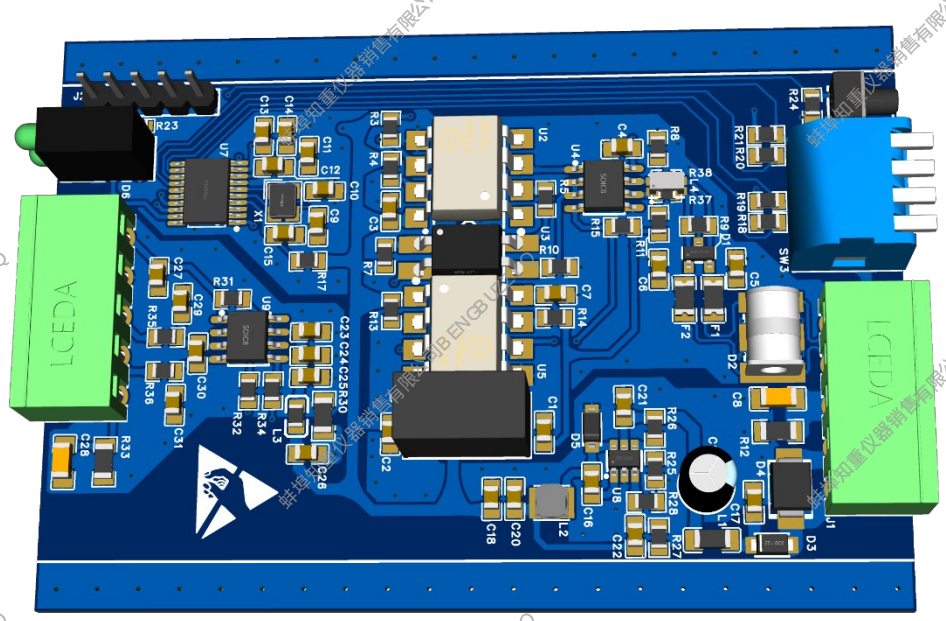
485 Digital Weighing Module

Instruction manual



蚌埠知重仪器销售有限公司BENGBUZZYQ

10-point correction calibration Digital calibration Sampling frequency 1280Hz

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1. Declaration

We do our best to improve the robustness and long-term stability of our products, but there is a risk of failure in actual application due to unexpected reasons (such as surge voltage, wiring disconnection, strong vibration, etc.), and failures may cause the product to work abnormally or stop working. Users should analyze the application system of the product and do a good job of systematic abnormal handling of possible failures of the product, so as not to pose a threat to the safe operation of the equipment and the personal safety of the operator. Industrial equipment should be considered from the beginning of the design of mechanical or electrical parts to deal with the fault, and the company shall not be liable for economic loss or personal injury caused by product failure.

2. Overview

This transmitter is a digital weighing transmitter, which can be directly connected to the Wheatstone resistive bridge pull/pressure sensor, through the internal signal amplification circuit and AD acquisition circuit, etc. to convert the microvoltage analog signal of the sensor into a digital signal, and the microprocessor built into the module supports the calibration algorithm, which can be directly read from the 485 interface to the real-time weight value after calibration operation. The 485 interface output of the module supports the Modbus - RTU protocol.

The standard Modbus - RTU communication protocol allows the module to be easily connected with PLC, DCS, microcomputer and other devices as a weighing front-end signal processing module.

