



ELCO PROFIBUS DP ENCODER

----- User Manual



TIANJIN ELCO AUTOMATION CO., LTD.
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Version 1.0

Preface

1. Scope of application of this manual:

Encoder products for ELCO's PROFIBUS-DP protocol.

From the information in the manual, you can connect the controller in PROFIBUS-DP mode to run the encoder product on the PROFIBUS-DP bus.

2. Basic knowledge required:

This manual assumes that you have a basic knowledge of electrical and automation engineering.

This manual describes each component based on valid data at the time of release. New components and parameter adjustments are updated in the new manual.

3. Guide:

This manual describes the hardware and use of the encoder under the PROFIBUS-DP protocol, including:

- Installation and wiring
- Technical characteristics
- Use case
- Technical parameters

4. Technical support:

This manual describes the product characteristics and usage of multi-turn encoders as comprehensively as possible. If you have any questions or other questions regarding this product, please contact local ELCO office or call the service hotline 400-608-4005. You can also visit the ELCO website to learn more about automation products.

TIANJIN ELCO AUTOMATION CO., LTD. www.elco-holding.com.cn
ELCO Industrie Automation GmbH www.elco-automation.de

5. Liability exemption:

We have checked the consistency of the content and hardware and software described in the manual. However, the possibility of deviation is not excluded, and the content cannot be guaranteed to be completely consistent with the hardware and software.

The data parameters have been tested as required, and the necessary modifications will be improved in the new version.

Product Overview

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1. Product overview

1.1 Introduction

The PROFIBUS-DP bus encoder complies with the PROFIBUS-DP standard described in the European standard EN50170, Volume 2, and complies with the established encoder device management file.

The encoder PROFIBUS device management file serial number is 3.062. This manual mainly describes PROFIBUS-DP. Bus encoder installation and encoder configuration with PROFIBUS-DP interface.

1.2 Product Introduction

The PROFIBUS-DP encoder provides functions such as real-time position, direction setting, single-turn resolution setting, total number of turns setting, address dialing switch setting, and terminal resistance dialing.

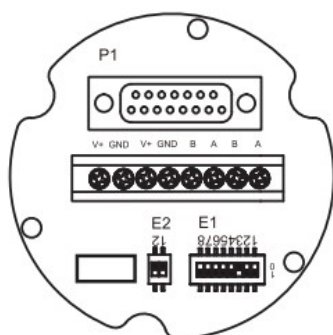
1.3 Features

- LED and screen status indication, and provide online diagnosis and channel protection
- Display bus device status, with RESET function
- Configurable parameters such as rotation direction, single-turn resolution, and total number of turns.

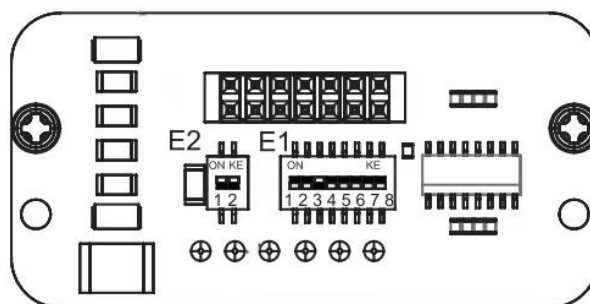
2. Technical characteristics

2.1 Interface Description

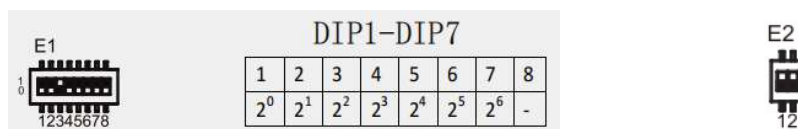
This figure is the schematic diagram of the wiring terminal, DIP switch and terminal resistance of PROFIBUS-DP encoder.



EAM58-DP



EAM90-DP



E1: DIP1-DIP7 for address setting.

E1: Default address 4

e. g. DIP1-DIP7, 1000110=49, DIP8 ON. Counting direction changed.

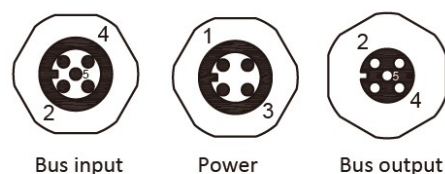
E2: The DIP switch is set to ON, If the encoder is a terminal or a stand-alone device, turn the DIP switch to ON and the resistance is 220Ω. E2: DIP1-DIP2 default OFF.

Connection

TERMINAL ASSIGNMENT

V+	Supply voltage	1
GND	Grounding	3
B (IN)	Profibus-DP input (RED)	4
A (IN)	Profibus-DP input (GREEN)	2
B (OUT)	Profibus-DP output (RED)	4
A (OUT)	Profibus-DP output (GREEN)	2

TERMINAL ASSIGNMENT- M12 CONNECTOR



Tip: When wiring, first confirm the power cord and voltage level to prevent irreversible damage to the encoder.

