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RA Series Weighing Expansion Module User Manual

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Preface

Thank you for choosing the Rtelligent RA Series Weighing Expansion Module!

This manual serves as a guide for the relevant information and operating instructions of the Rtelligent RA Series Weighing Expansion Module. Before using this product, please read this manual carefully and proceed with wiring, programming, and debugging only after fully understanding its contents. Only operators with certain electrical knowledge should perform operations such as wiring, programming, and debugging on this product. When using the product, please first verify independently whether it meets your requirements and safety standards. If you encounter anything you do not understand during use, please consult our company's technical personnel for assistance.

As we are committed to the continuous improvement of the RA series, the information provided by our company is subject to change without prior notice.

Revision History

Date	Changed Version	Change Content
February 2025	V1.00	Initial Release

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Safety Instructions

■ Safety Precautions

1. Before installing the controller, make sure to disconnect all external power sources. Otherwise, there is a risk of electric shock.
2. After powering on the controller, do not touch the terminals. Do not perform any wiring or disconnection operations on the terminals while they are powered. Otherwise, there is a risk of electric shock.
3. Install and use this product under the environmental conditions specified in the manual. Do not use it in damp, high-temperature, dusty, smoky, conductive dust, corrosive gas, flammable gas, or vibrating and shock-prone locations. Otherwise, it may cause electric shock, fire, malfunction, and product damage.
4. Design a safety circuit outside the controller to ensure that the entire system can operate safely when the controller malfunctions. Otherwise, there is a risk of malfunction and failure.
5. Connect the DC24V power supply correctly to the dedicated power terminal of the controller. Connecting the power supply incorrectly may burn out the controller.
6. Do not bundle the control wiring with the power wiring. In principle, they should be separated by at least 10 cm. Otherwise, it may cause malfunction and product damage.
7. Do not directly touch the conductive parts of the product. Otherwise, it may cause malfunction and failure.
8. Use DIN46277 rails or M3 screws to fix this product and install it on a flat surface. Incorrect installation may cause malfunction and product damage.
9. When processing the screw holes, do not let cutting powder or wire debris fall into the product housing. Otherwise, it may cause malfunction and failure.
10. When connecting or disconnecting peripheral devices, expansion devices, batteries, etc., make sure to operate after power off. Otherwise, it may cause malfunction and failure.

11. Use a 2mm wire to perform the third type of grounding on the controller's grounding terminal. Do not ground it with the strong current system's common ground. Otherwise, it may cause failure and product damage.

12. When connecting wires to the terminals, make sure to tighten them securely and do not let the conductive parts touch other wires or terminals. Otherwise, it may cause malfunction and product damage.

13. Before making any changes to the program in the controller, make sure to stop it first. Otherwise, it may cause malfunction.

14. Do not disassemble or assemble this product without authorization. Otherwise, it may cause damage to the product.

15. Please unplug and plug in the connecting cable only when the power is off. Otherwise, it may cause damage to the cable and lead to incorrect operation.

16. Do not modify this product under any circumstances. Otherwise, it may cause injury or mechanical damage.

17. When disposing of the product, please handle it as industrial waste or in accordance with local environmental protection regulations.

■ Notes for confirming the arrival of the products

Confirm the project	Description
Are the delivered products in accordance with the model of the products you ordered?	The packaging box contains the products you ordered. Please confirm them by checking the label model on the controller.
Is there any damage on the product?	Please check the exterior of the packaging to see if there are any damages during the transportation of the product. If any omissions or damages are found, please contact our company or your supplier.

1. Product Information

1.1. Product Overview

The RA series weighing expansion module is an IO expansion module launched by Rtelligent. It features a small size, high integration, and a wide range of types, which can meet the usage requirements of different customers. The RA series economical weighing expansion module can be matched with Rtelligent PLC for use.

This manual mainly introduces the basic parameters and usage methods of the RA series weighing expansion modules.

1.2. Product Model Information

1.3. Module Name and Brief Description

Module type	Model number	Description
Weighing module	RA-0200-WT	Two-channel weighing channel, spring-type connector

