

RB Series IO Module

User Manual

DECOWELL Industrial Intelligence makes reliable partners



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Preface

■ Profile

Thank you for purchasing DECOWELL RB series card-type I/O modules!

RB series card-type I/O modules are distributed expansion modules developed by DECOWELL. This series of modules consists of adapters, I/O modules, power modules, and terminal modules. The adapter can support a variety of communication buses, such as PROFINET, EtherCAT, Ethernet/IP, etc. I/O modules can be divided into digital input modules, digital output modules, analog input modules, analog output modules, and functional modules. Users can match them according to actual applications.

RB-6321 is a Modbus RTU master communication module.

This manual mainly describes the specifications, features and usage of the module. Please read it carefully before use so that you can use this product more clearly and safely.

Due to continuous product and technical updates and improvements, the content in this document may not fully correspond to the actual product. Please understand. In case of any discrepancies, the actual product shall prevail. Content changes resulting from product upgrades are subject to change without prior notice.

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Safety Precautions

■ Security Statement

1. Before installing, operating, or maintaining the product, please read and comply with these safety precautions.
2. To ensure personal and equipment safety, follow all safety labels on the product and all safety instructions contained in this manual during installation, operation, and maintenance.
3. The “Note”, “Caution”, “Warning”, and “Danger” statements in this manual do not represent all safety precautions that should be observed; they are supplementary to the overall safety requirements.
4. This product must be used under conditions that meet the specified design requirements. Failure to meet these conditions may result in malfunction. Functional abnormalities or component damage caused by non-compliance are not covered by the product warranty.
5. DECOWELL assumes no legal liability for personal injury, property damage, or other losses caused by improper or unauthorized operation of the product.

■ Security level definition



Note

Indicates additional information or explanations that supplement the operating instructions.



Caution

Indicates a hazardous situation that may result in minor to moderate personal injury or equipment damage if not operated as instructed.



Warning

Indicates a hazardous situation that may result in serious personal injury or death if not operated as instructed.

Warning — During Control System Design

01. When applying this system, please be sure to design a safety circuit to ensure that the control system can still operate safely when the external power supply fails or the expansion module malfunctions.
02. If the output circuit experiences prolonged overcurrent due to exceeding the rated load current or a load short circuit, the module may smoke or catch fire. External safety devices such as fuses or circuit breakers should be installed.

Caution — During Control System Design

01. It is essential to install an emergency braking circuit, a protection circuit, an interlock circuit for forward and reverse operation, and upper and lower limit interlock switches to prevent machine damage in the external circuit of the expansion module;
02. To ensure the safe operation of the equipment, please design external protection circuits and safety mechanisms for output signals related to major accidents;
03. When the output units of the expansion module, such as relays and transistors, are damaged, their outputs cannot be controlled to be in the ON or OFF state;

Caution — During Installation

01. During installation, prevent metal shavings and wire ends from falling into the module's ventilation holes, as this may cause fire, malfunction, or misoperation;
02. After installation, ensure that there are no foreign objects on its ventilation surface, otherwise it may cause poor heat dissipation, resulting in fire, malfunction, or misoperation;
03. During installation, ensure that the module is securely connected to its respective connector and that the module connection hooks are firmly locked. Improper module installation may lead to malfunctions, failures, or detachment.

Warning — During Installation

01. Only professional maintenance personnel who have received relevant electrical equipment training and possess sufficient electrical knowledge can install this product;

02. When installing or removing modules, all external power supplies to the system must be completely disconnected before proceeding. Failure to disconnect the power supply may result in electric shock, module malfunction, or accidental operation.

03. Do not use the module in the following locations: places with dust, fumes, conductive dust, corrosive gases, or flammable gases; places exposed to high temperatures, condensation, or wind and rain; places subject to vibration or impact. Electric shock, fire, or misoperation may also cause product damage and deterioration.

1.Product Information

1.1 Product naming and nameplate

RB-6 3 2 1

① ② ③ ④ ⑤

NO.	Name	Description Definition
①	Product Series Name	RB Series
②	Module Type	6: Functional modules
③	Function Type	3: Communication module
④	Encoder Type	0: RS485 free port communication module 1: RS232 Free port communication module 2: Modbus RTU master module
⑤	Number of channels	1:1 channel

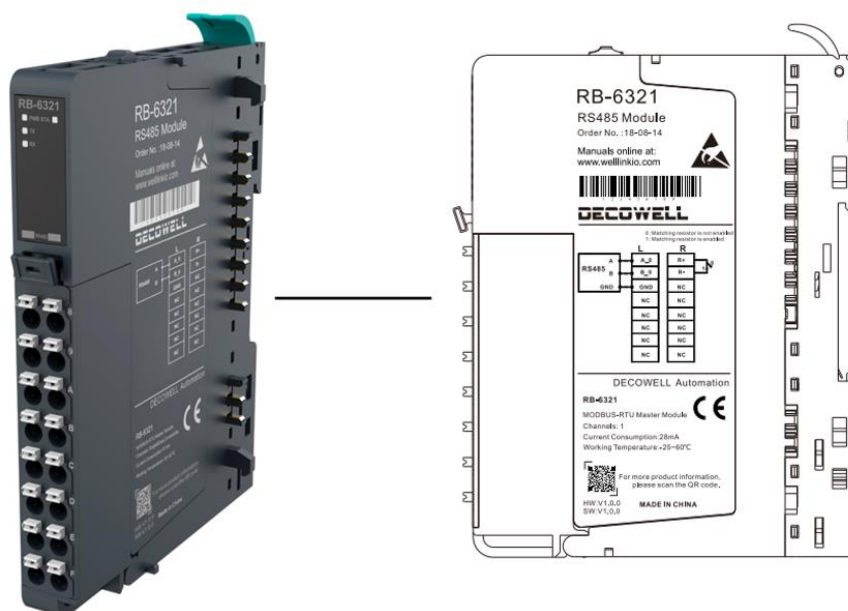
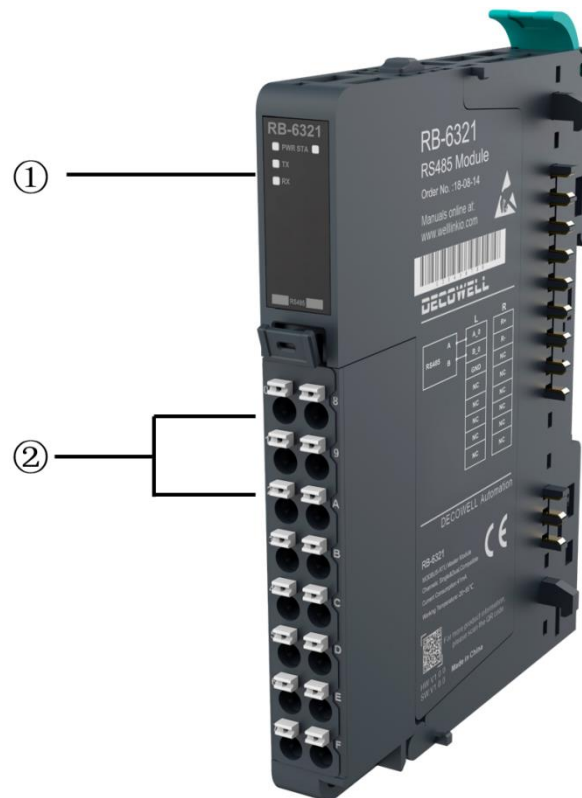


