



User Manual



APG Serial bus gateway

PROFINET Protocol transfer
MODBUS RTU RS485 master station
Model number: APG1502

CATALOGUE

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1.introduction

1.1 Usage of the document

This document describes product specifications, installation, operation, and configuration, as well as network protocols. This document is intended for use only by trained electrical automation engineers.

(1) Disclaimer

The author has made the necessary checks on the documentation, but with the development of the product upgrade, the documentation may contain technical parameters or editing errors, we reserve the right to make adjustments and changes without prior notice to the user.

(2) Trademarks

PROFINET® is a registered trademark of the PI Association

(3) Patent description

The designer of this product has applied for patent protection for the appearance and technical implementation of the product, and any attempt to copy, copy or reverse design may violate the law.

(4) Copyright

Do not copy, distribute, or use this document without the authorization of the author.

1.2 Security Matters

This product is a professional equipment used in industrial occasions, and only staff with electrical operation experience can use it.

Please read this manual carefully before use and follow the instructions to avoid personal injury or product damage.

1.3 Document History

《IEC11631-22007 Programmable controllers –Part 2:Equipment requirements and tests》 ;

《IEC/TR 61158 Industrial Communication Network - Fieldbus Specification》 ;

《 IEC61784-1 Industrial Communication Network - Industry regulations Part I Fieldbus Industry Regulations》 ;

《PNO-7.352, PROFINET IO Device Integration, Guideline for PROFINET, Version 1.0, October 2014,PROFIBUS & PROFINET International, Order Number 7.352》



2.Specification parameter

2.1 APG1502 Parameter Table

PROFINET Communication parameters		
Serial number	item	argument
1	agreement	PROFINET RT (IEC 61158 Type3)
2	Transmission rate	10/100 Mbaud, automatic identification of transmission speed
3	Bus interface	Dual RJ45 switch (IEEE 802.xx standard industrial Ethernet with auto-negotiation and auto-cross)
4	Correspondence address	Unique MAC address in the world
5	Transmission cable	CAT5e Shielded cable
7	Port protection	Transformer isolation, 1500V DC (IEC61000-4-2)
Modbus Communication format		
1	Transmission mode	Modbus _RTU Master
2	Physical interface	Open connector 5-pin (with terminal resistance interface)
3	Baud (kbps)	2400,4800,9600,19200,38400,57600,115200
4	Function code	01H、02H、03H、04H、05H、06H、0FH、10H
Other parameters		
1	Overall dimension	(W) 31*(H)118* (D) 86mm
2	Installation mode	DIN35mm guide rail
3	Class of protection	IP20
4	Ambient temperature	Transportation and storage: -40°C ~ +70°C Operating temperature: -20°C ~ +55°C
5	Supply voltage	24 VDC(±20%)
6	Rated current	110 mA (24 VDC)



