



LX3V-2WT Manual

V3.2

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1. Operating principle

When a metal material is subjected to tension, the metal material becomes thinner and the electrical impedance increases; conversely, when it is compressed, the metal impedance becomes smaller, and the strain gauge made by this method is called a weighing module. This type of sensing device can transform the pressure of physical phenomena into electrical signal output, so it is often used in load, tension and pressure conversion applications.

2. Introduction

- (1) WECON LX3V-2WT expansion module's resolution is 24-bit. The module can be used for reading signals from 4- or 6- wire configuration; The response speed can be adjusted to meet customer needs, easily meeting the full range of needs in the current load application market.
- (2) To ensure proper installation and operation of this product, please read the instruction manual carefully before using the module. This manual is intended only as an operating guide and introductory reference for the LX3V-2WT.
- (3) The LX3V-2WT weighing module can read and write data with the instruction FROM/TO through LX3V or LX5V

 **Note:** Disconnect power before installing/removing modules or wiring the modules to avoid contact or product damage.

2.1 Specification

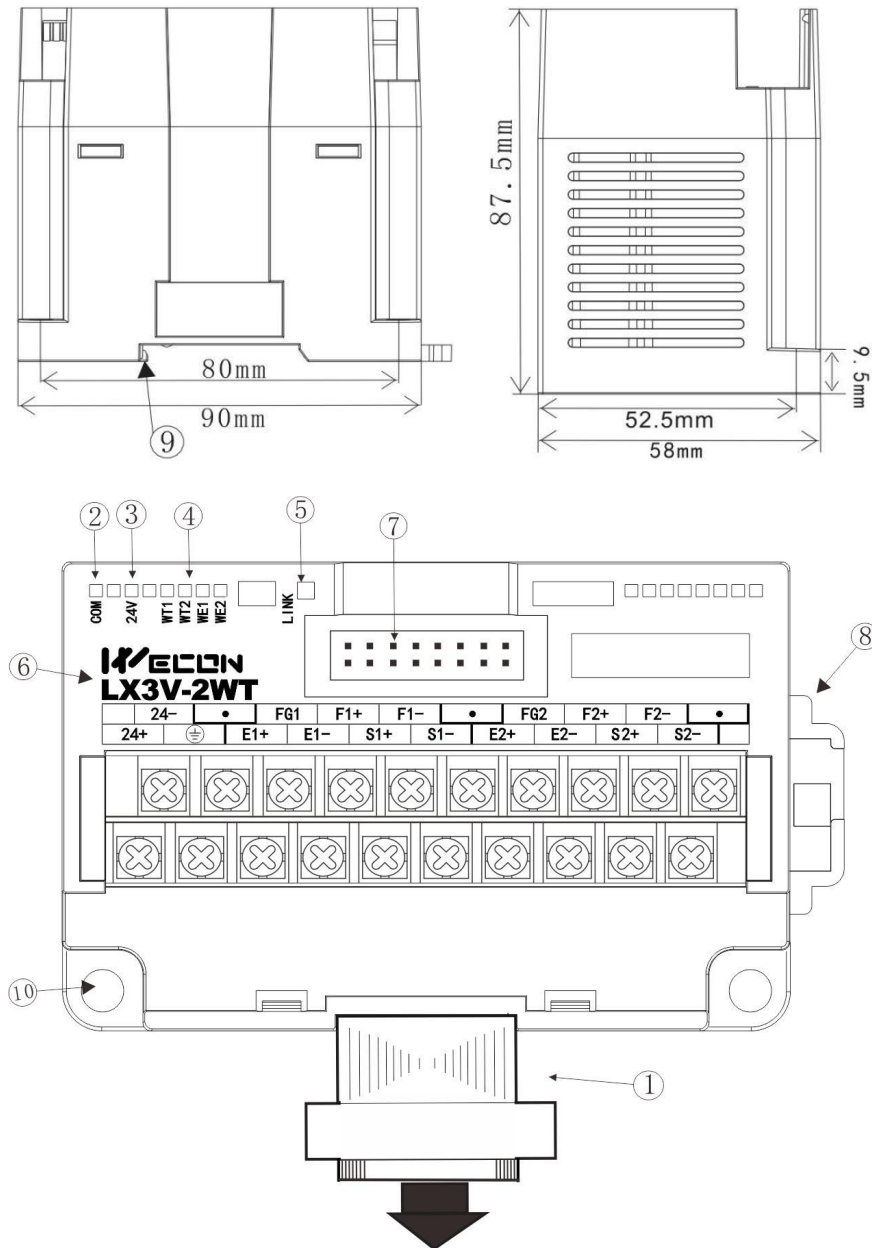
Item	Description
Channel	Dual channel
A/D converter	24 bit $\Delta\Sigma$ A/D
Resolution	24 bit (signed)
Speed	7.5/10/25/50/60/150/300Hz available
Polarity	Unipolar and bipolar
Non-linearity	$\leq 0.01\%$ full scale(25°C)
Zero drift	$\leq 0.2\mu\text{V}/^\circ\text{C}$
Gain drift	$\leq 10\text{ppm}/^\circ\text{C}$
Excitation voltage/ load	Dual 5V, single load impedance not less than 200 Ω
Sensor sensitivity	1mV/V to 15mV/V
Isolation	Transformer (power supply) and the optical coupler (signal)
Indicator light	Module power supply (24V) light, module internal data communication light (COM), communication indicator between PLC and module (LINK), channel indicator light and channel calibration light
Power supply	24V \pm 20% 2VA
Operating temperature	0 to 60 °C
Storage temperature	-20 to 80 °C
Dimension	90(L)x58(W)x80(H) mm

2.2 Valid bits

Refer to sampling frequency in BFM description, Chapter 5 of this manual.

