



RA Series Thermocouple Temperature Module User Manual

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Preface

Thank you for using the Ritter RA series temperature expansion module products!

This manual is to guide the information and instructions for the use of the Ritter RA series temperature expansion module. Please read the manual carefully before using this product and perform wiring and programming debugging on the premise of fully understanding the contents of the manual. Only operators with a certain level of electrical knowledge are allowed to perform operations such as wiring and programming debugging for this product. When using this product, please first confirm by yourself whether it meets the requirements and is safe. If you have any questions during use, please consult our technicians 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 further notice.

Revision History

Date	Updated version	Changes
December 2025	V1.00	First Release

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Safety alerts

■ Safety Tips

1. Before installing the controller, be 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 operations such as wiring, unwiring, etc. on the terminals while they are powered on. There is a risk of electric shock.
3. Install and use this product under the environmental conditions specified in the manual specifications. Do not use in damp, hot, dusty, smoky, conductive dust, corrosive gas, flammable gas, or vibrating and shock-prone environments. Otherwise, it may cause electric shock, fire, malfunction, product damage, etc.
4. Design a safety loop outside the controller to ensure that the entire system can operate safely when the controller malfunctions. Otherwise there is a risk of misoperation and malfunction.
5. Please connect the DC24V power supply correctly to the dedicated power terminal of the controller. Connecting the wrong power supply may burn out the controller.
6. Do not bind the control wiring to the power wiring together. In principle, keep them 10cm apart. Otherwise, it may cause maloperation and damage to the product.
7. Do not touch the conductive parts of the product directly. Otherwise, it may cause misoperation and malfunction.
8. Use DIN46277 rails or M3 screws to secure this product and install it on a flat surface. Incorrect installation may cause misoperation and damage to the product.
9. When processing screw holes, do not let cutting powder or wire debris fall into the product housing. Otherwise, it may cause misoperation and malfunction.

10. When connecting or removing peripheral devices, expansion devices, batteries, etc., be sure to turn off the power. Otherwise, it may cause misoperation or malfunction.
11. Use a 2mm wire for the third type of grounding of the controller's ground terminal and do not ground it in common with the strong current system. Otherwise, there is a possibility of malfunction, product damage, etc.
12. When using wire connection terminals, be sure to tighten them and do not let the conductive parts come into contact with other wires or terminals. Otherwise, it may cause misoperation and damage to the product.
13. Before making any changes to the program in the controller, be sure to STOP it first. Otherwise, it may cause misoperation.
14. Do not disassemble or assemble this product without authorization. Otherwise it may cause damage to the product.
15. Plug and unplug the connecting cable when the power is off. Otherwise, it may cause damage to the cable and malfunction.
16. Do not modify this product under any circumstances, otherwise it may cause injury or mechanical damage.
17. When the product is discarded, dispose of it as industrial waste or in accordance with local environmental protection regulations.

■ Confirm the precautions upon the arrival of the product

Confirm items	Instructions
Does the product that has arrived match the model you ordered?	The package contains the product you ordered. Please confirm the model on the label of the controller.
Is there any damage to the product?	Please check the outer packaging to see if the product has been damaged during transportation. If any omissions or damages are found, please contact our company or your supplier.

1 Product Information

1.1 Product Overview

The RA series temperature expansion module is an IO expansion module launched by Ritter, which has the advantages of small size, high integration, and full variety, and can meet the usage requirements of different customers. The RA series of economical temperature expansion modules can be used in conjunction with Ritter PLC.

This manual mainly presents the basic parameters and usage methods of the RA series temperature expansion module.

1.2 Product Model Information

RA - 04 00 - TC
1 2 3 4

① RA Analog expansion module	③ 00: Analog output pints
② 04: Analog input points	④ Function code N: NPN P: PNP IV: Supports current/voltage WT: Weighing TC: thermocouple TR: thermal resistance

1.3 Module name and brief description

Module Type	Model	Description
Temperature module	RA-0400-TC	4-channel thermocouple input, supporting J-type, K-type, R-type, S-type, T-type, E-type, N-type, B-type thermocouples, resolution 0.1 ° C, fastest response 250ms