Figure 1-1-1 Product appearance diagram

1.2 Component Description



picture1-2-1Component Description Diagram

Parts Description Table

NO.	Name	LED	State
1	PWR	ON(green)	Internal power supply is normal
		OFF	Internal power supply abnormality
	STA	ON (green)	The module is working properly
		ON(red)	The module has not established communication with the adapter, and configuration information loading failed.
		1HZ flashing (red)	Module hardware abnormality
		5HZ flashing (red)	Module self-test abnormality (internal fault)
	TX	Flashing (green)	Data transmission
	RX	Flashing (green)	Data Reception

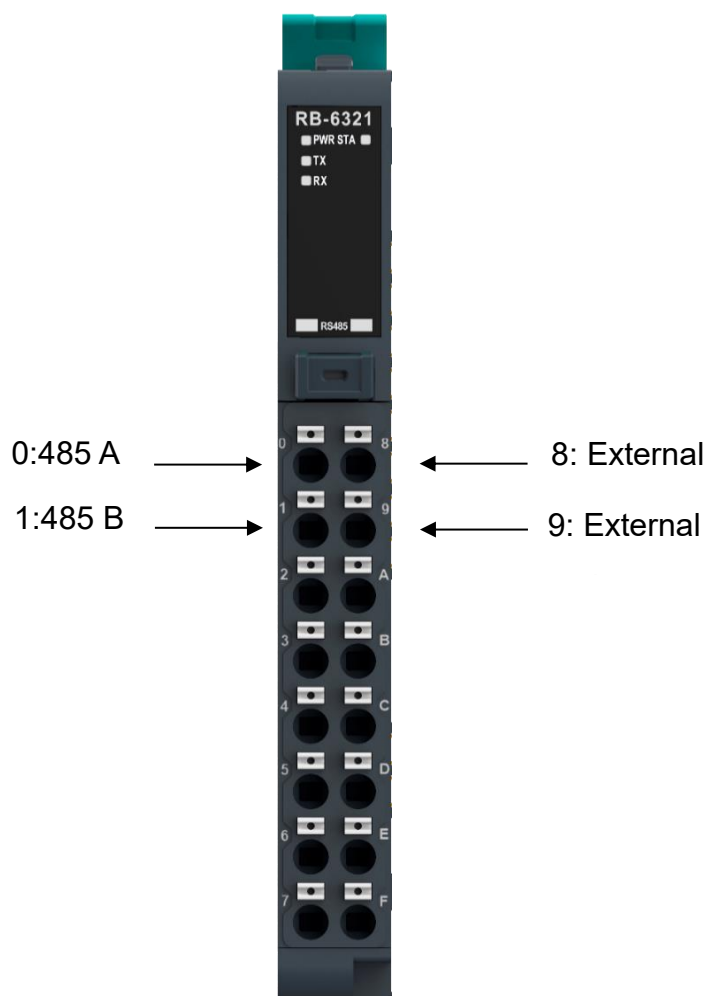


Figure 1-2-2 Terminal Definition

1.3 Technical specifications

Basic parameters	
Dimensions	100mm×77mm×12mm
Protection level	IP20
Wiring specifications	0.2~1.5mm ²
Wiring method	Straight-through spring terminal connection
Technical Parameters	
model	RB-6321

Product Name	Modbus RTU Master Module
Current consumption	Max 28mA
Number of channels	Single Channel
Baud rate	Optional: 1200/2400/4800/9600 (default)/ 14400/19200/38400/57600/115200 bps
Data bits	8-bit
Check digit	No parity (default), odd parity, even parity
Stop bits	1 (default), 2 stop bits
Response time	After the master sends a command, it waits for the slave to respond. The configurable range is 1-65535, the default is 1000, (ms).
Character spacing	Optional: 1.5/3.5/5 (default)/10/20/50/100/200 characters

1.4 Environmental Specifications

Environmental parameters	
Operating temperature	-25~60°C
Operating humidity	95% non-condensing
atmosphere	≥795 hPa (altitude ≤ 2000 m) as per IEC 61131-2
Storage temperature	-40~85°C
Overvoltage category	I

2. Mechanical Installation

2.1 Installation dimensions

The installation dimension information is shown in the figure below, with the unit in (mm).

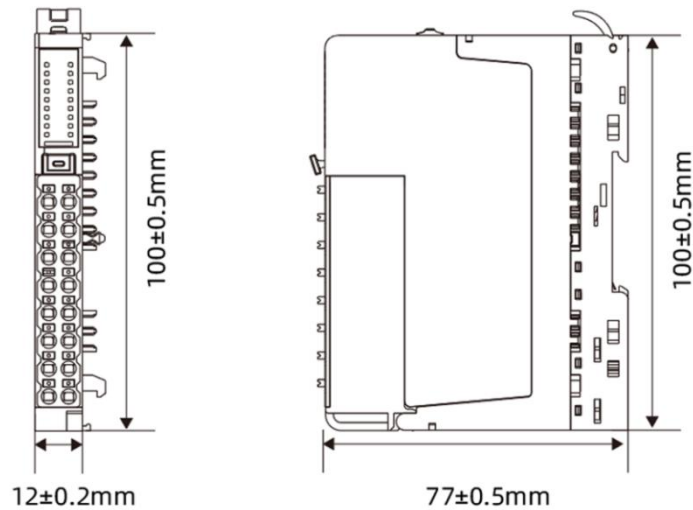


Figure 2-1-1 Module dimensions

2.2 Installation Method

2.2.1 Inter-module installation

Before installation, push the lock and release lever on the top of the module backward. After all the module levers are open, insert the modules horizontally. After installation, push the lever back to its original position.

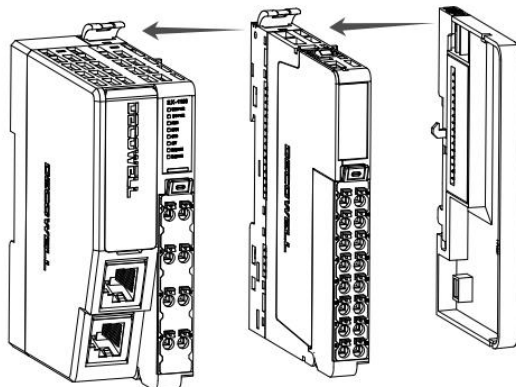


Figure 2-2-1 Schematic diagram of installation between modules

2.2.2 Installation on rails

Install:

Before installation, push all the locking/release levers on the top of the modules backward, align the module with the DIN35 rail and press the module in the direction indicated by the arrow. After fixing to the rail, push all the locking/release levers back. As shown in the figure below.

