用户手册

EPC-CM37-PROFIBUS-DP通信卡

EPC-CM37-PROFIBUS-DP Communication Card User Manual

For GK 900

Version: A00

colophon

edition	Change the content
A00	The first edition was released

Disclaimer

This product document is accurate and reliable at the time of release, and GTAKE Electric reserves the right to change the product specifications described in this manual without notice.

Technical support

If you need assistance with installing and configuring products, please contact GTAKE Electric.

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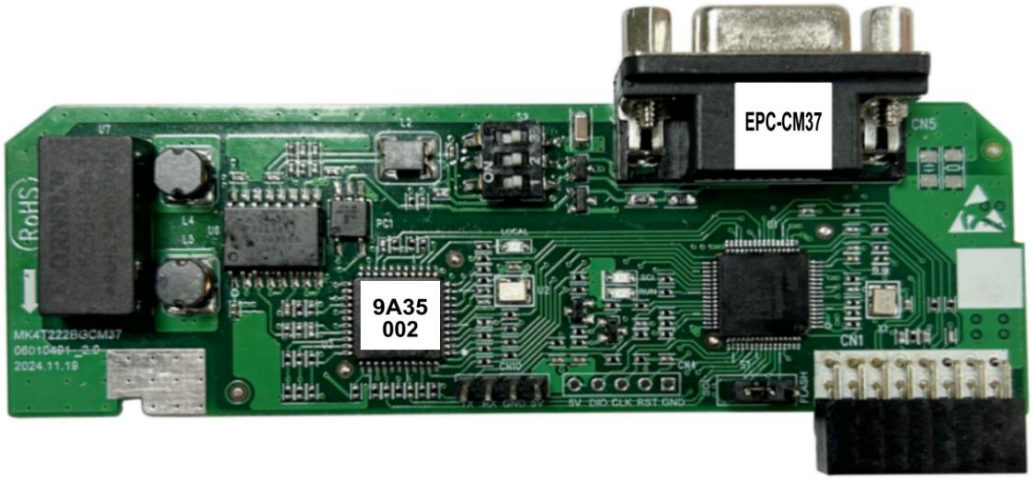
Preface:

The purpose of this manual is to guide the user to read the relevant parameters of the specific frequency converter (please specify the inverter model or series in the Siemens S7-120 series PLC). The manual content is divided into three parts:
Part 1: PROFIBUS-DP communication basis: introduce the basic knowledge of PROFIBUS-DP communication in detail, including its principle, protocol characteristics and other related instructions, to provide a theoretical basis for the subsequent operation and application.
Part 2: Application method of PROFIBUS-DP card in the system: explain the main application mode of PROFIBUS-DP card in Siemens S7-1200 series PLC and inverter communication system, including hardware connection, parameter configuration and other contents.
Part 3: Operation process: With clear and understandable steps, guide users to complete the specific operation process of reading inverter related parameters in Siemens S7-1200 series PLC through Botu software, and may include solutions to common problems.

Through this manual, users are able to systematically understand PROFIBUS-DP communication and master the complete method to read the inverter parameters in Siemens S7-1200 series PLC using Botu software.

1. Basic description

1.1 Product profile diagram



1.2 Description of the jumper switch

Jump line switch	functional description	Factory setting
S1	The CM37 program function selection Flash: Normal mode SCI: burning mode	Flash
S2	PROFIBUS-DP communication terminal resistance selection ON: Select terminal resistance (all three choices) OFF: No terminal resistance (all three)	OFF

If DP head is selected Note: If the DP head on the cable has selected the terminal resistance, select OFF at S2 of the CM37 card. If the DP head on the selected cable does not have terminal resistance or terminal resistance and is not selected, the terminal resistance at S2 should be dialed to on.

1.3 Basic characteristics of transmission technology

① Network topology: linear bus, with active bus terminal resistance at both ends.

② Media: shielded twisted pair cable can also be cancelled, depending on environmental conditions (EMC).

③ Number of stations: 32 stations per section (without relay), up to 127 more stations (with relay).

④ Plug connection: 9-pin D-type plug, and the connector pin is allocated as

shown in the table.

It is recommended to use the standard DB9 connector produced by SIEMENS company. If the communication wave rate is greater than 187.5kbps, please strictly refer to the wiring standard of SIEMENS. Up to 32 stations (main or slave stations) can be connected on each segment. When more than 32 segment stations exist, a repeater must be used to connect each bus segment. There are generally no more than three repeaters in series.

1.4 Definition of connector plugs and pins

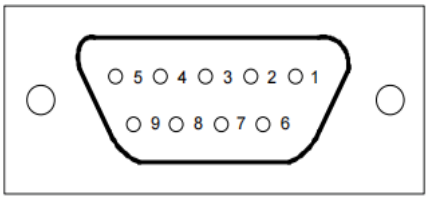


Figure 1.4 Connector plug

Pin of connector plugs		Explanation
1	--	Not used
2	--	Not used
3	B-Line	Data plus(Twisted pair1)
4	RTS	Send request
5	GND_BUS	Isolated GND
6	+5V BUS	Isolated 5DC Electricity supply
7	--	Not used
8	A-Line	Data plus(Twisted pair2)
9	--	Not used
Housing	SHLD	PROFIBUS-DP Cable shielding wire

Table 1.4 Description of the connector pin

1.5 PROFIBUS-DP Schematic diagram of the bus connection

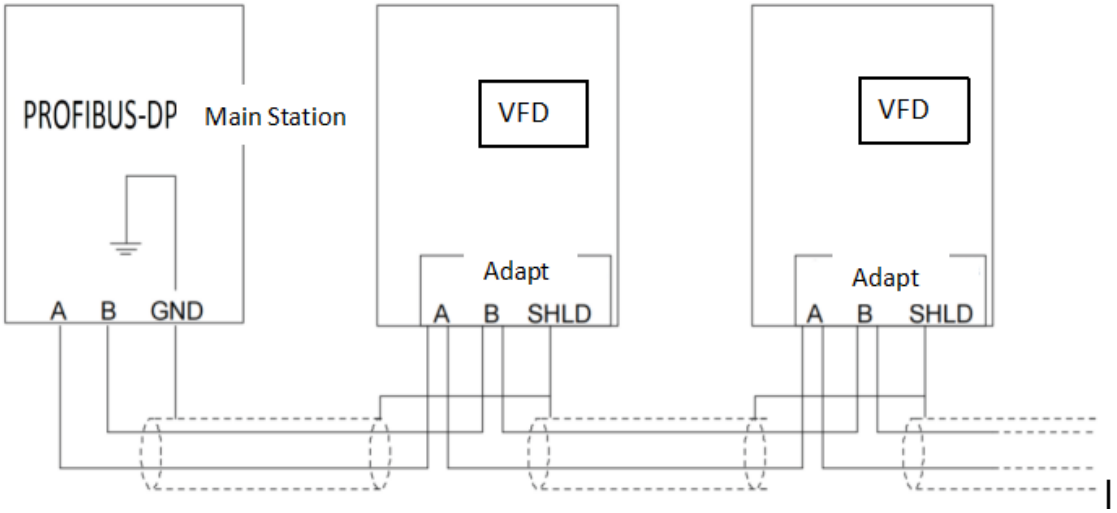


Figure 1.5 PROFIBUS-DP bus connection

1.6 Description of the GSD file

Every PROFIBUS-DP slave station on the PROFIBUS-DP bus will have a "device description file" called a GSD file used to describe the characteristics of the PROFIBUS-DP device. The software we provide to the user contains the GSD files (equipment data files) related to the frequency converter, and the user can request the type definition files (GSD) of various hosts.

