



RA Series Analog Expansion Module

User Manual

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Preface

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

This manual serves as a guide for the relevant information and operating instructions of the Rtelligent RA Series Analog Expansion Module. Before using this product, please read the manual carefully and proceed with wiring, programming, and debugging only after fully understanding its contents. Only operators with sufficient electrical knowledge should perform wiring, programming, debugging, and other related operations. When using this product, please first verify whether it meets the requirements and safety standards. If you encounter any uncertainties during use, please consult our technical personnel for assistance.

As part of our commitment to continuous improvement of the RA Series, any updates to the provided documentation may be made without prior notice.

Revision History

Date	Version	Description
2025.02	V1.00	Products first launched

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Safety Reminder

■ Safety Precautions

1. Before installing the controller, ensure all external power sources are disconnected. Failure to do so may result in electric shock.
2. After powering on the controller, do not touch the terminals or perform wiring, disconnection, or other operations while the power is on. Electric shock may occur.
3. Install and use this product only under the environmental conditions specified in the manual. Avoid using it in damp, high-temperature, dusty, smoky, conductive, corrosive, or flammable gas environments, or in places with vibration or impact. Otherwise, electric shock, fire, malfunction, or product damage may occur.
4. Design an external safety circuit for the controller to ensure the entire system operates safely even if the controller malfunctions. Otherwise, malfunctions or failures may occur.
5. Connect the DC24V power supply correctly to the dedicated power terminal of the controller. Incorrect power connection may damage the controller.
6. Do not bundle control wiring with power wiring. Keep them at least 10cm apart to prevent malfunctions or product damage.
7. Do not touch the conductive parts of the product directly, as this may cause malfunctions or failures.
8. Install the product securely using DIN46277 rails or M3 screws on a flat surface. Improper installation may lead to malfunctions or product damage.
9. When drilling screw holes, ensure that metal shavings or wire debris do not enter the product casing, as this may cause malfunctions or failures.
10. Always disconnect the power before connecting or disconnecting peripheral devices, expansion units, batteries, or other equipment to prevent malfunctions or failures.
11. Use a 2mm wire for the third-class grounding of the controller's grounding terminal, and avoid sharing a ground with high - voltage electrical systems to prevent malfunctions or product damage.
12. When connecting wires to terminals, ensure they are tightly secured and that conductive parts do not contact other wires or terminals to prevent malfunctions or damage.
13. Before modifying the controller's program, ensure it is in STOP mode to prevent malfunctions.

14. Do not disassemble or reassemble the product without authorization, as this may cause damage.

15. Always disconnect the power before plugging or unplugging cables to avoid cable damage or malfunctions.

16. Never modify this product, as it may result in injury or mechanical damage.

17. When disposing of the product, follow industrial waste disposal regulations or local environmental protection laws.

■ **Checking Product Upon Delivery**

Check Item	Description
Does the delivered product match the model you ordered?	The package contains the product you ordered. Please verify the model number on the controller's label.
Is there any damage to the product?	Inspect the packaging for any signs of damage during transit. If any missing or damaged items are found, please contact our company or your supplier.

1 Product Information

1.1 Product overview

The RA series of economical analog expansion modules are IO expansion modules launched by Rtelligent. They feature small size, high integration, and a wide range of types, which can meet the usage requirements of different customers. The RA series of economical analog expansion modules can be used in conjunction with the RX8U small PLC and the RM510, RM418, and RM518 medium-sized PLCs.

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

1.2 Naming rule

$$\begin{array}{ccccccc} \text{RA} & - & \text{04} & & \text{00} & - & \text{IV} \\ \textcircled{1} & & \textcircled{2} & & \textcircled{3} & & \textcircled{4} \end{array}$$

①RA: Analog Expansion Module

③00: Analog Output Points

②04: Analog Input Points

④IV: Supports Current or Voltage Input

1.3 Module Name and Brief Description

Module type	Model No.	Description
Analog input module	RA-0400-IV	4-channel analog input, supporting current/voltage input, spring-type connector

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Analog output module	RA-0004-IV	4-channel analog output, supporting current/voltage input, spring-type connector
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1. 4 Product appearance