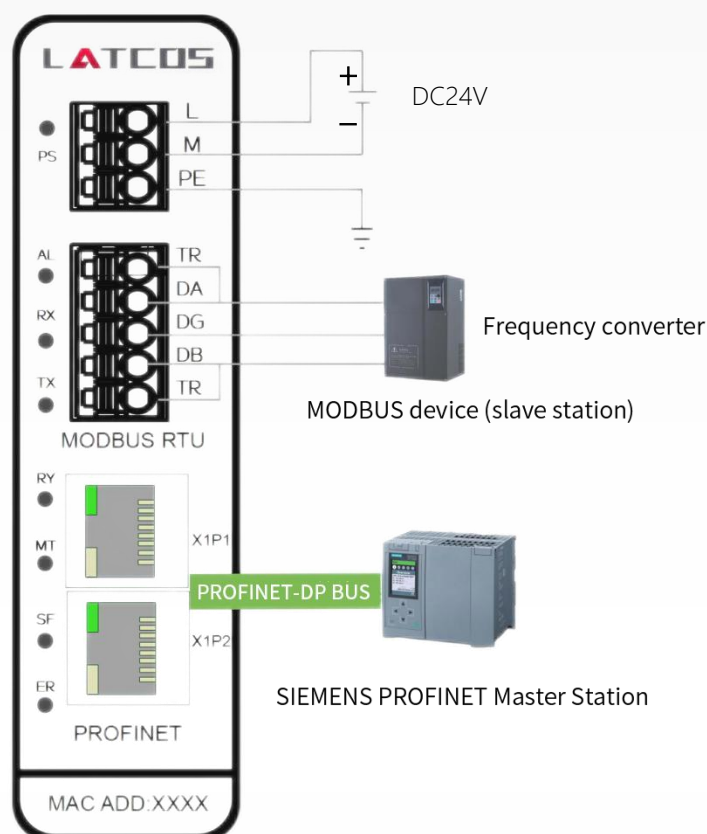
3.Hardware description

3.1 Appearance introduction



3.2Indicator meaning

LED indicators are divided into three types of indicators. These include power indicator, Modbus status indicator, profinet status indicator, as defined in the table below



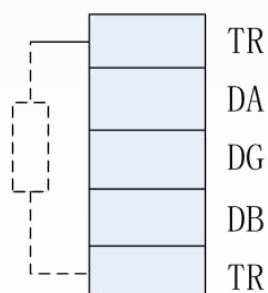
LED indication definition

name	colour	Instructions
PWR	green	Power indicator light
AL	red	The Modbus communication is abnormal. Data timed out or data received incorrectly
RX	green	Modbus has data to accept
TX	green	Data is sent by Modbus. Procedure
RY	green	The module enters the operate state and successfully establishes cyclic data exchange with the master station
MT	green	There is a maintenance request for the LED indicator module
SF	Red light	System failure - Module hardware failure or software failure
ER	Red light	The Profinet bus is not in the correct mode: there is a communication, running error, or a communication timeout detected by the communications timing monitor (watchdog).

3.3 Modbus Communication interface

The module uses its own wiring sockets as the physical interface for Modbus communication, and two of the TRS are terminal resistance selective wires. A $120\ \Omega$ terminal resistor is integrated into the internal module. When TR1 is with DA, TR2 is with DB short-circuited terminal resistor effective. The following table describes the interface definitions

Definition of Modbus terminals



lead	signal	Description
1	TR1	Terminal resistance select wiring
2	DA	Receive/send data, Line A (red)
3	DG	statistically
4	DB	Receive/send data, Line B (red)
5	TR2	Terminal resistance select wiring



4.Protocol conversion

4.1 Status register

status is the status register of the gateway

The definition is as follows:

Bit: 7	Bit: 6	Bit: 5	Bit: 1...4	Bit: 0
reserve	Reception error	Overtime	Error code	Running state

关于 Bit: 1...4 的错误码说明

Bit: 4	Bit: 3	Bit: 2	Bit: 1	It is expressed in base 10	Description
0	0	0	0	0	infallibility
0	0	0	1	1	Illegal registered address
0	0	1	0	2	Illegal parameter
0	0	1	1	3	Received data error
0	1	0	0	4	Send timeout error
0	1	0	1	5	The host is busy at the moment
0	1	1	0	6	Execution function error

4.2 Control register

control is the control register of the gateway

The definition is as follows:

Bit: 3..7	Bit: 2	Bit: 1	Bit: 0
reserve	Reset gateway	Error clearing	Start/stop



5.Product use

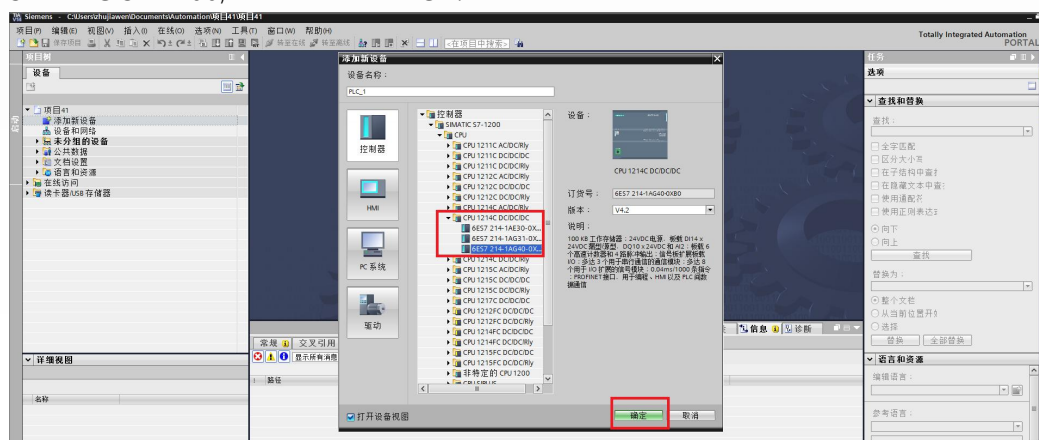
The following describes the configuration parameters of the module based on the TIA PORTAL software of Siemens.