2. The PROFIBUS-DP protocol format

2.1 Data transfer format

PPO type is used as the data transmission format in ProfiDrive (variable speed transmission) protocol, and PPO types are divided into PPO 1, PPO 2, PPO3, PPO4 and PPO 5. This DP extension card supports all data formats. The functions supported by each data format are shown in the table below.

data type	Support function
PPO1	Single-function parameter operation Frequency converter command and frequency setting Read the frequency converter status and operating frequency
PPO2	Single-function parameter operation Frequency converter command and frequency setting Read the frequency converter status and operating frequency

	Four functional parameters are written periodically to them Four functional parameters were read periodically
PPO3	Frequency converter command and frequency setting Read the frequency converter status and operating frequency
PPO4	Frequency converter command and frequency setting Read the frequency converter status and operating frequency Four functional parameters are periodically written and four functional parameters are periodically read
PPO5	Single-function parameter operation Frequency converter command and frequency setting Read the frequency converter status and operating frequency 10 functional parameters are periodically written and 10 functional parameters are periodically read

Table 2.1.1: PPO Type data transfer Support function

The data blocks contained in the PPO type data format are divided into two areas, namely PKW area (parameter area) and PZD area (process data area). The PPO type data format supported by this DP extension card is shown in the figure below.

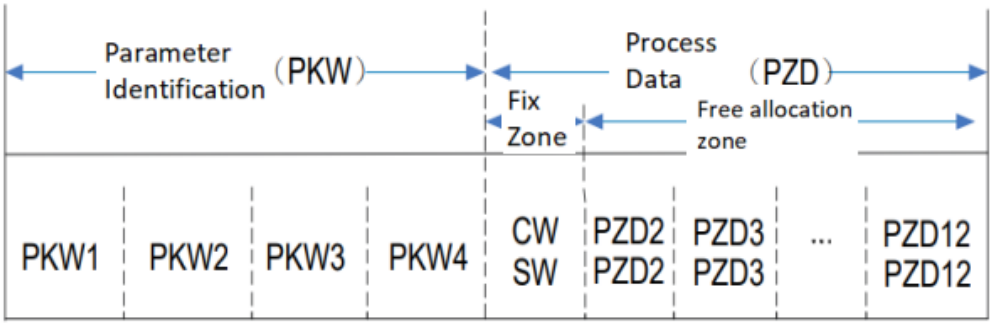


Figure 2.1.1 PROFIBUS-DP-DP information frame data structure

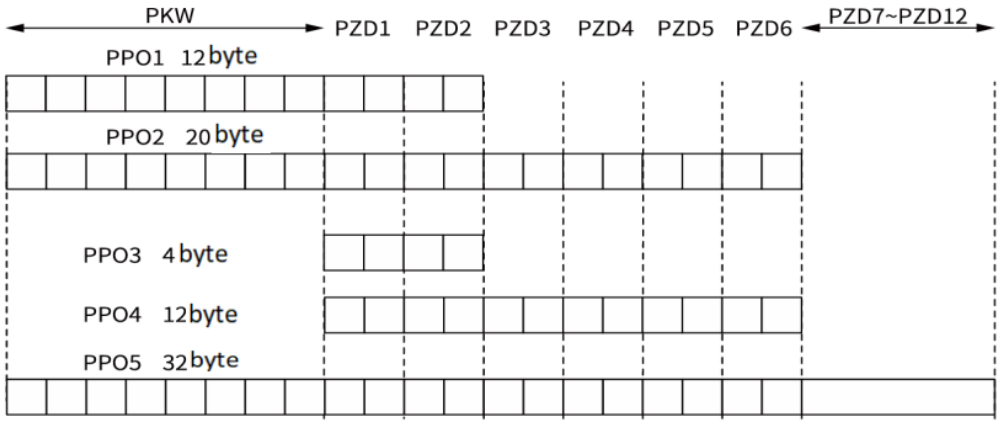


Figure 2.1.2 Description of the PPO type data format

2.2 Description of the PKW data

PKW data mainly realizes the read and write operation of a single parameter of the converter in the main station, and the communication address of the converter parameters is directly given by the communication data. The functions implemented are as follows:

● Functional parameters of frequency converter Read Change ● Functional parameters of frequency converter

PKW data contains three sets of array areas, namely PKE, IND and PWE. PKE data is 2 bytes, IND is 2 bytes, and PWE is 4 bytes. The data format is shown in the following table.

Main Station Send the Data PKW							
Operation Command	Parameter Address		Keep			Writing Operation:Parameter value Reading Operation: None	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE
VFD responds Data							
Operation Command	Parameter Address		Keep			Success: Return Value Fail: Error information	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE

Main Station Data send PKW description		VFD responds Data PKW description	
PKW	High 4 bits: Command code. 0 indicates no request; 1 indicates reading parameter data; 2 indicates changing parameter data (the above command codes are in decimal format). Low 4 bits: Reserved. Low 8 bits: High byte of the parameter address.	PKW	High 4 bits: Response code. 0: No request; 1: Parameter operation is correct; 7: Unable to execute. Low 8 bits: High byte of the parameter address.
IND	High 8 bits: Low byte of the parameter address. Low 8 bits: Reserved.	IND	High 8 bits: Low byte of the parameter address. Low 8 bits: Reserved.
PWE	High 16 bits: Reserved. Low 16 bits: Not used during a read request; Represents the parameter value during a write request.	PWE	When the request is successful: Parameter value. When the request fails: Error code (consistent with the standard MODBUS). 1: Illegal command. 2: Illegal address. 3: Illegal data. 4: Other errors.

Figure 2.2.1 Description of the PKW type data format

Application examples are as follows:

The main station reads the transmission data PKW area and the converter response data PKW area of the converter function parameter B0-02, as shown in the figure below