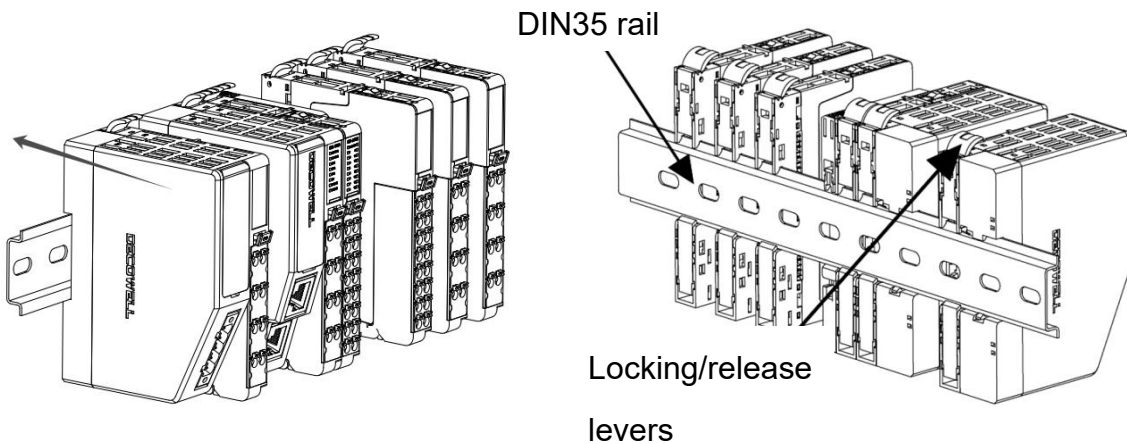


Figure 2-2-2 DIN rail installation diagram

Disassembly:

Use your hand to lift the locking/release lever upward, then pull the module away from the DIN35 rail.

lifting the locking/release lever

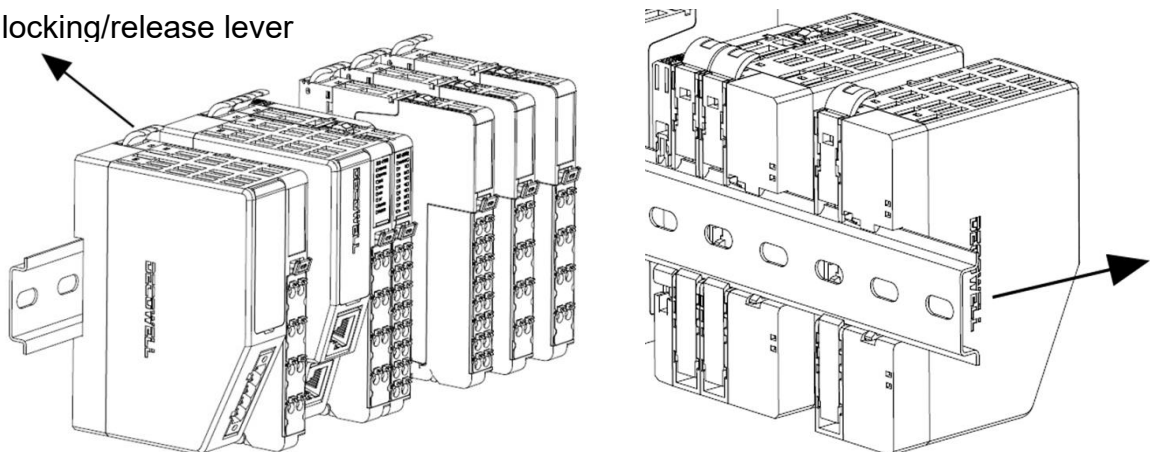


Figure 2-2-3 DIN rail disassembly diagram

The module is installed on a DIN rail. The DIN rail must comply with the IEC 60715 standard (35 mm wide and 1 mm thick). The dimensions are as follows:

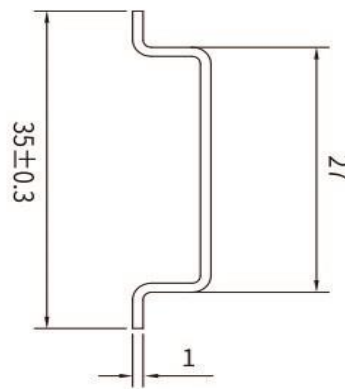


Figure 2-2-4 DIN35 rail dimensions



Notice

- If this product is installed on DIN rails other than those recommended above (especially the thickness of the DIN rail ≤ 1.0 mm), the DIN rail lock may fail, the product cannot be installed in place, and the product cannot work properly.

3. Electrical Installation

3.1 Cable Selection

In the table below, the wire diameter is for reference only. It can be reasonably calculated and adjusted based on actual usage.

Name	Compatible Wire Gauge		KST	
	Standard (mm ²)	AWG	Model	Crimping Tool
Ferrule Type	0.25	24	E0208	KST2000L
	0.5	20	E0510	
	0.75	18	E7510	
	1.0	18	E1010	
	1.5	16	E1510	

Stripping length: 8–10 mm

The shape and size requirements of the riveted terminals are shown in the figure below.

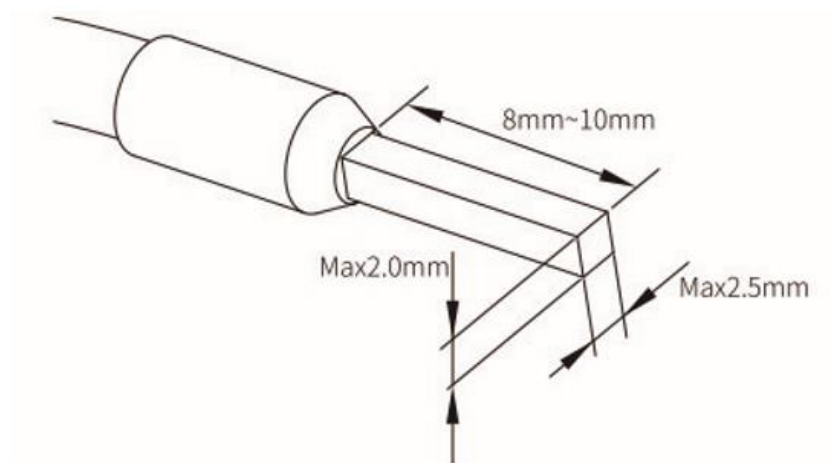


Figure 3-1-1 Terminal size requirements

3.2 Terminal Wiring

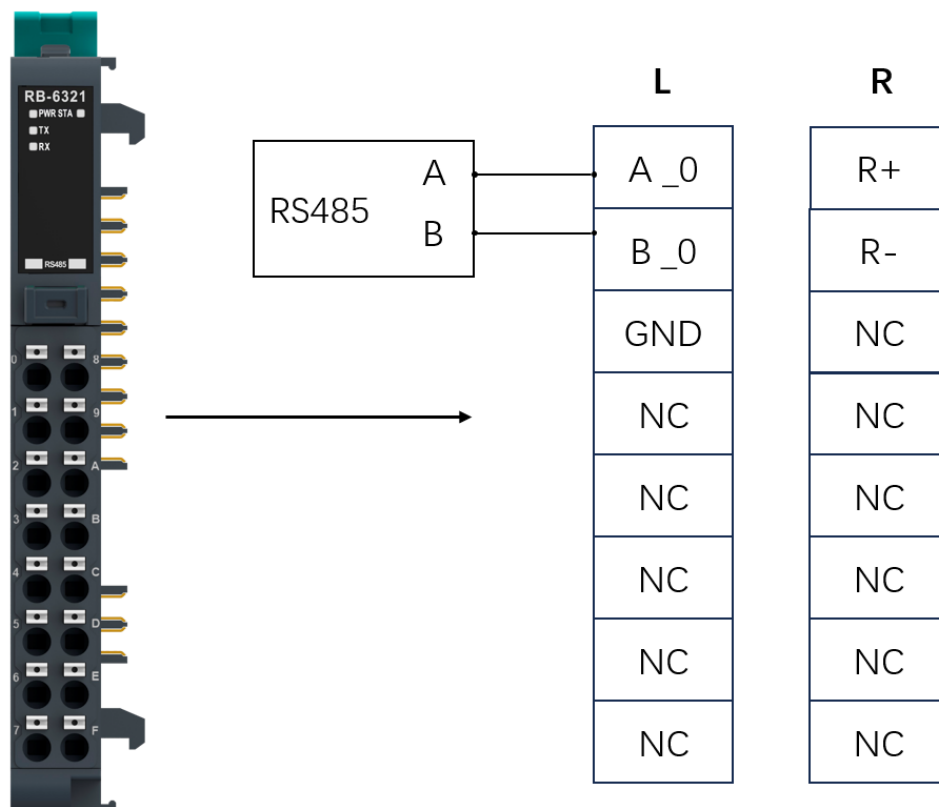


Figure 3-2-1 Module wiring diagram



Notice

- When routing extension cables, avoid bundling them together with power lines (high voltage, high current) and other cables that transmit strong interference signals. They should be routed separately and parallel runs should be avoided.
- Use recommended cables and adapter plates for connection. It is recommended to use shielded cables for extension cables to improve anti-interference capabilities.
- Must access GND line, otherwise it may cause communication failure.