1.4. Product Appearance

1.5. General Information

1.5.1. Basic Specifications

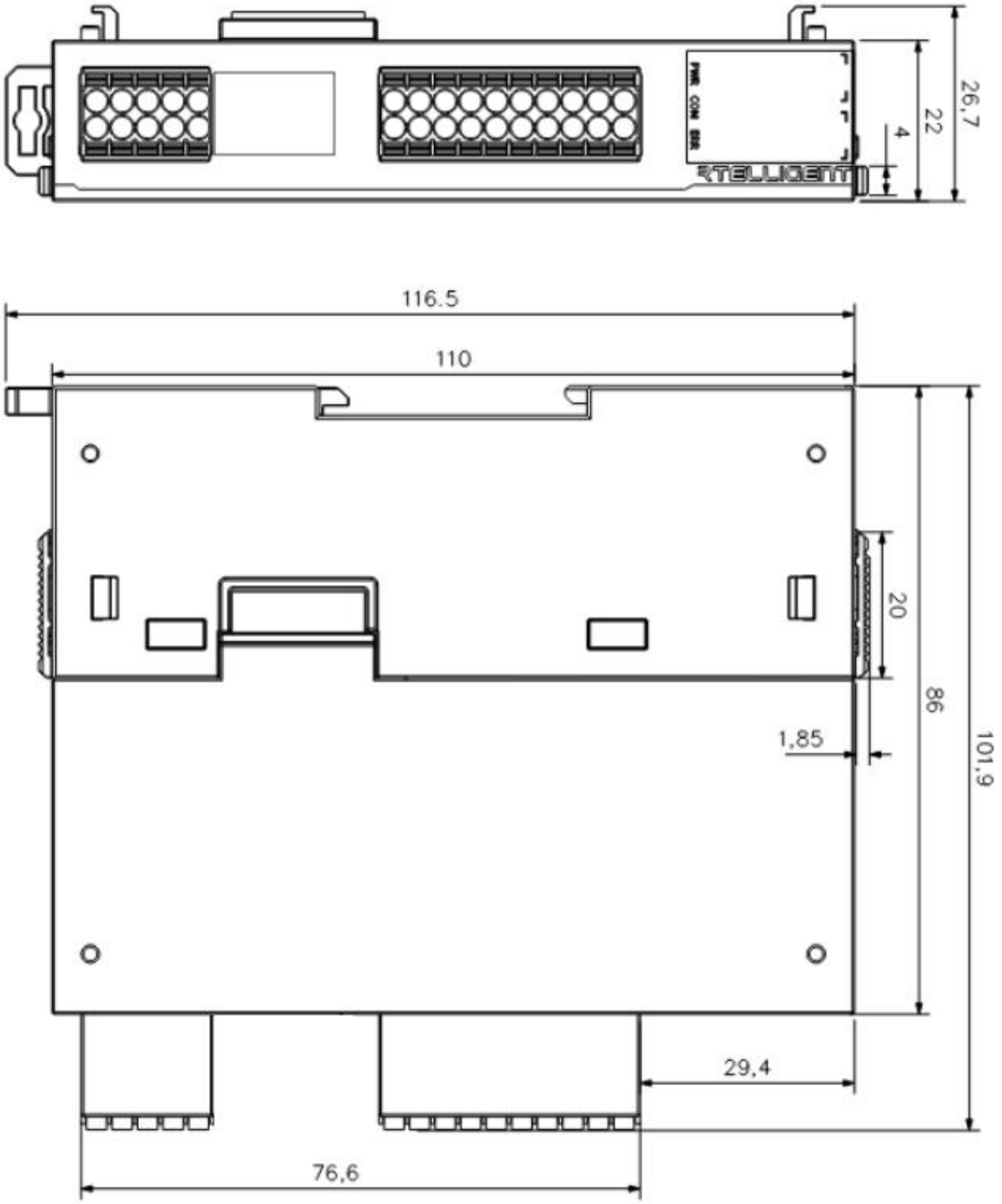
This section describes common specifications such as environmental temperature, humidity, vibration, shock, air pressure, EMC, and other key indicators and specifications related to installation.

Project	Specification
Operating environment temperature	0~50°C
Storage environment temperature	-20~70°C
Operating environment humidity	5~95%，no condensation
Storage environment humidity	5~95%，no condensation
Work environment	No corrosive gases are present
Safety regulations	IEC61131-2
Applicable atmospheric pressure	Operation：1080~795hPa（Equivalent to altitude-1000~2000m） Storage：1080~660hPa（Equivalent to altitude-1000~3500m）

1.5.2. Installation Specifications

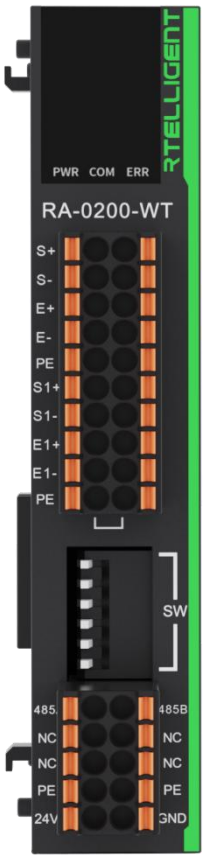
Project	Specification
Input terminal	Spring-type connector, spacing 3.5mm
Number of input terminals	The terminals are divided into two parts - upper and lower. Each terminal has 10 points, totaling 20 points.
Installation method	Standard DIN rail installation
Installation dimensions	Length*Width*Height = 85*27*112.94（Unit：mm）