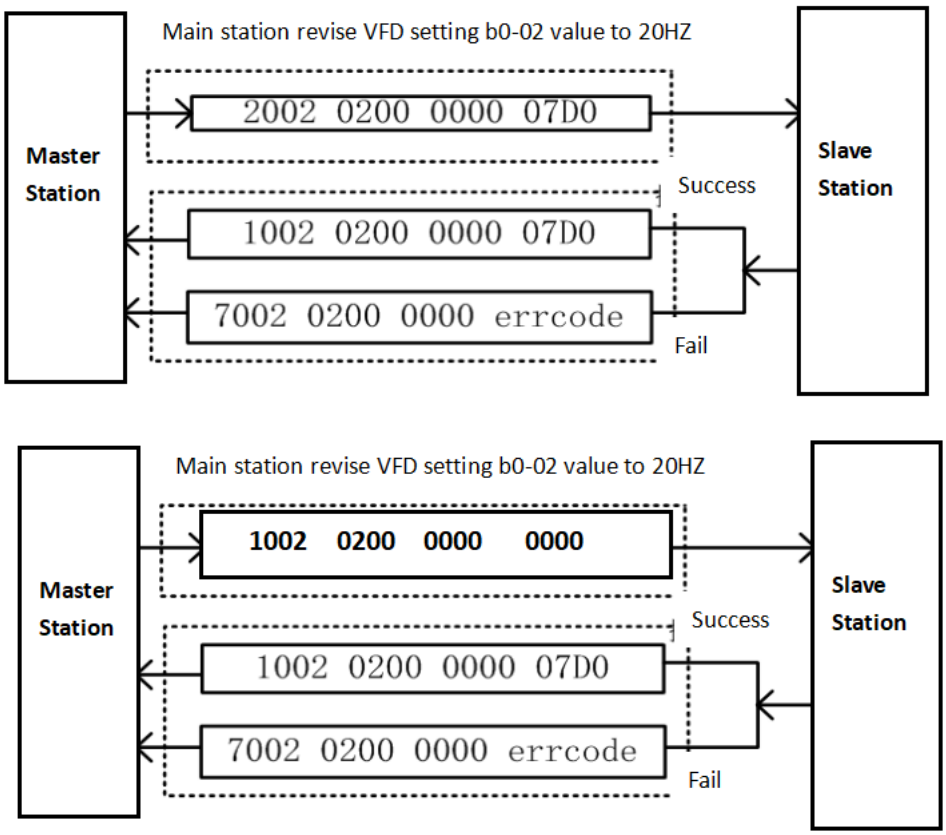


Figure 2.2.2 Examples of PKW type data sending and receiving application

2.3 Data description of the PZD area

The data of PZD area realizes the real-time change, reading and periodic data interaction of the inverter data of the main station. The mailing address of the data is directly configured by the frequency converter. It mainly includes the following contents:

The frequency converter control command and target frequency are given in real time.

The current state and operating frequency of the frequency converter are read in real time.

Real-time interaction of functional parameters and monitoring parameters between the frequency converter and the PROFIBUS-DP main station The PZD process data mainly complete the periodic data interaction between the main station and the frequency converter, and the interaction data is shown in the following table.

The master station sends the data to the PZD zone		
Frequency converter command	Target frequency of the frequency converter	The function parameters of the frequency converter are changed in real time
PZD1	PZD2	PZD3~PZD12

The PZD area of the inverter response data

Frequency converter command	Target frequency of the frequency converter	The function parameter value of the frequency converter is read in real time
PZD1	PZD2	PZD3~PZD12

Table 2.3.1: PZD type data delivery protocol

Description of the data sent by the master station

A PZD description of the sending data from the master station	
PZD1	Frequter command word (command source should be set to communication b1-00 = 2)
	0: No command 01: forward turn 02: reverse run 03: positive turn point 04: reverse point 05: free stop 06: deceleration stop 07: fault reset
PZD2	**Frequter target frequency (frequency source shall be set to communication)**
PZD3~PZD12	Change the functional parameter value in real time, do not write the EEPROM configuration mode see PZD data configuration

Description of the frequency converter response data

A PZD description of the inverter response data	
PZD1	Operation status of the frequency converter
PZD2	Operation status of the frequency converter
PZD3~PZD12	Read the functional code parameters in real time

Table 2.3.2: Description of the PZD type data delivery protocol

Configure PZD PZD1, PZD 2 for the solidified configuration, the user does not need to modify. From PZD 3 to PZD 12, we can customize the periodic data interaction for the user, and this parameter is set in the PLC configuration.

3. Protocol function

In the function code system of the frequency converter, the function code address adopts the specific conversion rules. It is composed of high and low bytes, high bytes correspond to functional code groups, and low bytes correspond to serial numbers within the group. The serial number in the function code group of GK 900 series frequency converter is in decimal system. For example, for the function code "B2-12", "B2" is the function code group, "12" is the serial number within the group, and the decimal 12 to hexadecimal is 0x0C. The correspondence between GK 900 functional code group and hexadecimal value is as follows:

A0	0
A1	1
B0	2
B1	3
B2	4
C0	5
C1	6
C2	7
C3	8
C4	9
D0	A
D1	B
D2	C
D3	D
D4	E
D5	F
E0	10

E1	11
E2	12
F0	13
F1	14
F2	15
F3	16
F4	17
F5	18
F6	19
H0	1A
H1	1B
H2	1C
L0	1D
L1	1E
U0	1F
control word	62
status word	63

According to the above correspondence, the corresponding hexadecimal value of "B2" is 0x04, so the full address corresponding to "B2-12" is 0x040C.

Data sending and receiving and functional code mapping

In terms of data transmission, it is divided from the main station (PLC) to the slave station (frequency converter) and from the slave station to the main station. The master station issues the parameter change value, and the slave station returns the current value of the parameter. In the case of PZD 3, when the master station (master) sends data to the slave (slave), if the value of PZD 3 is 1024, convert it to hexadecimal is 0400H.0x04 corresponds to the function code group number, which represents "B2", and the serial number in the group is 0, that is, the PZD 3 data sent by the main station to the frequency converter is used to modify the function code "B2_00". The function code "U0-00", the corresponding hexadecimal representation is 1F 00, converted to decimal is 7936, this value is the value of PZD 3 (slave master) returned from the station to the main station.

View the PKW and PZD input / output addresses in the PLC

To view the input and output addresses of the corresponding PKW (parameter identification word) and PZD (process data) in the PLC, you can specify the map I and Q addresses of the communication data in the slave station. The specific operation steps are: open the "Device and Network" interface of Btu software, switch to "Device View", select the corresponding slave slave station, drag "PPO-05" from the right directory to the designated position below, and complete the configuration of I and Q addresses. Among them, I address is the address sent by the inverter to the PLC, and Q address is the address sent by the PLC to the inverter.

4. Networking example protocol function

4.1 Networking

After adding the plc and DP master station controls, add the GSD file of our products. How to add the PLC and DP components. Click to Add a new device

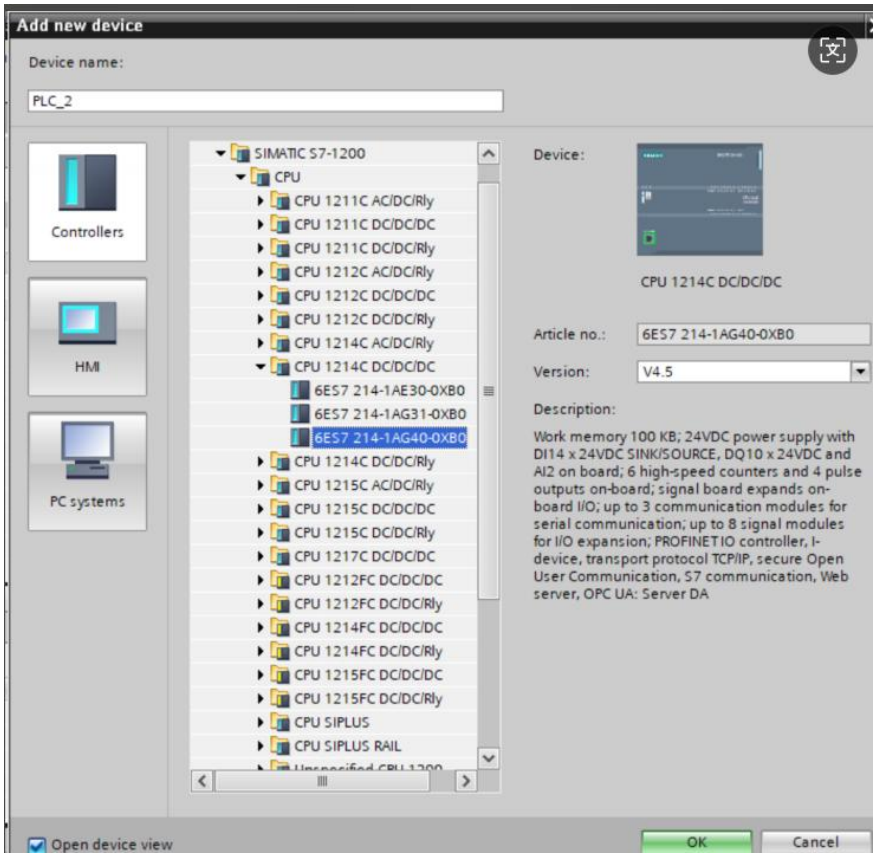


Figure 4.1-1 Networking process 1

Select the corresponding file according to the actual equipment. Add the CM1542-5 module again, select the attribute "PROFIBUS-DP Address" of CM1542-5, click "Add a new subnet" and set the DP address.