4.Product Use Cases

4.1 Usage and configuration of RB-6321 in TwinCAT3

Install the XML description file to the path C:\TwinCAT\3.1\Config\Io\EtherCAT

	DECOWELL_FNS-1005-EC_V1.0.0.xml	修改日期: 2024/1/11 13:51 大小: 4.10 KB
	DECOWELL_LS-EC_V1.0.5.xml	修改日期: 2024/7/4 10:22 大小: 1.30 MB
	DECOWELL_MTC-1100_V1.0.3.xml	修改日期: 2024/7/29 9:25 大小: 590 KB
	DECOWELL_RB-1100_V1.1.1_20240805.xml	修改日期: 2024/8/26 9:31 大小: 1.08 MB
	DECOWELL_RS-EC2_Coupler_V1.0.8.xml	修改日期: 2024/7/17 16:12 大小: 309 KB
	DECOWELL_RX-1100_V1.0.8_20240725.xml	修改日期: 2024/8/19 10:21 大小: 750 KB
	DECOWELL_SDEC-8IOL-M12-00_BITARR_V1.0.7.xml	修改日期: 2023/11/6 16:46 大小: 781 KB

Figure 4-1-1 Install XML file

Open the TwinCAT3 software, select "File" > "New" > "Project" from the menu bar, and select "TwinCAT project" in the new project window.

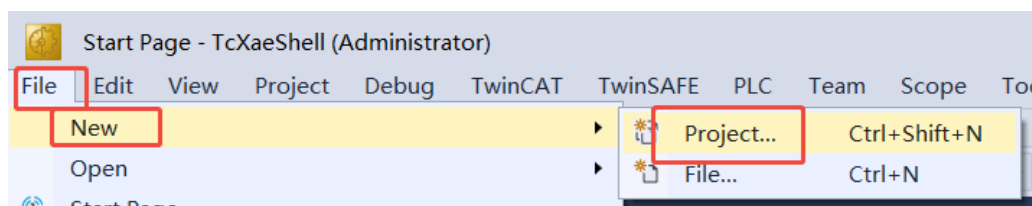


Figure 4-1-2 New Project

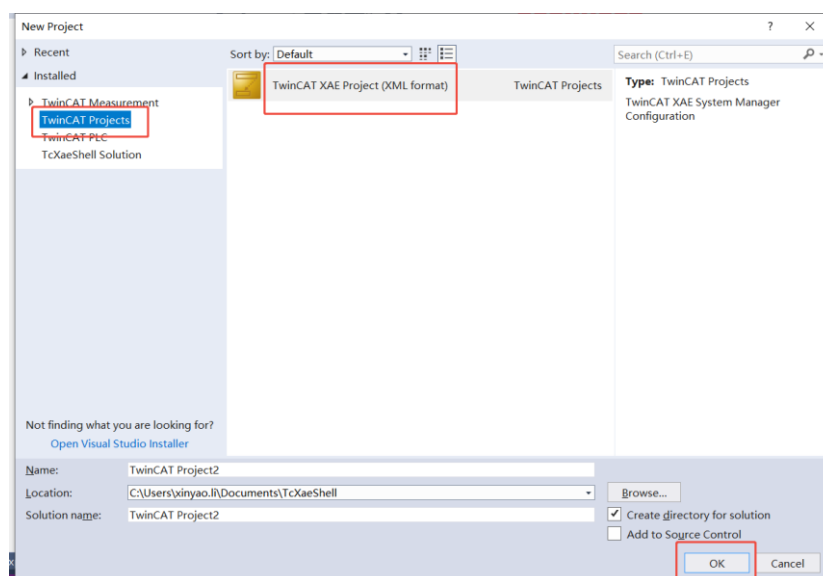


Figure 4-1-3 Create a new TwinCAT project

Scan the IO connected to the programming computer into the project. In the project tree, click “I/O” > “Devices” > “Scan” to scan the hardware configuration.

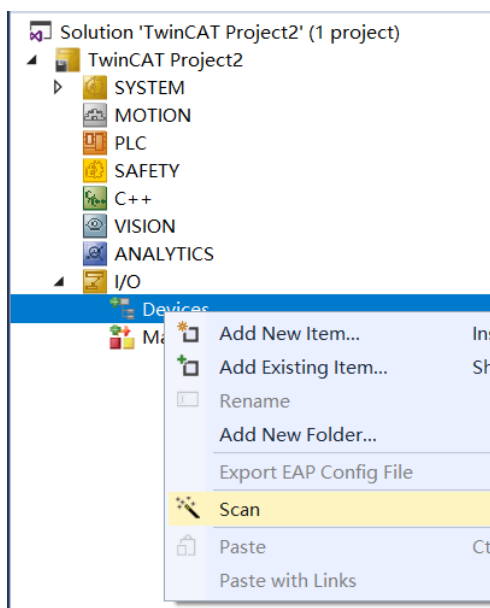


Figure 4-1-4 Add IO module

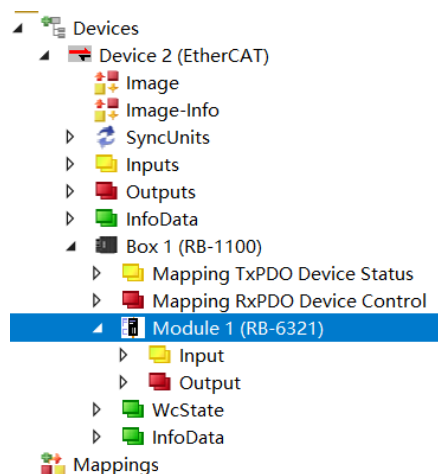


Figure 4-1-5 Hardware Configuration

Click the RB-1100 module to change the RB-6321 configuration parameters in COE Online, as shown in the figure.