5.1 Installation of GSDML files

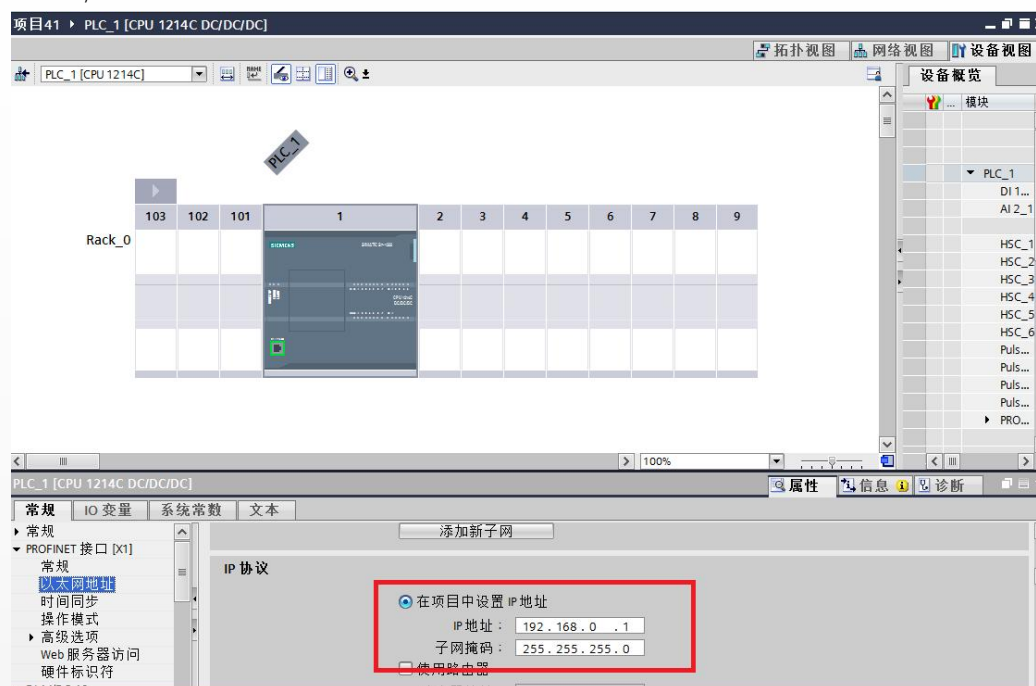
In the dropdown menu of Boto software, click "Options-Manage common station description file", find the directory where the gateway GSDML file is stored in the source path, click Install, and wait for the update of the hardware directory.

5.2 Hardware configuration

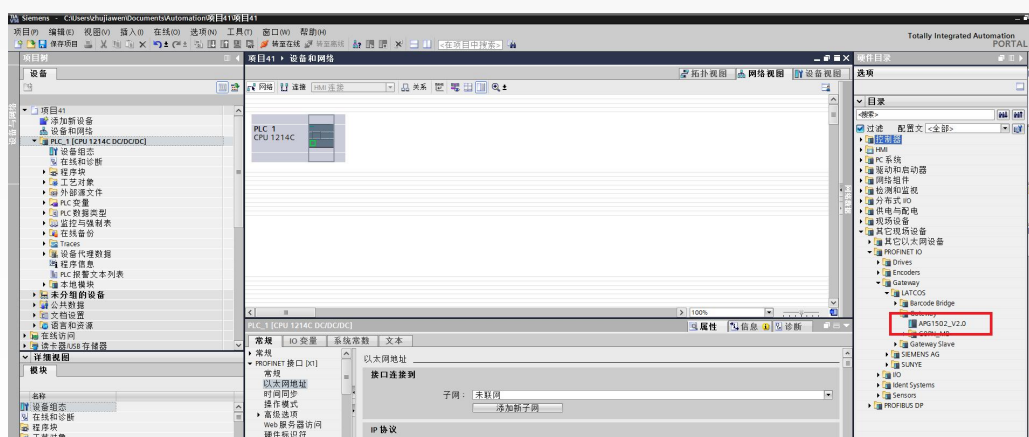
① Take the S7-1200 as an example, first click Add new device, then add a 1214C CPU in SIMATIC S7-1200, and then click OK.