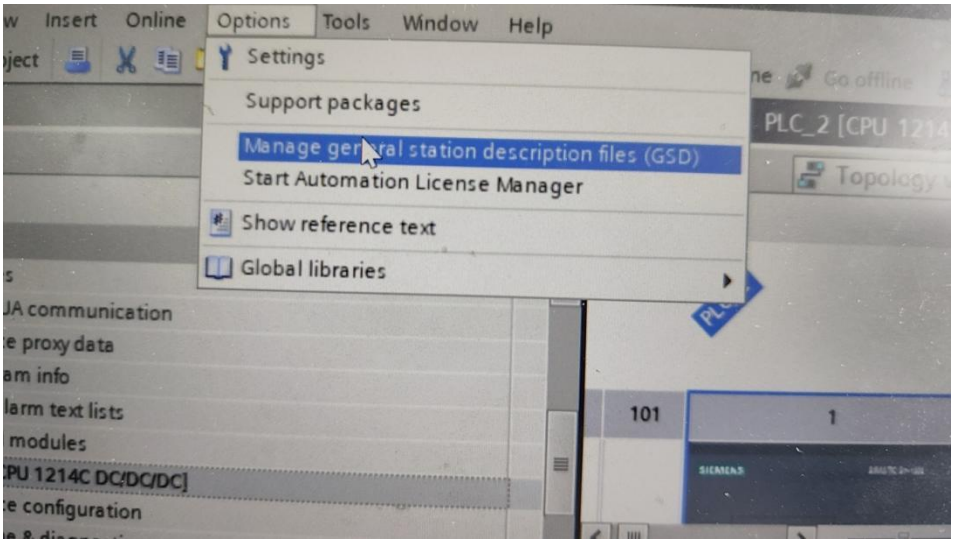


Figure 4.1-2 Networking process 2

Select the source path of the GSD file, select the GSD file corresponding to the company's products, and click Install.

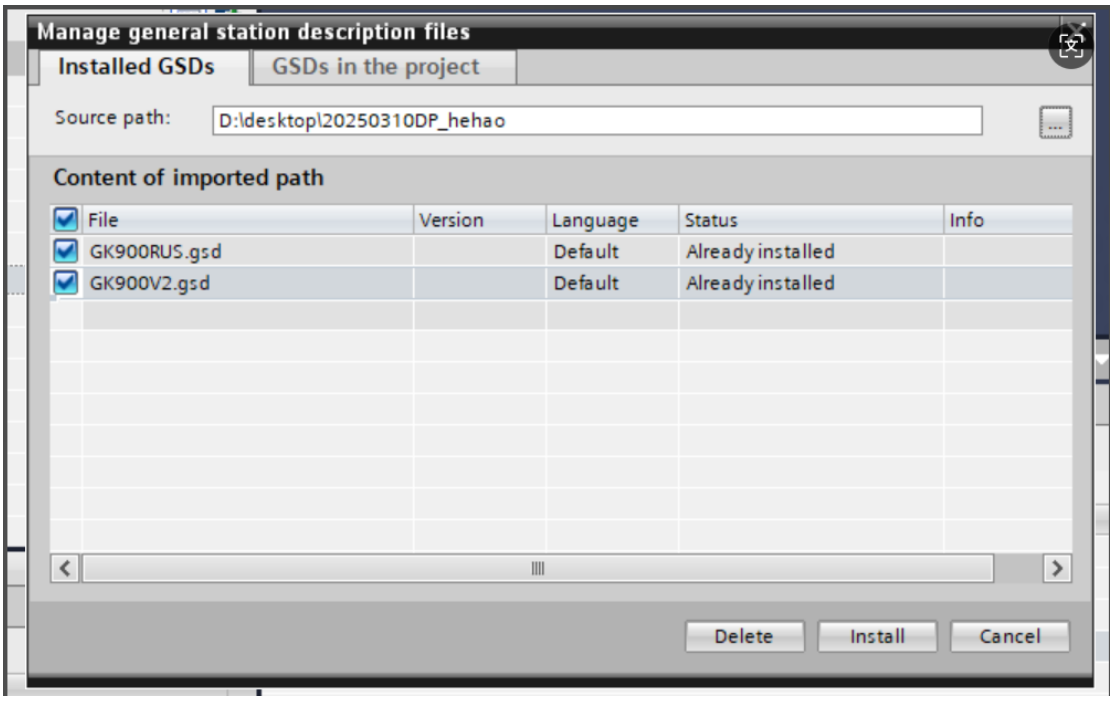


Figure 4.1-3 Networking process 3

Add the engineering equipment with the PROFIBUS-DP network. Click the device and network, select the network view, select the machine in the hardware directory, drag into the PROFIBUS-DP network, select the main station. Select another field device in the

hardware directory, select PROFIBUS-DP and select the GTAKE component.