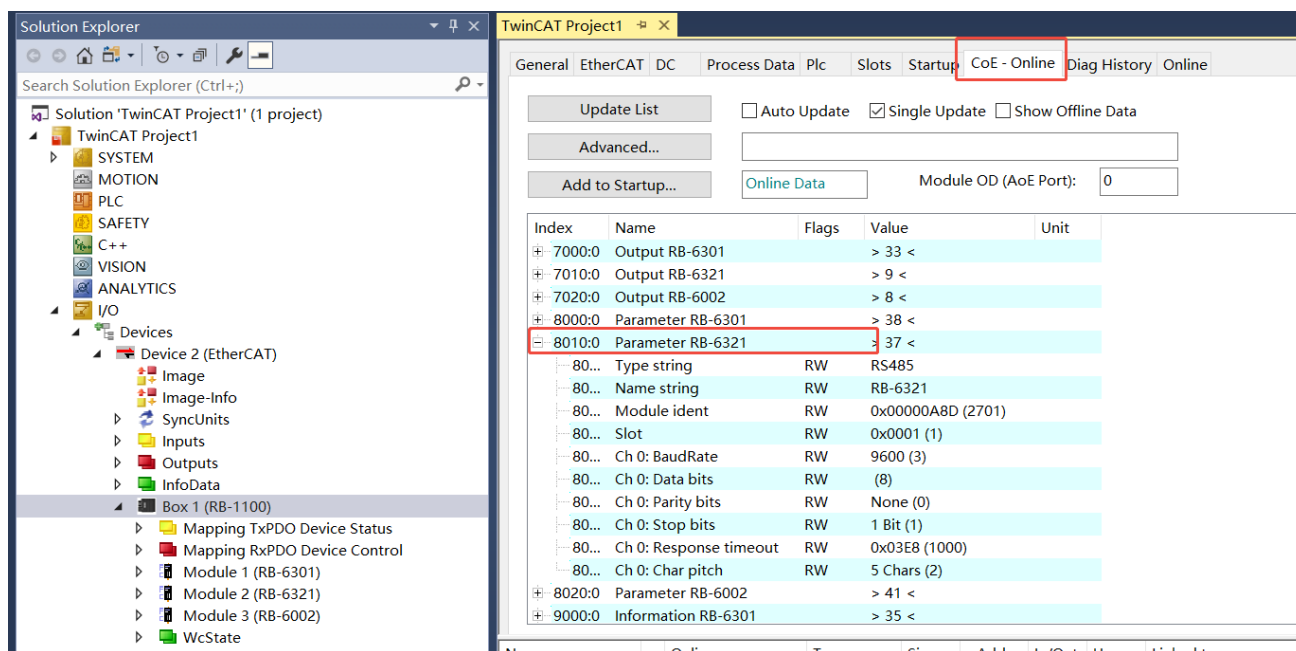


Figure 4-1-6 Module parameter changes

RB-6321 Configurable parameters

(baud rate, parity, stop bit, communication timeout, etc.)

Number	Parameter	Illustrate	Remark
1	Baud Rate	Baud rate	User selectable standard baud rates
2	Data Bits	Data bits	Fixed to 8 bits
3	Parity Bits	Parity	The default is no check, configurable
4	Stop Bits	Stop bits	The default is 1 bit
5	Response Timeout	Timeout settings	Communication timeout value setting, unit is ms
6	Char Pitch	Character length	The default is 5 char, user configurable

RB-6321 The functions and descriptions corresponding to the input and output addresses

Sending Area				
NO.	Name	Illustrate	Data Types	Remark
1	Control Byte	Data transmission enable	USINT/Bit	Bit0: Data transmission enable
2	Slave_ID	Modbus slave address	USINT	1-247(decimal)
3	Function	Modbus function code		Supported function codes: 01/02/03/04/05/06/15/16
4	Coil Or Register Quantity	The length of the data to be read or written		Number of registers: 1~4 Number of coils: 1~64
5	Address	Slave register address	UINT	0~65535
6	Data Out 1	Master sends data#1	UINT	Coil bit setting
7	Data Out2	Master sends data#2		
8	Data Out3	Master sends data#3		
9	Data Out4	Master sends data#4		

Receiving Area				
NO.	Name	Illustrate	Data Types	Remark
1	Status Byte	Status word	USINT/Bit	Bit0: Sending completion flag Bit1: Receive completion flag Bit2: Error flag
2	Slave Station Num	Modbus RTU Slave Address	USINT	Return slave address
5	Modbus Error Code	Modbus RTU communication error code	UINT	See the fault code table for details.
6	Data In1	Slave returns data #1		The slave register data read is returned
7	Data In2	Returning data from the slave#2		
8	Data In3	Returning data from the slave#3		
9	Data In4	Returning data from the slave#4		

For example, read Modbus RTU Slave#1 Register 40001/40002/40003/40004Data:

Slave_ID → 1 (slave address is 1)

Function → 03 (03 Function code reading)

Address → 00 (Starting address 40001, the corresponding address is 0)

Coil Or Register Quantity → 04 (Read 4 registers continuously)

Control Byte → TRUE (Data sending)

Slave#1 return register 40001/40002/40003/40004, the data are stored in:

Data In1, Data In2, Data In3, Data In4

For example, write data to ModbusRTU Slave#2 Register 40010/40011/40012/40013 are 100, 3000,80, 300:

Slave_ID → 2 (The slave address is 2)

Function → 16 (16 function code write)

Address → 00 (Starting address 40010 corresponds to address 0)

Coil Or Register Quantity → 04 (Write 4 registers consecutively)

Data Out1→ 100

Data Out2 → 3000

Data Out3 → 80

Data Out4 → 300

Control Byte → 0 to 1 (data sent)

Note: Control Byte from 1 to 0, The data of Data Out1-Out4 will be automatically cleared.

4.2 Usage and configuration of RB-6321 in TIA Portal

Start the TIA Portal V17 software and select "Create a new project". Select the name and path of the project to be created and click Create.

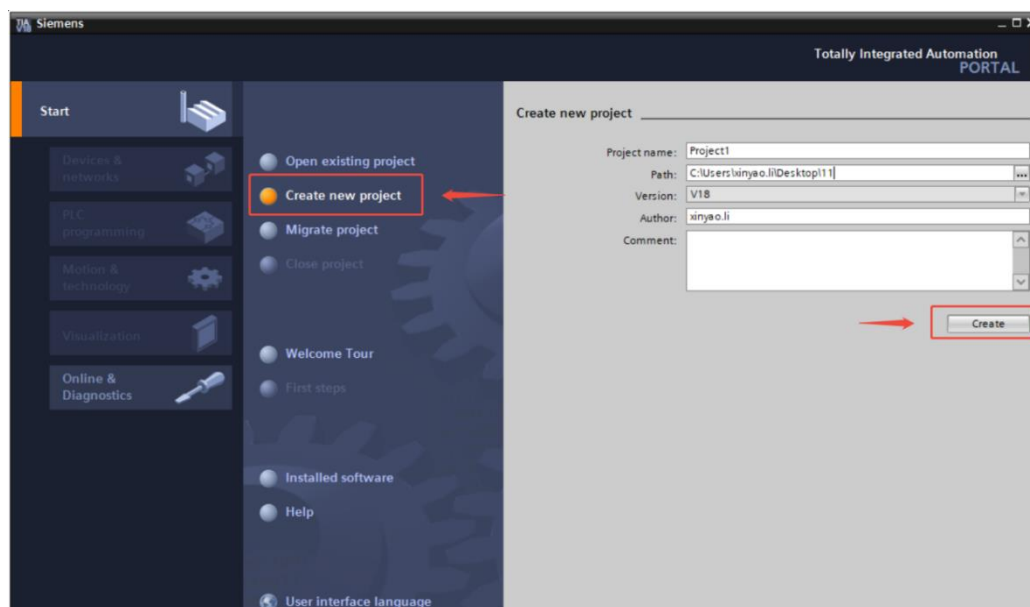


Figure 4-2-1 Create a new project

1. Select Devices and Networks, and click Add Device;
2. Select the PLC model (the PLC model used in the case is S7-1200)