1.5.3. Installation Dimension Drawing



2. Weighing Module

2.1. Input Terminal Configuration

RA-0200-WT	Port
	S+
	S-
	E+
	E-
	PE
	S1+
	S1-
	E1+
	E1-
	PE
	DIP switch
	485A 485B
	NC NC
	NC NC
	PE PE
	24V GND

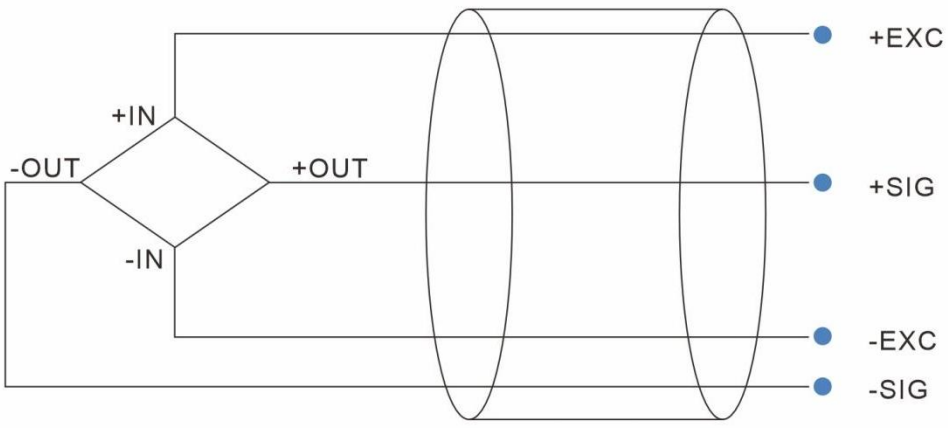
Attention:

1. The upper terminal is connected left and right in the same row, while the lower terminal is not interconnected.
2. External DC 24V power supply.
3. DIP switches 1-3 set the slave address (all OFF is default address 1). Switches 4 and 5 set the sampling rate for Channel 1 and 2 to either 10 Hz (OFF) or 80 Hz (ON), requiring a power cycle to take effect. Switch 6 enables the terminal resistor when ON.

2.2. General Specifications

RA-0200-WT Channel specifications	
A/D actual resolution	1/8388607（23Bit）
Nonlinear	±0.001%
Conversion speed	10HZ/80HZ
Power supply	DC24V±10%
Sensor excitation power supply	5VDC/120mA
Communication	Support two communication methods: PLC expansion module communication or external Modbus communication. Communication parameters: 115200 8-bit data no checksum 1 stop bit
Response speed	The internal communication speed has reached 1ms
Precision	The converted accuracy is ±0.01% of the weighing value (at an ambient temperature of 25 degrees Celsius)

2.3. Sensor Wiring Diagram



Four-wire connection method

2.4. Panel Indicator Light

Indicator Light	Status	Description
PWR	Power Indicator	Lights up steadily when the module is online and communicating normally; turns off when offline.
COM	Module Online Indicator	Off under normal conditions; blinks when an alarm is triggered
ERR	Module Alarm Indicator	Lights up steadily when the module power supply is normal

3. Description of Weighing Module Registers

3.1. Weighing Module Modbus Corresponding Addresses

3.1.1. First Weighing Channel Registers

Register	Valid Data Type		Read/Write	Function	Function Description
10	32-bit Signed	Low Word	R	Channel 1 Real-time Weight	Unit: G
11		High Word			
12	32-bit Floating Point	Low Word	RW	Channel 1 Weight Coefficient	Key parameter for unit conversion
13		High Word			
14	16-bit Unsigned		RW	Filtering Count	Default is 1
15	16-bit Unsigned		RW	Write 1 to calibrate	Write 1 and wait for the value to change to 0. When the real-time weight becomes 0, the calibrate operation is successful.
16	32-bit Unsigned	Low Word	RW	Zero Point Value	Initial value when the weight is 0
17		High Word			
30	32-bit Floating Point	Low Word	RW	Calibration Weight (KG)	Input the calibration weight mass during weight calibration
31		High Word			
32	16-bit Unsigned		RW	Write 1 for Weight Calibration	Write 1 and wait for the value to change to 0, indicating successful calibration.
36	16-bit Unsigned		RW	Channel 1 Gain Factor	The default gain factor is 64, with optional values of 64 or 128.
42	16-bit Unsigned		RW	Channel 1 Mode	0: Weight Calibration, 1: Digital Calibration
44	32-bit	Low Word	RW	Channel 1 Range	Secondary calibration