3. Technical specifications

3.1 General technical specifications

Power supply DC 7-28VDC

Power consumption <1W

The operating current varies depending on the number of external sensors and the supply voltage Drive capacity is 500mA

Applicable ambient temperature -40~85 C

Humidity 0%~95% without condensation

Isolation Protection Optocoupler Isolation Power Isolation Anti-Surge Protection (Basic None

IP65 degree of protection

Installation method Mounting hole fixed

Weight ≈ 250g

3.2 Sensor interface performance

Applicable Sensor Types Suitable for all Wheatstone resistive strain gauge sensors

Sensor excitation voltage 5VDC±3%

Sensor Drive Capability 8 x 350Ω sensors

Input signal range 0-±30mV

Temperature coefficient ≤ 0.01%+0.3d/°C of the reading

Nonlinear error ≤0.003%F· S

Stable resolution 1/500000

Sample rate 10Hz, 40Hz, 640Hz, 1280Hz

Sampling method Sig Delta AD

3.3 Communication interface

Communication method RS485

Communication protocol Standard modbus RTU protocol supports 03, 06, 16 (0X10) function codes

Baud rate 2400 4800 9600 19200 28800 38400 57600 115200 256000 500000

slave software address 1-255 broadcast address 254

Slave dial addresses 0-15

3.4 Factory default parameters

Porter rate	Data bits	stop position	Check position	Module address	CRC byte order	Data byte order
9600	8	1	None	1	Small end mode	2143

4. Detailed explanation of registers

All registers are located in the power-down hold register area in the Modbus protocol, each register is a 16-bit number, and some functions in the module are represented in a 32-bit way, for example, the real-time weight value register is a 32-bit signed representation method, and the 32-bit number is represented by using two adjacent registers to form a 32-bit number, in which the register with a small address is a low word in the 32-bit number. All 32-bit registers should be read and written in a 32-bit signed manner, although sometimes it is correct to read only the low character display in the 32-bit register in the 16-bit way, but there are often display exceptions when doing so when negative and large numbers.

The register layout of the module is as follows:

Internal address		PLC Address	RMS type		Read and write	Write protection	Function	Function description:
decimal	Hexadecimal							
0	0X0000	40001	32 bits are signed	Low words	R	None	Real-time weight	The high position is in the front, and the low position is at the back to form a 32-bit signed data, with the first digit being 0 representing a positive number and 1 representing a negative number
1	0X0001	40002		High character				
2	0X0002	40003	32-bit unsigned	Low words	R	None	Internal code value	The AD code value corresponding to the current weight
3	0X0003	40004		High character				
4	0X0004	40005	32-bit unsigned	Low words	R	None	Current zero	When the output weight is 0, write 1 to the register 0X0016 the corresponding AD internal code value to achieve zero point calibration
5	0X0005	40006		High character				
6	0X0006	40007	16-bit unsigned		W	there is	Weight value	Range: 20~65535 Represents the weight value of the calibration (the weight weight is not without decimal point), so when the actual weight is calibrated as 100.00, the value filled in should be 10000, and the user device reads the weight value and adds a decimal point by itself, and writes the weight value to the register to achieve