3. Click Add.

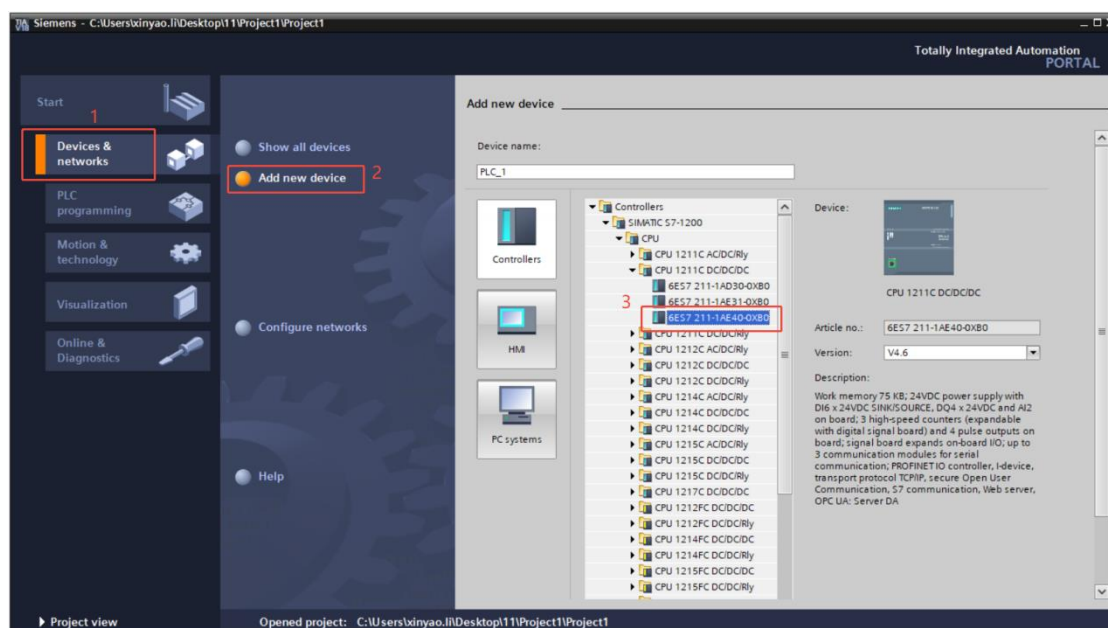
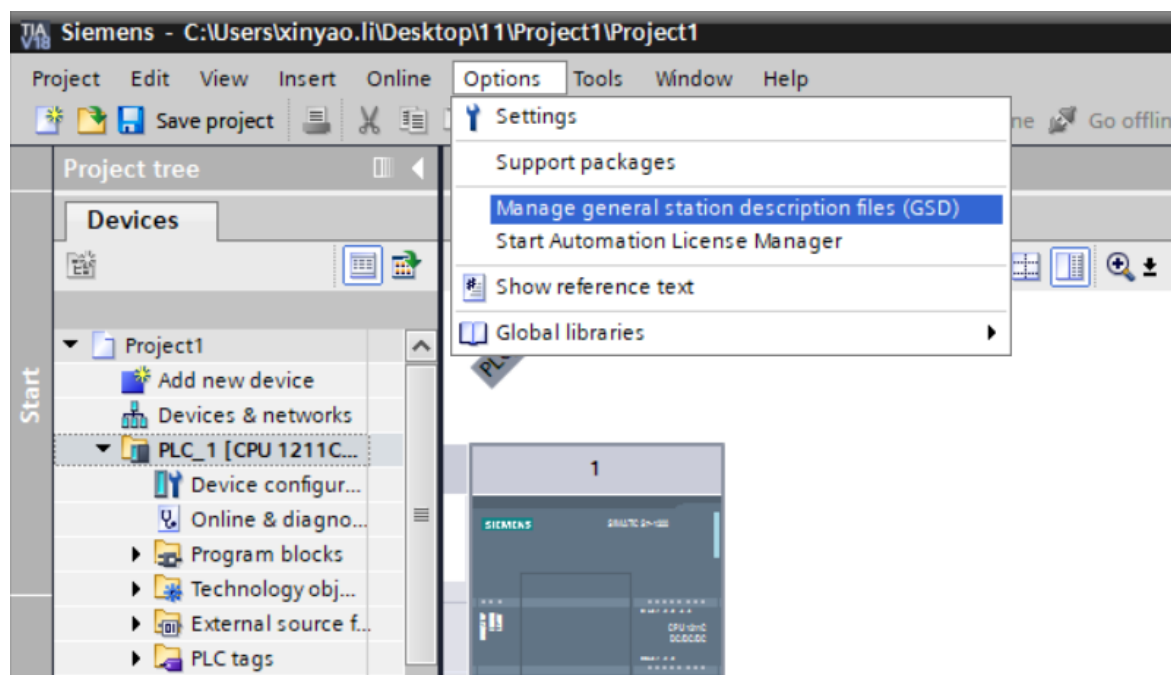


Figure 4-2-2 Add PLC

Add GSD file

1. Select the path where the GSD is stored;
2. Select the corresponding GSD file;
3. Click Install (the configuration example uses the RB -1110)



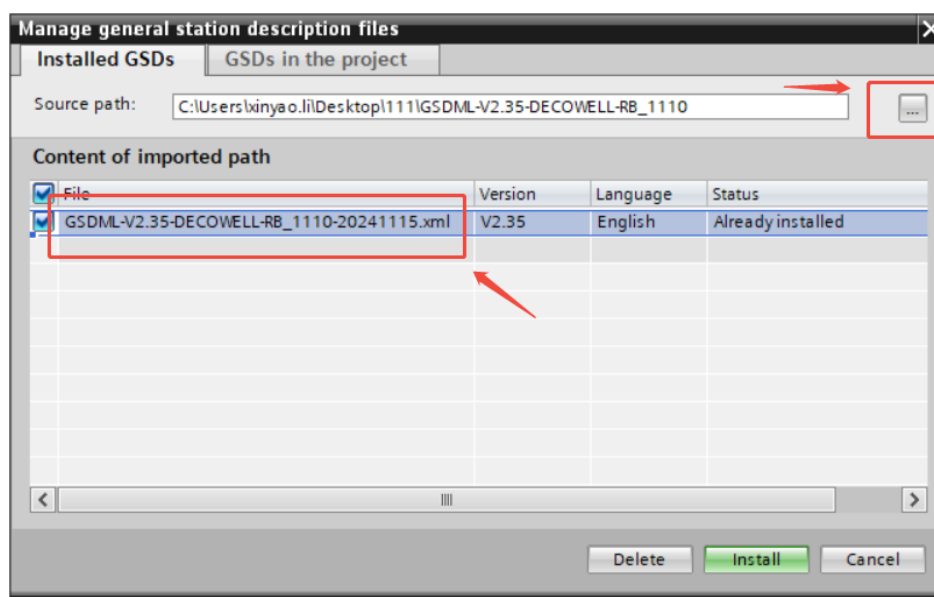


Figure 4-2-3 Add GSD file

Add PROFINET slave device:

1. Click Network View;
2. Click Other Field Devices;
3. Click PROFINET IO;
4. Click DECOWELL and select the RB -1110 module.