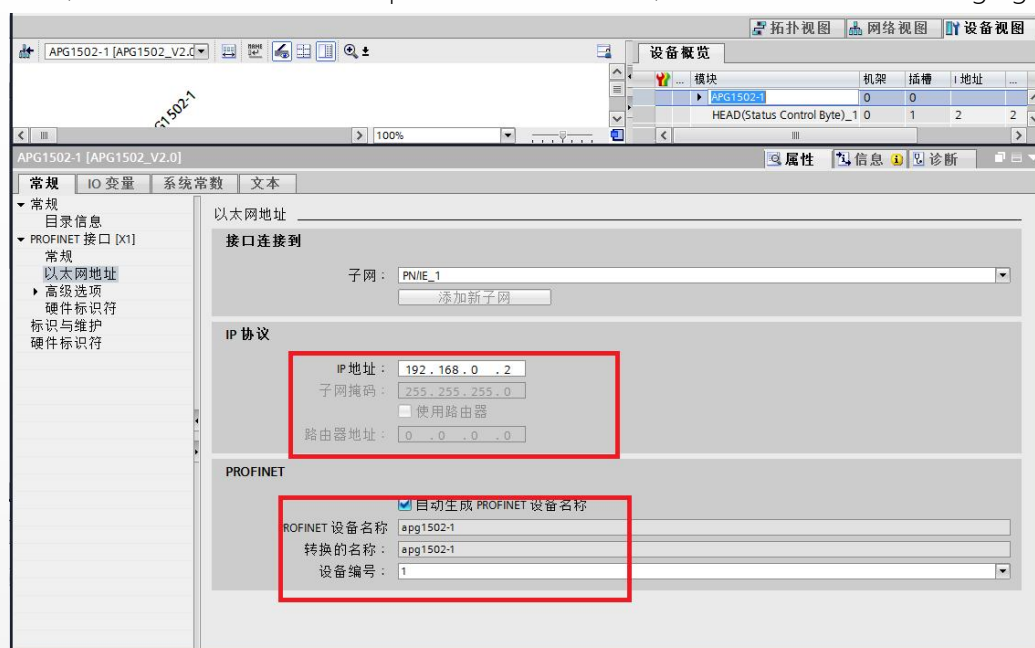
② Click Add a new subnet. The IP address must be the same as the CPU address. In this case, the 1200 address is 192.168.0.1.



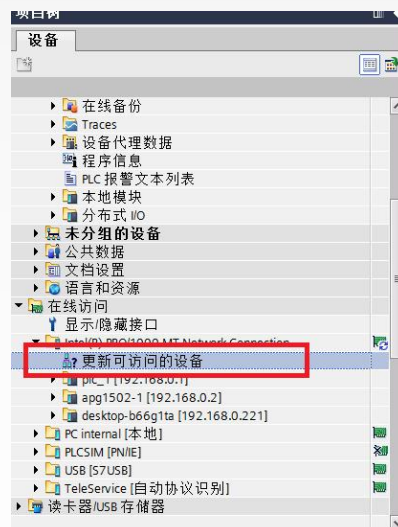
③ In the network view, click other field devices, IO/GateWay/LATCOS under PROFINET IO/GateWay/APG1502_V2.0, the APG1502_V2.0 drag in the network view, then right-click the undistributed, assigned to a new I/O controller.



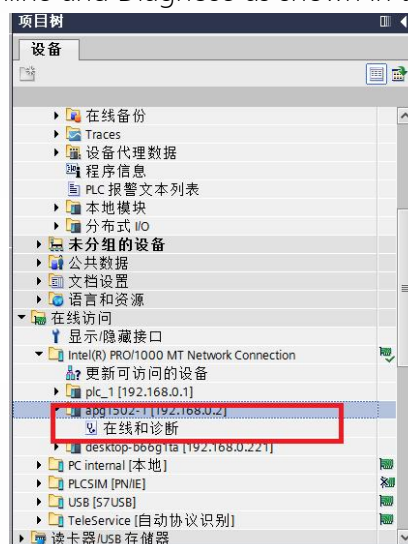
④ Distributed IO name assignment, click Properties, open properties, in the Ethernet address, view the IP address and profinet device name, as shown in the following figure