3. Dimensions

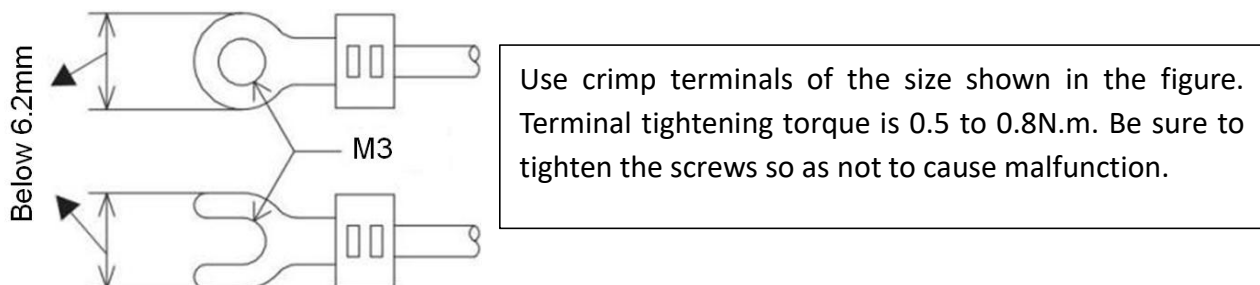
3.1 Dimensions



- ① Extension cable
- ② COM light: Module internal data communication indicator
- ③ 24V light: Always on when connected to external 24V power supply
- ④ WT light: Channel input/output indicator
WE light: Channel calibration indicator
- ⑤ LINK: Communication indicator between PLC and module (LINK)
- ⑥ Expansion module name
- ⑦ Expansion module interface
- ⑧ DIN rail mounting clip
- ⑨ Hook for DIN rail
- ⑩ Holes for direct mounting: 2 places ($\phi 4.5$)

Name	Description	Light status	Event status
LINK light	Communication indicator between PLC and module	Light flashes	Data is interacting normally (communication is normal)
		Lights off	Data interaction is abnormal, stopped or failed
		Always ON	Abnormal software operation or hardware failure
COM light	Module internal data communication indicator	Light flashes	Data is interacting normally (communication is normal)
		Lights off	Data interaction is abnormal, stopped or failed
		Always ON	Abnormal software operation or hardware failure
WT light	Channel output/input indicator	Light flashes	Analog input is out of range
		Always ON	Analog input is within the range
		Lights off	Channel closed
WE light	Calibration indicator for the channel	Lights off	Calibration succeeded
		Always ON	Calibration failed or not calibrated