45	Floating Point	High Word		Coefficient	coefficient under digital calibration mode
48	16-bit Unsigned		RW	Channel 1 Resolution	1: No decimal point 10: 1 decimal place 100: 2 decimal places E.g., Measured weight is 100.123, if set to 10, the read value is 1001. The master station needs to divide this value by 10 for display.
50	32-bit Floating Point	Low Word	RW	Digital Calibration Range (KG)	/
51		High Word			
52	32-bit Floating Point	Low Word	RW	Digital Calibration Sensitivity (MV)	/
53		High Word			
60	16-bit Unsigned		RW	Auto-Zero Range (G)	Weight value around zero
61	16-bit Unsigned		RW	Auto-Zero Enable	Write 1 to enable
62	16-bit Unsigned		RW	Auto-Zero Cycle (MS)	Auto-zero function parameter
63	16-bit Unsigned		RW	Creep Tracking	/
64	16-bit Unsigned		RW	Dynamic Tracking	/
65	16-bit Unsigned		RW	Dynamic Tracking Refresh Rate	/
66	16-bit Unsigned		RW	Division Value	/
67	16-bit Unsigned		RW	Temperature Compensation	/
68	16-bit Unsigned		RW	Excitation Voltage (MV)	/
84	32-bit Floating Point	Low Word	RW	Filter Coefficient	Default is 0.4
85		High Word			

3.1.2. Second Weighing Channel Registers

Register	Valid Data Type		Read/Write	Function	Function Description
20	32-bit Signed	Low Word	R	Channel 2 Real-time Weight	Unit: G
21		High Word			
22	32-bit Floating Point	Low Word	RW	Channel 2 Weight Coefficient	Key parameter for unit conversion
23		High Word			
24	16-bit Unsigned		RW	Filtering Count	Default is 1
25	16-bit Unsigned		RW	Write 1 to calibrate	Write 1 and wait for the value to change to 0. When the real-time weight becomes 0, the calibrate operation is successful.
26	32-bit Unsigned	Low Word	RW	Zero Point Value	Initial value when the weight is 0
27		High Word			
33	32-bit Floating Point	Low Word	RW	Calibration Weight (KG)	Input the calibration weight mass during weight calibration
34		High Word			
35	16-bit Unsigned		RW	Write 1 for Weight Calibration	Write 1 and wait for the value to change to 0, indicating successful calibration.
43	16-bit Unsigned		RW	Channel 2 Mode	0: Weight Calibration, 1: Digital Calibration
46	32-bit Floating Point	Low Word	RW	Channel 2 Range Coefficient	Secondary calibration coefficient under digital calibration mode
47		High Word			
49	16-bit Unsigned		RW	Channel 2 Resolution	1: No decimal point 10: 1 decimal place 100: 2 decimal places E.g., Measured weight is 100.123, if set to 10, the read value is 1001. The master station needs to divide this value by 10 for display.

55	32-bit Floating Point	Low Word	RW	Digital Calibration Range (KG)	/
56		High Word			
57	32-bit Floating Point	Low Word	RW	Digital Calibration Sensitivity (MV)	/
58		High Word			
70	16-bit Unsigned		RW	Auto-Zero Range (G)	Weight value around zero
71	16-bit Unsigned		RW	Auto-Zero Enable	Write 1 to enable
72	16-bit Unsigned		RW	Auto-Zero Cycle (MS)	Auto-zero function parameter
73	16-bit Unsigned		RW	Creep Tracking	/
74	16-bit Unsigned		RW	Dynamic Tracking	/
75	16-bit Unsigned		RW	Dynamic Tracking Refresh Rate	/
76	16-bit Unsigned		RW	Division Value	/
77	16-bit Unsigned		RW	Temperature Compensation	/
78	16-bit Unsigned		RW	Excitation Voltage (MV)	/
86	32-bit Floating Point	Low Word	RW	Filter Coefficient	Default is 0.4
87		High Word			