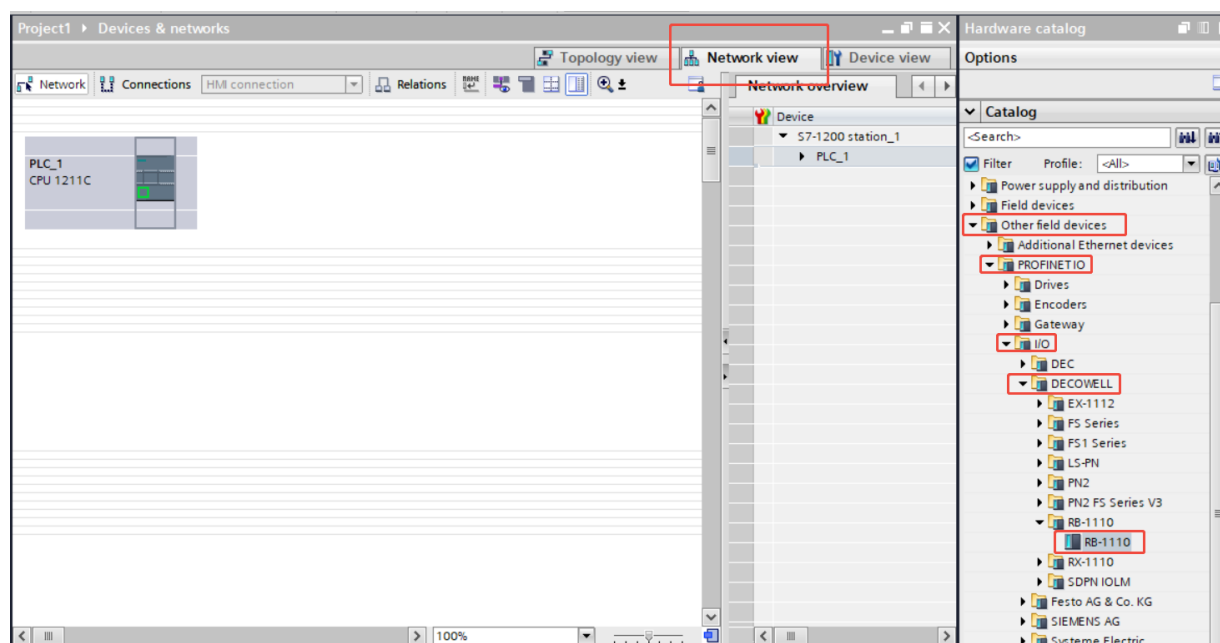


Figure 4-2-4 Manual Configuration

Connect the PLC and PROFINET slave devices. Click the Unassigned of the DEC module and click PLC -1. PROFINET interface.

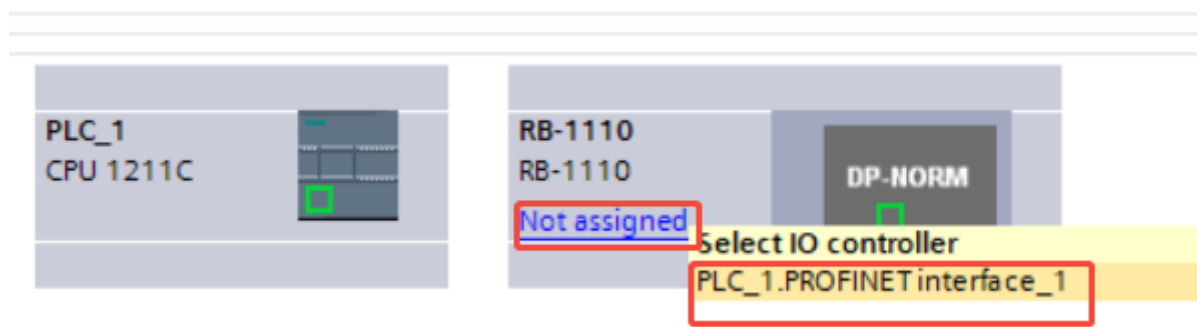


Figure 4-2-5 Network port allocation

Add a Modbus RTU master module. Double-click the added RB-1110 module in the network view, select the module FM, double-click to add RB-6321.

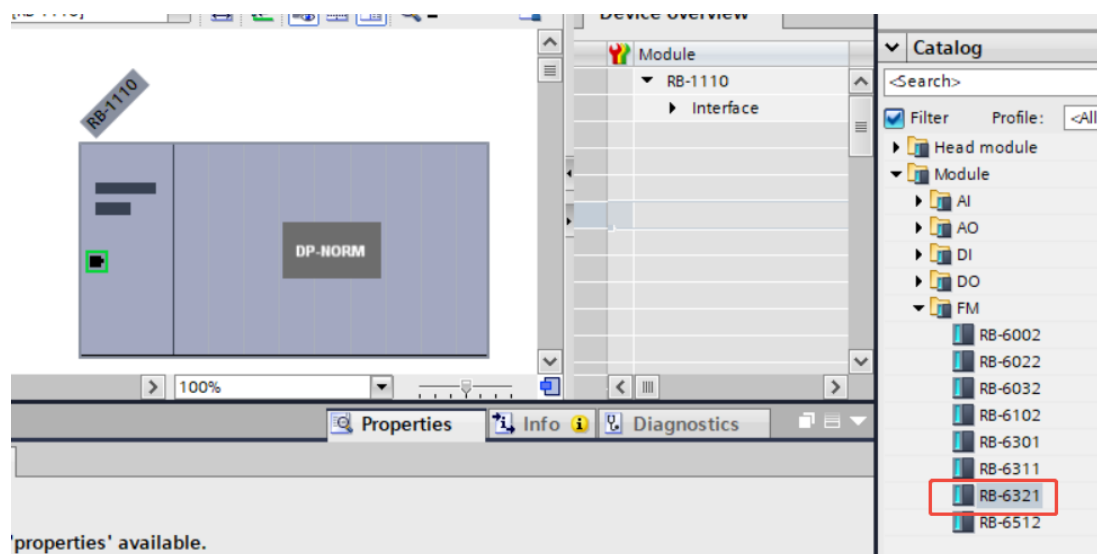


Figure 4-2-6 Manually add RB-6321Modules

Configuring RB-6321 communication parameters, click the RB-6321 module, you can set the parameters in the module parameters, as shown in the figure.

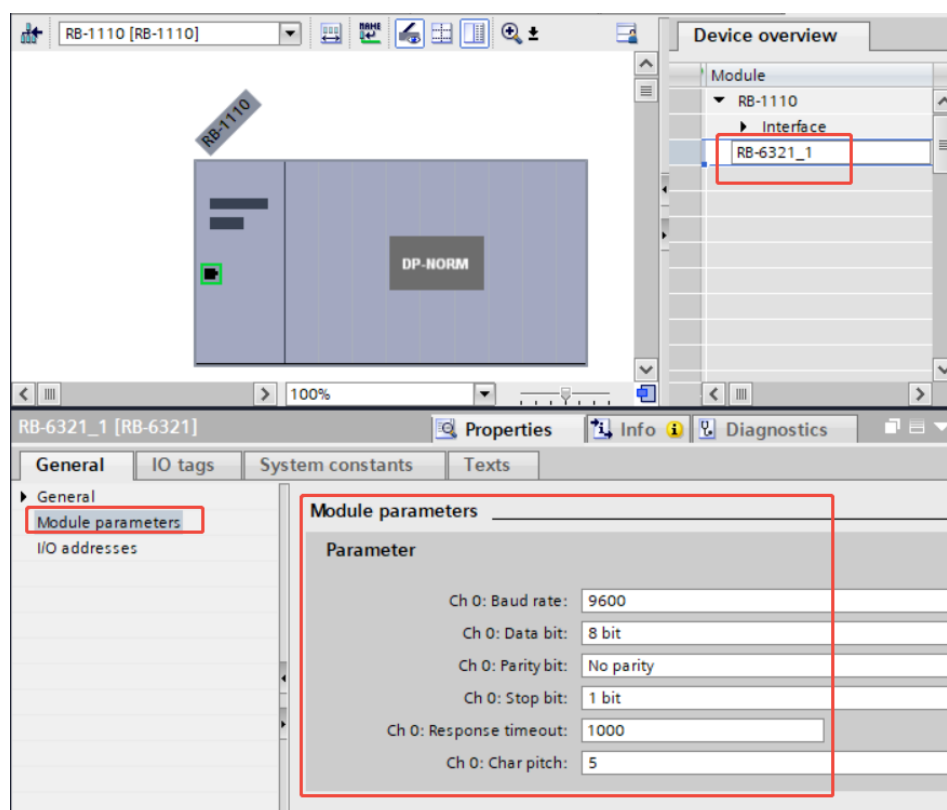


Figure 4-2-7 Parameter configuration

RB-6321 Configurable parameters

(baud rate, parity, stop bit, communication timeout, etc.)

