XSQB Weighing and Force Measuring Display Controller

Operating Manual

Please read the following before use for your safety

▣Caution

Do not use it on life-related equipment such as nuclear equipment and medical devices.

This instrument does not have a power fuse. Please install safety circuit breakers, such as fuses, in the power supply circuit of this instrument for protection.

Do not use this product outside of the specified range.

Do not use this product in flammable or explosive environments.

Avoid installing the instrument directly above high-heat devices such as heaters, transformers, or high-power resistors.

⚠Warning

When the ambient temperature exceeds 50℃, use forced fans or cooling machines for cooling. However, do not let the cooling air blow directly onto the instrument.

For panel-mounted instruments, necessary measures should be taken on the final equipment to prevent users from coming into contact with high-voltage parts, such as power terminals.

The installation, commissioning, and maintenance of this product should be carried out by qualified engineering and technical personnel.

If a fault or abnormality in this product could potentially lead to a major system accident, please set up appropriate protection circuits externally to prevent accidents from occurring.

Our company is not liable for any direct or indirect losses other than those relating to the product itself.

Our company reserves the right to change the product specifications without prior notice.

Contents

CHAPTER I OVERVIEW 1

1.1 INTRODUCTION 2

1.2 SECURITY TIPS 2

1.3 TECHNICAL PARAMETERS AND OVERALL DIMENSIONS 2

1.4 INTERFACE DEFINITION 2

CHAPTER II OPERATION METHODS 3

2.1 KEY AND DISPLAY AREA DEFINITIONS 3

2.2 PARAMETER DISPLAY AND SETTING 3

2.2.1 01-SEt System parameters 3

2.2.2 02-APP Application Parameters 4

2.2.3 03-CAL System Operation 4

2.2.4 04-INF system information 4

CHAPTER III SERVICE INSTRUCTION 5

3.1 MODBUS COMMUNICATION PROTOCOL 5

3.2 OTHER COMMUNICATIONS: 5

3.2.1 Protocol for active sending ..... 错误！未定义书签。

3.3 OTHER FUNCTIONS 6

Chapter I Overview

1.1 Introduction

Thank you for choosing our products! Before using this product, please read this manual carefully to ensure that the product can function to its fullest extent.

This product uses a 24-bit ∑-△ADC to convert the analog signal from the bridge-type weighing sensor into a digital signal. It also has 2-way digital input and 2-way relay dry contact output. In addition to transmitting the weighing signal, it also has upper and lower limit alarm outputs.

The device is powered by 220V AC.

This product also features sensor circuit detection. When the sensor is not connected or when there is a sensor failure (including wiring disconnection), corresponding alarm prompts will be given.

Product features:

1. Strong resistance to RF interference and electromagnetic interference (EMI), with excellent electromagnetic compatibility (EMC) characteristics;
2. Powered by 220V AC voltage;
3. High-speed 24-bit ∑-△ADC sampling, with a sampling rate exceeding 500Hz;
4. Comprehensive sensor fault detection, including signal exceeding limits, module sampling failure, sensor circuit connection failure, etc.;
5. Optional 485 communication interface.

1.2 Security tips

1. This instrument is designed to be resistant to interference. It is essential to ensure that the instrument is reliably grounded and that the ground wire is separate from the AC power supply ground wire.
2. Do not use this instrument in environments with flammable gases.
3. Avoiding direct sunlight
4. The power supply should be within the range of 180-242VAC, and the power supply and relay voltage must not exceed this range.

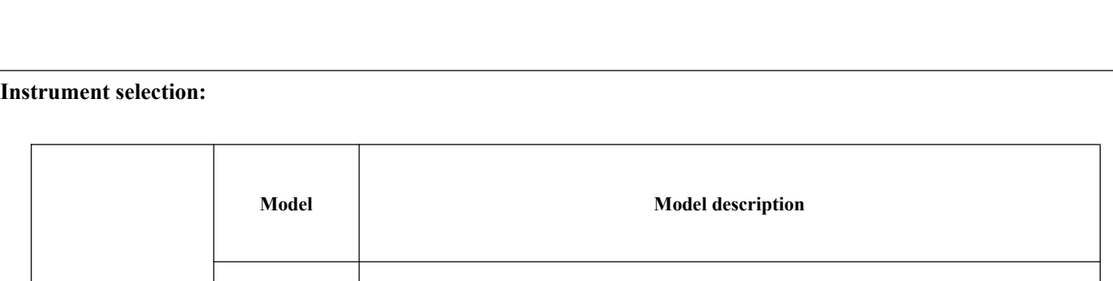
1.3 Technical parameters and overall dimensions