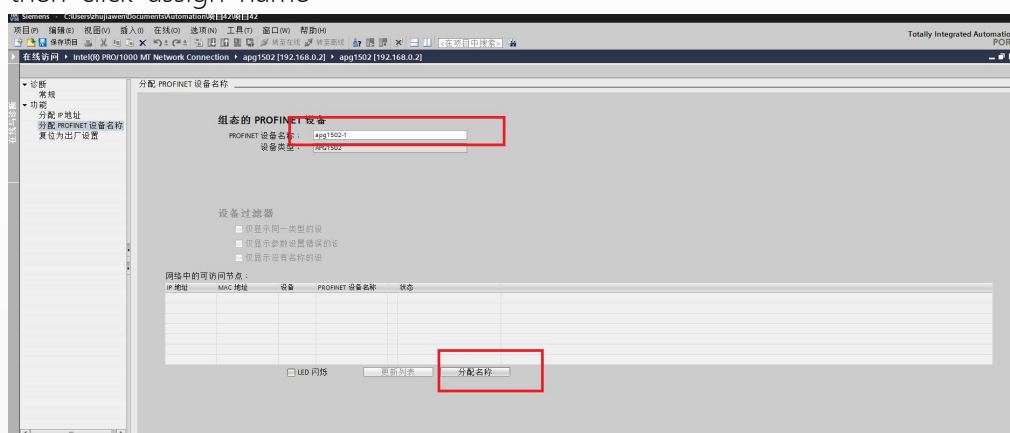
⑤ Device name assignment method: Click Online Access, click under the network adapter to update accessible devices



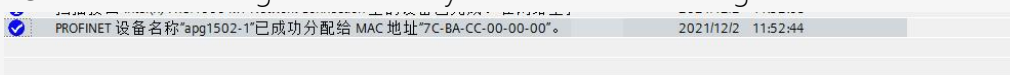
Right click and click Online and Diagnose as shown in the picture below



As shown in the picture below, click assign name, then assign device name, and then click assign name



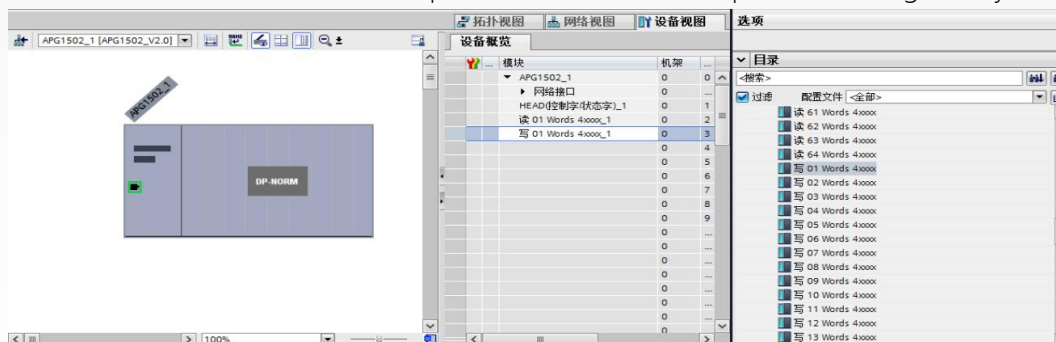
Confirm the message bar notifies you of a successful assignment name



Note: The device name must be consistent with the device name in the configuration topology.

5.3 Message setting

In the network view, select the packet command to be placed in the gateway slot

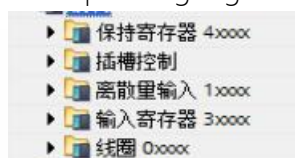


Specific operation:

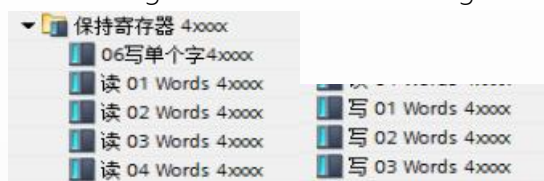
Open the Hardware Directory module drop-down menu - "Select the directory corresponding to the MODBUS function code -" Select the desired packet and double-click it to place it in the slot of the gateway. A slot supports a maximum of 56 packets

(1), select the packet description

Register area classification: Select the corresponding communication message in the corresponding register area.