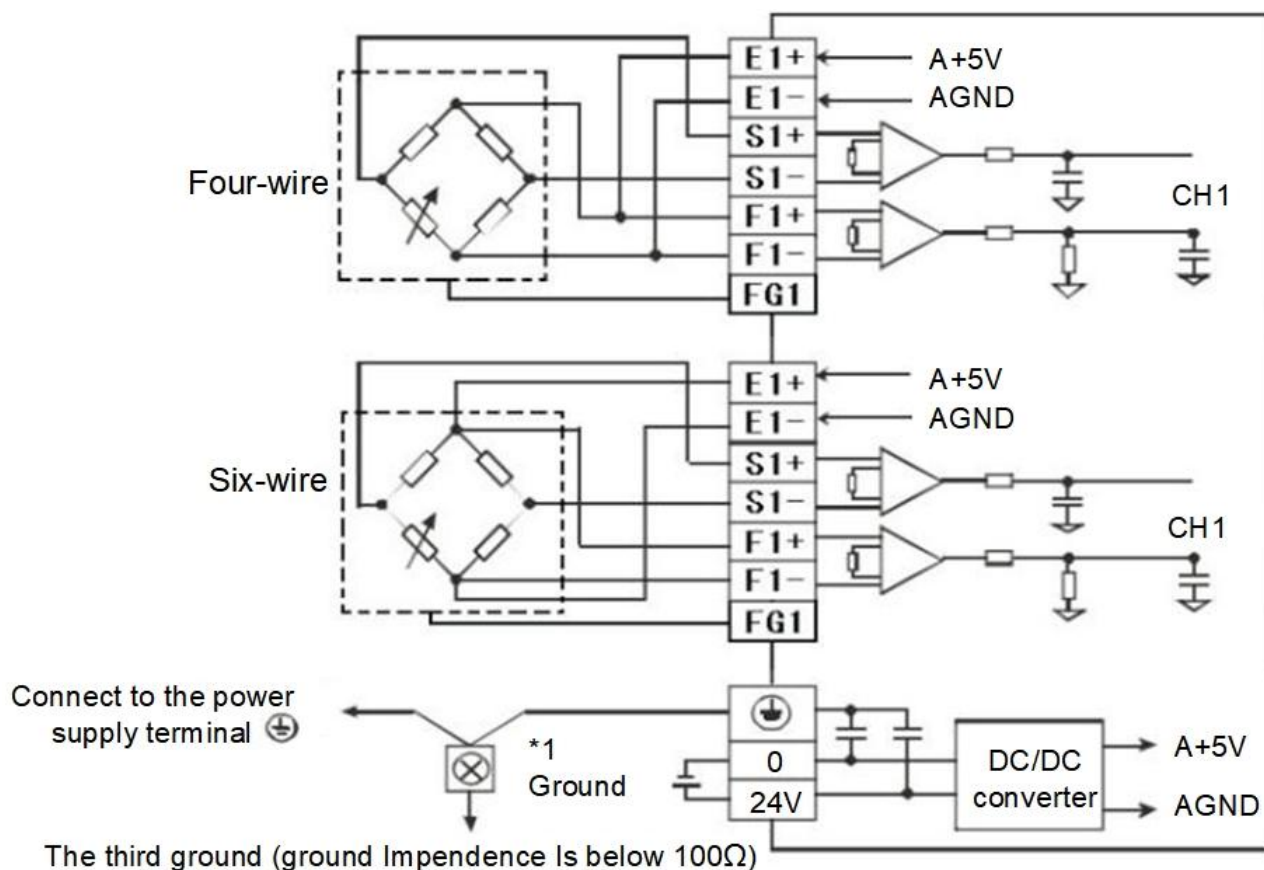
3.2 Use of blade terminals



3.2 Terminals instruction

Terminal	Terminal Instructions
24V+	External DC24 power supply+
24V-	External DC24 power supply-
Ground	Ground
FG1	Sensor housing
E1+	First sensor 5V power +
E1-	First sensor 5V power -
F1+	First sensor power supply feedback +
F1-	First sensor power supply feedback -
S1+	First sensor signal output +
S1-	First sensor signal output -
E2+	Second sensor 5V power +
E2-	Second sensor 5V power -
F2+	Second sensor power supply feedback +
F2-	Second sensor power supply feedback -
S2+	Second sensor signal output +
S2-	Second sensor signal output -
FG2	Second sensor housing
Other empty terminals	Empty pin, not connect any wires

4. Wiring



Note:

Impedance of the weighing sensor is greater than 200 Ω.

Sensors with 4 wires need to have E1+ and F1+ connected, E1- and F1- connected.

5. Buffer register (BFM)

5.1 BFM list

BFM number		Power-off hold	Read/write	Register name	Default	Range	Illustrate
CH1	CH2						
#0		O	R	Model type	5012	-	System default, the model number of LX3V-2WT
#1		O	R	Software version	15004	-	Software version number
#2	#42	O	R/W	Unipolar/Bipolar	0	0 to 1	0: Bipolar 1: Unipolar
#3	#43	O	R/W	Sampling frequency	1	0 to 4800	0: 7.5HZ 1: 10HZ 2: 25HZ 3: 50HZ 4: 60HZ 5: 150HZ 6: 300HZ 7: 600HZ 8: 960HZ 9: 2400HZ 10 to 4800: 10Hz to 4800Hz
#4	#44	X	R	Status code	0	-	For details of each status code, refer to "Buffer Register BFM Description"
#5	#45	X	R	Error code	0	—	A data register that stores all error states. Each error state is determined by the corresponding bit. It is possible to generate more than two error states at the same time. 0 means normal without error, 1 means there is an error state. #45: Reserved b0: Abnormal power supply b1: Hardware failure b2: CH1 conversion error b3: CH2 conversion error b4: CH1 input calibration parameter error b5: CH2 input calibration parameter error Others: Reserved

BFM number		Power-off hold	Read/write	Register name	Default	Range	Illustrate
CH1	CH2						
#6	#46	X	R/W	Tare reading	0	0 to 1	Read the current average value as the tare weight value. 0: Normal (invalid). 1: Execute tare setting, then reset to 0. Others: Invalid.
#7	#47	O	R/W	Gross weight/ net weigh display	0	-	Choose to display the current weight as gross weight (K0) or net weight (K1). 0: display gross weight. 1: display net weight. 0xF: Channel closed
#8	#48	X	R/W	Calibration	0	-	The calibration is to make the module match the weight value of the load cell of the weighing module. The default value is 0. 0x0001: CH1 zero instruction. 0x0002: CH1 weight base point instruction. 0x0003: CH1 no weight calibration instruction. (supported by 15004 and above) 0x0004: CH1 modify calibration parameter instruction. (supported by version 15004 and above) Note: When a value is written to BFM#8 or BFM#48 using the device monitor, it is automatically reset to 0.
#9	#49	X	R/W	Reset	0	0 to 3	#49: Reserved 1: Reset CH1 2: Reset CH2 3: Reset all channels Others: no action
#10	#50	O	R/W	Filtering method	0	0 to 1	Recalibration required after change
#11	#51	O	R/W	Filter strength	0	0 to 7	Recalibration required after change
#12	#52	O	R/W	Zero tracking intervals	0	0 to 20000	When the zero tracking function is enabled, the minimum interval between two consecutive zero resets. The unit is 1ms.