1.5 General information

1.5.1 Basic Specifications

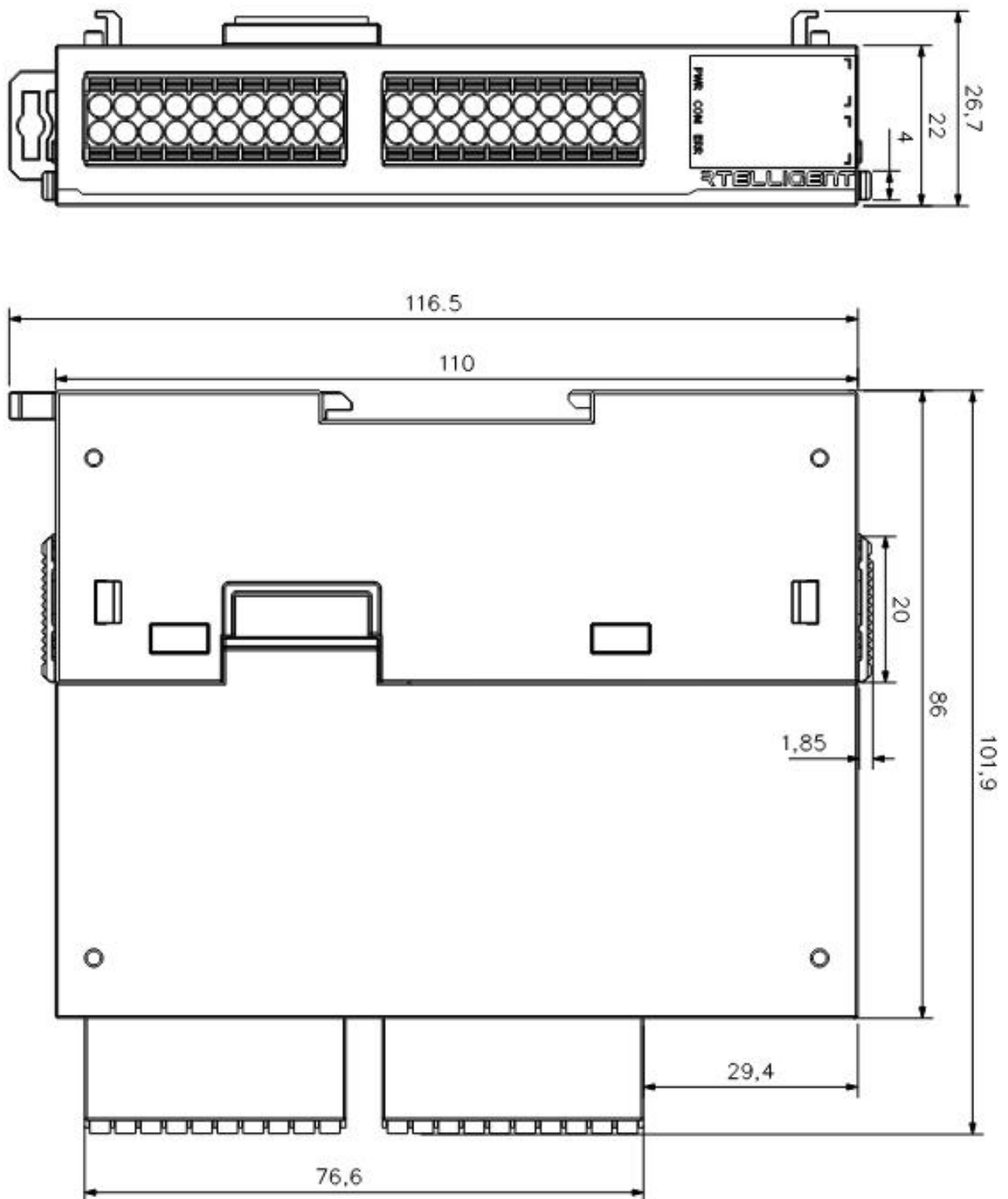
This section describes common specifications, including key technical indicators related to environmental temperature, humidity, vibration, shock, atmospheric pressure, EMC (Electromagnetic Compatibility), and installation.

Item	Spec
Operating temperature	0~50°C
Storage temperature	-20~70°C
Operating humidity	5~95%, No condensation
Storage humidity	5~95%, No condensation
Work environment	no corrosive gas
safety specification	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

Item	Spec
Input terminal	Spring-type connectors with a spacing of 3.5mm
No.of input terminals	The terminal is divided into two parts, upper and lower. Each terminal has 10 points, totaling 20 points
Mounting method	Standard DIN rail mounting
mounting dimension	Length * width * height =85*27*112.94 (unit: mm)

1.5.3 Installation dimension



2 Analog input module

2.1 Product Feature

2.1.1 Supports multiple input modes

The module supports voltage/current input modes, which can meet the usage requirements of customers in different occasions.