1. 4 Product appearance



1.5 General Information

1.5.1 Basic Specifications

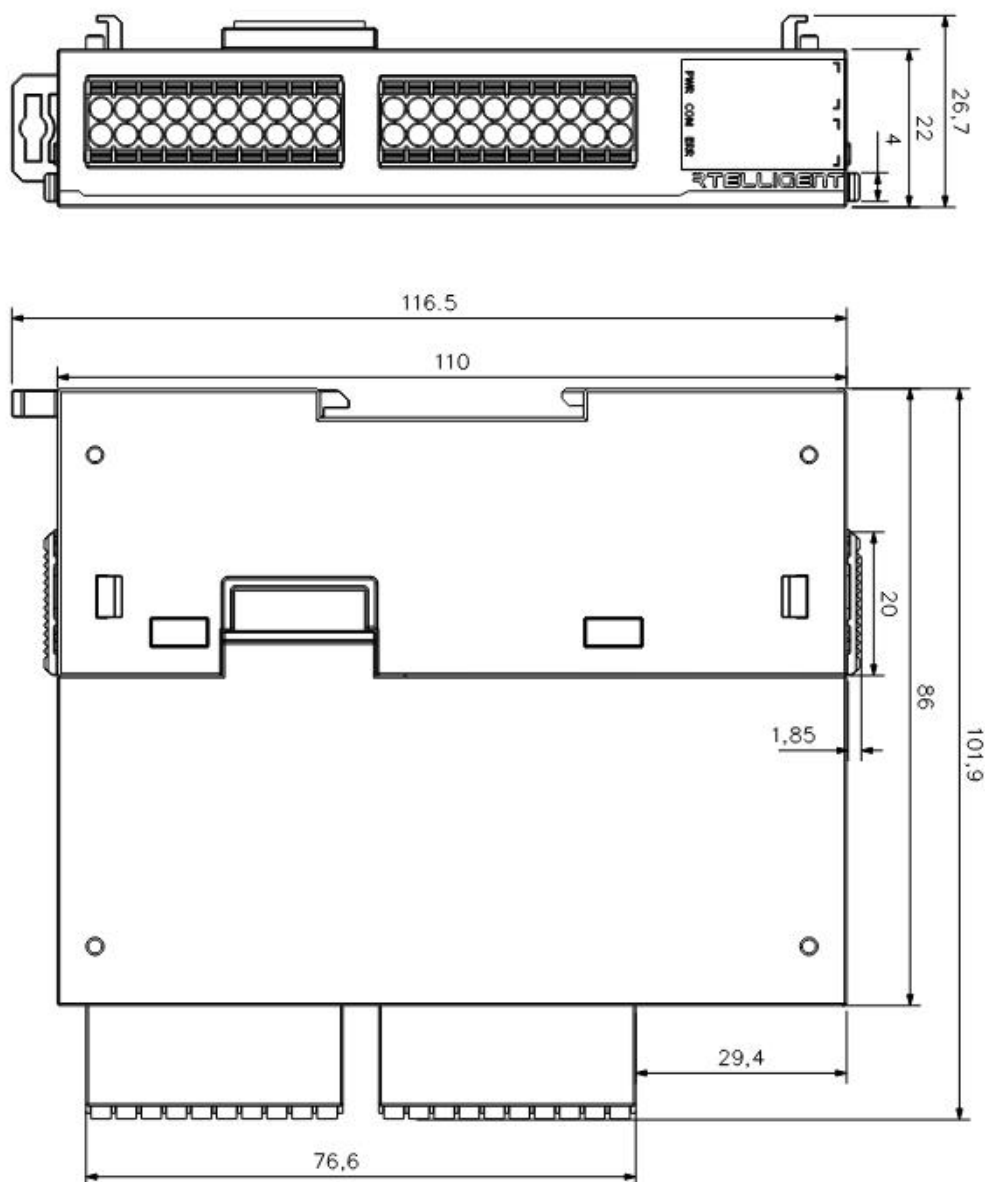
This section describes common specifications such as ambient temperature, humidity, vibration, shock, air pressure, EMC, key indicators related to installation, etc.