BFM number		Power-off hold	Read/write	Register name	Default	Range	Illustrate
CH1	CH2						
#13	#53	O	R/W	Zero tracking range	0	0 to 100	0: Disable the zero tracking function Others: Set the zero tracking range (absolute value)
#14	#54	O	R/W	Automatically reset after boot	0	0 to 4	0: Disable automatic reset at startup 1: $\pm 2\%$ MAX 2: $\pm 5\%$ MAX 3: $\pm 10\%$ MAX 4: $\pm 20\%$ MAX
#15	#55	O	R/W	Sensor sensitivity setting (inside the module)	4	0 to 5	0: $< 1V/V$ 1: $< 125mV/V$ 2: $< 62.5mV/V$ 3: $< 31.25V/V$ 4: $< 15.625mV/V$ 5: $< 7.812mV/V$ Note: Recalibration is required after setting. (Only supported by version 13904 and above)
#16	#56	X	R	Average weight L	0	-2147483648 to 2147483647	Average weight display value (low word)
#17	#57			Average weight H	0		Average weight display value (high word)
#18	#58	O	R/W	Sliding average	5	1 to 50	The setting range is K1 to K50, and the default value is K5. When the set value exceeds the range, it is automatically changed to the critical value K1 or K50.
#19	#59	O	R/W	Tare weight value L	0	-2147483648 to 2147483647	You could write or read the tare weight #7 by instruction.
#20	#60		R/W	Tare weight value H			
#21	#61	O	R/W	CH1 Stability check time	200	0 to 20000	Stability check time, used in conjunction with the stability check range. Unit: ms.
#22	#62	O	R/W	Stability check range	1	1 to 100	If the stability check range is set to 100 and the stability check time is set to 200ms, the value is considered to be stable if the current weight bounce range is within 100 for 200ms. In other cases, it is considered unstable, and the stability flag is displayed in BFM#4.

BFM number		Power-off hold	Read/write	Register name	Default	Range	Illustrate
CH1	CH2						
#23	#63	O	R/W	Weight value calibration L	1000	-2147483648 to 2147483647	Input weight base point weight with calibration weight
#24	#64		R/W	Weight value calibration H			Input sensor range without calibration weight
#25	#65	O	R/W	Weight upper limit L	32767	-2147483648 to 2147483647	You could set the maximum weight value. When the measured value exceeds the set value, an error code will be recorded.
#26	#66		R/W	Weight upper limit H			
#27	#67	O	R/W	Zero judgment check upper limit L	10	-2147483648 to 2147483647	Zero point judgment function: You could use the zero point judgment function to know that the item has been removed from the weighing module. You could judges that the measurement value is stable and the Bit is 1, which means that the item has been removed from the weighing module, and you could perform the next step at this time. (The zero point weight Bit in the zero point judgment range is 1)
#28	#68		R/W	Zero judgment check upper limit H			
#29	#69	O	R/W	Zero judgment check lower limit L	-10	-2147483648 to 2147483647	
#30	#70		R/W	Zero judgment check lower limit H			
#31	#71	X	R/W	Additional function options	0	0 to 1	0: Default value. Additional functions are not enabled 1: Enable filter reset function. Others: Reserved
#32	#72	X	R/W	Additional functions Parameter 1	0	0 to 100	Enable filter reset function: 0: The default value does not work 0 to 100: The number of sampling cycles to wait to restart filtering. The values collected during the period are accumulated and averaged as the initial value of filtering.
#33	#73	X	R	Digital value L	0	-	Digital quantity collected by ADC
#34	#74	X	R	Digital value H			
#35	#75	O	R/W	Calibration parameter A	1	-3.402823E+38 to 3.402823E+38	Described in CH1: After modifying the calibration parameters, #8 does not write 4, it is only displayed, and not used for weight value calculation, and will not be saved
#36	#76						

BFM number		Power-off hold	Read/write	Register name	Default	Range	Illustrate
CH1	CH2						
#37	#77	O	R/W	Calibration parameter B	0	-3.402823E+38 to 3.402823E+38	when power off. After #8 is written to 4, if the parameter range is correct, write and save it for weight value calculation, # 4 error code Bit4 is set to 0. If the parameter range is wrong, no write operation is performed, and #4 error code Bit4 is set to 1.
#38	#78						
#39	#79	O	R/W	Sensor sensitivity (specification)	2000	0 to 32767	The default setting of 2000 means 2mV/V. For calibration without weights, you need to set the sensitivity and accuracy of the sensor. The sensitivity range is 0 to 32.767mV/V, the sensor sensitivity BFM#39 input negative value, directly convert it to 32767 and execute. For example: Modified to 1942 represent 1.942mV/V.
#40	#80	X	R/W	Sensor feedback voltage L	0	-	Write: 0: not displayed 1: Display the current sensor feedback voltage in real time 2: Display the zero-point voltage during calibration 3: Display the voltage reading of the applied weight during calibration: Displays the low bit of the voltage value. Unit: uV.
#41	#81	X	R	Sensor feedback voltage H	0	-	Read: Displays the low bit of the voltage value. Unit: uV.