Input mode	RA-0400-IV
Voltage input mode	1V~5V
	-5V~5V
	0V~5V
	0V~10V
	-10V~10V
Current input mode	4mA~20mA
	0mA~20mA
	-20mA~20mA

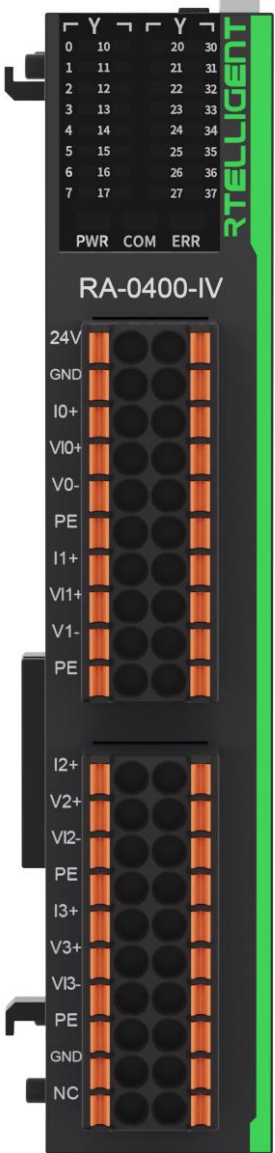
2.1.2 High response speed

The module features a fast response time of **1ms per channel**.

2.1.3 High accuracy

The accuracy after conversion is $\pm 0.1\%$ for voltage and $\pm 0.2\%$ for current (ambient temperature 25 degrees Celsius).

2.2 Input Terminal Layout

RA-0400-IV	Port
	24V
	GND
	I0+
	VI0+
	V0-
	PE
	I1+
	VI1+
	V1-
	PE
	I2+
	V2+
	VI2-
	PE
	I3+
	VI3-
	PE
	GND
	NC

Attention:

1. Same-row terminals must be connected side-by-side.
2. For current input, the V+ and I+ terminals must be interconnected.
3. When handling differential signals, connect "GND" to the analog ground of compatible devices to eliminate common-mode interference and ensure sampling accuracy.
4. Use an external 24V DC power supply.

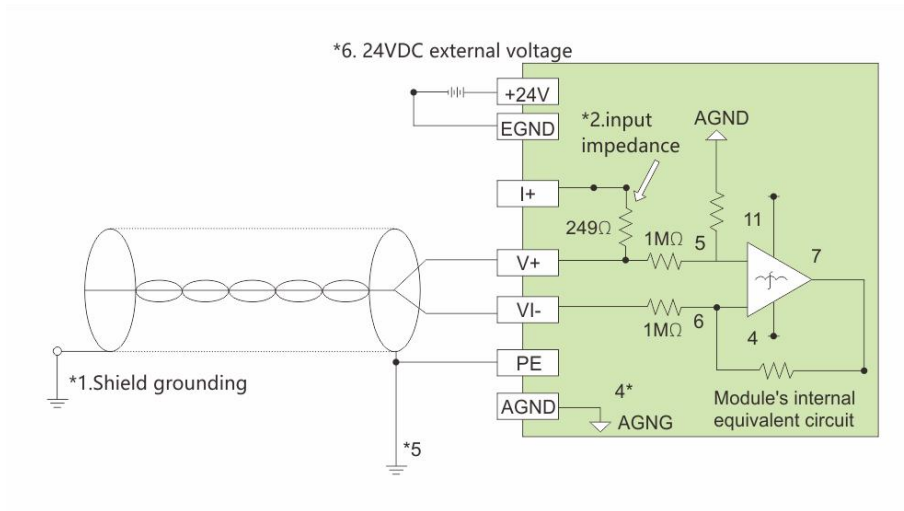
2.3 General specification

RA-0400-IV Input port specification									
Input channel count	4								
Module maximum power consumption	1.2W								
Statue Indicators	Software + Hardware status indicator, Power supply indicator (PWR), Module online status indicator (RUN), Alarm indicator (ALM)								
Input Type	Voltage/Current								
Power supply voltage	DC24V (21~27V)								
Input impedance	Voltage input: >1MΩ Current sampling: 250Ω								
Accuracy	Voltage±0.1%、Current±0.2% (0℃~25℃) ; Voltage±0.2%、Current±0.3% (0℃~50℃)								
Rated input range	1 ~ 5V	-5 ~ 5V	0 ~ 10V	-10 ~ 10V	-10 ~ 10V	0 ~ 5V	4 ~ 20mA	0 ~ 20mA	0 ~ 20mA
Rated digital conversion range	0 ~ 3200 0	-3200 0 ~ 32000	0 ~ 3200 0	-3200 0 ~ 32000	-2000 0 ~ 20000	0 ~ 3200 0	0 ~ 32000	0 ~ 32000	0 ~ 20000