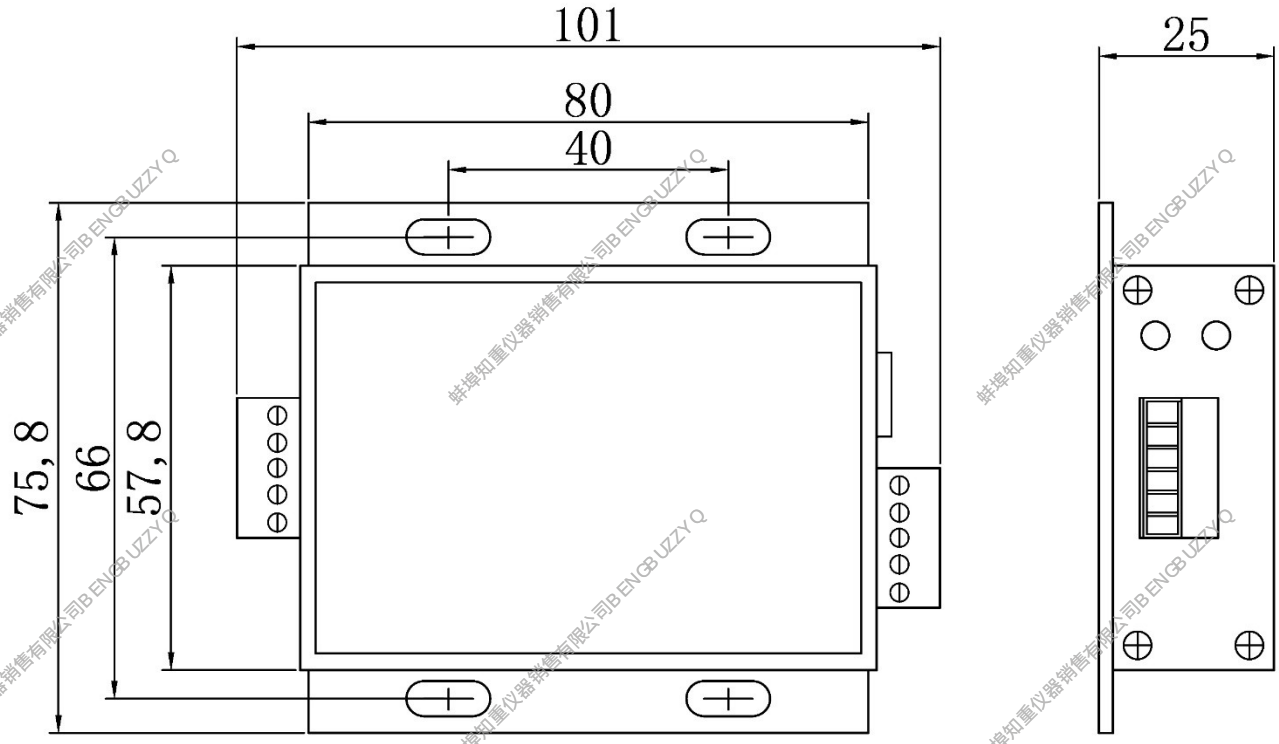
							single-point weight calibration
7	0X0007	40008				Reserved	
8	0X0008	40009				Reserved	
9	0X0009	40010	16-bit unsigned	R/W	there is	Chasing zero intensity	Range 1~20, default is 5 Chasing zero is the AD value of chasing zero point step by step, the smaller the intensity, the slower the chase of zero, but the more accurate the chasing; The greater the intensity, the faster the chase of zero, but it may chase more, resulting in a large deviation from 0 points.
10	0X000A	40011	16-bit unsigned	R/W	there is	Dynamic chasing zero	Range 1~50, default to 3 When the detected weight is within this range and in steady state, after multiple acquisitions and judgments, the automatic zero chasing operation is carried out, and the zero chasing range is independent of the index value.
11	0X000B	40012	16-bit unsigned	R/W	there is	Zero Catch Enable	Range 0~3, default to 3 0: Turn off the boot and dynamic zero chasing 1: Only turn on the power on, set zero, and turn off dynamic zero chasing 2: Turn off the boot and set zero and only turn on dynamic zero chasing 3: Turn on the boot and set zero and dynamic zero chasing
12	0X000C	40013	16-bit unsigned	R/W	there is	Index value	Ranges 1,2,5,10,20,50,100 default to 1 The index value is used to limit the output digit minimum runout value of the weight value output register. When the register is set to a 2-index value, the output weight will only be an even number, and when the register is set to 5, the weight value register will only output a multiple weight value of 5.
13	0X000D	40014	16-bit unsigned	R/W	there is	Median filtering	Ranges 1, 3, 5, 7, 9 default to 3 It refers to the stable output of 3 AD acquisitions through internal acquisition, the larger the median filter setting, the more stable it is, but the module processing time is long, it is recommended to use the default value 3.
14	0X000E	40015	16-bit unsigned	R/W	there is	Sampling rate	10Hz, 40Hz, 640Hz, 1280Hz optional, the default is 40Hz, the sample rate is greater than 40Hz, it is recommended to use a baud rate above 115200.
15	0X000F	40016	16-bit unsigned	R/W	there is	Module address	Range 1~255 defaults to 1 Write the corresponding value to the register, that is, modify the module software address (all dial addresses need to be zeroed), and 254

