7. Electrode communication

7.0 Default communication instructions:

Note: 1. Data starting at 0x represents hexadecimal;

2. The check code is 16CRC, the low byte is in the front and the high byte is in the back;

3. Floating point number occupy four bytes;

7.1 Communication description (factory default):

Factory default	
baud rate	9600(default)
data bit	8
stop bit	1
check bit	no
address	1 (default)

7.2 Host computer transmission format:

	Data type	Description	Remarks
Integer	16 bit integer	The high and low bytes of the word component are not reversed	Example: 0x 0032 to decimal number is 50
Floating point number	(CDAB) 3412	The high-low word of the double-byte component is reversed, but the high-low byte of the word is not reversed.	Example: 72 37 41 DB transfer to floating point number, CDAB change order is ABCD, ie 41 DB 72 37 transfer to floating point is 27.4

7.3 Function code description

7.3.1 This product supports 03,06,16 and other common function codes

7.3.2 The output register uses 16 function codes when writing double word data or writing multiple data in batches

03	Read single or multiple registers
06	Write single register
16	Write multiple registers

7.4 Read floating point number

7.4.1 Host computer transmission format:

	ID address	Function code	Register start address		Qty of registers		CRC16	
			High byte	Low byte	High byte	Low byte	Low byte	High byte
Example 1 Read measured value	0x 01	0x 03	0x 00	0x 01	0x 00	0x 02	0x 95	0x CB
Example 2 Read Temp value	0x 01	0x 03	0x 00	0x 03	0x 00	0x 02	0x 34	0x 08

7.4.2 Slave computer response format:

	ID address	Function code	Qty of registers	Read register data in hexadecimal floating point number				CRC16	
				C	D	A	B	Low byte	High byte
Example 1 Measured value return	0x 01	0x 03	0x 04	0x 2C	0x 81	0x 40	0x 91	0x 52	0x E7
Example 2 Temp value return	0x 01	0x 03	0x 04	0x 72	0x 37	0x 41	0x DB	0x 20	0x 8E

Note: 72 37 41 DB transfer to floating point number, CDAB change order is ABCD, ie 41 DB 72 37 transfer to floating point is 27.4

7.5 Read integer

7.5.1 Host computer transmission format:

	ID address	Function code	Register start address		Qty of registers		CRC16	
			High byte	Low byte	High byte	Low byte	Low byte	High byte
Example 1 Read warning status	0x 01	0x 03	0x 00	0x 07	0x 00	0x 01	0x 35	0x C8

7.5.2 Slave computer response format:

	ID address	Function code	Qty of registers	Read register data in hexadecimal integer		CRC16	
				A	B	Low byte	High byte
Example 1 Warning status return	0x 01	0x 03	0x 02	0x 00	0x 00	0x B8	0x 44

7.6 Write floating point number

7.6.1 Host computer transmission format:

	ID address	Function code	Register start address		Qty of registers		Qty of bytes	Write register data in hexadecimal floating point number				CRC16	
			High byte	Low byte	High byte	Low byte		C	D	A	B	Low byte	High byte
Example 1 Write Measured value offset	0x 01	0x 10	0x 00	0x 12	0x 00	0x 02	0x 04	0x 00	0x 00	0x 3F	0x 80	0x 63	0x 2A

7.6.2 Slave computer response format:

	ID address	Function code	Register start address		Qty of registers		CRC16	
			High byte	Low byte	High byte	Low byte	Low byte	High byte
Example 1 Measured value offset return	0x 01	0x 10	0x 00	0x 12	0x 00	0x 02	0x E1	0x CD

Note: the measured value is offset by 1.00, floating point number 1.00 converts to hexadecimal 0X3F800000, transpose the high and low positions 0X00003F80 and write 0X0012.