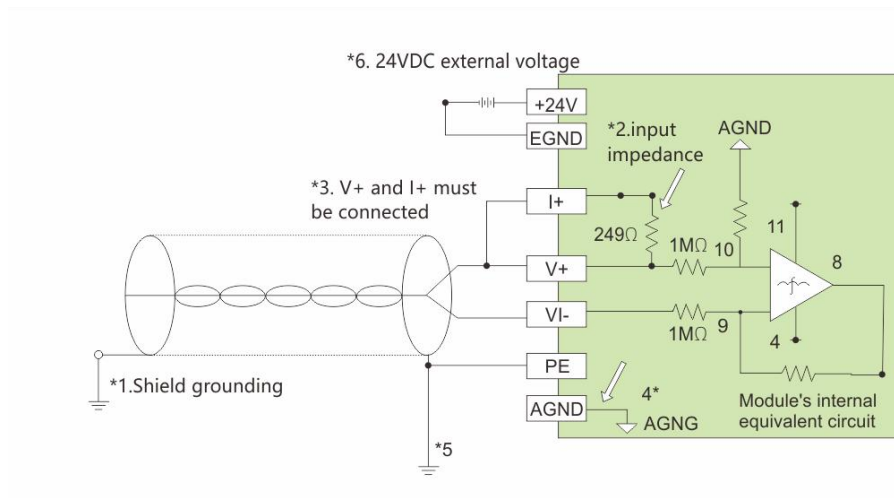
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Input range limits	0.2V ~ 5.1V	-5.1 ~ 5.1V	-0.2 ~ 10.2V	-10.2 ~ 10.2V	-10.2 ~ 10.2V	-0.1V ~ 5.1V	1 ~ 20.4m A	-0.2 ~ 20.4m A	-0.2 ~ 20.4m A
Maximum digital conversion range	-640 0 ~ 3264 0	-3264 0 ~ 32640	-640 ~ 3264 0	-3264 0 ~ 32640	-3264 0 ~ 32640	-640 ~ 3264 0	-6000 ~ 32640	-320 ~ 32640	-200 ~ 20400
Channel configuration	8	5	6	0	1	7	3	2	4
Response time	1ms/1 Channel								

2.4 Wiring diagram



RA0400-IV: Voltage signal input



RA0400-IV: Current signal input

3 Analog output module

3.1 Product feature

3.1.1 Supports multiple output modes

The module supports voltage/current output modes, which can meet the usage requirements of customers in different occasions.

Output mode	RA-0004-IV
Voltage output mode	1V~5V
	0V~5V
	-5V~5V
	0V~10V
	-10V~10V
Current output mode	0mA~20mA
	4mA~20mA

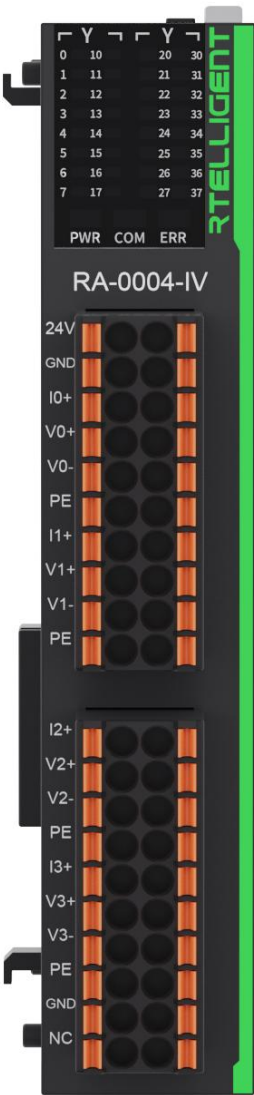
3.1.2 High response speed

The module features a fast response time of **1ms per channel**.

3.1.3 High accuracy

The accuracy after conversion is $\pm 0.1\%$ for voltage and $\pm 0.2\%$ for current (ambient temperature 25 degrees Celsius).