** Saves register area related messages



There are three types of messages in the hold register

A, 06 Write Single Word 6xxxx: corresponding to modbus function code 06 (hexadecimal)

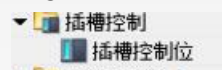
B, Read 01 Words 4xxxx (Read 01 Words 4xxxx) : corresponding to modbus function code 03 (hexadecimal)

(01 Words indicates one word. If you need to read two Words, select 02 Words.)

C, Write 01 Words 4xxxx (Write 01 Words 4xxxx) : corresponding to modbus function code 10 (hexadecimal)

(01 Words indicates one word. If you need to read two Words, select 02 Words.)

** Slot control



Slot control: sends packets to the corresponding slot and monitors the status of the slave station. There should be input word I (4words) and output word Q (4words)

Input word I indicates the status of the reply message from the slave station: 0 indicates normal, 1 indicates error.

Enter the word Q to control the sending of packets: 0 for not sending, 1 for sending.

For example:

模块	机架	插槽	I 地址	Q 地址
APG1502	0	0		
网络接口	0	0 X1		
HEAD(控制字/状态字)_1	0	1	8	8
插槽控制位_1	0	2	9...16	9...16
读 01 Words 4xxxx_1	0	3	17...18	
06写单个字4xxxx_1	0	4		17...18

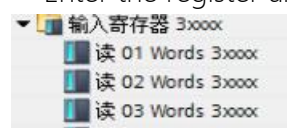
As shown in the figure, the I input word for slot control assignment is 9... 16, Q output word is 9... 16

I9.0: indicates the communication status of slot 3, and Q9.0 indicates the control of slot 3.

I9.1: indicates the communication status of slot 4, and Q9.1 indicates the control of slot 4.

And so on.

** Enter the register area related message



The input register has one type of message

Read 01 Words 3xxxx (Read 01 Words 3xxxx) : corresponding to modbus function code 04 (hexadecimal)

(01 Words indicates one word. If you need to read two Words, select 02 Words.)

** Discrete input area related packets

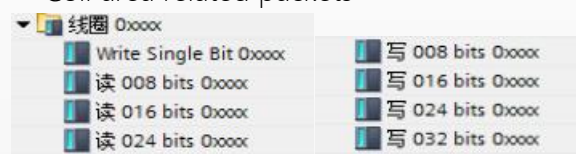


Discrete input indicates one type of packet

Read 008 bits 1xxxx (Read 008 bits 1xxxx) : corresponds to the modbus function code 02 (hexadecimal).

(008 bits indicates 8 bits. If you want to read 16 bits, select 016 bits.)

** Coil area related packets



The coil has three types of messages

A, Write Single bit 0xxxx (Write Single Bit 0xxxx) : corresponding to the modbus function code 05 (in hexadecimal)

B, Read 008 bits 0xxxx (Read 008 bits 0xxxx) : corresponds to the modbus function code 01 (hexadecimal).

(008 bits indicates 8 bits. If you want to read 16 bits, select 016 bits.)

C, Write 008 bits 0xxxx (Write 008 bits 0xxxx) : corresponds to the modbus function code 0F (hexadecimal).