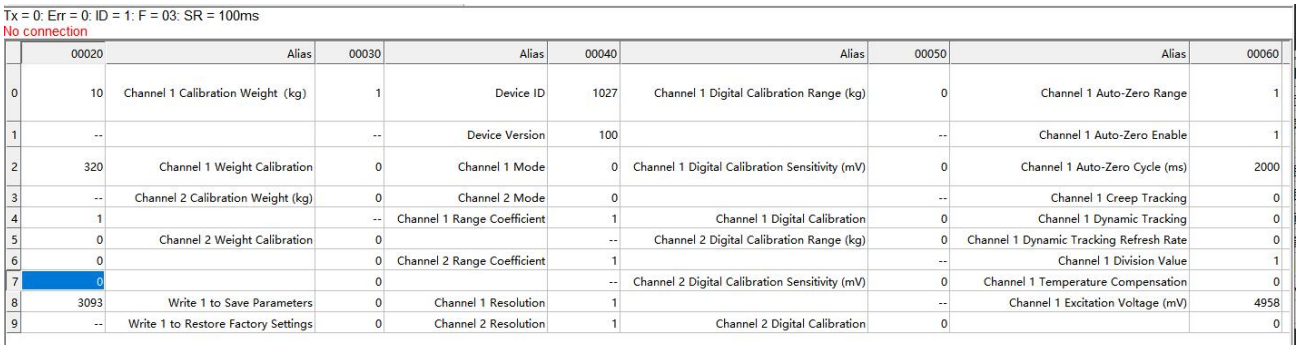
3.1.3. Description and Operation of Other Registers

Register	Valid Data Type		Read/Write	Function	Function Description
4	32-bit integer	Low Word	RW	Baud Rate	115200 / 57600 / 38400 / 19200 / 9600 Default: 115200
5		Low Word			
6	16-bit Unsigned		RW	Parity Bit	0: None 1: Odd 2: Even
7	16-bit Unsigned		RW	Data Bits	7: 7 Data Bits 8: 8 Data Bits Default: 8 Data Bits
8	16-bit Unsigned		RW	Stop Bit	1: 1 Stop Bit 2: 2 Stop Bits
38	16-bit Unsigned		RW	Save Parameters	Write 1
39	16-bit Unsigned		RW	Restore Factory Settings	Write 1

3.2. Calibration Procedure Description

3.2.1. Weight Calibration Steps

Operation can be performed using the provided Modbus_Poll project:


Tx = 0: Err = 0: ID = 1: F = 03: SR = 100ms
No connection

	00020	Alias	00030	Alias	00040	Alias	00050	Alias	00060
0	10	Channel 1 Calibration Weight (kg)	1	Device ID	1027	Channel 1 Digital Calibration Range (kg)	0	Channel 1 Auto-Zero Range	1
1	--		--	Device Version	100		--	Channel 1 Auto-Zero Enable	1
2	320	Channel 1 Weight Calibration	0	Channel 1 Mode	0	Channel 1 Digital Calibration Sensitivity (mV)	0	Channel 1 Auto-Zero Cycle (ms)	2000
3	--	Channel 2 Calibration Weight (kg)	0	Channel 2 Mode	0		--	Channel 1 Creep Tracking	0
4	1		--	Channel 1 Range Coefficient	1	Channel 1 Digital Calibration	0	Channel 1 Dynamic Tracking	0
5	0	Channel 2 Weight Calibration	0		--	Channel 2 Digital Calibration Range (kg)	0	Channel 1 Dynamic Tracking Refresh Rate	0
6	0		0	Channel 2 Range Coefficient	1		--	Channel 1 Division Value	1
7	0		0		--	Channel 2 Digital Calibration Sensitivity (mV)	0	Channel 1 Temperature Compensation	0
8	3093	Write 1 to Save Parameters	0	Channel 1 Resolution	1		--	Channel 1 Excitation Voltage (mV)	4958
9	--	Write 1 to Restore Factory Settings	0	Channel 2 Resolution	1	Channel 2 Digital Calibration	0		0

(1) Write 1 to calibrate. When the Weight Value L and Weight Value H display 0, it indicates the calibrate is complete.

	Alias	00010	Alias	00020	Alias	00030
0	Weight Value L (R)	0	Weight Value L (R)	0	Channel 1 Calibration...	0
1	Weight Value H (R)	0	Weight Value H (R)	0		--
2	Weight Coefficient (RW)	161.91	Weight Coefficient (RW)	320	Channel 1 Weight Cal...	0
3		--		--	Channel 2 Calibration...	0
4	Filtering Count (RW)	1	Filtering Count (RW)	1		--
5	Write 1 to Tare (RW)	0	Write 1 to Tare (RW)	0	Channel 2 Weight Cal...	0
6	Value L After Tare (RW)	368	Value L After Tare (RW)	0		0
7	Value H After Tare (RW)	0	Value H After Tare (RW)	0		0
8		165594		3093	Write 1 to Save Para...	0
9		--		--	Write 1 to Restore Fa...	0

(2) Place the weight, input the calibration weight value (using a 500g weight as an example here), then write 1 to the Weight Calibration register.

