00	03	00	02	xx	xx

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Number of bytes	High byte	...	...	Low byte	CRCH	CRCL
XX	0x03	04	Xx	xx	xx	xx	xx	xx

Explanation: The slave responds to the distance information, which is expressed in four bytes, in cm units. When the range is exceeded or the signal at the bottom of the sand and gravel is weak, the returned data is 0x00000000.

Host sends information frame: 03 03 00 03 00 02 35 e9

Slave response information frame: 03 03 04 xx xx xx xx xx xx

## Signal Strength (Address: 05)

Host write information frame format (hexadecimal):

Station number	Function code	Address high byte	Address low byte	Number high byte	Number low byte	CRCH	CRCL
XX	0x03	00	05	00	02	xx	xx

The slave responds to the master information frame format (hexadecimal):

Station number	Function code	Number of bytes	High byte	...	...	Low byte	CRCH	CRCL
XX	0x03	04	Xx	xx	xx	xx	xx	xx

Explanation: The slave response distance information is represented by four bytes.

Host sends information frame: 03 03 00 05 00 02 d5 e8

Slave response information frame: 03 03 04 xx xx xx xx xx xx