Note:

- ① O means retentive type.
- ② X means non-retentive type.
- ③ R means readable data.
- ④ W means writable data.

5.2 BFM description

(1) BFM0: Module code

LX3V-2WT model code: 5012

(2) BFM1: module version

The software version is displayed in decimal, which is used to indicate the software version of the expansion module.

(3) BFM2: Polarity




For bipolar, the signal will go through zero while it is in changing process, but unipolar will not. The result of the conversion from analog value to digital value is signed, so for bipolar signal the value could be minus.

(4) BFM3: Sampling frequency

The frequency of input signal reading, the lower the frequency is, the more stable the value it gets, and the higher the precision is, but the lower speed gets.

Setting	Sample frequency (HZ)	Sample precision (Bits)	Setting	Sample frequency (HZ)	Sample precision (Bits)
0	7.5	23.5	5	150	21.5
1	10	23.5	6	300	21
2	25	23	7	600	20.5
3	50	22	8	960	20
4	60	22	9	2400	17.5

(5) BFM4: State code

Bit NO.	Status code	
	1	0
Bit0	CH1 zero weight (no load)	CH1 is not empty
Bit1	CH2 zero weight (no load)	CH2 is not empty
Bit2	CH1 exceeds weight upper limit (overload)  Note: The upper limit weight is set by #27 and #28.	CH1 is not overloaded
Bit3	CH2 exceeds weight upper limit (overload)  Note: The upper limit weight is set by #27 and #28.	CH2 is not overloaded
Bit4	CH1 measurement value is stable	CH1 measurement value is unstable
Bit5	CH2 measurement value is stable	CH2 measurement value is unstable
Bit6	CH1 uncalibrated / calibrated error	CH1 calibrate successfully
Bit7	CH2 uncalibrated / calibrated error	CH2 calibrate successfully
Bit8	00: no error	01: No-load calibration
Bit9	10: The weight of the base point of weight is too large	11: Uncalibrated
Bit10	00: no error	01: No-load calibration
Bit11	10: The weight of the base point of weight is too large	11: Uncalibrated
Bit12	CH1 exceeds the sensor range  Note: Determined by sensor feedback voltage	CH1 is within the sensor range
Bit14	CH1 enters the calibration without weights	CH1 has not entered the calibration without weights
Bit15	CH2 enters the calibration without weights	CH2 has not entered the calibration without weights

(6) BFM5: Error code

Bit NO.	Content	Error state
Bit0	K1 (H0001)	Abnormal power supply
Bit1	K2 (H0002)	Hardware fault
Bit2	K4 (H0004)	CH1 conversion error
Bit3	K8 (H0008)	CH2 conversion error
Bit4	K16 (H0010)	CH1 write calibration parameter error
Bit5	K32 (H0020)	CH2 write calibration parameter error
Others		Reserved
BFM#45		Reserved

Note: A data register that stores all error states. Each error state is determined by the corresponding bit. It is possible to generate more than two error states at the same time. 0 means normal without error; 1 means there is an error state.

(7) Tare setting: CH1-BFM6, CH2-BFM46

Writing 1 to CH1-BFM6/CH2-BFM46 is valid; After execution, reset to 0. Select the current weight value (BFM16-17) as the weight value for the tare weight (BFM19-20). Takes CH1 as an example.

The current weight value is 100, after tare setting:

If the gross weight is currently displayed (BFM7=0), the tare weight (BFM19-20) becomes 100, and the current weight is still 100;

If the net weight is currently displayed (BFM7=1), the tare weight (BFM19-20) becomes the original value + the current weight value, and the current weight value becomes 0.

(8) BFM8: Weight calibration instruction

Steps are as follows. (Described with CH1)

1) Calibration with weights

Step1: Do not put any weights on the load cell.

Step2: Write 0x0001 to #8.

Step3: Add standard weights to the load cell.

Step4: Write the weight of the current weight on the chassis into #23.

Step5: Write 0x0002 to #8..

2) Weightless calibration

Step1: Do not put any weights on the load cell.

Step2: Write the maximum range of the sensor into #23.

Step3: Write the sensor sensitivity into #39, accurate to three decimal places.

Step4: Write 0x0003 to #8.

3) Modify calibration parameters:

Step1: Modify the calibration parameter values in BFM#35 to BFM#38;

Step2: Write 0x0004 to #8.

Note: When a value is written to BFM#8 or BFM#48 using the device monitor, it is automatically reset to 0.

(9) BFM11: filtering strength

The higher the filter strength is, the more stable and accurate the weight value is. But the delay time will increase accordingly, and the sensitivity will decrease.