Items	Specifications
Operating ambient temperature	0~50°C
Storage ambient temperature	-20~70°C
Operating environment humidity	5 to 95 percent, no condensation
Storage environment humidity	5 to 95 percent, no condensation
Working environment	No corrosive gases are present
Safety Specifications	IEC61131-2
Applicable atmospheric pressure	Operating: 1080 to 795hPa (equivalent to -1000 to 2000m) Storage: 1080 to 660hPa (equivalent to -1000 to 3500m)

1.5.2 Installation specifications

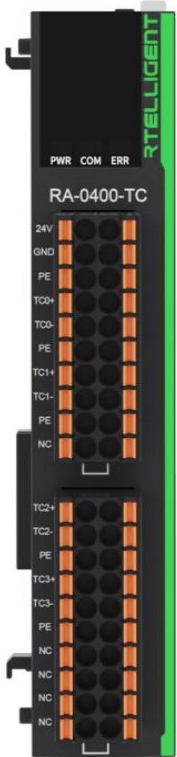
Project	Specifications
Input terminals	Spring connector, spacing 3.5mm
Number of input terminals	The terminals are divided into two parts, top and bottom. Each terminal has 10 dots, totaling 20 dots
Installation method	Standard DIN rail mounting
Installation dimensions	Length * Width * height =85*27*112.94 (unit: mm)

1. 5. 3 Installation dimension drawing



2 Temperature module

2.1 Input terminal configuration

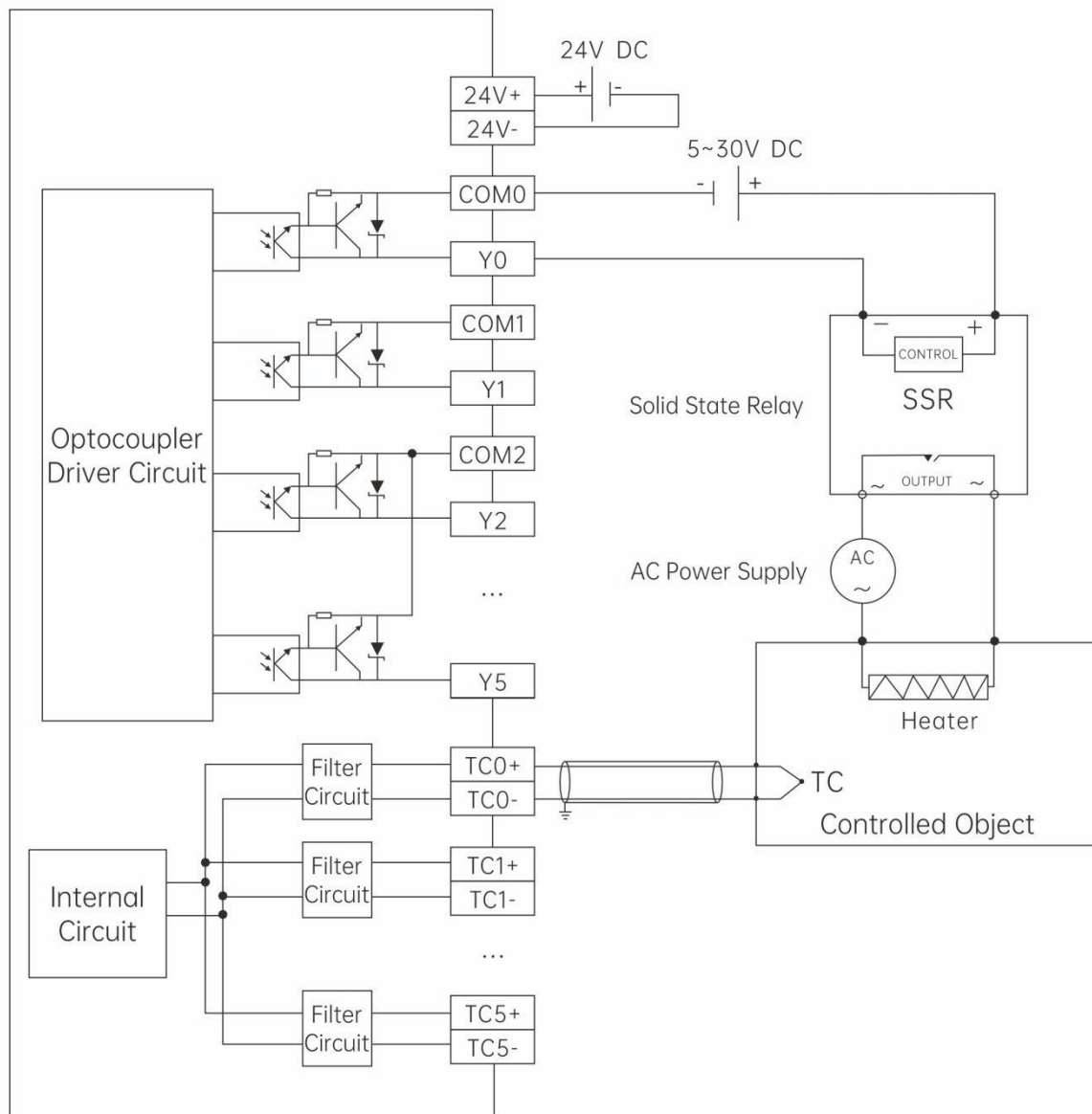
RA-0400-TC	Port
 The diagram shows the RA-0400-TC terminal block with two rows of terminals. The top row is labeled with 24V, GND, PE, TC0+, TC0-, PE, TC1+, TC1-, PE, NC. The bottom row is labeled with TC2+, TC2-, PE, TC3+, TC3-, PE, NC, NC, NC, NC. The module has a green side label 'RTelligent' and status indicators 'PWR COM ERR'.	24V
	GND
	PE
	TC0+
	TC0-
	PE
	TC1+
	TC1-
	PE
	NC
	TC2+
	TC2-
	PE
	TC3+
	TC3-
	PE
	NC
	NC
	NC
	NC