2.2 Hardware parameters

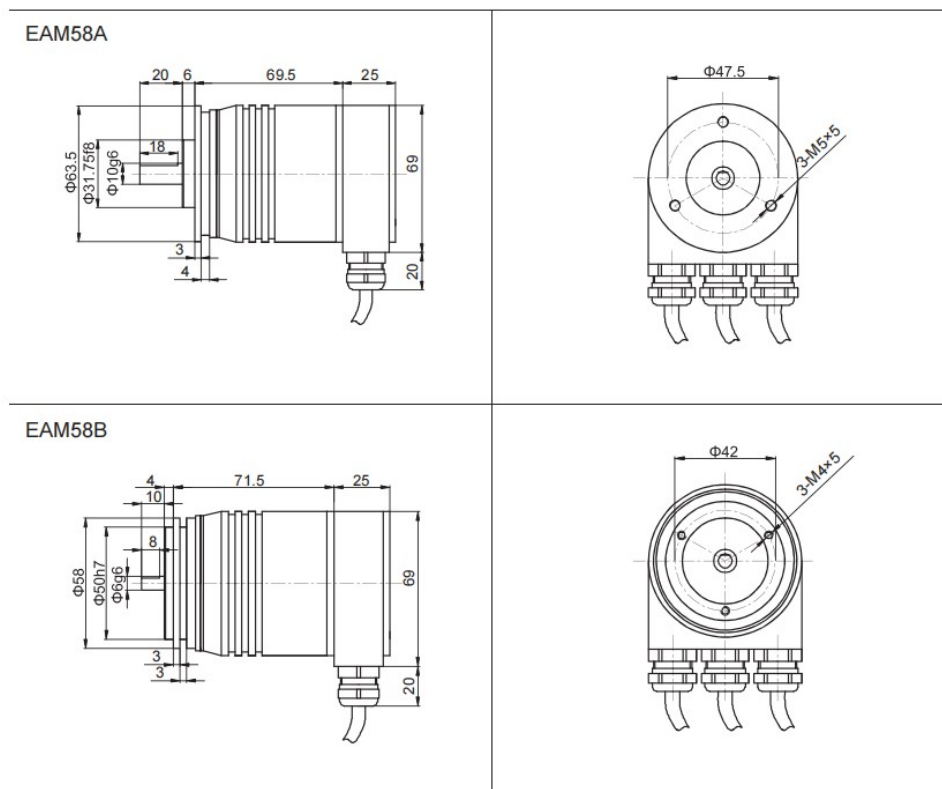
Power input	+24 V DC
Input voltage	10 ... 30 V DC
Operating temperature	-40 ... 80 °C
Storage temperature	-45 ... 85 °C
Vibration resistance	10 g, 10 ... 2000 Hz
Impact resistance	50 g, 11 ms
Shaft load	80 N Axial / 160 N Radial
Protection level	IP65
Bearing life	10^9

2.3 LED light indication

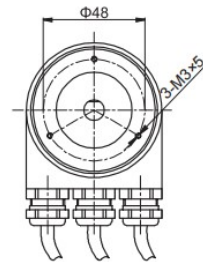
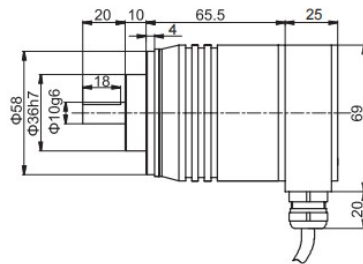
Indicator name	Indicator status	Indicator meaning	Possible cause
Power	Off	No power	Power cable failure
	green	Normal power supply	
ERR	red	Abnormal communication	1. Network cable failure 2. Software DP address configuration and encoder DIP switch are inconsistent
	Off	PROFIBUS master and encoder communication is normal	

3. Installation size

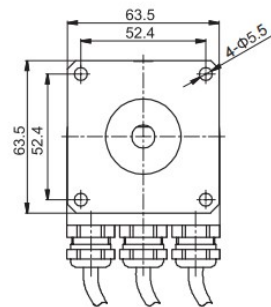
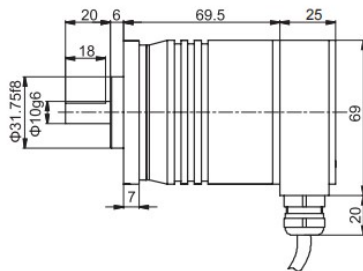
3.1 Dimensions