Measurement signal	-20mV~20mV, up to six 350 ohm load cells can be driven in parallel
Sampling frequency	640Hz
Detection accuracy	Level III
Response time	1/500000
Input output quantity	2-way digital input, low-level effective; 2-way relay dry contact output.
Communication interface	Standard configuration includes 1 channel RS232 and 1 channel RS485. Optional configurations include Ethernet, 0-10V output, etc.
Non-linearity	0.005%FS
Working power supply	Power supply module 10-30V DC Sensor power supply 5V
Weight	About 0.1kg
Overall dimensions	96*48*70 Length * Width * Height (Unit: cm)
Power consumption	< 5W
Operating temperature	-20~+65℃

Instrument selection:

	Model	Model description
Instrument selection content description	**XSQ**	**Power supply: 220V, 6-digit display, two sets of normally open and normally closed relays.**
	XSQ4	**Power supply: 220V, 6-digit display, two sets of normally open and normally closed relays, RS485 output.**
	XSQB	**Power supply: 24V, 6-digit display, two sets of normally open relays, output options include RS485/RS232/0-10V or 4-20mA.**

1.4 Interface definition



Terminal instruction

1： 1: 11V+ and 12V- are the module power supply, it is recommended to use 24V DC.

2： 13E+, 14E-, 15S+, and 16S- are for sensor wiring;

3： 19G, 17TX, and 18RX are for the RS232 interface. The standard configuration includes a 485 interface, with 9 as 485A and 10 as 485B; 20DA is for 0-10V/4-20mA+ output, and 19G is for 0-10V/4-20mA- output.

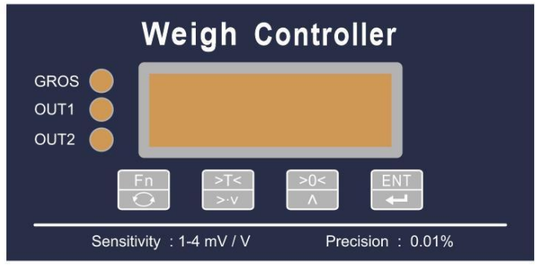
4: 3 and 4 are the NO (Normally Open) passive dry contact outputs for OUT1, and 1 and 2 are the NO passive dry contact outputs for OUT2.

5.I1 and 6.I2 are the digital input ports, and they are active low (triggered by V-).

5: 7 and 8 are the expansion module interfaces.

Chapter II Operation Methods

2.1 Key and display area definitions



Totally 4 keys: Fn >T< >0< ENT

Fn: To enter the menu or go back to the previous level Long press on the main screen and enter the password 000123 to unlock.

>T<: In the weighing screen, long press for 3 seconds to tare the weight. In the menu screen, it will change the menu options. In the parameter modification screen, it will move the cursor.

>0<: In the weighing screen, long press for 3 seconds and release after 1 second to zero the weight; In the menu screen, it will change the menu options; In the parameter modification screen, it will increase the value.

ENT: In the weighing screen, long press for 3 seconds to clear the peak value. In other screens, it will confirm the current operation.

When GROS (gross) is lit, it indicates the total weight. When GROS is off, it indicates the net weight. When GROS is rapidly blinking (approximately 5 times per second), it indicates an abnormal condition. When GROS is slowly blinking (approximately 2 times per second), it indicates the peak value display (if set as 1 or 2 in the 02-004 setting).

2.2 Parameter display and setting

Before entering the parameter settings, on the main screen, press a button Fn and enter the password 000123;

On the main screen, press a button Fn to enter the parameter setup screen. At this point, the first line displays 01-SEt (system parameters). Press the button >T< >0< to switch the display to 02-APP (application parameters), 03-CAL (system operation), and 04-INF (system information). Once the desired setting function is selected, press the button ENT to enter the corresponding parameter table. At this point, pressing the button >T< >0< can switch to display other parameters. Pressing the button ENT will enter the parameter modification mode or display the next level. Pressing and holding the button Fn for more than 3 seconds will directly exit to the weight display interface.