							is the broadcast address
16	0X0010	40017	16-bit unsigned	R/W	there is	Porter rate	The range 1~10 defaults to 3 1=2400 2=4800 3=9600 4=19200 5=28800 6=38400 7=57600 8=115200 9=256000 10=500000 The baud rate modification takes effect immediately and needs to be powered off and reconnected
17	0X0011	40018	16-bit unsigned	R/W	there is	Average filtering	Range 1~50 defaults to 10 Take several consecutive periods of data, calculate its average value, and output stable data with small fluctuations, which customers can set according to actual needs.
18	0X0012	40019	16-bit unsigned	R/W	there is	Dynamic tracking range	The range 0~50 defaults to 1 For example, if the parameter is set to 5, then the output data fluctuates at 100±5, and the module will stably output 100, and only when the fluctuation is greater than 5, it will be re-collected.
19	0X0013	40020	16-bit unsigned	R/W	there is	Creep tracking range	Range 0~10 defaults to 5 If the sensor is continuously charged for a long time, the output value will drift, increase or decrease, and be corrected by setting this parameter.
20	0X0014	40021	16-bit unsigned	R/W	there is	Stabilizing weight switch	0: Off 1: On, default to 0, When opening, there is no intermediate process for data output, and the final value is directly output, for example, weighing 100kg, the data will be directly from 0 to 100, without 10, 20, 80..... When the sampling rate is 10, the median filter is forced to be 1, and when the ≥ is 40, the median filter is forced to be 3, which is not necessary and is not recommended.
21	0X0015	40022	16-bit unsigned	W	None	Peel	1: peel 2: unpeel
22	0X0016	40023	16-bit unsigned	W	there is	Command register	1: Zero Point Calibration 9: Factory Reset
23	0X0017	40024	16-bit unsigned	R/W	None	Write protection registers	0: On 1: Close
24	0X0018	40025	16-bit unsigned	W	there is	Calibration method selection	0: Weight calibration FF: Digital calibration 1-10: Turn on the corresponding 1-10 point polyline calibration Example: Write 5, which means that it can be calibrated in 5 points
25	0X0019	40026	16-bit unsigned	W	there is	The first point is the weight value	Range: 20~65535 (without decimal point) 24 registers 0X0018 write 1-10 corresponding to open a few points of polyline calibration, up to 10 points, 10 points weight regardless of
26	0X001A	40027	16-bit	W	there	The second	

			unsigned		is	point is the weight value	size, automatic sorting and matching after calibration is completed, if the sensor's own accuracy meets the needs of use, it is recommended to turn off the polyline correction (write 0 0X0018), write the weight value to 0X0006 complete the calibration.
27	0X001B	40028	16-bit unsigned	W	there is	The third point is the weight value	
28	0X001C	40029	16-bit unsigned	W	there is	The fourth point is the weight value	
29	0X001D	40030	16-bit unsigned	W	there is	The fifth point is the weight value	
30	0X001E	40031	16-bit unsigned	W	there is	The sixth point is the weight value	
31	0X001F	40032	16-bit unsigned	W	there is	The seventh point is the weight value	
32	0X0020	40033	16-bit unsigned	W	there is	Eighth point weight value	
33	0X0021	40034	16-bit unsigned	W	there is	The ninth point is the weight value	
34	0X0022	40035	16-bit unsigned	W	there is	The tenth point is the weight value	
35	0X0023	40036	16-bit unsigned	W	there is	Total sensor range	Valid when calibrated digitally, range 20-65535
36	0X0024	40037	16-bit unsigned	W	there is	Sensor sensitivity	Valid for digital calibration, 2000=2.0mv/v, 1542=1.542mv/v
37	0X0025	40038	16-bit unsigned	W	there is	Voltage correction ratio	This parameter is 1,1000=1.000 by default, and this parameter does not need to be modified because the voltage reference of this module is directly input to the AD sampling chip
38	0X0026	40039	16-bit unsigned	W	there is	Range correction factor	Affected by the sampling accuracy and sensor sensitivity error, there is a certain error in the digital calibration, and this coefficient can be corrected for the linearity of the sensor, 10000=1.0000

4. Installation

4.1 Installation and overall dimensions



4.2 Installation environment

♦ This transmitter is a precision electronic instrument, and the installation, connection and operation should be very careful.