	Alias	00010	Alias	00020	Alias	00030
0	Weight Value L (R)	0	Weight Value L (R)	0	Channel 1 Calibration...	0.5
1	Weight Value H (R)	0	Weight Value H (R)	0		--
2	Weight Coefficient (RW)	161.91	Weight Coefficient (RW)	320	Channel 1 Weight Cal...	0
3		--		--	Channel 2 Calibration...	0
4	Filtering Count (RW)	1	Filtering Count (RW)	1		--
5	Write 1 to Tare (RW)	0	Write 1 to Tare (RW)	0	Channel 2 Weight Cal...	0
6	Value L After Tare (RW)	368	Value L After Tare (RW)	0		0
7	Value H After Tare (RW)	0	Value H After Tare (RW)	0		0
8		165594		3093	Write 1 to Save Para...	0
9		--		--	Write 1 to Restore Fa...	0

When the weight value matches the weight value, it indicates the calibration is complete.

(3) Save Parameters

	Alias	00010	Alias	00020	Alias	00030
0	Weight Value L (R)	0	Weight Value L (R)	0	Channel 1 Calibration...	0.5
1	Weight Value H (R)	0	Weight Value H (R)	0		--
2	Weight Coefficient (RW)	161.91	Weight Coefficient (RW)	320	Channel 1 Weight Cal...	0
3		--		--	Channel 2 Calibration...	0
4	Filtering Count (RW)	1	Filtering Count (RW)	1		--
5	Write 1 to Tare (RW)	0	Write 1 to Tare (RW)	0	Channel 2 Weight Cal...	0
6	Value L After Tare (RW)	368	Value L After Tare (RW)	0		0
7	Value H After Tare (RW)	0	Value H After Tare (RW)	0		0
8		165594		3093	Write 1 to Save Para...	0
9		--		--	Write 1 to Restore Fa...	0

3.2.2. Digital Calibration Steps

(1) Using Channel 1 as an example here, write the Digital Calibration Range (i.e., the sensor range) and the Sensor Sensitivity.

00030	Alias	00040	Alias	00050
1	Device ID	1027	Channel 1 Digital Calibrati...	0
--	Device Version	100		--
0	Channel 1 Mode	0	Channel 1 Digital Calibrati...	0
0	Channel 2 Mode	0		--
--	Channel 1 Range Coefficient	1	Channel 1 Digital Calibrati...	0
0		--	Channel 2 Digital Calibrati...	0
0	Channel 2 Range Coefficient	1		--
0		--	Channel 2 Digital Calibrati...	0
0	Channel 1 Resolution	1		--
0	Channel 2 Resolution	1	Channel 2 Digital Calibrati...	0

(2) Set the Channel 1 Mode to 1. The default is 0 for Weight Calibration; 1 is for Digital Calibration.

00030	Alias	00040	Alias	00050
1	Device ID	1027	Channel 1 Digital Calibrati...	0
--	Device Version	100		--
0	Channel 1 Mode	1	Channel 1 Digital Calibrati...	0
0	Channel 2 Mode	0		--
--	Channel 1 Range Coefficient	1	Channel 1 Digital Calibrati...	0
0		--	Channel 2 Digital Calibrati...	0
0	Channel 2 Range Coefficient	1		--
0		--	Channel 2 Digital Calibrati...	0
0	Channel 1 Resolution	1		--
0	Channel 2 Resolution	1	Channel 2 Digital Calibration	0

(3) Write 1 to Save Parameters.

20	Alias	00030	Alias	00040
10	Channel 1 Calibration...	1	Device ID	1027
--		--	Device Version	100
20	Channel 1 Weight Cal...	0	Channel 1 Mode	0
--	Channel 2 Calibration...	0	Channel 2 Mode	0
1		--	Channel 1 Range Coefficient	1
0	Channel 2 Weight Cal...	0		--
0		0	Channel 2 Range Coefficient	1
0		0		--
93	Write 1 to Save Para...	0	Channel 1 Resolution	1
--	Write 1 to Restore Fa...	0	Channel 2 Resolution	1

PS: Digital calibration is relatively less accurate compared to weight calibration. A range coefficient is provided for secondary calibration, defaulting to 1. For example, if the actual weight is 500g but the measured weight is 508g, you can calculate this coefficient for secondary calibration: 500/508 ≈ 0.984. After writing the range coefficient, save the parameters. Ensure this coefficient is 1 before performing the calculation.

4. Usage of the Weighing Module in the RX Series

The RX series PLC main unit can be expanded with digital and analog I/O according to customer needs. This section describes the hardware identification and address allocation of expansion modules by the main unit.