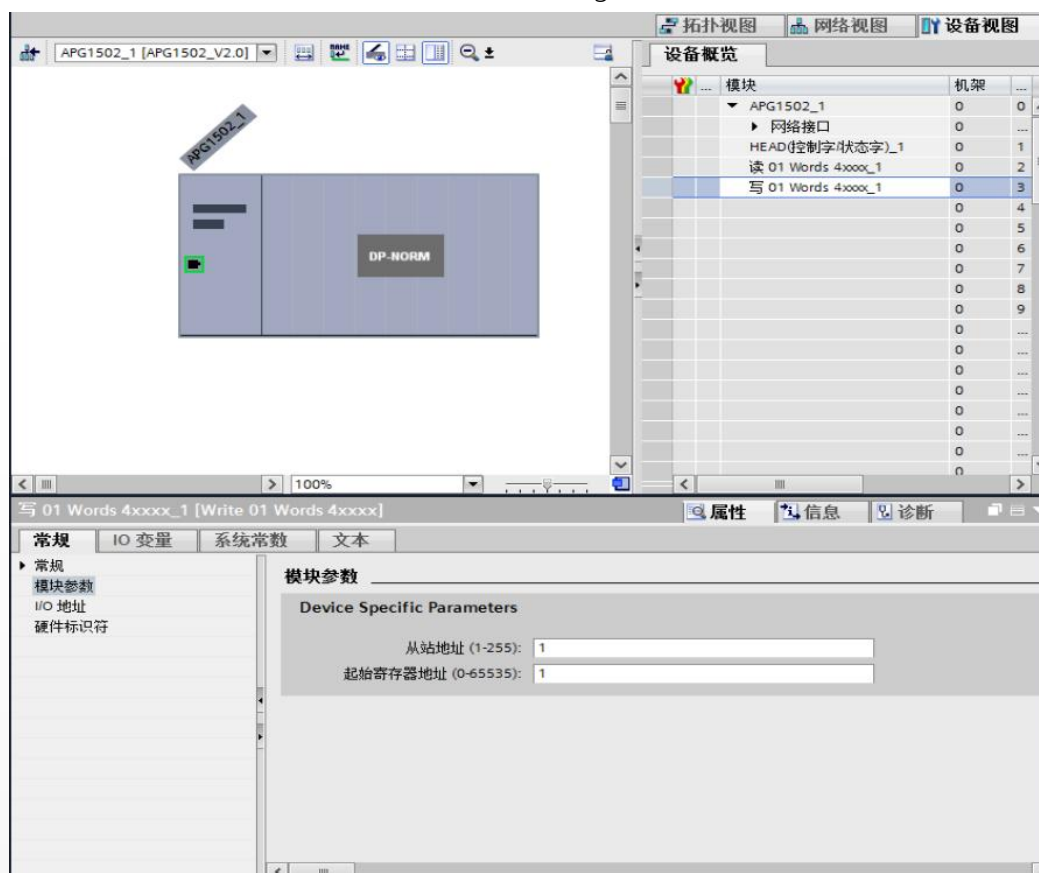
(008 bits indicates 8 bits. If you want to read 16 bits, select 016 bits.)

(2) Packet parameter Settings

Double-click the slot where the packet is placed and select Module Parameter from the drop-down list. In the list below

SLave Address: indicates the address of the slave station corresponding to the packets in the slot. (base 10)

Start Address: indicates the start address of the register. (base 10)



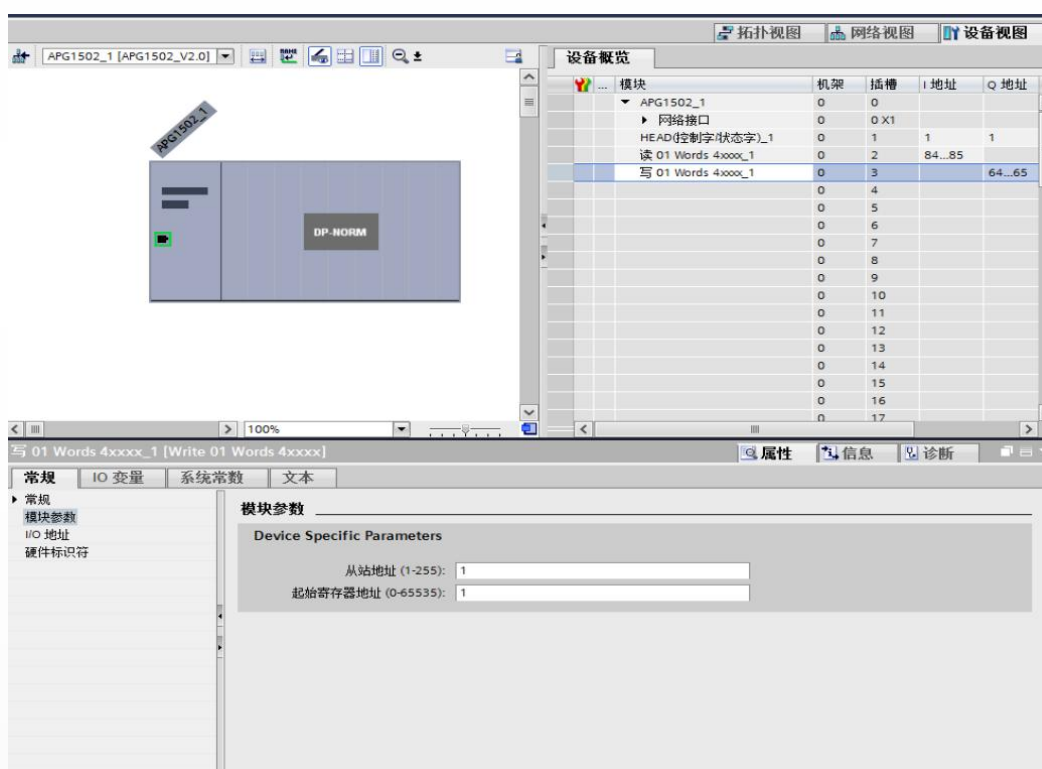
(3) Set communication parameters and enable gateway