♦ Although this product meets the industrial grade temperature range, to ensure the accuracy of this transmitter, please avoid installing the transmitter in direct sunlight or in an environment where the temperature can change suddenly.

♦ Make sure the transmitter has enough space to breathe and dissipate heat.

♦ The transmitter can only protect against normal splashing water and should not be used in a long-term immersion environment.

♦ Please avoid violent vibration and impact of this transmitter.

♦ Do not install this transmitter in any place where there is a risk of explosion.

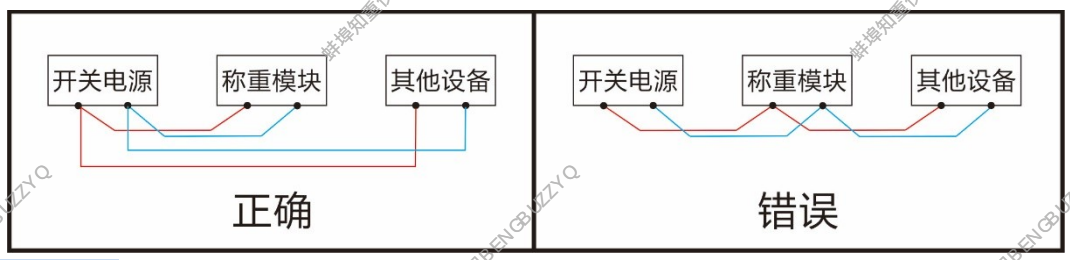
4.3 Power supply

♢ Power supply: 7~28VDC, sufficient capacity, no transient, clutter signal.

♢ Condensation can form inside the transmitter, so it is recommended to always turn on the power to the transmitter or open the lid regularly to check for condensation.

♢ Use the appropriate power cord and make sure that the rated voltage or current of the power cord meets the requirements, if there is not enough female fruit, it may cause leakage or fire.

♢ In particular, when drawing power from multiple machines, please connect the power cord as follows:



4.4 Wiring definition

◆ When the module is connected to the power cable, it should ensure that the power cable is not supplied to prevent short circuit or accidental contact with the low-voltage signal line inside the module due to the lack of fixed wire head.

◆ The sensor wire color definition of each manufacturer may be different, so the following figure does not give a wiring diagram with color, to prevent customers from misreferring to lead to wiring errors, please determine the line color definition of the sensor with the sensor manufacturer before wiring.

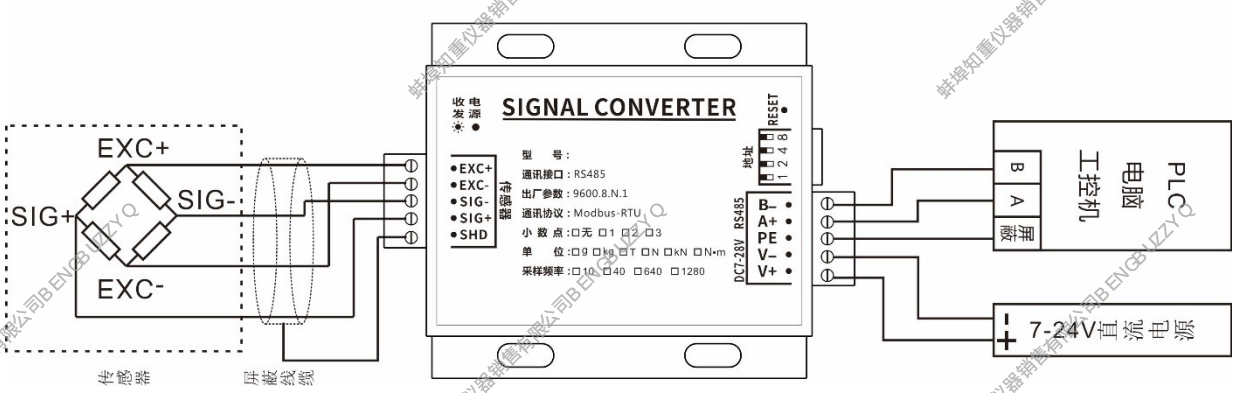
◆ The excitation and signal lines of the sensor must only be connected to the module, and the external excitation signal cannot be used, nor can any wiring of the sensor be shared with other acquisition modules, otherwise it will cause the module to be unusable or damaged.