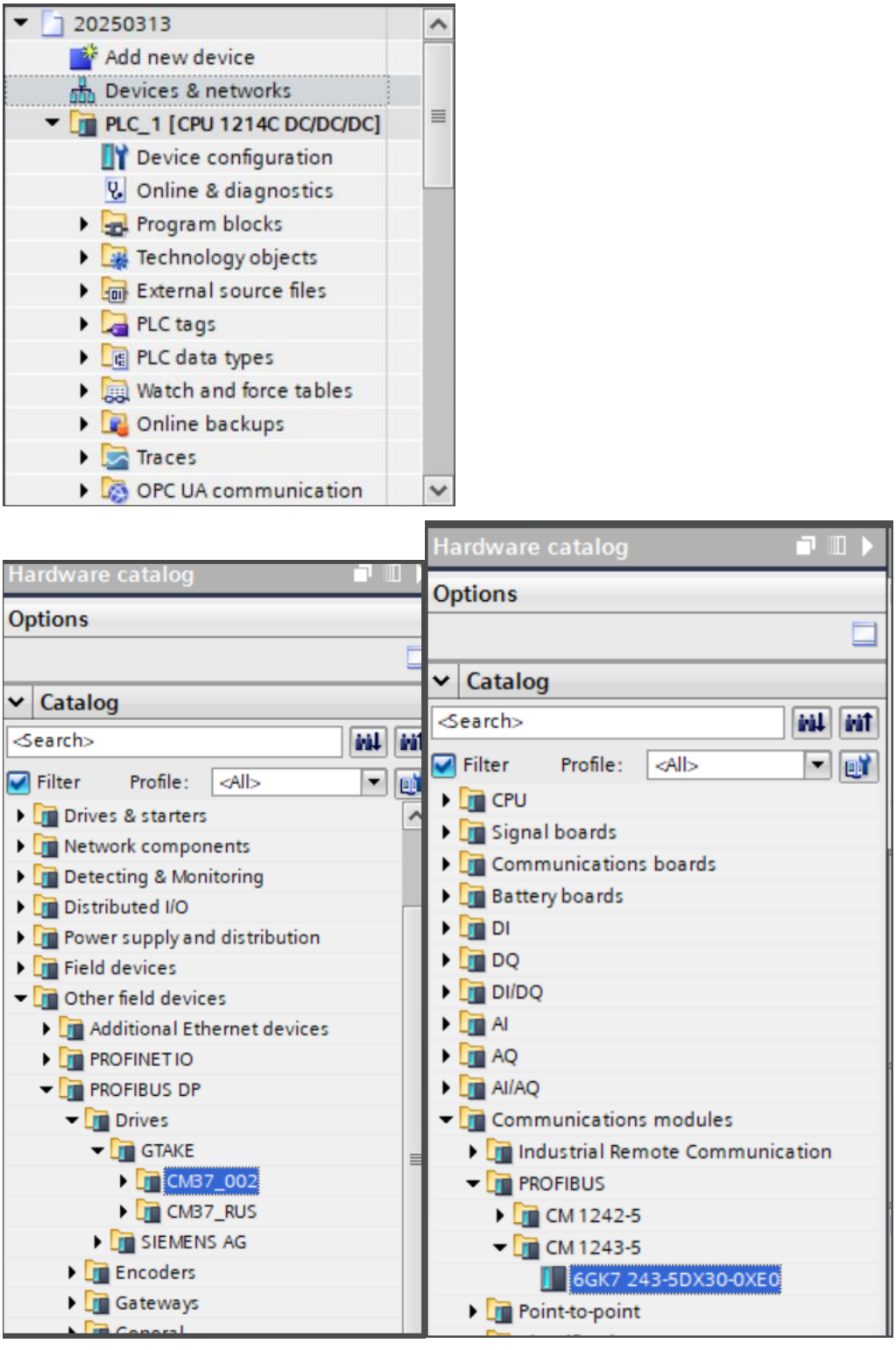
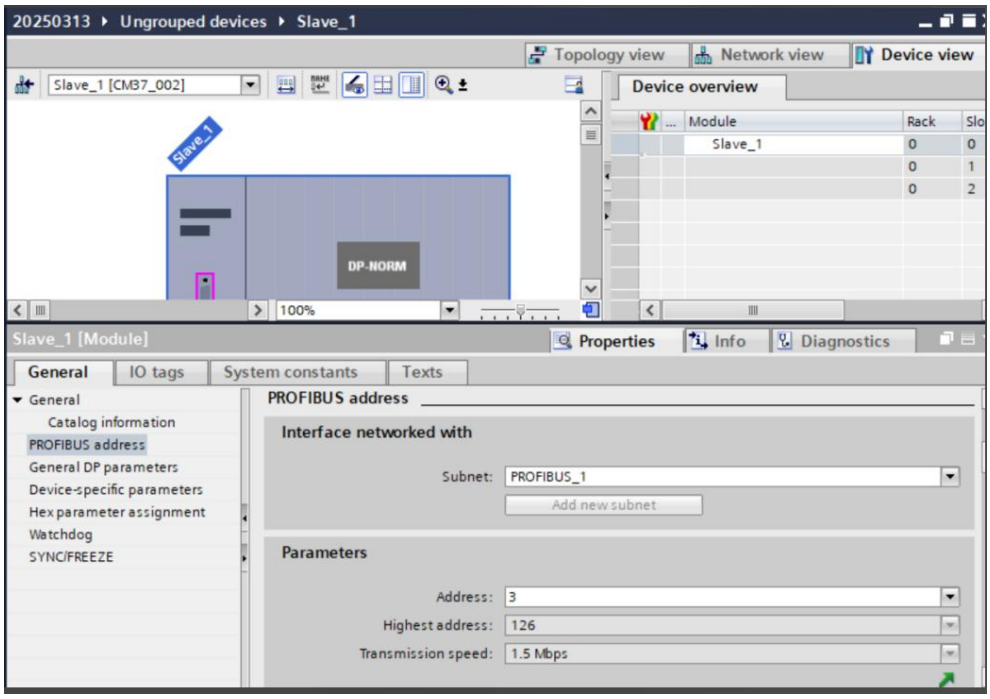
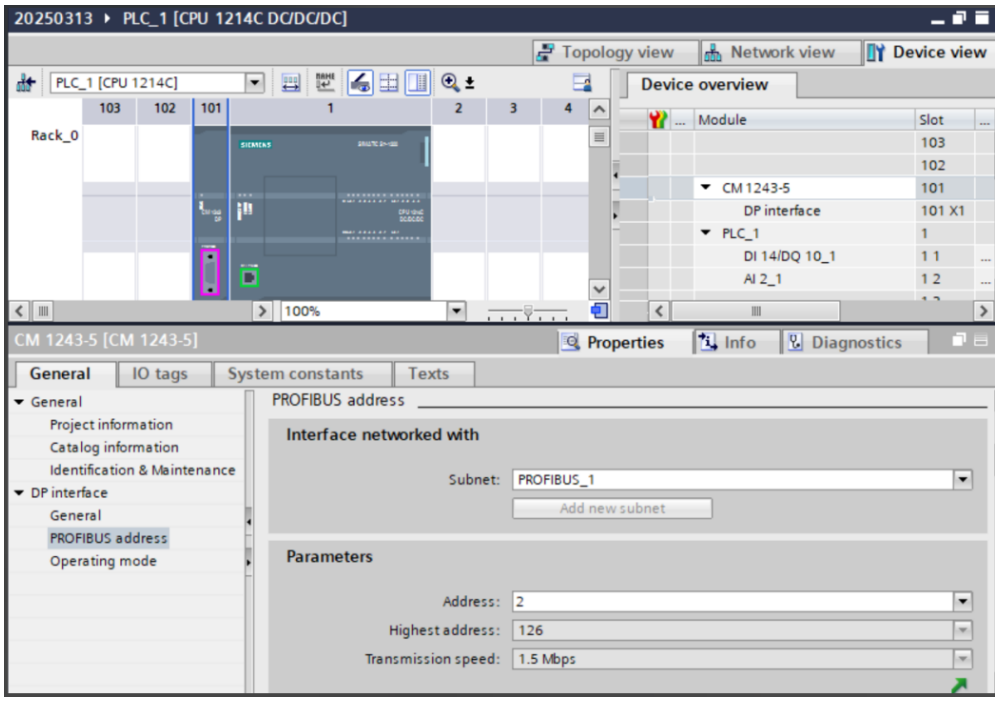


Figure 4.1-4 Networking process 4

Double click the network icon of the unit twice, in the lower attribute bar in the general tab, slave station number, communication parameter configuration, port rate can be set in the main station part, this support the port rate adaptation.