Note:

1. The upper and lower terminals are connected left and right in the same row.
2. Connect an external DC 24V power supply.

2.2 Sensor wiring diagram

- Examples of input/output wiring



2.3 General Specifications

RA-0400-TC channel specification	
Sensor input types and specifications	K, S, E, N, B, T, J, R type thermocouples
Input channel	4 channels
Sensor wiring	Two-wire system

Measuring temperature range	K: 1000 °C ~ 1350 °C / 148 °F ~ 2462 °F R type: 0 °C ~ 1750 °C / 32 °F ~ 3182 °F E: - 150 °C ~ 980 °C / 238 °F ~ 1796 °F B: 200 °C ~ 1800 °C / 392 °F ~ 3272 °F T: 150 °C ~ 400 °C / 238 °F ~ 752 °F N type: 150 °C ~ 1300 °C / 238 °F ~ 2372 °F S type: 0 °C ~ 1750 °C / 32 °F ~ 3182 °F J type: 80 °C ~ 1200 °C / 112 °F ~ 2192 °F
Response time	250ms, 500ms, 1000ms/4 channels
Sensitivity	0.1 ° C, 0.1°F
Resolution	Temperature: 0.1°C
Combined accuracy	±0.1%+1°C (cold end compensation) at full scale within the range of (25°C, 77°F) ±0.3%+1°C (cold end compensation) at full scale within (-20 to 60°C, -4 to 140°F)
Power supply	DC24V±10%
Diagnostic protection	Disconnection detection, power protection
Cold end compensation	Supports cold end compensation, accuracy ±1 ° C
Display mode	Degrees Celsius (° C)

2. 4 Panel indicator light

Indicator lights	Status	Notes
PWR	Power indicator light	The module power supply is normal and the indicator light remains constantly on
COM	Module Online Indicator light	The module remains on during normal communication and off during disconnection
ERR	Module alarm indicator light	Normally off, alarm flashing

3 The use of the temperature module on the RX series

The RX series PLC host can be expanded with switch and analog (temperature) as required by the customer. This section describes the hardware identification and address allocation of the host for the expansion module.

3.1 Extension module

3.1.1 Hardware identification of the extension module

When the host detects the switch module, the number of bytes of the switch input/output is displayed in the corresponding specified register. The number of switch inputs and outputs is counted in bytes, with one byte counted for every 8 inputs or 8 outputs.

When the host detects the analog (temperature) module, it displays the number of characters (i.e., the number of channels) of the input/output in the corresponding specified register.

If the extension module is properly connected to the host and the host does not detect the module (i.e., the data in the register does not match the actual number of extension modules), plug and unplug the host and the extension module.

Registers	Function Description
D8054	The number of bytes of switch input
D8055	Number of analog (temperature) input channels
D8056	Switch output bytes
D8057	Number of analog output channels
D8058	Weigh the number of input channels

3.1.2 Expand module input read

D8055 input word count for analog quantity (temperature); The address is directly assigned, and the extended register reads the values as shown in the table below:

Serial number	Register
AD0	R23700
AD1	R23701
AD2	R23702
AD3	R23703
....	
AD49	R23749

3. 1. 3 Filtering and type Settings for the temperature input

See the table below for specific Settings:

Registers	Filtering (high eight bits)	Type (low eight)	Indicate type	Number Conversion Range
R23500 - R23549	1-100	0	K-type thermocouple	- 1000 °C ~ 1350 °C / 148 °F ~ 2462 °F
		4	R-type thermocouple	0 °C ~ 1750 °C / 32 °F ~ 3182 °F
		5	Type E thermocouple	- 150 °C ~ 980 °C / 238 °F ~ 1796 °F
		6	Type B thermocouple	200 °C ~ 1800 °C / 392 °F ~ 3272 °F
		7	T-type thermocouple	- 150 °C ~ 400 °C / 238 °F ~ 752 °F
		8	N-type thermocouple	- 150 °C ~ 1300 °C / 238 °F ~ 2372 °F
		9	S-type thermocouple	0 °C ~ 1750 °C / 32 °F ~ 3182 °F
		11	Type J thermocouple	- 80 °C ~ 1200 °C / 112 °F ~ 2192 °F

Note:

1. Register value = (high eight bits *256) + low eight bits

Example: Set the 1MS filter, K-type thermocouple. $(1*256) + 0 = 256$

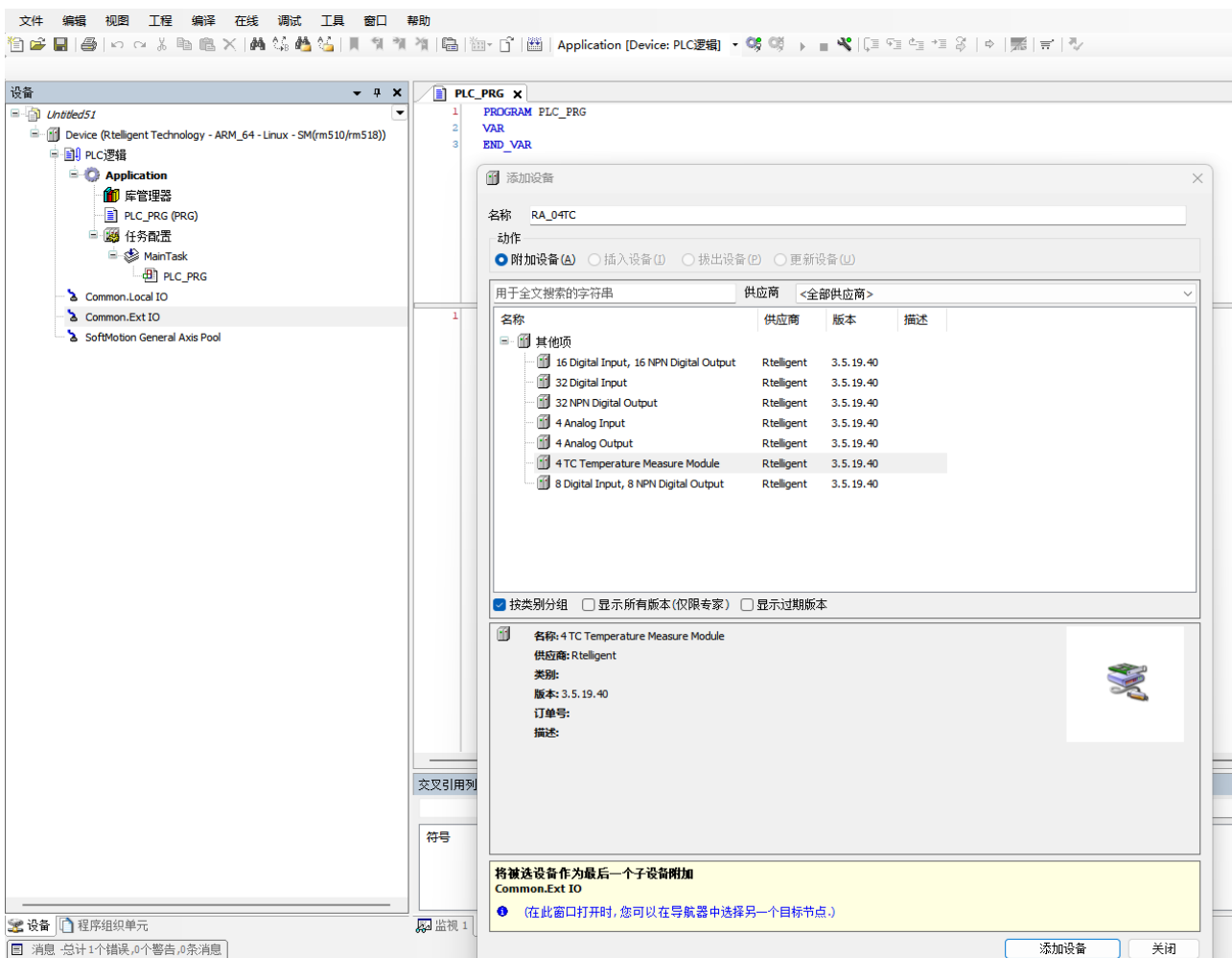
Set the 25MS filter, J-type thermocouple. $(25*256) + 11 = 6411$