◆ The wiring of the sensor should be sorted out before the calibration operation, and the wire should not be moved or bent greatly after calibration, otherwise it is possible

It can lead to measurement errors.

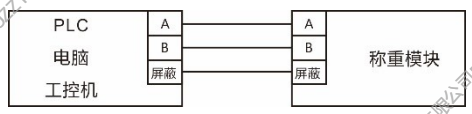
◆ All wiring should be pressed tightly inside the terminals to prevent system abnormalities caused by loose falling off or poor contact.

◆ The excitation voltage of the module is only used for sensor drive, not for driving other loads.

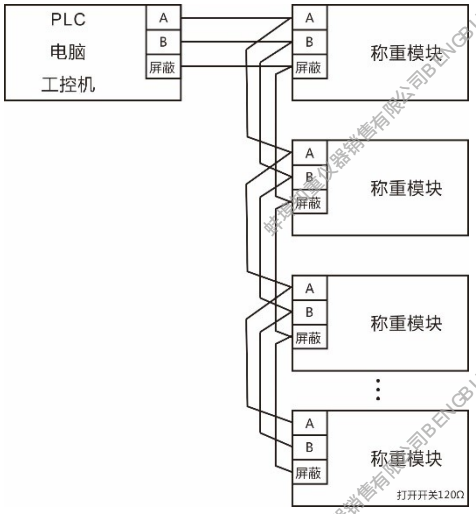


4.5 RS485 interface

The 485 wiring diagram is shown below:



One-on-one



The RS485 interface is used, and the maximum transmission distance of the interface is as a communication channel

At a baud rate of 9600 meters at 1200 meters, up to 32 devices can be cascaded on the same bus

In short-distance debugging, it can be connected with ordinary direct wires, and it can be built when it is actually used

The A and B lines of Proposal 485 are twisted pairs, and the shielding uses direct connecting wires, when the distance is long

Twisted pair shielding wires should be used. When using a one-to-many connection, the 120Ω power should be connected in parallel

The resistor switch is turned on.

One-to-many

4.6 Station address

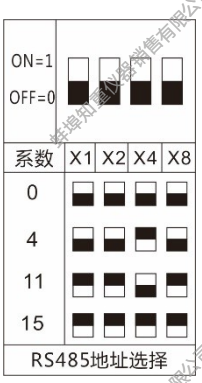
The module supports Modbus - RTU as the master-slave mode, that is, each communication process is initiated by the host PLC, DCS, computer, the command sent by the host contains the station address of the operated module, only the station address in the command is consistent with the station address set by the module, the module will respond, this module supports station address 0-15, and address offset register 1-255 (software setting address).

If the address offset register of the module is misconfigured or the last write value is forgotten, it will cause the problem of not

being able to get the actual station address In this regard, we have added a broadcast address to solve the problem, the value of the broadcast address is 254, that is, when using this address to communicate with the module, no matter what the actual station address of the module is, it will respond if you use this address to communicate with multiple devices on the 485 bus, because this command will cause all modules to reply data. The 485 bus does not allow multiple devices to send data at the same time, so it will cause bus data conflicts, and the host cannot receive the reply instruction 254 The correct usage of the broadcast address is to keep only one device on the bus.