EAM58C



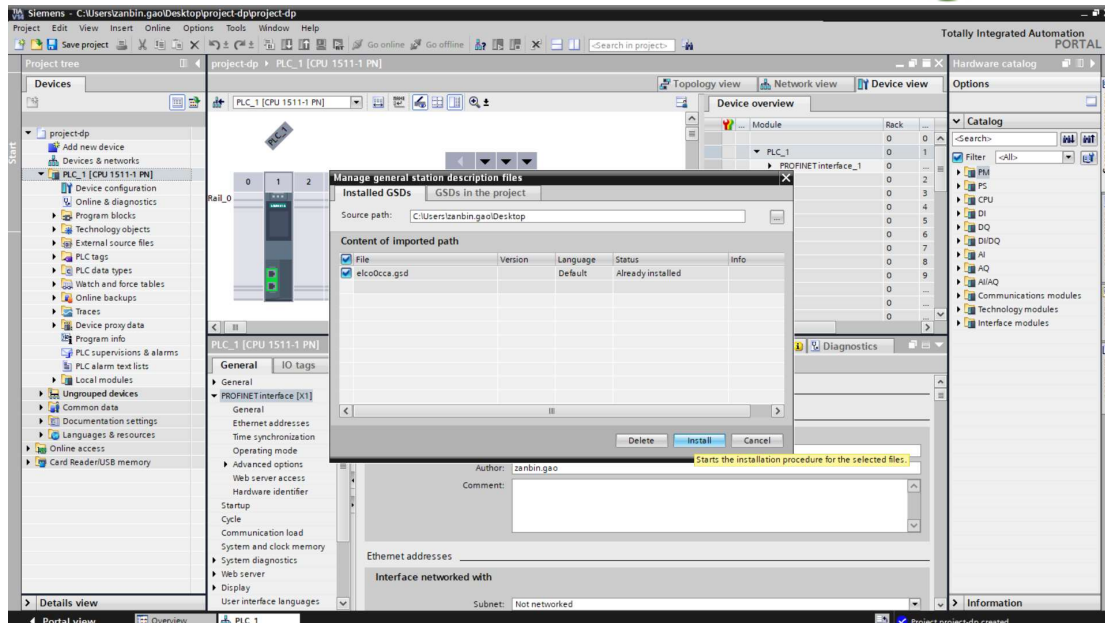
EAM58D



4. Use examples

4.1 Installing the encoder GSDML file

In this section, according to the TIA Portal V14 software, click “Manage general station description file (GSD)” in the “Options” drop-down menu of the software to open the dialog box, and find the path of the GSDML file to be installed in the source path. To select the GSDML file you need to install, click the "Install" button. as follows:



4.2 Encoder configuration

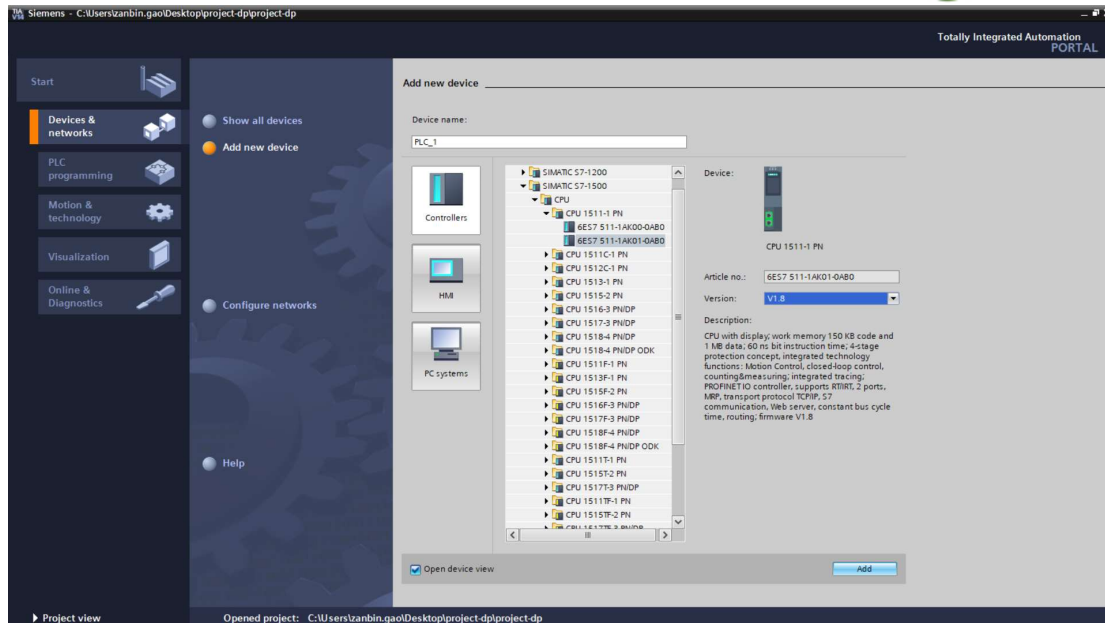
In this section, the user can fully understand the actual use of the PROFIBUS DP encoder through a practical operation flow of the configuration connection. In this example, the PROFIBUS DP encoder of ELCO is used as the PROFIBUS DP slave to connect the Siemens s7-1500 PLC DP communication module CP1542-5, and the configuration and debugging are carried out through the TIA Portal V14 software on the PC. We will detail the specific software configuration and debugging process.

1) Device connection

The PROFIBUS DP communication module CP1542-5 is connected via the s7-1500 controller to the PC network port with the TIA Portal V14 software. Connect the power cable of the encoder and PLC module to the power output of +24VDC, and connect the communication line between the DP communication module and the encoder.