4.1. Weighing Module

4.1.1. Hardware Identification of Expansion Modules

When the main unit detects a digital I/O module, the corresponding designated registers will display the number of bytes for digital inputs and outputs. The quantity of digital inputs and outputs is calculated in bytes, with every 8 inputs or 8 outputs counting as one byte.

When the main unit detects analog I/O modules and weighing modules, the corresponding designated registers will display the number of words (i.e., channels) for inputs and outputs.

If the expansion module is correctly connected to the main unit, but the main unit does not detect the module (i.e., the data in the registers does not match the actual number of expansion modules), please disconnect and reconnect the main unit and the expansion module.

Register	Function Description
D8054	Number of Digital Input Bytes
D8055	Number of Analog Input Channels
D8056	Number of Digital Output Bytes
D8057	Number of Analog Output Channels
D8058	Number of Weighing Input Channels

4.2. Address Allocation for the Weighing Module

When the main unit detects an expanded weighing module, addresses are assigned directly. The register read values for the expansion are shown in the tables below:

First Weighing Channel:

Register	Valid Data Type		Read/Write	Description
RA23400	32-bit Signed	Low Word	R	Channel 1 Real-time Weight
RA23401		High Word		
RA23402	32-bit Floating Point	Low Word	R	Channel 1 Weight Coefficient
RA23403		High Word		
RA23404	16-bit Unsigned		R/W	Filtering Count
RA23405	16-bit Unsigned		R/W	Write 1 to Tare

Second Weighing Channel:

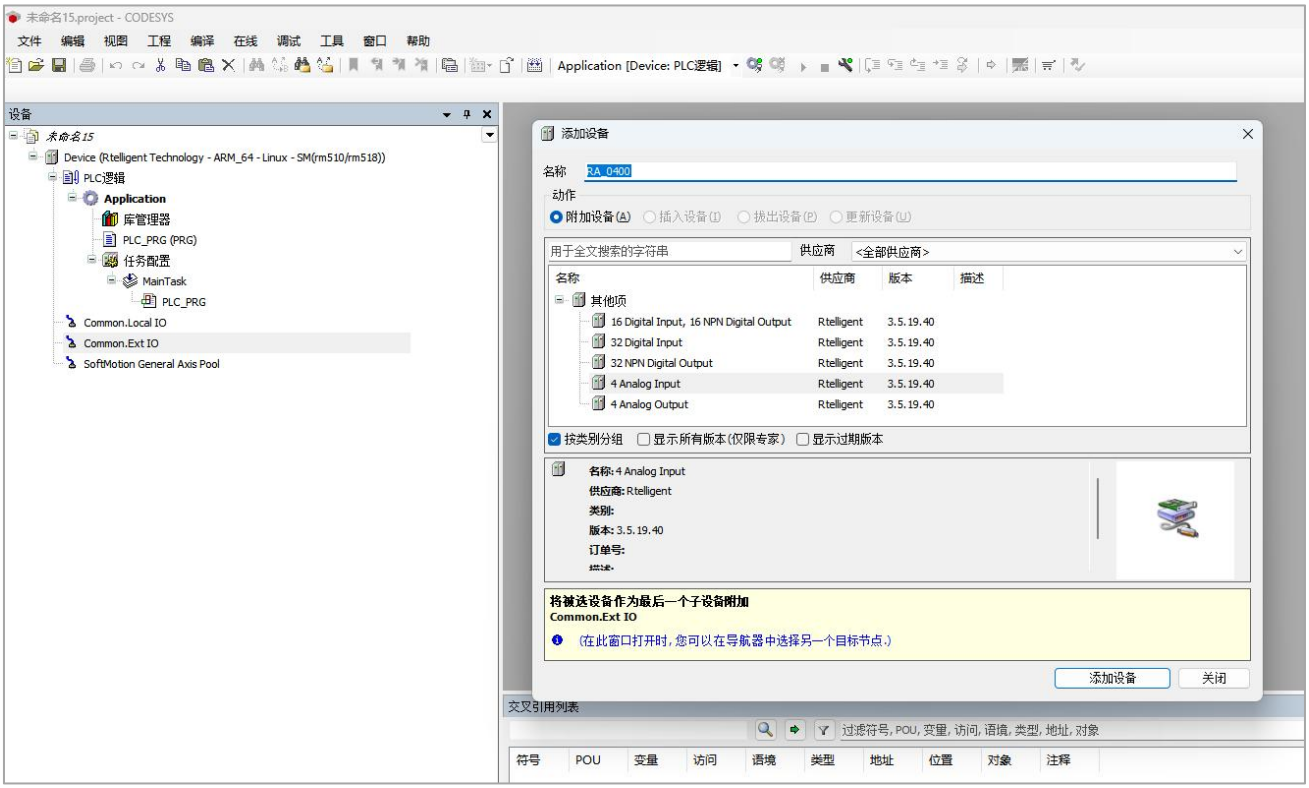
Register	Valid Data Type		Read/Write	Description
RA23410	32-bit Signed	Low Word	R	Channel 2 Real-time Weight
RA23411		High Word		
RA23412	32-bit Floating Point	Low Word	R	Channel 2 Weight Coefficient
RA23413		High Word		
RA23414	16-bit Unsigned		R/W	Filtering Count
RA23415	16-bit Unsigned		R/W	Write 1 to Tare