NO.	Parameter	Illustrate	Remark
1	Baud Rate	Baud rate	User selectable standard baud rates
2	Data Bits	Data bits	Fixed to 8 bits
3	Parity Bits	Parity	The default is no check, configurable
4	Stop Bits	Stop bits	The default is 1 bit
5	Response Timeout Low	Timeout low byte	For example, the communication timeout is 1000ms, converted to 16Base 0x03E8, decimal value of E8 is 232
6	Response Timeout High	Timeout high byte	For example, the communication timeout is 1000ms, converted to 16Base 0x03E8, decimal value of 03 is 03

7	Char Pitch	Character length	The default is 5 char, user configurable
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The address allocation table of RB-6321(Modbus RTU Master Modules) in the case is shown in the following table. **Note: In the examples, the starting addresses of the input and output areas all start at 1**

Sending area (Q area)				
NO.	Address	Illustrate	Data Types	Remark
1	QB1 /Q1.0	Data transmission enable	USINT/Bit	0→1: Data transmission and reception 1→0 : Send and receive closed
2	QB2	MODBUS RTU Slave Address	USINT	1-247(decimal)
3	QB3	MODBUS function codes		Support function codes: 01/02/03/04/05/06/15/16
4	QB4	The length of the data to be read or written		UINT: Length value 1-4 Bit: Length value 1-64
5	QW5	Slave register address	UINT	0~65535
6	QW7	Master sends data #1	UINT	Coil bit setting
7	QW9	Master sends data #2		
8	QW11	Master sends data #3		
9	QW13	Master sends data #4		
Receiving area (Zone I)				
NO.	Address	Illustrate	Data Types	Remark
1	I1.0	Sending completion standard bit	Bit	0→1: Data sending completed
2	I1.1	Receive completion flag	Bit	0→1: Data reception completed

3	I1.2	Error flag	Bit	0→1: Module error
3	IB2	MODBUS RTU slave address return	USINT	Return slave address
4	IW3	MODBUS RTU Communication Error Codes	UINT	See the fault code table for details.
5	IW5	Slave returns data #1	UINT	Only valid when reading registers
6	IW7	Slave returns data #2		
7	IW9	Slave returns data #3		
8	IW11	Return data from the station #4		

Address allocation table

For example, read Modbus RTU Slave#1

Register 40001/40002/40003/40004 Data:

QB2 QB3 QW5 QB4 The corresponding data are:

01 03 00 04

(Slave station address Function code Slave station sender address Read data length)

Then Q1.0 Set to TRUE

In IW5/IW7/IW9/IW11 can view the register 40001/40002/40003/40004 data;

For example, for Modbus RTU Slave#2

Register 40010/40011/40012/40013 The written data are 100, 3000, 80, 300:

QB2 QB3 QW5 QB4 QW7 QW9 QW11 QW13 The corresponding data are:

02 16 00 04

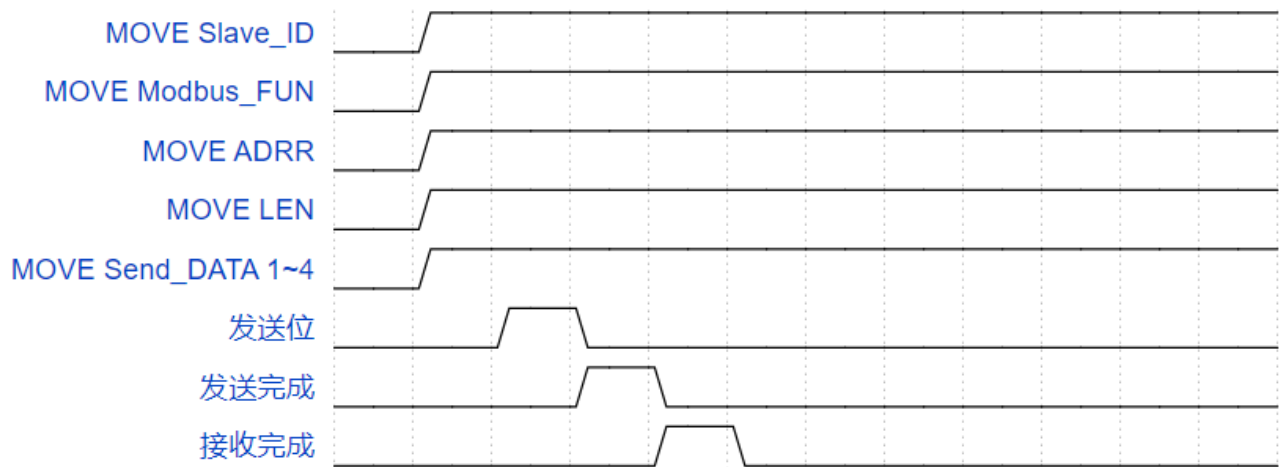
(Slave station address Function code Slave station sender address Write data length)

100 3000 80 300 (Data to be written)

The address corresponding to Start address 40010 is 0

Then Q1.0 Set to TRUE (**Q1.0 1→0, IW5/IW7/IW9/IW11 data will be automatically cleared**)

4.3 RB-6321 control timing diagram



5. Appendix

5.1 Fault Codes

Exception code	Name	Illustrate
01	Illegal function	The function code received in the query is an impermissible operation for the slave.
02	Illegal data address	The data address received in the query is not an allowable address for the slave.
03	Illegal data	The value in the data field is forbidden for the slave.
04	Slave Equipment failure	The slave station cannot respond to the message or abort error.
05	confirm	The slave station has been accepted and is being processed a long program task. A "probe" message should be sent. Check when the program is completed. If it is not yet completed, slave will issue a negative response to the "probe" message.
06	Busy, refused to execute	The message was received correctly, but the slave station is currently occupied executing a long program command. Please retransmit later when the slave station is available.
08	Memory parity mistake	The extended memory readout checks the memory bit being accessed. Recheck should be performed when the error does not recur. If all rechecks fail, repair should be performed.
0C	Illegal slave station number	Station number exceeds 247
0D	Slave response timeout	It may be that the slave station being queried is not online
0E	Response frame CRC check failed	Abnormal response frame from device

5.2 Function code definition

Function Code	Function	Functional meaning
0x01	Read	Reading digital outputs
0x02	Read	Read digital input
0x03	Read	Reading analog output
0x04	Read	Reading analog input
0x05	Write	Write a single digital quantity
0x06	Write	Write a single analog value
0x0F	Write	Write multiple digital quantities
0x10	Write	Write multiple analog quantities

5.3 RB-6321 Applicable Models

Adapter modules	Is it compatible with RB-6321?	Maximum number of mountable
RB-1100	√	4
RB-1110	√	4
RB-1120	√	4
RB-1130	√	4
RB-1140	√	4



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