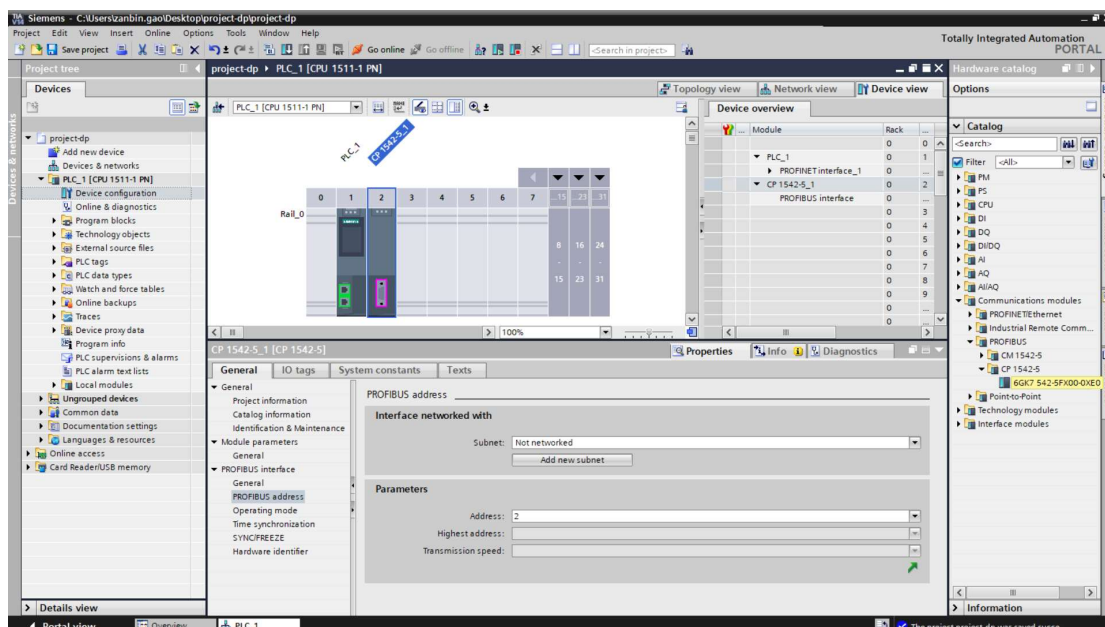
2) Add new equipment

Double-click "Add New Device" in the "Project" menu on the left side of the TIA Portal V14 software to select the PLC with the same model and version, and click the "Add" button. as follows:



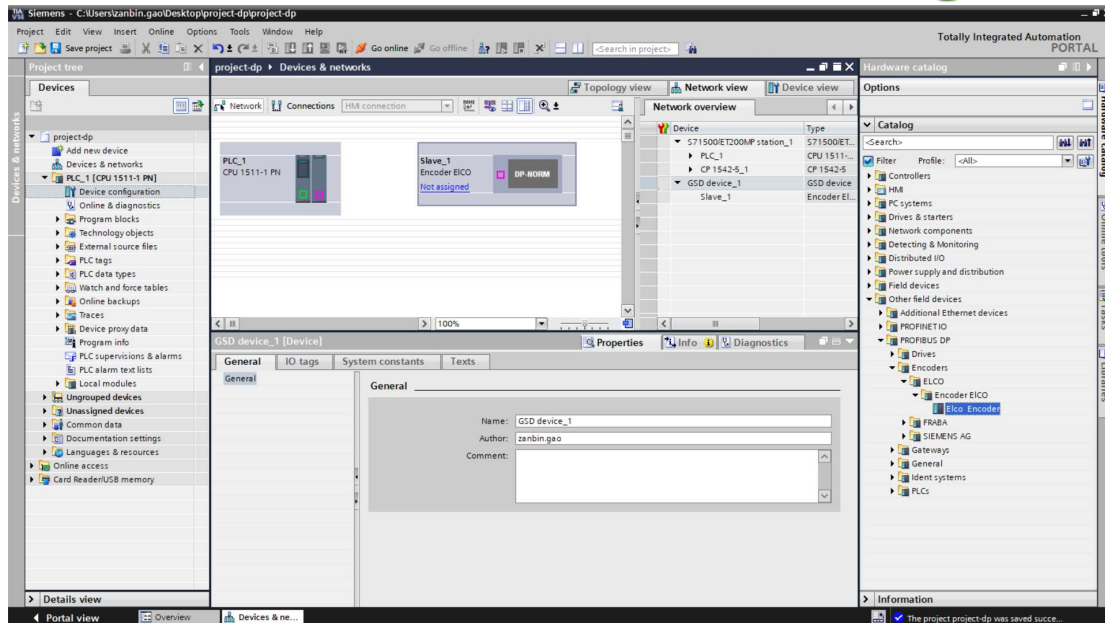
Find the name of the communication module to be added in the "Communications Modules" in the "Hardware Catalog" menu on the right side of the TIA Portal V14 software, and drag it into the network view.

This manual selects the PROFIBUS communication module CP1542-5 as follows:

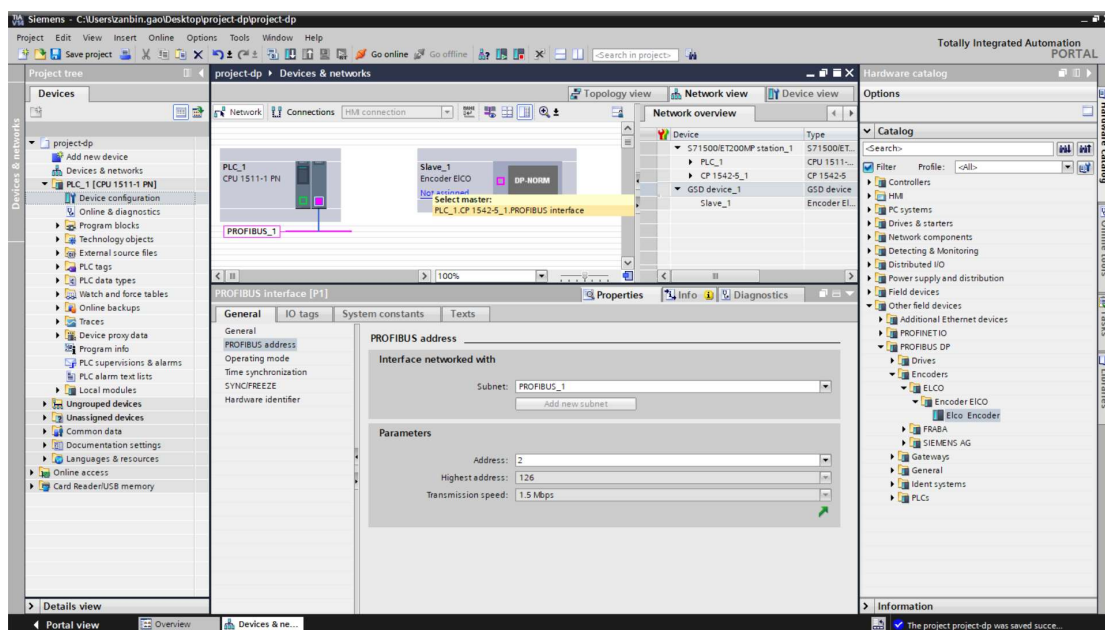


3) Configuration settings

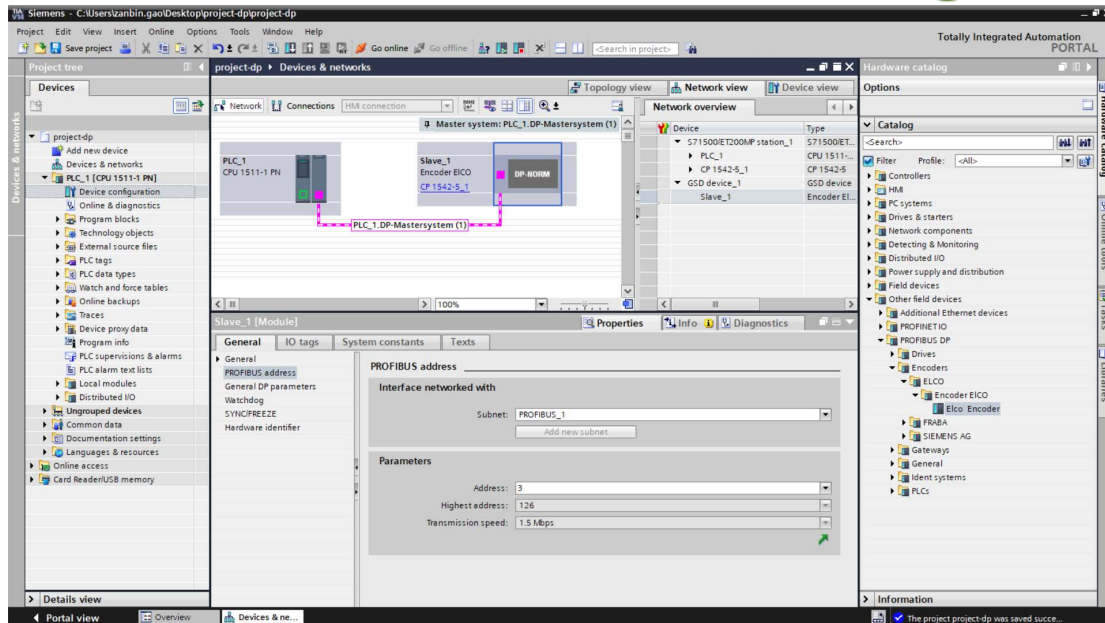
Select the network view. In the "Other Field Devices" menu on the right side of the TIA Portal V14 software, find the submenu PROFIBUS DP and select the corresponding encoder and drag it into the network view. as follows:



Double-click the PROFIBUS communication module CP1542-5, click "Properties" in the pop-up dialog box, select "add new subnet", set up the DP communication network, and set the DP address. as follows:

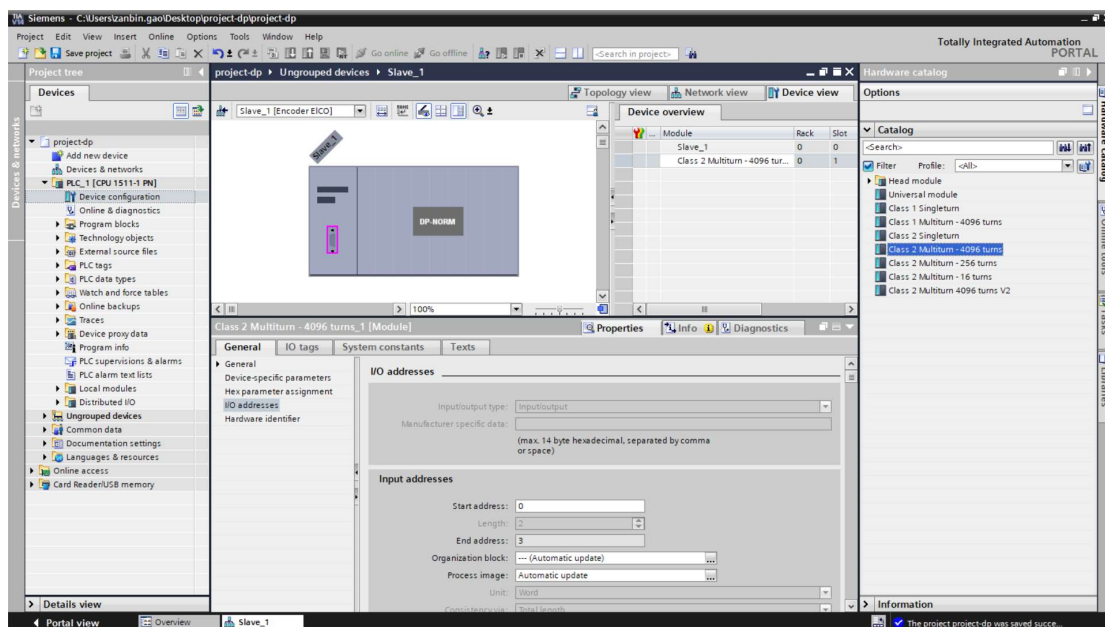


Click "Not Assigned" to select PLC_1.CP1542-5_1.PROFIBUS interface. The CP1542-5 module is automatically connected to the encoder. as follows:



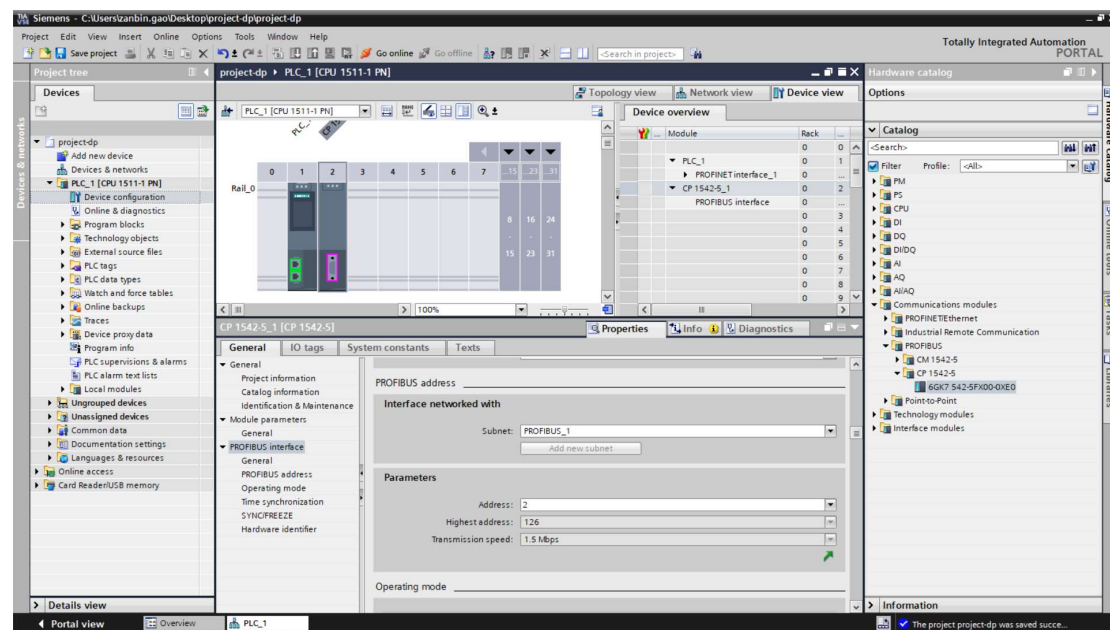
Double-click the encoder device to enter the device view interface. Click the module drop-down arrow in the hardware directory on the right side of the software, and then select the required module and drag it to the device overview area.

This manual uses Class 2 Multiturn-4096 turns as an example, as follows:

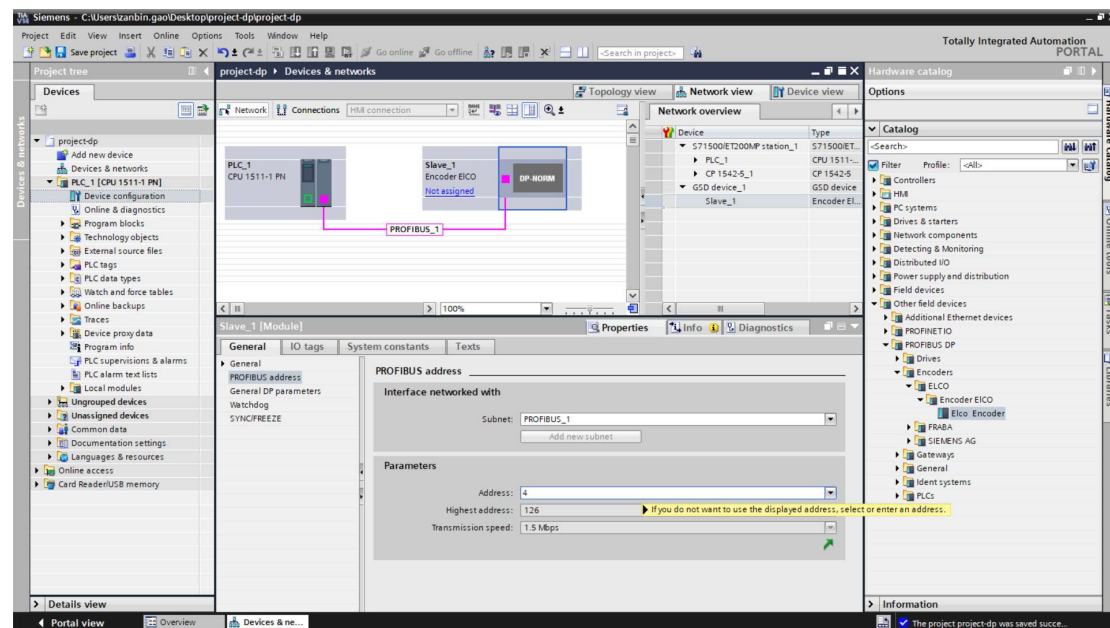


Double-click the CP1542-5 module and encoder device block, set the PROFIBUS DP bus and set the DP address in the general dialog box, CP1542-5 as the master station, the encoder as the slave station, and the encoder software sets the DP address to be the same as the encoder dial switch.