(10) BFM12: zero tracking interval

BFM#12 is used in conjunction with BFM#13. When BFM#13 is not 0, BFM#12 indicates the interval between the current automatic weight reset and the next automatic reset to prevent continuous reset.

Note: This function is generally used to correct sensor temperature drift.

(11) BFM13: Zero tracking range

The accumulation range of zero point tracking. If the accumulation exceeds this range, the tracking will not continue.

Settings	Description	Remark
0	Do not enable zero tracking	Default
1 to 300	When setting the zero tracking range (absolute value), tracking must be performed when the value is stable and the current weight is within the zero tracking range.	If set to 10, the current weight is ± 9 and the stable flag is 1, the current weight is cleared.
Note: When the accuracy of the measured items is not high, the temperature drift has little effect, and this function is not required.		

E.g: The setting value is 100, after the zero point drifts from the 0 position to more than ± 100 , the tracking will not continue. If it drifts back to within ± 100 , the tracking will be resumed.

(12) BFM15: Set the AD chip gain

It can be set according to the sensor range. After the BFM is set, it needs to be re-calibrated.

BFM15	voltage range	Sensor sensitivity
0	$\pm 5V$	$< 1V/V$
1	$\pm 625mV$	$< 125mV/V$
2	$\pm 312.5mV$	$< 62.5mV/V$
3	$\pm 156.2mV$	$< 31.25mV/V$
4	$\pm 78.125mV$	$< 15.625mV/V$
5	$\pm 39.06mV$	$< 7.812mV/V$

5.3 Function description

(1) Net weight measurement function

You could choose whether the measured weight is net weight or gross weight. Net weight refers to the weight of the product itself, that is, the actual weight of the product after removing the weight of the outer packaging. The weight of the outer packaging is generally called the tare weight, and the gross weight is the total weight, which refers to net weight plus tare weight.

- ① Tare weight: Refers to the weight of the outer packaging.
- ② Net weight: Refers to the weight of the product itself, that is, the actual weight of the product after removing the weight of the outer packaging.
- ③ Gross weight: Refers to the total weight, that is, the weight of the product itself (net weight), plus the weight of the outer packaging (tare weight)
- ④ Gross weight = net weight + tare weight

E.g: There is a product that is 10KG, the carton it is packed in weighs 0.2KG, and the total weight is 10.2KG.

Net weight=10KG

Tare weight=0.2KG

Gross weight=10.2KG

E.g: Use CH1 to measure the value to display the net weight, and CH2 to select OFF. (If the weight of the outer package is known, you can skip the step of reading the tare weight).

1) Read the tare value

- ① Write H0000 in BFM7;
- ② Place the package on the CH1 weighing module;
- ③ Write H0001 in BFM6, and take the current package weight as the tare weight.

2) Set BFM7=H0001

(2) Stability check

When placing the item on the weighing module to measure the weight, the user can use the stability check function to know that the current measurement value is stable.

- ① If the variation range of the measured value is within the stable range #22 set by the user, the #4 stable bit of the measured value will be set to 1.
- ② When the variation range of the measured value exceeds the set stability range, the #4 stable bit of the measured value will be set to 0, until the stability check time #21 is within the stable range, the #4 stable bit of the measured value will be set to 1 again.

E.g: The stability check time is set to 200ms, and the stability check range is 10. When the change range exceeds 10, the measurement value is unstable, that is, the #4 stable bit of the measured value will be set to 0. When the beating range is within 10 within 200ms, the stable bit of the measurement value will be set to 1 again. (It is recommended that the user should judge whether the current measurement value is stable before performing control).

(3) Zero point judgment

You could use the zero point judgment function to know that the item has been removed from the weighing module. You could judge that the measurement value is stable and the Bit is 1, which means that the item has been removed from the weighing module, and you could perform the next step at this time. (The zero point weight Bit in the zero point judgment range is 1).

(4) Filter function

The average value is the function of summing and averaging the read values to obtain a slowing value, but the environment used will have unavoidable external force factors, which will cause the read value to have a sharp change in the surge value. The change also becomes larger. The function of filtering is not to include the sharply changing surge value in the aggregated average, and the obtained filtered average value will not be affected by the sharply changed surge value.

6. Example

(1) Current state of weight



Read the current weighing state BFM4 and judge it by Bit state. For details, please refer to the description of BFM4 in "5.2 Buffer Register Description".

(2) Get current weight value

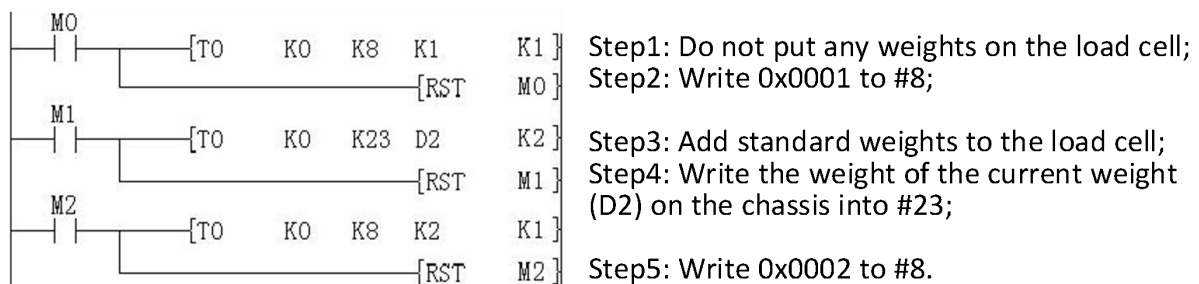


Write the average weight value (BFM16) of CH1 in the weighing module into D0.