3.2 Output terminal layout

RA-0004-IV	Port
	24V
	GND
	I0+
	V0+
	V0-
	PE
	I1+
	V1+
	V1-
	PE
	I2+
	V2+
	V2-
	PE
	I3+
	V3+
	V3-
	PE
	GND
	NC

Attention:

1. Same-row terminals must be connected side-by-side.
2. Use an external 24V DC power supply.

3.3 Basic Spec

RA-0004-IV Output Port Specifications									
Output Channel Count	4								
Module Maximum Power Consumption	1.2W								
Status Indicators	Software + Hardware Indicator , Power Indicator (PWR), Module Online Indicator (RUN) , Alarm Indicator (ALM)								
Input Type	Voltage/Current								
Power Supply Voltage	DC24V (21~27V)								
Input Impedance	Voltage Output Load: 1K~1MΩ; Current Output Load: 100Ω~250Ω								
Accuracy	Voltage±0.1%、Current±0.2% (0℃~25℃) ; Voltage±0.2%、Current±0.3% (0℃~50℃)								
Rated Output Range	1 ~ 5V	0 ~ 5V	-5 ~ 5V	0 ~ 10V	-10 ~ 10V	-10 ~ 10V	0 ~ 20mA	4 ~ 20mA	0 ~ 20mA
Rated Digital Conversion Range	0 ~ 32000	0 ~ 32000	-3200 0 ~ 32000	0 ~ 32000	-3200 0 ~ 32000	-2000 0 ~ 20000	0 ~ 32000	0 ~ 32000	0 ~ 20000
Output Range Limits	0.2V ~ 5.1V	0V ~ 5.1V	-5.1V ~ 5.1V	0V ~ 10.2V	-10.2V ~ 10.2V	-10.2 ~ 10.2V	0 ~ 20.4mA	3.8 ~ 20.4mA	0 ~ 20.4mA

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Maximum Digital Conversion Range	-640 0 ~ 326 40	0 ~ 3264 0	-3264 0 ~ 32640	0 ~ 3264 0	-3264 0 ~ 32640	-2040 0 ~ 20400	0 ~ 32640	-400 ~ 32640	0 ~ 20400
Channel Configuration Settings	8	7	5	6	0	1	2	3	4
Response Time	1ms/1 Channel								

4 Using Expansion Modules with RX Series

The RX8U PLC main unit supports digital (I/O) and analog expansion modules according to customer requirements. This section describes the hardware recognition and address allocation for expansion modules by the main unit.

4.1 Digital I/O

4.1.1 Hardware Recognition for Digital I/O Modules

When the main unit detects a digital I/O module, it displays the number of input/output bytes in the corresponding designated registers. The quantity of digital inputs/outputs is calculated in bytes, with every 8 inputs or 8 outputs counted as one byte.

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

Register	Description
D8054	Number of digital input bytes
D8056	Number of digital output bytes

4.1.2 Address Allocation for Digital I/O Modules

When the main unit detects digital I/O expansion modules, it automatically assigns addresses sequentially from left to right starting from X20 or Y20.

4.2 Analog I/O

4.2.1 Hardware Recognition for Analog Modules

For analog input module expansion, the input type for each channel must first be configured in registers R23500~R23549 of the main unit. Refer to Section 4.2.3 for the correspondence between values and types.

For analog output module expansion, the output type for each channel must first be configured in registers R23550~R23599 of the main unit. Refer to Section 4.2.4 for the correspondence between values and types.

With correct type settings, when the main unit detects an analog module, it will display the number of analog input/output words (i.e., channels) in the corresponding designated registers.

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

Register	Function Description
D8055	Analog Input word length
D8057	Analog output word length

4.2.2 Extended analog module input reading

D8055 is an analog input word count. The address is directly assigned. The read values of the extended registers are shown in the following table:

Series Number	Register
AD0	R23700
AD1	R23701
AD2	R23702
AD3	R23703
....	
AD49	R23749

4.2.3 Type Settings for analog input

For specific Settings, please refer to the following table:

Register	Setting Value	Type	Digital conversion range	remark
R23500~R23549	0	-10~+10V voltage input	-32000~32000	
R23500~R23549	1	-10~+10V voltage input	-20000~20000	
R23500~R23549	2	0~20mA current input	0~32000	
R23500~R23549	3	4~20mA current input	0~32000	
R23500~R23549	4	0~20mA current input	0~20000	
R23500~R23549	5	-5~5V voltage input	-32000~32000	
R23500~R23549	6	0~10V voltage input	0~32000	
R23500~R23549	7	0~5V voltage input	0~32000	
R23500~R23549	8	1~5V voltage input	0~32000	

4.2.4 Type Settings for analog output

For specific Settings, please refer to the following table:

Register	Setting Value	Type	Digital conversion range	remark
R23550~R23599	0	-10~+10V voltage input	-32000~32000	
R23550~R23599	1	-10~+10V voltage input	-20000~20000	
R23550~R23599	2	0~20mA current input	0~32000	
R23550~R23599	3	4~20mA current input	0~32000	
R23550~R23599	4	0~20mA current input	0~20000	
R23550~R23599	5	-5~5V voltage input	-32000~32000	
R23550~R23599	6	0~10V voltage input	0~32000	
R23550~R23599	7	0~5V voltage input	0~32000	
R23550~R23599	8	1~5V voltage input	0~32000	

4.2.5 Extended Analog Module Output Assignment

Direct assignment operation of registers: R23750 to R23799.