20250313 ▸ Ungrouped devices ▸ Slave_1
Topology view
Network view
Device view
Slave_1 [CM37_002]
Device overview
Module
Rack
Slave_1
DP-NORM
100%
Slave_1 [Module]
Properties
Info
Diagnostics
General
IO tags
System constants
Texts
General
Catalog information
PROFIBUS address
General DP parameters
Device-specific parameters
Hex parameter assignment
Watchdog
SYNC/FREEZE
PROFIBUS address
Interface networked with
Subnet:
PROFIBUS_1
Add new subnet
Parameters
Address:
3
Highest address:
126
Transmission speed:
1.5 Mbps


20250313 ▸ PLC_1 [CPU 1214C DC/DC/DC]
Topology view
Network view
Device view
PLC_1 [CPU 1214C]
Device overview
Rack_0
Module
Slot
CM 1243-5
DP interface
PLC_1
DI 14/DQ 10_1
AI 2_1
100%
CM 1243-5 [CM 1243-5]
Properties
Info
Diagnostics
General
IO tags
System constants
Texts
General
Project information
Catalog information
Identification & Maintenance
DP interface
General
PROFIBUS address
Operating mode
PROFIBUS address
Interface networked with
Subnet:
PROFIBUS_1
Add new subnet
Parameters
Address:
2
Highest address:
126
Transmission speed:
1.5 Mbps

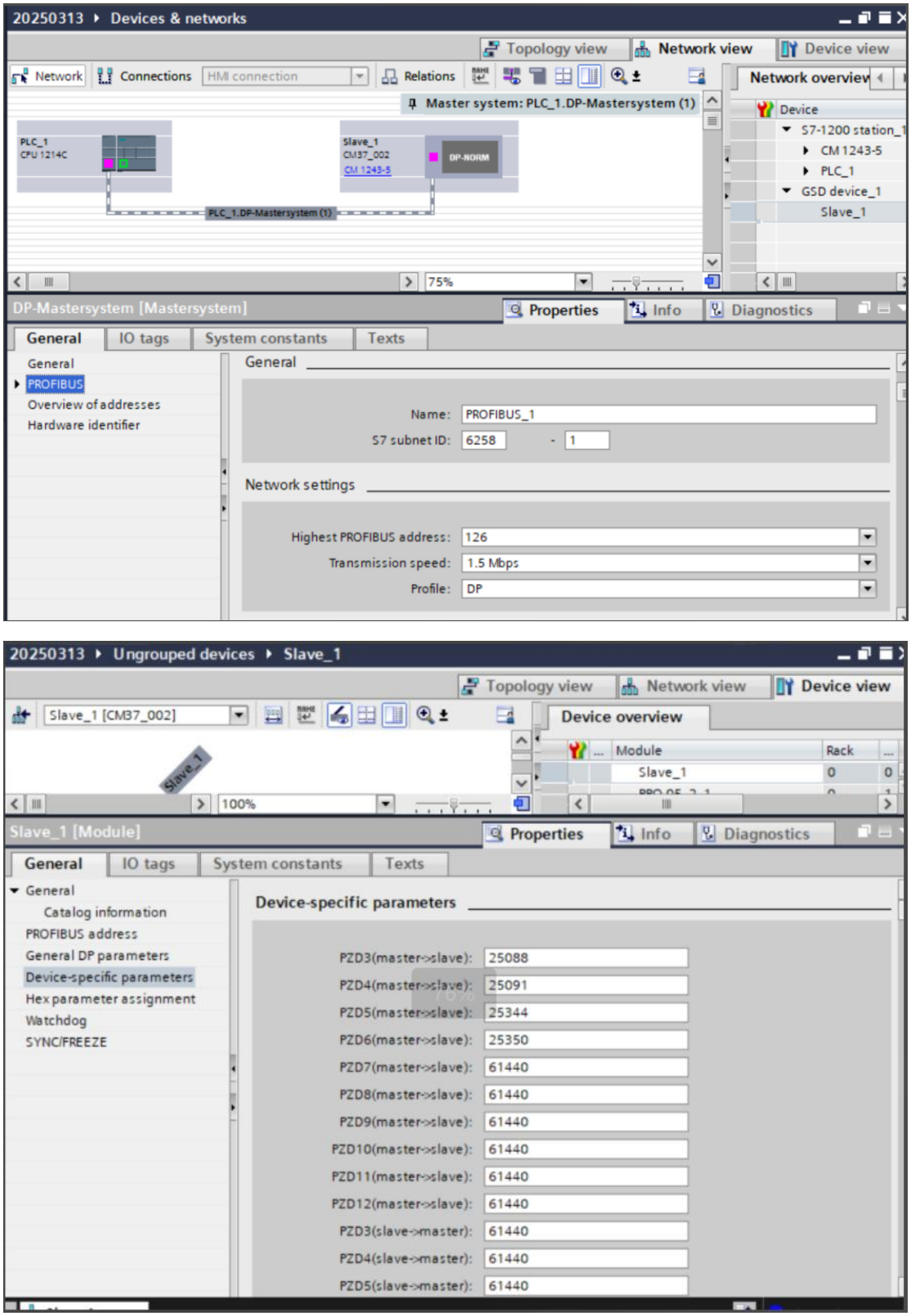


Figure 4.1-5 Networking process 5

The communication data is specified in the specific parameters of the device above. The PZD parameter of the master slave is the address corresponding to the pzd data sent by the main

station to the frequency converter. The PZD parameter noted by the slave master is the inverter address corresponding to the pzd data sent by the frequency converter to the PLC main station.(Reference protocol function)

4.2 Address mapping

In the PLC (programmable logic controller) system, to view the corresponding input and output address of the corresponding PKW (parameter identification word) and PZD (process data), follow the following steps:

First, the map I address and the Q address in the slave station. The specific operations are performed as follows:

Open the Device and Network interface of Botu software and switch to Device View. In this view, select the corresponding slave (slave) device. Find the PPO-05 option in the directory on the right, and drag it to the specified location below. After completing this operation, configure the I and Q addresses according to the system requirements.

In particular, the I address is the address used by the inverter to send the data to the PLC, while the Q address is the corresponding address when the PLC sends the data to the inverter. By properly configuring and viewing these addresses, proper data communication between the PLC and the inverter is ensured.

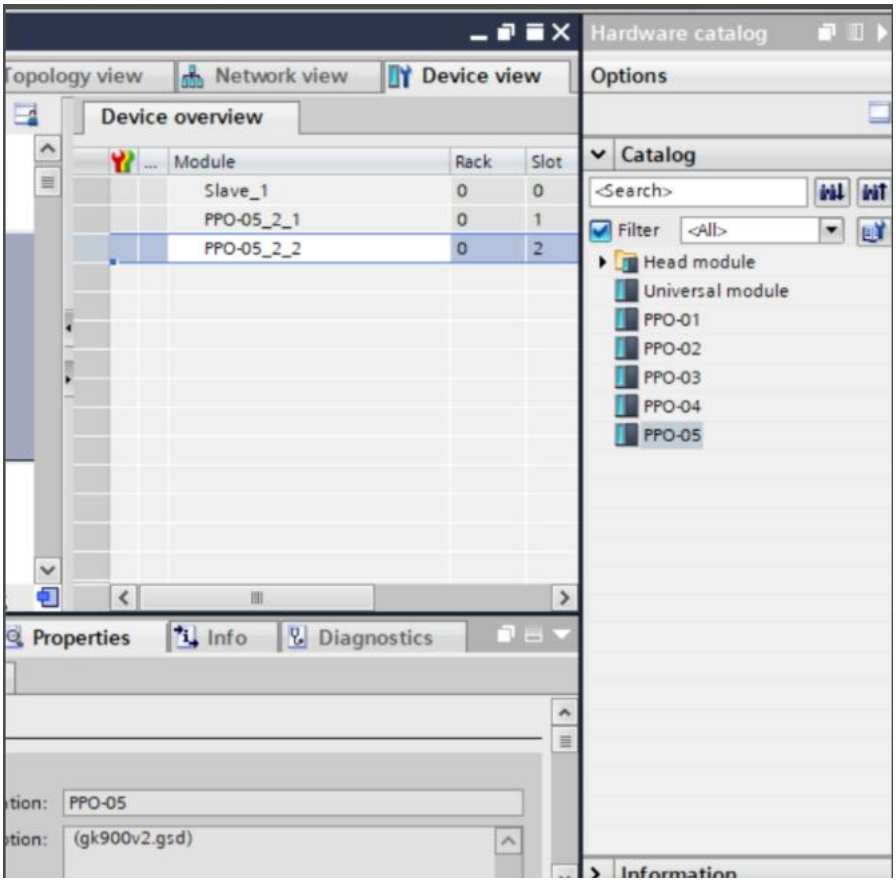


Figure 4.2-1 Address mapping process 1

PPO 5 (process data object 5) format is a data transmission format used for the communication between PLC (programmable logic controller) and frequency converter in industrial automation. It is mainly composed of PKW (parameter recognition word) and PZD (process data). Among them, PKW occupies 8 bytes and PZD occupies 24 bytes.