7.7 Write integer

7.7.1 Host computer transmission format:

	ID address	Function code	Register start address		Write register data in hexadecimal integer		CRC16	
			High byte	Low byte	A	B	Low byte	High byte
Example 1 Write device address	0x 01	0x 06	0x 00	0x 19	0x 00	0x 02	0x D9	0x CC

7.7.2 Slave computer response format:

	ID address	Function code	Register start address		Write register data in hexadecimal integer		CRC16	
			High byte	Low byte	A	B	Low byte	High byte
Example 1 Device address return	0x 01	0x 06	0x 00	0x 19	0x 00	0x 02	0x D9	0x CC

Note: change the local computer address 1 to address 2 and write the hexadecimal number 0x 00 02 into register 0x 00 19.

7.8 Calibrating instructions

7.8.1 Before calibration

Write the value of zero calibration (that is, the value of the first point) and the value of slope calibration (that is, the value of the second point) to the electrode before calibration;

If the zero calibration value is 1.000ppm, write the data 0x3F 80 00 00 to register 0x36;

Send command: 01 10 00 36 00 02 04 00 00 3F 80 60 C1;

If the slope calibration value is 10.000ppm, write the data 0x41 20 00 00 to register 0x38;

Send command: 01 10 00 38 00 02 04 00 00 42 C8 C0 2B.

7.8.2 Start calibration

First step:

Clean and dry the electrode ,put the electrode in the solution 1.000ppm of zero point calibration;

Send command: 01 03 00 66 00 01 64 15;

After the measured AD value is stable, read the AD value in the 0x66 register;

Write the instruction to confirm the calibration to the 0x 3E register;

Send command: 01 06 00 3E 00 FF A8 46.

Second step:

Clean and dry the electrode ,put the electrode in the solution 10.00ppm of slope calibration;

Send command: 01 03 00 66 00 01 64 15;

After the measured AD value is stable, read the AD value in the 0x66 register;

Write the instruction to confirm the calibration to the 0x 3F register;

Send command: 01 06 00 3F 00 FF F9 86.

7.9 Address description

Name	Hosting number	Data type	Length	Read/write	Description
Measurements	0X 00 01	floating point	2	read	Storage location for measured value(ppm or mg/L)
Temperature measurement	0X 00 03	floating point	2	read	Storage location for measured temperature
Current output value	0X 00 05	floating point	2	read	Output current based ION / mV measurements
Warning	0X 00 07	Integer	1	read	00: Normal 01: Measurement exceeds the upper limit; 02: Measurement exceeds the lower limit; 03: Temperature exceeds the upper limit; 04: Temperature exceeds the lower limit
Measure mode	0X 00 08	Integer	1	read/write	00: ION ; 01: mV
Upper limit of measurement	0X 00 0A	floating point	2	read/write	Upper limit of measured value (20mA corresponding value)
Lower limit of measurement	0X 00 0C	floating point	2	read/write	Lower limit of measurement value (4mA corresponding value)
Upper temperature limit	0X 00 0E	floating point	2	read/write	Upper temperature limit
Lower temperature limit	0X 00 10	floating point	2	read/write	Lower temperature limit
Measured value offset	0X 00 12	floating point	2	read/write	Adjust measurement
Temperature offset	0X 00 14	floating point	2	read/write	Adjust temperature value
Damping coefficient	0X 00 16	Integer	1	read/write	0-10
Device address	0X 00 19	Integer	1	read/write	1-255
Baud rate	0X 00 1A	Integer	1	read/write	0=2400, 1=4800, 2=9600 3=19200, 4=38400
Restore factory	0X 00 1B	Integer	1	write	
mV calibration value	0X 00 30	floating point	2	read/write	
Calibrating slope	0X 00 34	floating point	2	read	-0.1984
First point calibration solution	0X 00 36	floating point	2	read/write	1.000
Second point calibration solution	0X 00 38	floating point	2	read/write	10.000
Manual temperature	0X 00 3A	floating point	2	read/write	25℃
Zero confirmation	0X 00 3E	Integer	1	write	
Slope confirmation	0X 00 3F	Integer	1	write	
Measured AD	0X 00 66	Integer	1	read	

Note: When reading register data, do not continuously read more than 20 registers, the address register that does not list prohibits read and write data.