The dial code is dialed up to represent 1, and the dial code is dialed down to represent 0, and then the 4-digit dip is multiplied by the corresponding coefficient, and then the product is added to get the result

The value is the address of the station.



For example:

The first dial is dialed, and the rest are all dialed, 1×1+0×2+0×4+0×8=1

All four digits are dialed, 0×1+0×2+0×4+0×8=0

The third digit is dialed up, and the rest are all dialed, 0×1+0×2+1×4+0×8=4

The third digit is dialed down, and the rest are all dialed, 1×1 + 1×2 + 0×4 + 1×8 = 11

All four digits are dialed, 1×1+1×2+1×4+1×8=15

4.7 Indicator Light and Reset

The transmitter module has two working indicators for working status indication, the two indicators are located on the side of the sensor terminal block, namely the power indicator light, the communication indicator light, both indicator lights are green, the power indicator light is solid after the module is powered on, the command received by the communication indicator conforms to the format of Modbus - RTU protocol, and the station address in the command is the same as the actual station address of this module when switching off the state once the light is turned off or off to turn on, if the host stops sending the command after the indicator light is turned off, The communication indicator light will always be off.

The hidden button (RESET) in the upper right corner of the module is the reset button, and when the power is on, press the button for more than three seconds, and the two indicator lights flash at the same time, that is, the factory setting is successfully restored. Since all parameters are cleared after reset, including calibration parameters, this function should be used with caution, and if the slave address is forgotten and cannot communicate, the dial address and broadcast address will be applied first.

5. Communication examples

The following examples are all internal register addresses, if controlled by PLC, internal register 0 = PLC address 40001

5.1 Read the current weight

Send: 01 03 00 00 00 02 C4 0B

Analysis:

01 Module station address

03 Read save registers

00 00 reads from the address of save register 0

00 02 Read the values of 2 registers

C4 0B CRC16 checksum

Received: 01 03 04 04 D2 00 00 5B 3A

Analysis:

01 Module station address

03 Read and save the register reply

04 Valid data length is 4 bytes

04 D2 The value of the first register

00 00 The value of the second register

5B 3A CRC16 checksum

5.2 Zero point calibration

Send: 01 06 00 17 00 01 F8 0E

(Turn off write protection)

Send: 01 06 00 16 00 01 A9 CE

(Write 1 to 0x0016 achieve zero point calibration)

5.3 Weight calibration

Before weight calibration, complete the zero point calibration, and then load the weight, the weight calibration is limited by write protection, and the write protection should be turned off when the weight is calibrated.

Send: 01 06 00 18 00 00 09 CD (write register 0x0018 to 0, turn on weight calibration)

Send: 01 06 00 06 01 F4 69 DC

Analysis:

01 Module station address

06 Write Save Register (Single Register Write Command)

00 06 Write to the address of the register, hexadecimal 0X0006, convert decimal to 06

01 F4 writes 500, 500 is converted to hexadecimal value 01 F4, if the weight value is 1000, the write value is 03 E8, pay attention to change the CRC16 checksum

69 DC CRC16 checksum

5.4 Line calibration

In order to improve accuracy, this product supports up to 10 points of calibration, the following takes 5 points of calibration as an example, the weight values are 100, 500, 1000, 2000, 3000, corresponding to the hexadecimal 00 64, 01 F4, 03 E8, 07 D0, 0B B8, write these 5 values to the corresponding registers. (See register details)

Send: 01 06 00 17 00 01 F8 0E (Write Protection Off)

Send: 01 06 00 18 00 05 C9 CE

(Write the register 0X0018 to the value 5 to turn on the 5-point polyline correction, if you need 10 points, change 5 to 10, pay attention to changing the CRC16 checksum)