In the correspondence address mapping between the PLC and the frequency converter, the address range corresponding to the PKW data is% QW 80 to% QW 87. The I address (input address) and the Q address (output address) are both 80 to 87. When we write data to the addresses% QW 80 to% QW 87, we actually modify the PKW data sent by the PLC to the inverter; otherwise, by reading the data of these addresses, we can view the PKW data returned by the frequency converter.

The address of the PZD data is located after the PKW data, corresponding to the 24 bytes behind the PKW in the PPO 5 format. Specifically, the I address range is 88 to 111, and the Q address range is also 88 to 111. For example,% QW 88 is a PZD 1 address sent by the PLC,% QW 90 is a PZD 2 address, and so on. Write specific values to% QW 88 to control the start and stop of the frequency converter.

At this time, we can use the monitoring table function of Botu (TIA Portal) software to rewrite the corresponding function code (that is, the code used to set various parameters and functions of the inverter), so as to verify whether the address mapping is normal.

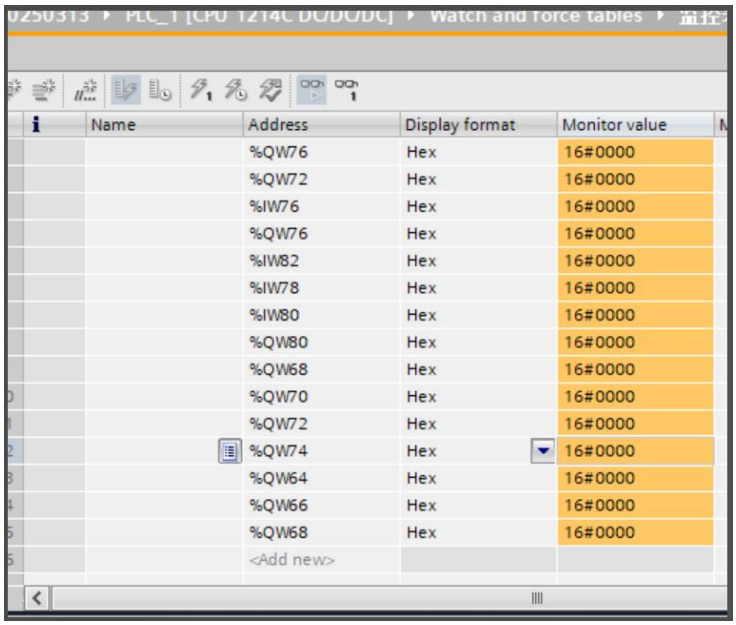


Figure 4.2-2 Address mapping process 2

4.3 Monitoring of frequency converter parameters

Use the network cable to connect the power-on plc, and set the computer network port to the same network segment as the plc.

Select the left item level directory on the left, click compile, download, go to online, you can operate plc online.

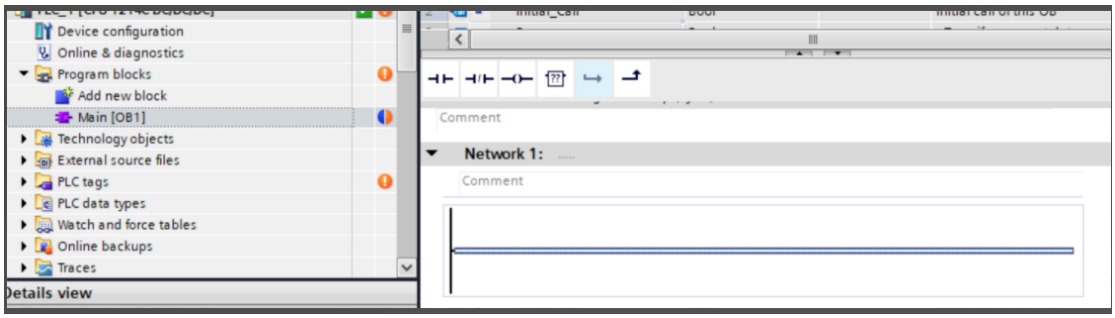


Figure 4.3-1 Commissioning process 1

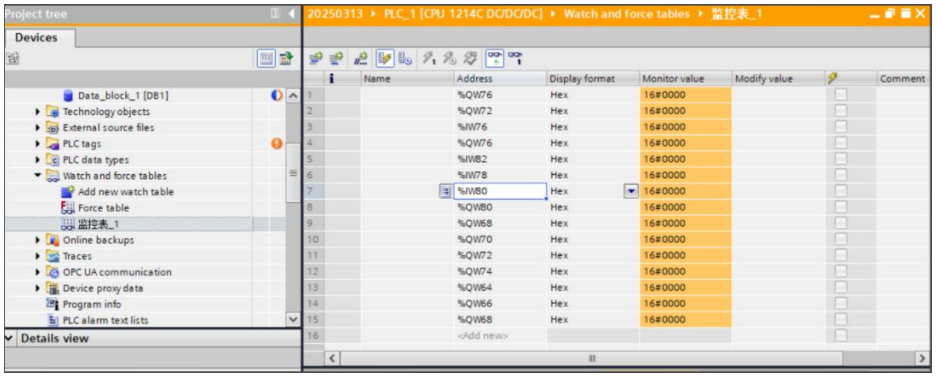
If you are configured for the first time, you can test the configuration on first from this section. The specific operations are performed as follows:

① Enter the online mode and click the monitor icon in the operation interface. At this point, you can observe the monitored values and modified values of the relevant parameters.

② Enter the value you expect in the modified value area.

③ After the input is completed, right-click the input box, select "modify" and "Change now" in the pop-up menu, and the system will write the expected value you input.

④ After the write operation is completed, you can observe the corresponding parameter changes on the local screen. If the parameters change, the configuration is on; if not, it may need to check the problems of the configuration.