5. Usage of the Weighing Module in the RM Series

5.1. Weighing Module

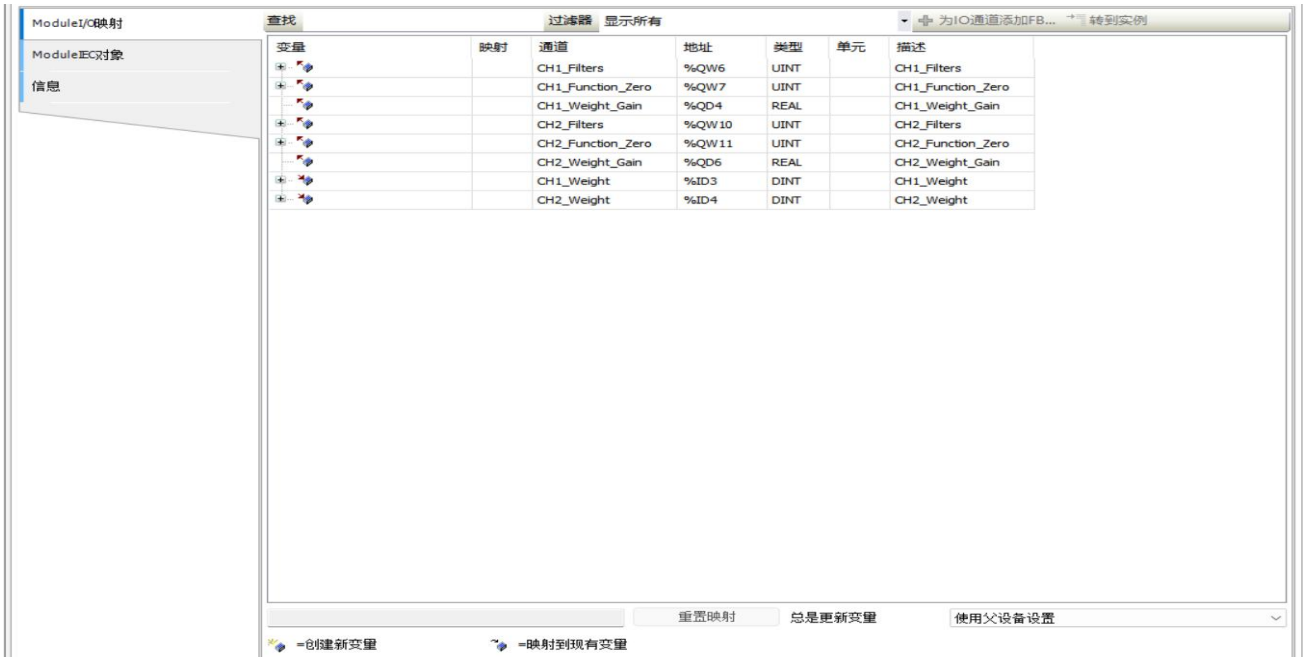
5.1.1. Adding the Weighing Expansion Module

After installing the device description file, add the required modules to the RM series PLC project as shown in the figure below.



5.1.2. Diagnostic Information and Channel Data Reading for the Weighing Module

The register read values in the I/O mapping parameters are shown in the figure below:



First Weighing Channel:

Register	Valid Data Type	Read/Write	Description
CH1_Weight	32-bit Signed	R	Channel 1 Real-time Weight
CH1_Weight_Gain	32-bit Floating Point	R	Channel 1 Weight Coefficient
CH1_Filters	16-bit Unsigned	R/W	Filtering Count
CH1_Function_Zero	16-bit Unsigned	R/W	Write 1 to Tare

Second Weighing Channel:

Register	Valid Data Type	Read/Write	Description
CH2_Weight	32-bit Signed	R	Channel 2 Real-time Weight
CH2_Weight_Gain	32-bit Floating Point	R	Channel 2 Weight Coefficient
CH2_Filters	16-bit Unsigned	R/W	Filtering Count
CH2_Function_Zero	16-bit Unsigned	R/W	Write 1 to Tare

SUPPORTS

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Leading the Way with Intelligent Motion Control