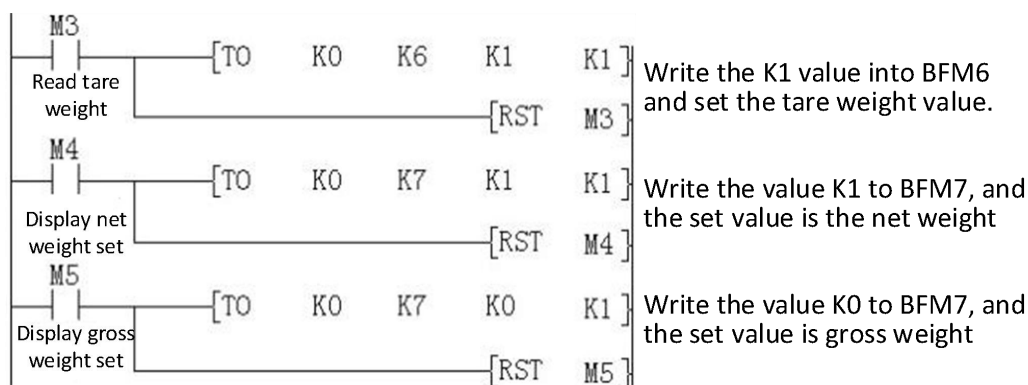
(3) Calibrating weight

*In the new version, the first step can also be used for manual reset.

The adjustment is to make the module match the weight value of the load cell of the weighing module. The adjustment steps are as follows. Described with CH1.

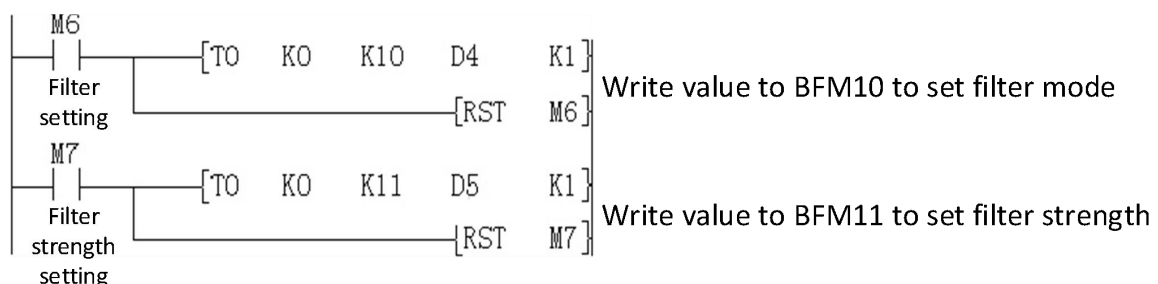


(4) Tare weight and gross weight



(5) Filter mode setting

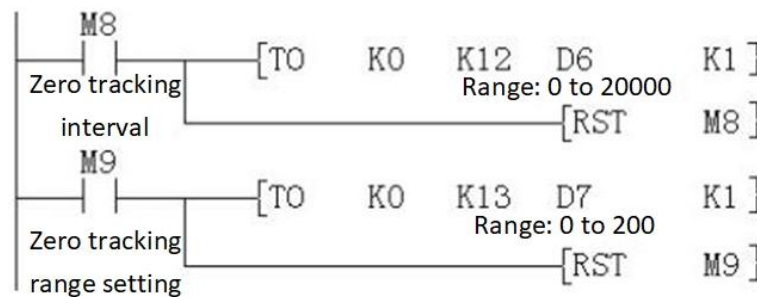
After setting the filtering mode and filtering strength, you need to calibrate it again.



(6) Zero tracking

Zero tracking is used to reduce the temperature drift interference;