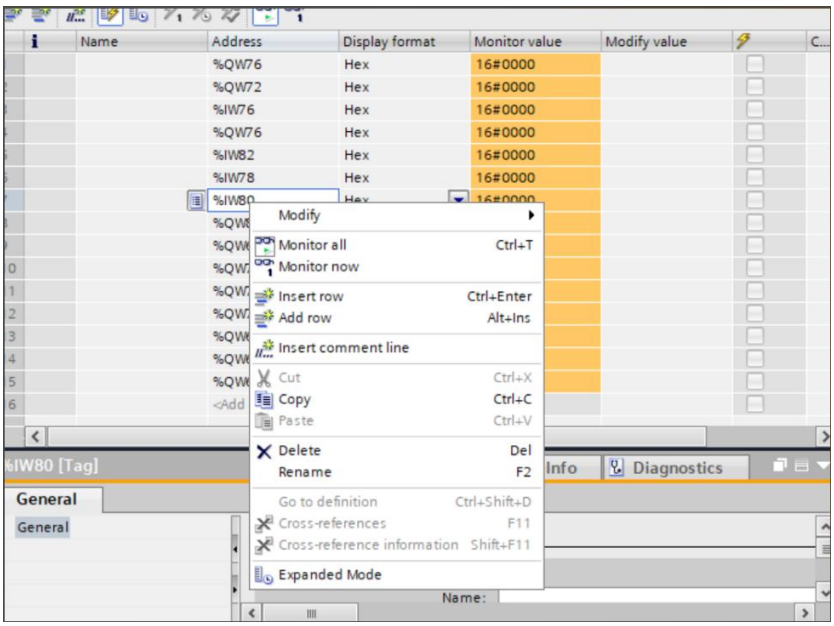
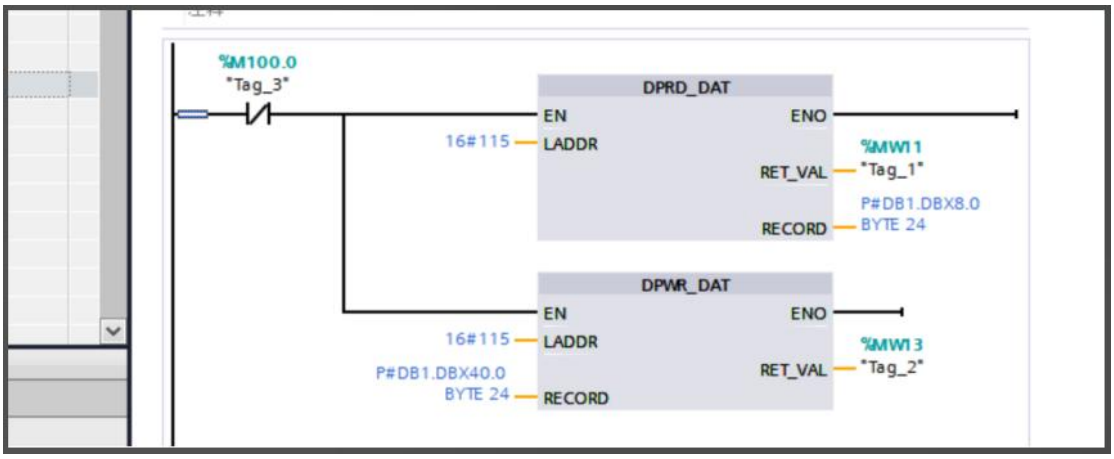
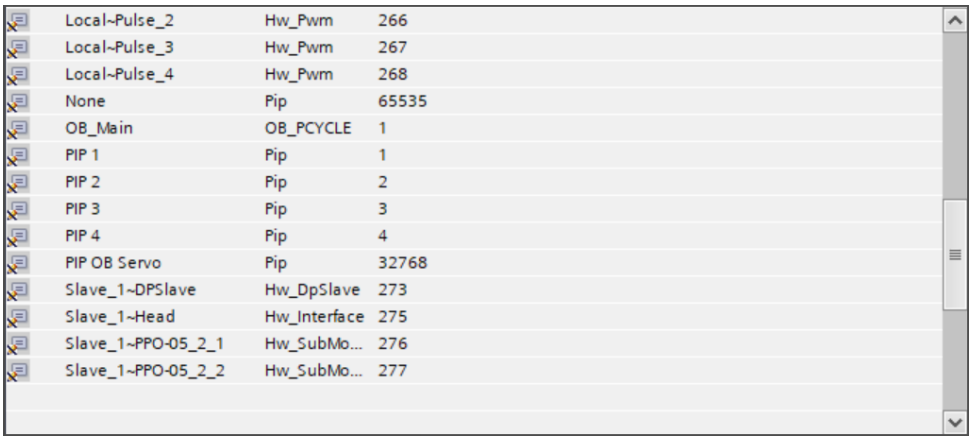


Figure 4.3-2 Commissioning process 2

For later use, SFC14 and SFC15 are used for mapping, and then read and write operations.





Local~Pulse_2	Hw_Pwm	266
Local~Pulse_3	Hw_Pwm	267
Local~Pulse_4	Hw_Pwm	268
None	Pip	65535
OB_Main	OB_PCYCLE	1
PIP 1	Pip	1
PIP 2	Pip	2
PIP 3	Pip	3
PIP 4	Pip	4
PIP OB Servo	Pip	32768
Slave_1~DPSlave	Hw_DpSlave	273
Slave_1~Head	Hw_Interface	275
Slave_1~PPO-05_2_1	Hw_SubMo...	276
Slave_1~PPO-05_2_2	Hw_SubMo...	277

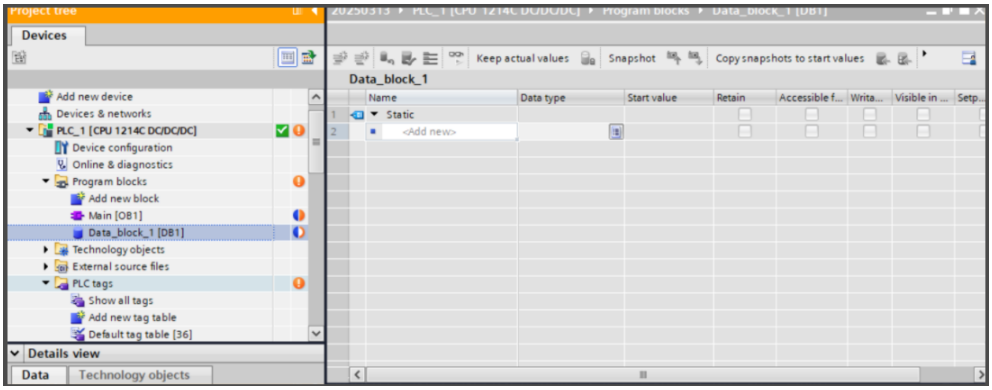


Figure 4.3-3 Commissioning process 3

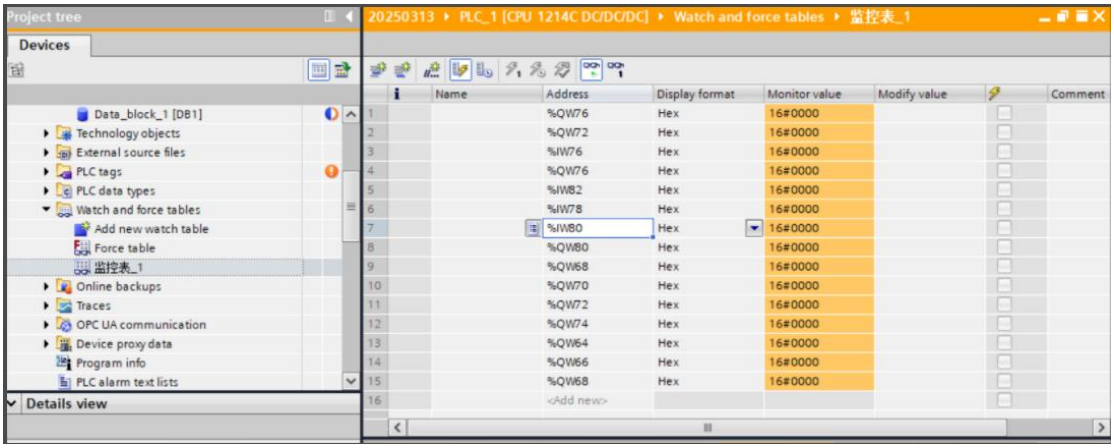


Figure 4.3-4 Commissioning process 4

GTAKE

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