Among them, D8057 is the analog output word count; The address is directly assigned. The read values of the extended registers are shown in the following table:

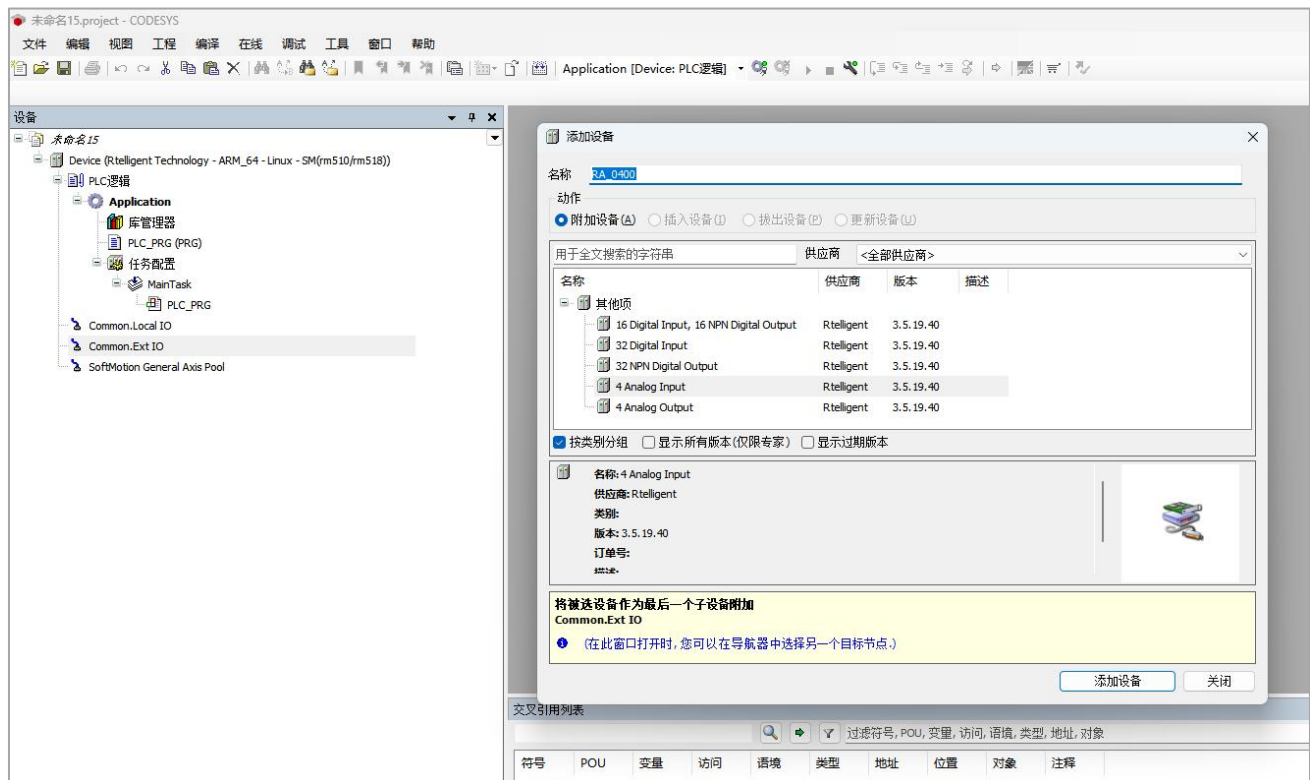
Series Number	Register
DA0	R23750
DA1	R23751
DA2	R23752
DA3	R23753
...	...
DA49	R23799