2.2.1 01-SEt System parameters

In the main screen Fn, when 01-SEt is displayed, press the button ENT to enter the system parameter display, including the parameters in the following table:

Display symbols	Definition	Default value (range)	Description	PLC register address Remarks: MODBUS Address minus one
01-000	Decimal point	2(0-4)		1001
01-001	Measuring range	100.00(0-9999.99)	Gross weight greater than this value, indicating OL.	1003
01-002	Zero point	0(0-999999)	Saved zero sampling value	1005
01-003	Linear coefficient.	1000(1-999999)	The coefficient formed when the school is full.	1007
01-004	Sampling frequency	2(0-3)	0:10 1:40 2:640 3:1280.	1009
01-005	Filter method	0(0-0)	Filtering method selection. Fixed to FIR filtering.	1011
01-006	Filter level	16(0-19)	The larger the value, the better the filtering effect, but the more lag the weight display.	1013
01-007	Refresh time for	0.10(0-9.99)	Time interval for refreshing the screen.	1015
01-008	Division value	0(0-5)	0:1 1:2 2:5 3:10 4:20 5:50。	1017
01-009	Stability range	0.01(0.00-99.99)	When this value is greater than 0, it begins to judge stability.	1019
01-010	Stabilization time	0.30(0.00-9.99)	During this time, if the weight change is within a stable range, it is stable.	1021
01-011	Creep range	0.00(0.00-99.99)	When this value is greater than 0, creep correction is performed.	1023
01-012	Creep time	10.00(0.00-99.99)	If the weight change within a certain period of time remains within the creep range and remains stable, perform creep correction.	1025
01-013	Zero setting range	0.00(0.00-99.99)	If this value is greater than 0, perform an automatic zeroing operation.	1027
01-014	Zero setting time	1.00(0.00-9.99)	If the weight remains within the range and remains stable within this period of time, perform an automatic zeroing operation. Zeroing should only occur once if the weight remains stable.	1029
01-015	Correspondence address	1(0-128)		1031
01-016	Baud rate of 232 ports	1(0-4)	0:9600 1:19200 2:38400 3:57600 4:115200 Note: Note: After modifying the baud rate, a power reset is required.	1033
01-017	232 verification	0(0-2)	0: No check 1: Even check 2: Odd parity check	1035
01-018	232 function	0(0-9)	0: RTU 1: Active sending Other: Standby	1037
01-019	232 32-bit sequence	0(0-3)	0:1234 1:2143 2:3412 3:4321	1039
01-020	485 Baud rate	1(0-4)	0:9600 1:19200 2:38400 3:57600 4:115200 Note: After modifying the baud rate, a power reset is required.	1041
01-021	485 verification	0(0-2)	0: No check 1: Even check 2: Odd parity check	1043
01-022	485 FUNCTION	0(0-9)	0: RTU 1: Active sending TCP(valid with Ethernet module) Other: Standby	1045
01-023	485 32-bit sequence	0(0-3)	0:1234 1:2143 2:3412 3:4321	1047
01-024	Active transmission interval	200(1-1000)	Unit: ms	1049
01-025	Segmental correction points	0(0-12)	Set to 0 without fixing.	1051
01-026	I1 Function	0(0-29)	0: None 1： Start-up peak; 2： Stop peak; 3： Zero setting 5: Peak clearing. Other: Standby	1053
01-027	I2 Function	0(0-29)		1055
01-028	Standby	0(0-29)		1057
01-029	OUT1 function	0(0-59)	1： W>S1 2: W<=S1 3: W>S2 4: W<=S2 5: W>S2 and W<=S1 6: W<=Z	1059
01-030	OUT2 function	0(0-59)		1061

01-031	Standby	0(0-59)	7： P>S1 8: P<=S1 9: P>S2 10: P<=S2 11: P>S2 and P<=S1 12 Peak detection in progress 13: Sampling error Other: Standby Note 1: Real-time weight W, peak weight P, The parameter of 02-000 is S1, the parameter of 02-001 is S2, and the zero zone is Z	1063
01-032	Standby	0(0-59)		1065
01-033	Standby	0(0-59)		1067
01-034	Standby	0(0-59)		1069
01-035	Standby	0(0-59)		1071
01-036	AO function	0(0-9)	0: Positive direction 0-10V 1: Two-way -10~10V	1073

2.2.2 02-APP Application Parameters

On the main screen, press button Fn, when “01-SEt” is displayed, pressing the button >T< >·v >0< ^ will switch the display to "02-APP". Pressing the button ENT will enter the display of application parameters, which includes the following table:

Display symbols	Function	Default (range)	Description	PLC register address Remarks: MODBUS Address minus one
02-000	OUT1 Alarm point	400.00(-9999.99-9999.99)	Set OUT1 alarm value, alarm mode in 01-029 parameter setting	1101
02-001	OUT2 Alarm point	400.00(-9999.99-9999.99)	Set OUT2 alarm value, alarm mode in 01-029 parameter setting	1103
02-002	Null area	10.00(0.00-9999.99)	Trigger point when the peak automatically triggers	1105
02-003	Peak minimum time	0.20(0.00-9.99)	Minimum time for peak detection	1107
02-004	Application functions	0(0-9)	0: Real-time value 1: Peak value	1109

Note 1: When 02-004 is set to "peak value", the module display area will show the peak value.

2: All the parameters mentioned above are 32-bit integer data

3: In principle, communication-related parameters should not be operated through communication.

2.2.3 03-CAL Calibration instruction

On the main screen, press button Fn, pressing the button >T< >·v >0< ^ when “01-SEt” is displayed will switch the display to "03-CAL". Pressing the button ENT will enter the module’s functional operations, such as zero calibration and full calibration. The following table describes the operations involved:

Display symbols	Function	Description
03-000	Zero calibration	
03-001	Full scale calibration	

Zero calibration: When “03-000” is displayed, pressing the button ENT will display the sampling value. Pressing the button ENT again will start a 3-second countdown. After the countdown ends, the zero point will be automatically saved and it will return to "03-000".

Full scale calibration: When “03-001” is displayed, place a weight (calibration weight) on the weighing platform. Press the button ENT, enter the weight of the calibration weight, and press the button ENT to confirm. The weight of the calibration weight will be displayed. If there is an error in the signal, an “ERR” error will be displayed. Pressing the button ENT again will start a 3-second countdown. After the countdown ends, the full-scale factor value will be automatically saved and it will return to "03-001".

2.2.4 04-INF system information

On the main screen, press the button Fn, pressing the button >T< >·v >0< ^ when “01-SEt” is displayed will switch the display to "04-INF". Pressing the button ENT will enter the module’s functional operations, such as zero calibration and full calibration. The following table describes the operations involved:

Display symbols	Function	Description
04-000	Version query	Query information such as version meter errors
04-001	Password management, etc.	Set the password, restore the default value, etc.
04-002	Ex-factory test	Factory testing and related factory operations

Version and other queries: For factory use only

Password management, etc.: When “04-001” is displayed, press ENT, pressing the button >T< >·v >0< ^ will cycle through the options "01-PASS", "02-dEF", and "03-FAC".

1. When “01-PASS” is displayed, pressing the button ENT will allow you to modify the password. First, enter the current password, and then enter the new password.

2. When “02-dEF” is displayed, pressing the button ENT and selecting “YES” and press ENT will allow you to restore the default settings.

3. When “03-FAC” is displayed, it is intended for factory use only.

Factory Testing: When “04-002” is displayed, press ENT, pressing the button >T< >·v >0< ^ will cycle through the sampling value, "dI-xxx", "do-x", "–Ao–", and "Errxxx".

1. “dI-xxx” indicates the status of the digital input. “xxx” represents I1, I2, I3, etc.

2. “do-x” indicates the status of the digital output. Pressing the button ENT will allow you to change the value of "x". The numbers 1-7 represent o1-o7, and a value of 0 indicates no output. Transmitter Output Adjustment: First, enter the full-scale range of the sensor in the parameter 01-001.

3. Transmitter Output Adjustment:

First, enter the full-scale range of the sensor in the parameter 01-001.

"--Ao--" sets the AO zero/full point. Press the button ENT. Enter zero point for "Z xxxx" and press ENT to save. Enter full point for "F xxxx" and press ENT to save after adjusting. When adjusting the value, you can simultaneously use a multimeter to measure whether the force output voltage value is correct.

Converter output example:

For example: Let’s consider a sensor with a range of 1000kg and a transmitter output of 10V or 20mA when fully loaded.

① Enter parameter 01-001 and input the sensor’s range as 1000.

② Connect a multimeter to terminals 19 and 20 of the instrument. Modify the Z xxxx parameter until the multimeter measures 0V or 4mA.

③ Modify the F xxxx parameter until the multimeter measures 10V or 20mA.

④ When the sensor is weighing 500kg, the transmitter output between terminals 19 and 20 should measure 5V or 12mA.