4 The use of the temperature module on the RM series

4.1 Extension module

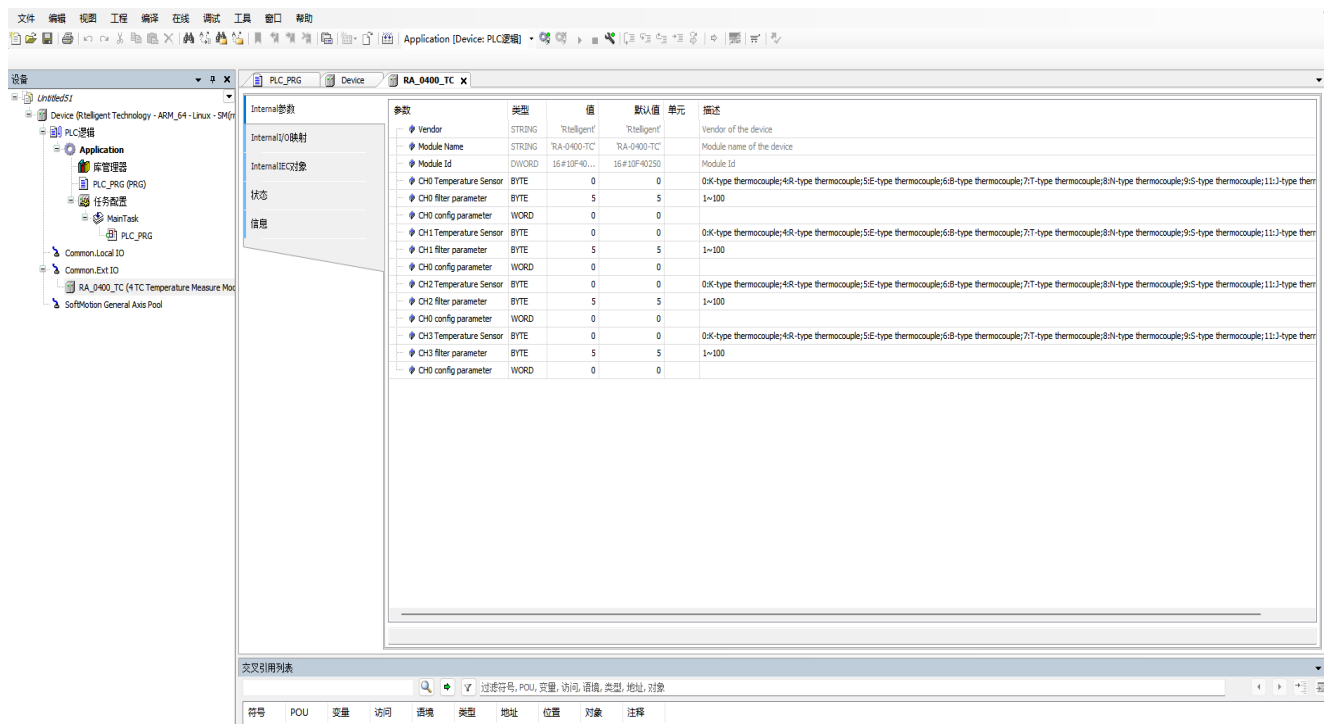
4.1.1 Add the temperature extension module

After installing the device profile. Add the required modules to the RM series PLC project as shown in the following figure