The DP address of the CP1542-5 module is set to 2, as follows:



The DP address of the encoder is set to 4, as follows:

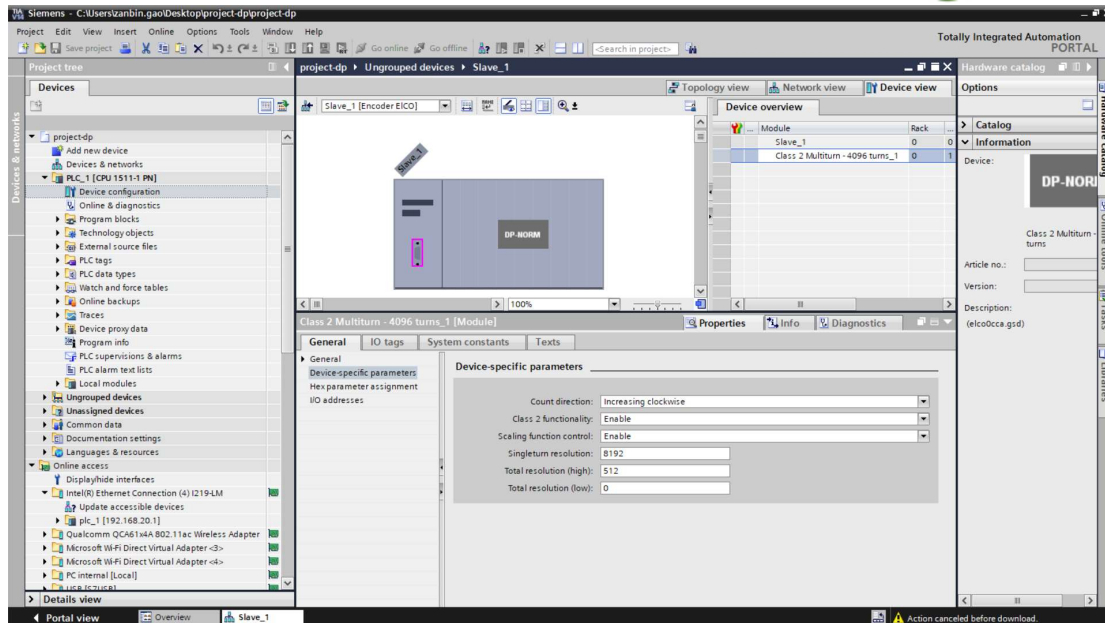


4.3 Use of encoder settings

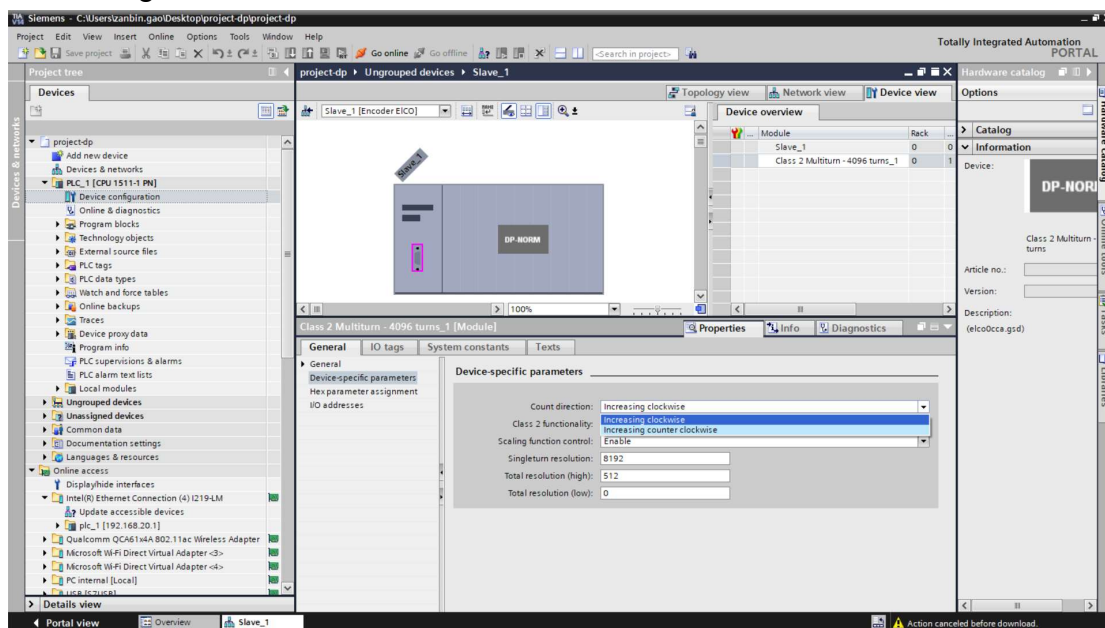
It provides a number of settable items including rotation direction, single-turn resolution, and total number of turns.

1) Rotation direction setting:

Click “Class 2 Multiturn-4096 turns_1” in device overview. In the dialog box that is displayed, click “Device specific parameters” to enter the parameter setting interface. as follows:



In the drop direction menu of Count direction, select Increasing clockwise or Increasing counter clockwise. as follows:



2) Single turn resolution and total number of turns:

Set the single-turn resolution in the singleturn resolution window. Since the general-purpose module is Class 2 Multiturn-4096 turns_1, the total number of turns is fixed at 4096, and the single-turn resolution is set according to the total resolution.

For example, the total resolution is 25 bits, then the single-turn resolution is 25 bits (total resolution) except for the total number of turns of 12 bits (4096), and the single-turn resolution is 8192 (2^{13}). If the total resolution is 24 bits, the single-turn resolution is 24 bits (total resolution) except for the total number of

turns of 12 bits, and the single-turn resolution is 4096 (2^{12}).