4. Errxxx indicates a sensor error query. If the value is not 0, a sensor error exists. Bit0,bit1, sensor excitation disconnection; bit2, overflow, the signal line may be broken or the sensor is faulty; bit3, sampling module failure;

Chapter III Service Instruction

3.1 Modbus Instructions

Function	Data class length	Description	PLC register address Remarks: MODBUS Address minus one
Weight	32-bit integer	Read-in 0: Zero calibration; Write other values, indicating that the weight of the input weighing table is full. If the weight is 2 decimal points and the weight is 10.00, write 1000.	1
Net weight	32-bit integer		3
Tare weight	32-bit integer		5
Sampling value	32-bit integer		7
Inputs/outputs	32-bit integer	Bits 0-1 are in the open state, and bits 3-4 are in the open state.	9
Other states	32-bit integer	Sampling error At bits 0,1, the excitation line may be broken; At bit 2, the signal overflow, the sensor may be bad or the signal line is broken; At bit 3, sampling module is faulty.	11

3.2 Other communications:

3.2.1 Protocol for active sending

Start character	Character [+/-]	Data [6bit]	Decimal point [0-3]	EOR verification	End
0x02	0x2B/0X2D	6 bytes	0x30-0x33	2 bytes	0xFF

1: Data is transmitted using ASCII code. For example, if the displayed value is 1234, it will be transmitted as 16 hexadecimal values 30 30 31 32 33 34.

2: To calculate the XOR parity bit, perform an XOR operation on all the data after the start symbol (excluding the start symbol itself).

This will result in a byte of data. Then, convert this byte into two ASCII codes. For example, if the calculated parity is 0x4A, its corresponding hexadecimal ASCII values would be 34 41.

MODBUS RTU communication protocol

According to the Siemens system address description rules, the actual instruction sent, which is in hexadecimal format, requires subtracting 1 from the address.

In the case of the host reading the weight from the slave, where the host wants to read a 32-bit weight value from register

1, the instruction to send for the read operation would be as follows:

Device Address Station Number	Function Code	Data address	Number of read data	CRC check
01	03	00 00	00 02	C4 0B

If the microcontroller receives this data, it can calculate the CRC checksum to verify the data integrity. If the data is determined to be correct, the microcontroller can send a response message to the host with a specific format.

For example: Return content

Device Address Station Number	Function number	Number of data bytes	Four byte data	CRC check
01	03	04	00 01 E2 40	E2 A3

The four hexadecimal bytes returned are weight converted to base 10, which is 123456

The host writes data to the slave

Zero and calibration instructions:

The host writes 32 bits of register 1

For example: During the zero clearing operation, the hexadecimal packet is:

Device Address Station Number	Function number	Data address	Number of registers	Number of bytes	Four byte data	CRC check
01	10	00 00	00 02	04	00 00 00 00	F3 AF

For example: As he weight of the calibration weight is 100, if one decimal place is added, 1000 is written into the calibration weight. If two decimal places are added, 10000 is written into the calibration weight

Device Address Station Number	Function number	Data address	Number of registers	Number of bytes	Four byte data	CRC check
01	10	00 00	00 02	04	00 00 27 10	E9 93

Return content:

Device Address Station Number	Function number	Data address	Number of registers	CRC check
01	10	00 00	00 02	41 C8

Modbus RTU CRC check code calculation method

In CRC calculation, only 8 data bits, start bits and stop bits, including parity bits if there are parity bits, are not involved in CRC calculation.

The calculation method of CRC is:

1. Load a 16-bit register with a value of 0xFFFF, which is the CRC register.

2. Perform an XOR operation between the first 8-bit binary data (i.e., the first byte of the communication message frame) and the 16-bit CRC register. The result of the XOR operation is stored back in the CRC register.

3. Shift the content of the CRC register one bit to the right, filling the highest bit with 0, and check if the shifted-out bit is 0 or 1.

4. If the shifted-out bit is 0, repeat step 3 (shift one more bit to the right). If the shifted-out bit is 1, perform an XOR operation between the CRC register and 0xA001.

5. Repeat steps 3 and 4, performing the processing for the entire 8-bit data by shifting right 8 times.

6. Repeat steps 2 and 5 to process the next byte of the communication message frame.

7. After calculating all the bytes of the communication frame according to the above steps, the high and low bytes of the obtained 16-bit CRC register are exchanged

8. The resulting CRC register contents are: CRC check code

3.3 Other functions

If you need to customize the function, contact the manufacturer in advance.