Send: 01 06 00 19 00 64 59 E6 (write 100 to register 0X0019) First point of weight calibration

Send: 01 06 00 1A 01 F4 A8 1A (write 500 to register 0X001A) Second point weight calibration

Send: 01 06 00 1B 03 E8 F9 73 (Write 1000 to register 0X001B) Third point weight calibration

Send: 01 06 00 1C 07 D0 4B A0 (write 2000 to register 0X001C) Fourth point of weight calibration

Send: 01 06 00 1D 0B B8 1E 8E (Write 3000 to register 0X001D) Fifth Point Weight Calibration

5.5 Digital calibration (weightless calibration)

Affected by the sampling accuracy, sensor sensitivity error, etc., there is a certain error in the digital calibration, this calibration method can only be used without standard weight (force source), the following is a sensor range of 5000, sensitivity 2.0mv/v as an example

Send: 01 06 00 17 00 01 F8 0E (Write Protection Off)

Send: 01 06 00 18 00 FF 49 8D (Write FF 0x0018 turn on digital calibration).

Send: 01 06 00 23 13 88 75 56 (write 5000 to 0x0023 set the sensor full scale to 5000, 13 88 to hexadecimal, convert to decimal to 5000)

Send: 01 06 00 24 07 D0 CA 6D (write 2000 0x0024 set the sensor sensitivity to 2.000, 07 D0 to 16, convert to decimal to 2000

If the sensor sensitivity is 1.542, write 1542 to the register 0x0024, and do not support sensitivity 4 decimal place writes, such as the sensor sensitivity is 1.5422, round to 1.542)

Send: 01 06 00 26 27 10 72 3D (write 10000 0x0026 this step is to modify the range factor to 1, if it is not modified before, this step can be ignored)

At this point, the digital calibration is completed, the above mentioned that there is a certain error in the digital calibration, for example, the actual weight (force value) is 2000, and the module displays the output value of 2008, in order to further reduce the error, we can modify the range coefficient, the calculation method is the actual value**/module display value, that is, 2000/2008≈ 0.9960,** and then we write 0.9960 to the register 0X0026,**Note that the range correction factor must be 1 before this operation, so before calculating the coefficient, you must perform 01 06 00 26 27 10 72 3D to modify the range factor to 1.** The method of modifying the range coefficient is as follows:

Send: 01 06 00 17 00 01 F8 0E (Turn off write protection, this step can be ignored if it is turned off)

Send: 01 06 00 26 26 E8 72 2F (write 9960 0x0026 modify the range factor to 0.9960, convert 9960 to hexadecimal to 26 E8)

5.6 Modify the communication rate

Example: Modify the communication rate to 1280Hz

Send: 01 06 00 17 00 01 F8 0E (Turn off write protection, this step can be ignored if it is turned off)

Send: 01 06 00 0E 05 00 EB 59 (write 1280 to register 0x000E, 1280 convert hexadecimal to 05 00).

5.7 Modify the station address

Example: Modify the station address to 2

Send: 01 06 00 17 00 01 F8 0E (Turn off write protection, this step can be ignored if it is turned off)

Send: 01 06 00 0F 00 02 38 08 (write 2 to register 0X000F)

5.8 Modifying the baud rate

Example: Modify the baud rate to 115200, and the default baud rate is 9600

Send: 01 06 00 17 00 01 F8 0E (Turn off write protection, this step can be ignored if it is turned off)

Send: 01 06 00 10 00 08 89 C9 (write 8 to register 0x0010, look at register table, 8 represents baud rate 115200)

Note: The modification of the baud rate takes effect immediately and needs to be powered off and reconnected

5.9 Peeling and unpeeling

Send: 01 06 00 17 00 01 F8 0E (Write Protection Off)

Send: 01 06 00 15 00 01 59 CE (write 1 to register 0x0015 complete peeling)

Send: 01 06 00 15 00 02 19 CF (Write 2 to register 0x0015 unpeel)

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