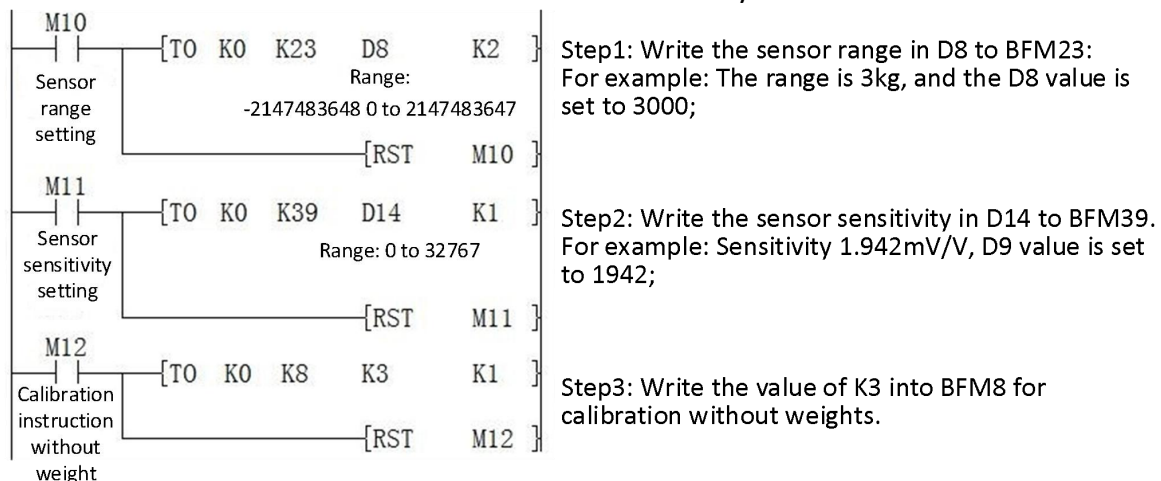
Set Zero Tracking Intensity to 0 to disable tracking. Set Zero Tracking Range to 0 to make it is unlimited.



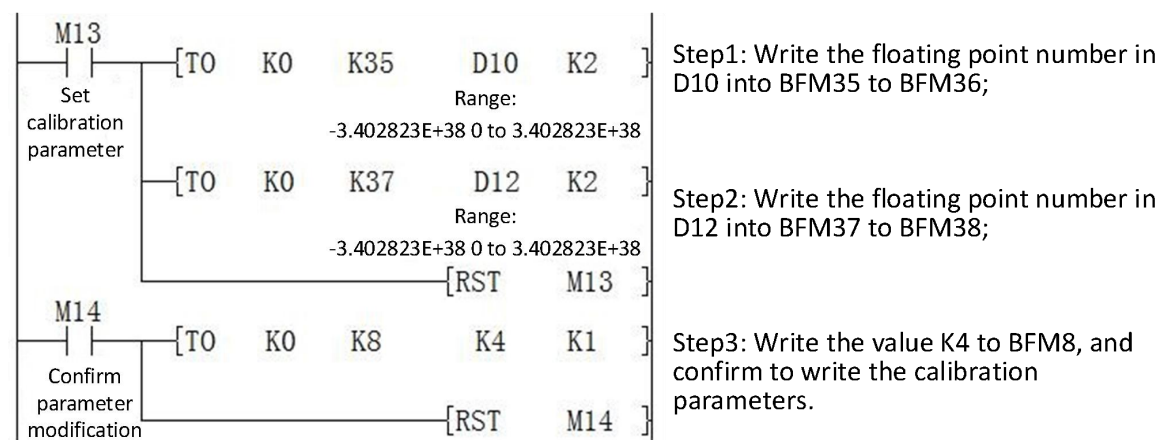
(7) Calibration without weights

Calibration without weights is performed by the zero point of the sensor and the maximum range of the sensor. The accuracy is related to the sensor specifications and depends on the sensor sensitivity (mV/V).

Example: The sensitivity of LAB-B-B sensor is $2.0 \pm 10\%$ mV/V, and there may be a maximum error of 10%, so it is best to use a sensor with a small sensor sensitivity error to use this function.



(8) Modify calibration parameters



Note: BFM35, BFM36, BFM37, and BFM38 are real number (float). Real numbers need to be input when inputting. If the input exceeds the range, BFM5 will report an error in writing calibration parameters.

7. Diagnosis

7.1 Check

- (1) Make sure all cables are connected properly;
- (2) Make sure all rules regarding LX3V expansion modules are met. Such as expansion modules other than digital inputs and outputs are no more than 8 in total. The total number of digital inputs and outputs are no greater than 256.
- (3) Make sure to select the correct operating range in application;
- (4) Make sure power supply is working properly;
- (5) LX3V CPU unit is in RUN mode;

7.2 Check errors

If the special function module LX3V-2WT does not operate normally, please check the following items.

- (1) Check the status of the LINK indicator
Blink: Expansion cables are properly connected.
Otherwise: Check the connection of the extension cable.
- (2) Check the status of the "24V" LED indicator (top right corner of the LX3V-2WT)
Light on LX3V-2WT is normal, and 24VDC power is normal.
Otherwise: 24V DC power supply may be faulty. If the power supply is normal then the LX3V-2WT is faulty.
- (3) Check the status of the "COM" LED indicator (top right corner of the LX3V-2WT)
Blink: Numeric conversion works fine.
Otherwise: Check buffer memory #5 (error status). If any of the bits (b0, b1, b2) are ON, that's why the COM indicator is off. For details, please refer to "(6) BFM5: Error Code" in "5.2 Buffer Register (BFM) Description" in "Chapter 5" of this manual.
- (4) Check the sensor, measure whether the voltage between S+ and S- is less than (5*sensor sensitivity) mv, the sensor sensitivity is found in the sensor manual used, the unit is (mv/v), if the voltage at this point is out of range, it means the sensor Deformation or wiring errors have occurred. Measure whether the voltage between F+ and F- is 5V, if not, check the sensor wiring.