5 The use of extension modules on the RM series

5.1 Analog

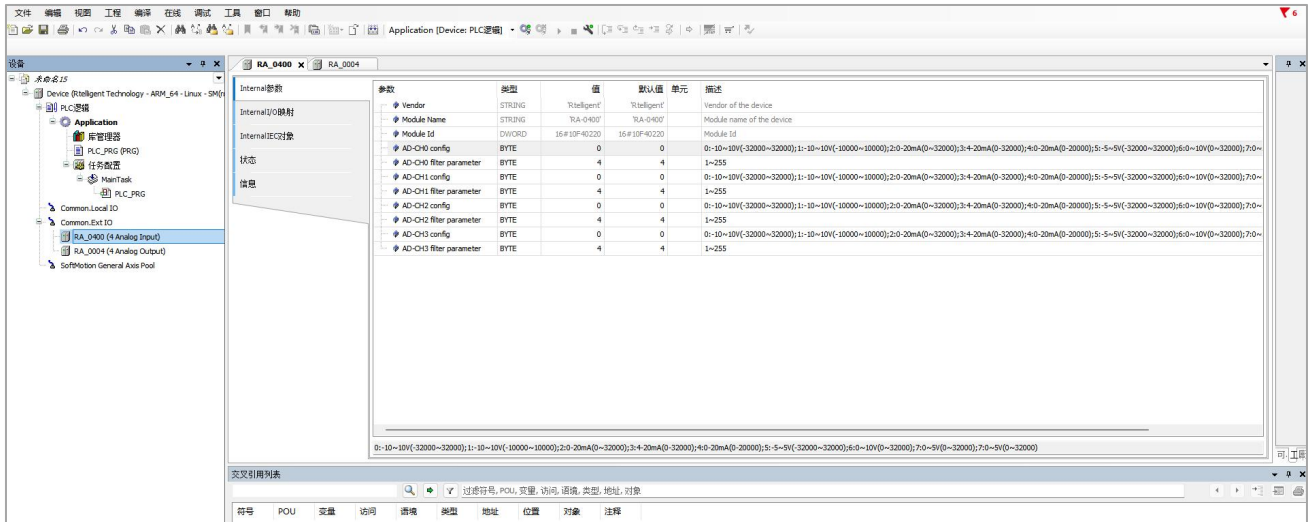
5.1.1 Add analog expansion modules

After installing the device description file. As shown in the following figure, add an AD or DA module to the RM series PLC project



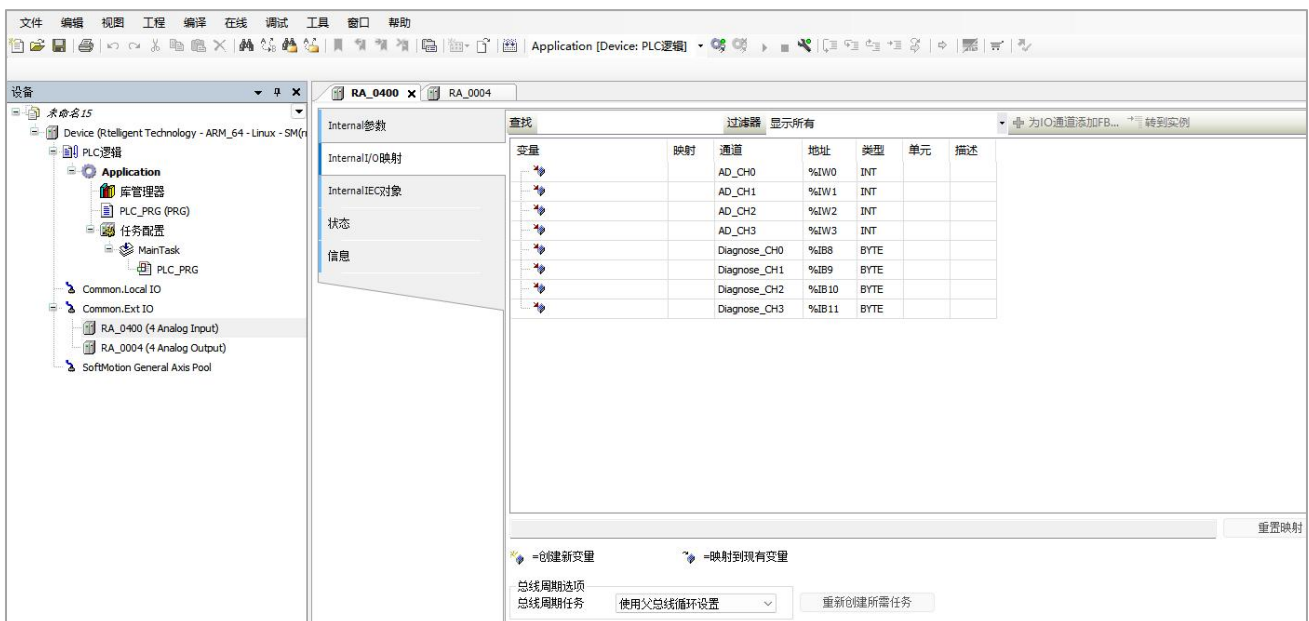
5.1.2 Type Settings of the analog input module