7.10 Common instruction examples

	Function	Send command	Return command	Remarks
1	Read measured value	01 03 00 01 00 02 95 CB	01 03 04 2C 81 40 91 52 E7	The 2C814091 change order to 40912C81 and its floating point is 4.53
2	Read temperature measurement	01 03 00 03 00 02 34 0B	01 03 04 72 37 41 DB 20 8E	The 723741DB change order to 41DB7237 and its floating point is 27.4
3	Read current output value	01 03 00 05 00 02 D4 0A	01 03 04 00 00 41 40 CB 93	The 00004140 change order to 41400000 and its floating point is 12.00
4	Read warning	01 03 00 07 00 01 35 CB	01 03 02 00 00 B8 44	0000 is the current state
5	Write measurement mode	01 06 00 08 00 01 C9 C8	01 06 00 08 00 01 C9 C8	Set to mV mode
6	Write upper limit of measurement	01 10 00 0A 00 02 04 00 00 41 20 42 58	01 10 00 0A 00 02 61 CA	The upper measurement limit is set to 10.00
7	Write lower limit of measurement	01 10 00 0C 00 02 04 00 00 3F 80 E3 AA	01 10 00 0C 00 02 81 CB	The lower measurement limit is set to 1.00
8	Write upper temperature limit	01 10 00 0E 00 02 04 00 00 42 C8 43 15	01 10 00 0E 00 02 20 0B	The upper temperature limit is set to 100.00
9	Write lower temperature limit	01 10 00 10 00 02 04 00 00 40 A0 C3 1B	01 10 00 10 00 02 40 0D	The lower temperature limit is set to 5.00
10	Write measured value offset	01 10 00 12 00 02 04 00 00 3F 80 63 2A	01 10 00 12 00 02 E1 CD	Set to 1.00
11	Write temperature offset	01 10 00 14 00 02 04 00 00 3F 80 E3 00	01 10 00 14 00 02 01 CC	Set to 1.00
12	Write damping coefficient	01 06 00 16 00 01 A9 CE	01 06 00 16 00 01 A9 CE	Set to 1
13	Write device address	01 06 00 19 00 02 D9 CC	01 06 00 19 00 02 D9 CC	Set to 2
14	Write baud rate	01 06 00 1A 00 00 A8 0D	01 06 00 1A 00 00 A8 0D	Set to 2400
15	Write restore factory	01 06 00 1B 00 FF B9 8D	01 06 00 1B 00 FF B9 8D	Factory default values are restored once sent
16	Write mV calibration value	01 10 00 30 00 02 04 00 00 42 AC C0 66	01 10 00 30 00 02 41 C7	Write mV standard liquid value 86mV
17	Read calibration slope	01 03 00 34 00 02 85 C5	01 03 04 CC CD 3E 4C 45 09	The CCCD3E4C change order to 3E4CCCD and its floating point is 0.2
18	Write first point calibration solution	011000360002040003F8060C1	01 10 00 36 00 02 A1 C6	Set to 1.000
19	Write second point calibration solution	011000380002040004120C095	01 10 00 38 00 02 C0 05	Set to 10.000
20	Write manual temperature	01 10 00 3A 00 02 04 00 00 41 A0 40 EC	01 10 00 3A 00 02 61 C5	Set to 20.0
21	Write zero calibration	01 06 00 3E 00 FF A8 46	01 06 00 3E 00 FF A8 46	Confirm to calibration zero
22	Write slope calibration	01 06 00 3F 00 FF F9 86	01 06 00 3F 00 FF F9 86	Confirm to calibration slope
23	Read measured AD	01 03 00 66 00 01 64 15	01 03 02 2E E0 A4 6C	2EE0 turns to integer 12000