Diagnostic information and channel data reading for the temperature module

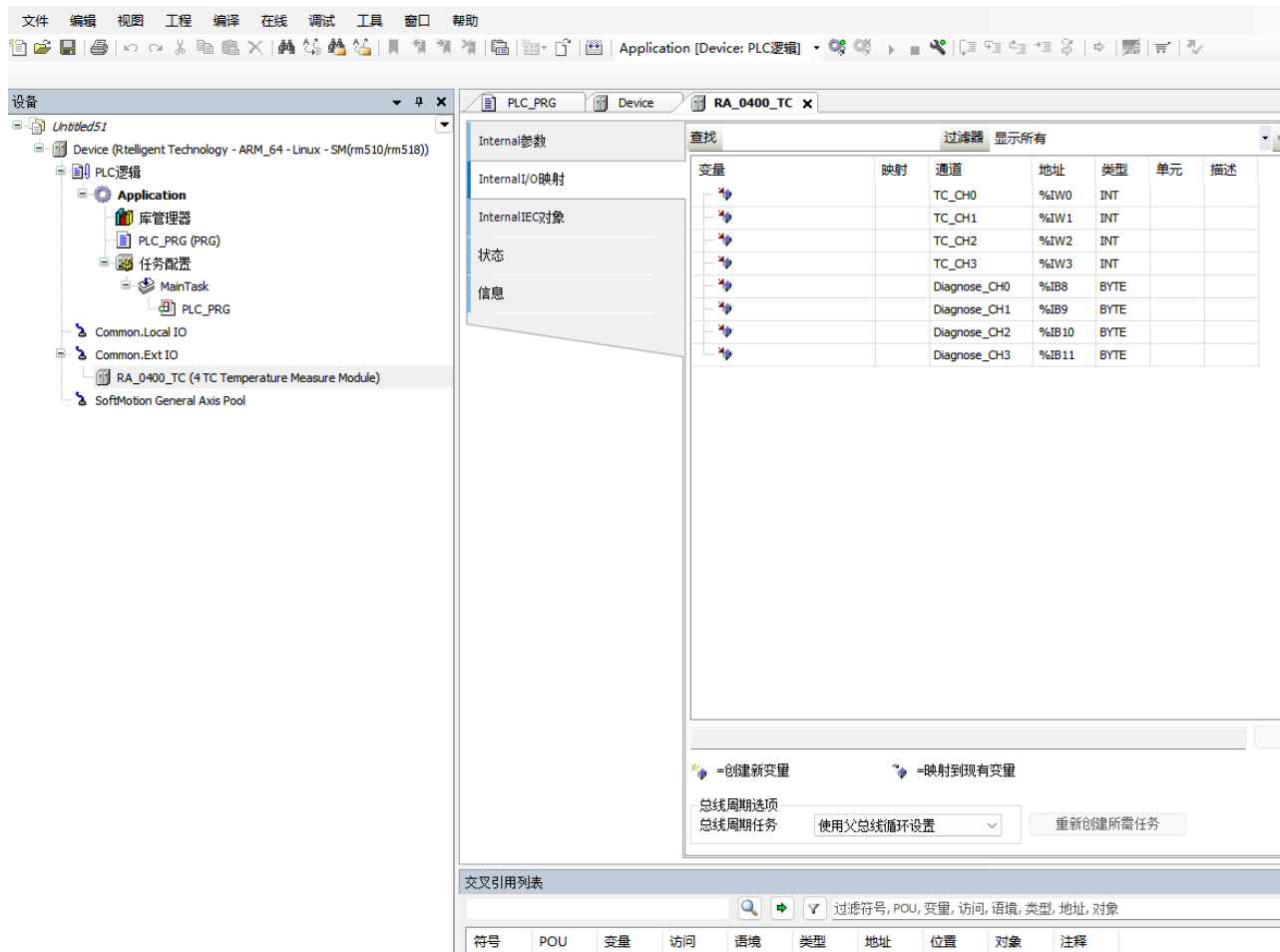
Set the type of thermocouple input channel in the Internal parameter



Registers	Valid value type	Read and write	Instructions
CH0 Temperature Sensor	BYTE	R/W	First path type Settings 0 K type thermocouple 4 R type thermocouple 5 E type thermocouple 6 B type thermocouple 7 T type thermocouple 8 N type thermocouple 9 S type thermocouple 11 J type thermocouple
CH0 filter parameter	BYTE	R/W	First-path filter Settings 1~100ms
CH0 config parameter	WORD	R/W	Retain
And so on.....			

4.1.2 The temperature module reads diagnostic information and channel data

As shown in the following figure, the read values of the registers in the I/O mapping parameters are as follows:



Registers	Valid value type	Read and write	Instructions
TC_CH0	32-bit signed	R/W	First channel real-time temperature
Diagnose_CH0	8 bits unsigned	R	First-path diagnostic information
And so on.....			

SUPPORTS

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