- Communication parameter setting

Double-click "Module Parameters" in the "HEAD(Status Control Byte)" drop-down list in the slot. The configuration of gateway communication parameters can be seen in the list on the right. The communication parameters of the slave station must be consistent with those of the master station.

- Gateway is enabled

There are corresponding areas I and Q in the Status Control Byte (HEAD) of the slot. The communication status parameter stored in %IW1 in the figure above does not need to be processed in general. %QW1 is the gateway enable signal. %QW1 sends packets to the slave station only when the gateway is set to 1 at the lowest level. That is, when %Q1.0: =1, the Modbus communication between the gateway and the slave station takes effect





6.Product use examples

Requirement description

- 1.Communication Object inverter (Address 2)
- 2 .Read the operating frequency (H1002), bus voltage (H1003), output voltage (H1004);
- 3 .Set the operating frequency of the inverter (H1002);
- 4 .Control the start and stop of the inverter (H2000);

(1) Insert command 3

- Read 03 Words 4xxxx(read command corresponding to Modbus function code 03H) (read bus voltage and output voltage)
- Write Single Word 4XXXX (Write command corresponds to Modbus function code 06H) (Set running frequency)
- Write Single Word 4XXXX (write command corresponding to Modbus function code 06H) (control the start and stop of the inverter)

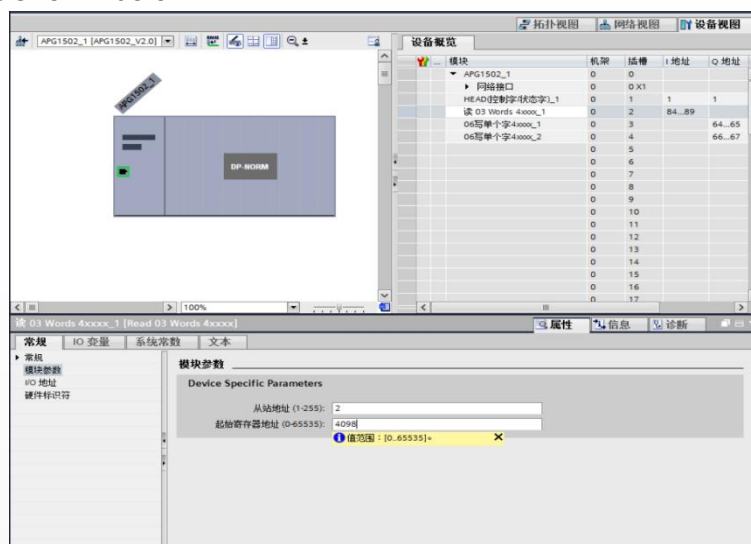
(2) Set read command parameters

- Double click the first read command message in the slot. Set the Slave Address =2 (the address of the inverter) "Start Address" =4098 (H1002 =K4098) in the module parameters to read two words continuously
- Double click the second write command message in the slot to set Slave Address =2 (address of the inverter) Start Address =4098 (H1002 =K4098) in the module parameter
- Double click the third write command message in the slot to set Slave Address =2 (the address of the inverter) Start Address = 8192 (H2000=K8192) in the module parameter

(3) Start G0PN_MB

%Q2.0=TRUE Enable gateway

The read content and the content to be written are placed in the I and Q sections respectively as shown below



The read content is placed at IB84----IB89

That is IW84----- Operating frequency IW86----- Bus voltage IW88----- output voltage

Write content is placed in QB64-- QB67

That is, when QW66 writes H01, the inverter runs in positive rotation, and when 05H is written, the inverter stops freely (assuming that H2000 sends H01 forward operation and H05 stops freely, different brands of inverters may be different)

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