As shown in the following figure, set the type of the analog input channel in the Internal parameter



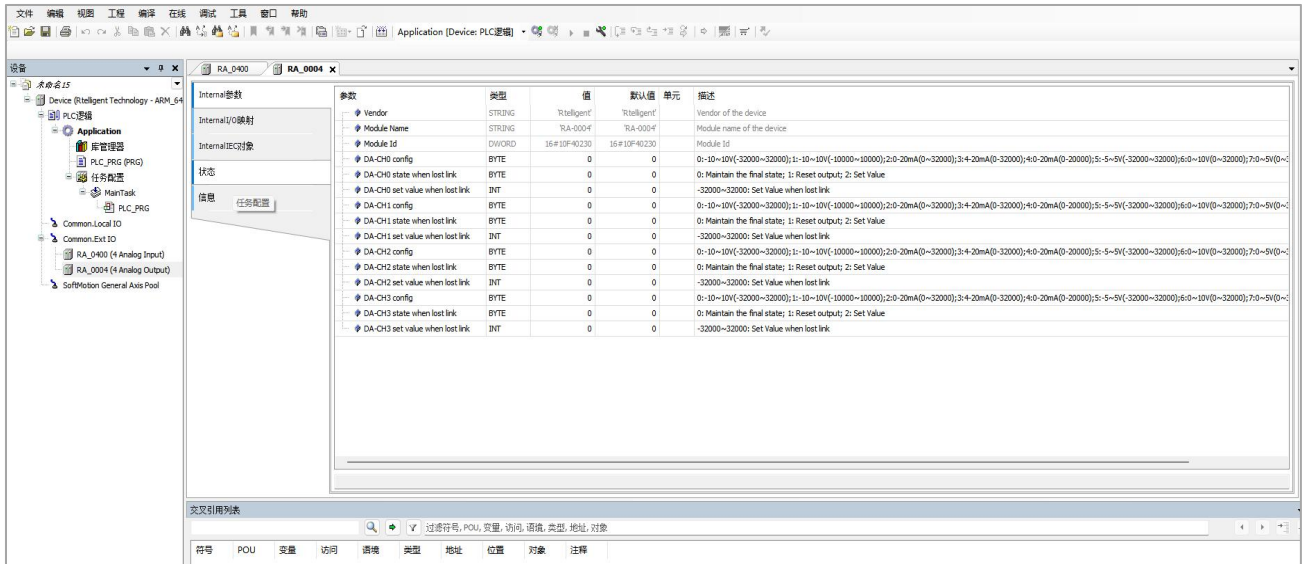
5.1.3 Diagnostic information and channel data reading of the analog input module

As shown in the following figure, view the diagnostic information and channel data in the internal I/O mapping



5.1.4 Type Settings of the analog output module

As shown in the following figure, set the type of the analog output channel in the Internal parameter



5.1.5 The diagnostic information and channel output data Settings of the analog output module

As shown in the following figure, view the diagnostic information and set the channel data in the internal I /O mapping

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文件 编辑 视图 工程 编译 在线 调试 工具 窗口 帮助

Application [Device: PLC逻辑]

设备

未命名15

Device (Rtelligent Technology - ARM_64)

PLC逻辑

Application

库管理器

PLC_PRG (PRG)

任务配置

MainTask

PLC_PRG

Common.Local IO

Common.Ext IO

RA_0400 (4 Analog Input)

RA_0004 (4 Analog Output)

SoftMotion General Axis Pool

RA_0400

RA_0004

Internal参数

InternalI/O映射

InternalIEC对象

状态

信息

查找

过滤器 显示所有

为IO通道添加FB...

变量	映射	通道	地址	类型	单元	描述
		Diagnose_CH0	%IB12	BYTE		
		Diagnose_CH1	%IB13	BYTE		
		Diagnose_CH2	%IB14	BYTE		
		Diagnose_CH3	%IB15	BYTE		
		DA_CH0	%QW0	INT		
		DA_CH1	%QW1	INT		
		DA_CH2	%QW2	INT		
		DA_CH3	%QW3	INT		

=创建新变量

=映射到现有变量

总线周期选项

总线周期任务

使用父总线循环设置

重新创建所需任务

SUPPORTS

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