Set the resolution in the Total resolution window. For example, the total resolution of the encoder is 25 bits (4096/8192), then the high bit is 25 bits minus 16 bits, and the 9 bits are 9 bits, which is 512 (29). For example, the total resolution of the encoder is 24 bits (4096/4096), then the high bit is 24 bits minus 16 bits, and the 8 bits are 256 (28).

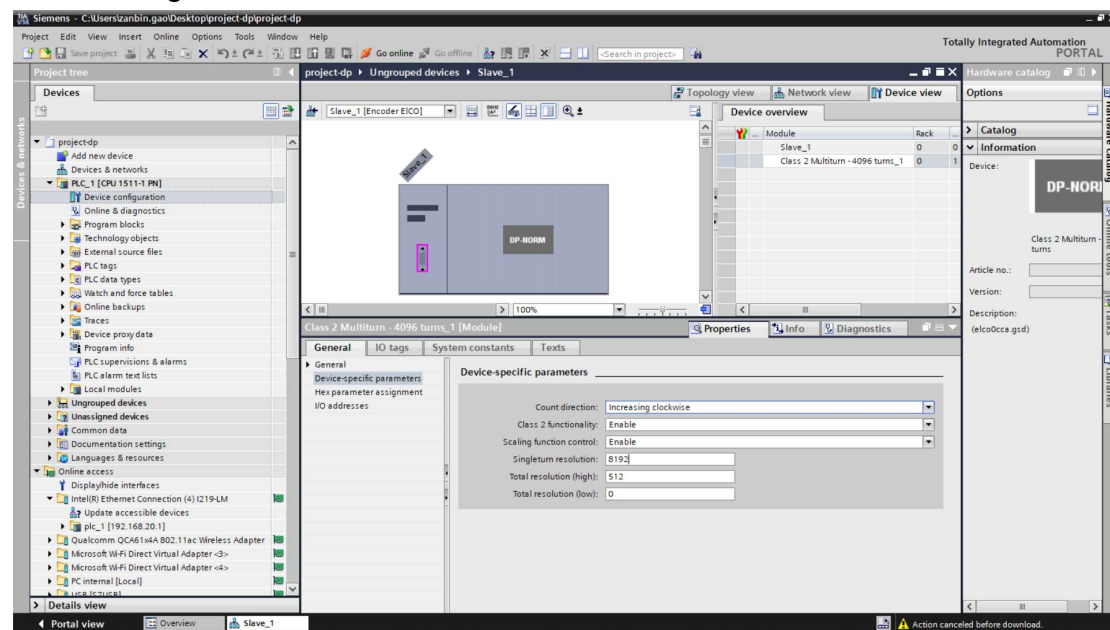
If the total resolution is lower than 16 bits, then Total resolution (high) fills in the value 0, and Total resolution (low) fills in actual resolution value, such as 15 bits, the value is 32768. The single-turn resolution specifies the input value according to the single-turn resolution setting.

Example:

If the single-turn resolution is 8192, the total resolution (high) is 512.

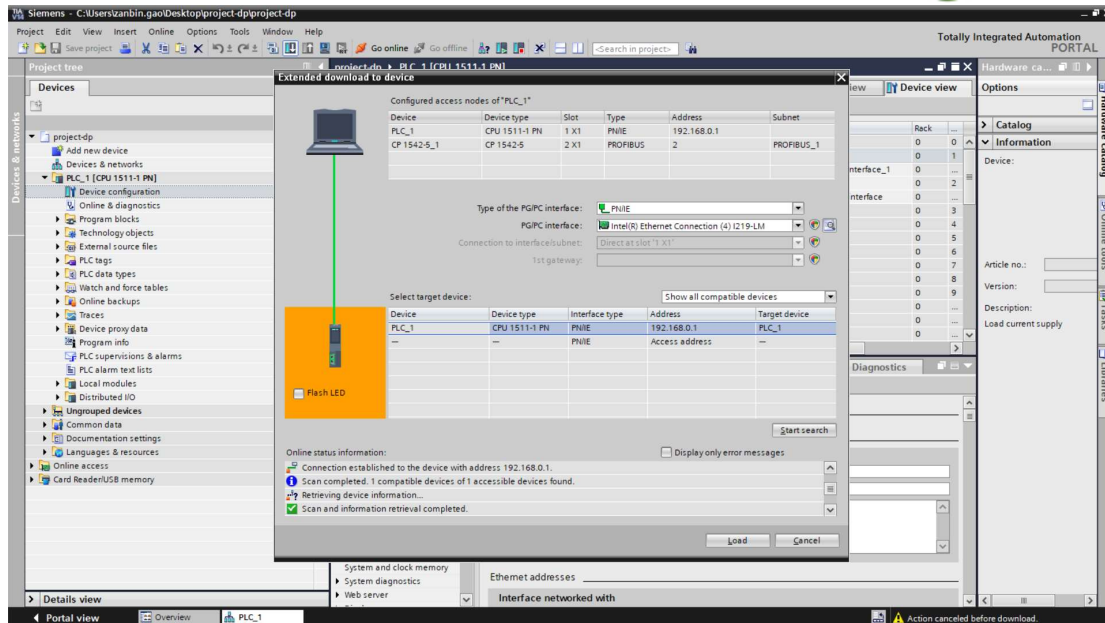
If the single-turn resolution is 4096, the total resolution (high) is 256.

Data settings, as follows:



3) Compile and download:

Click the “Extended download to device” button on the menu to compile the current configuration and download the compiled program to the corresponding PLC, as follows:

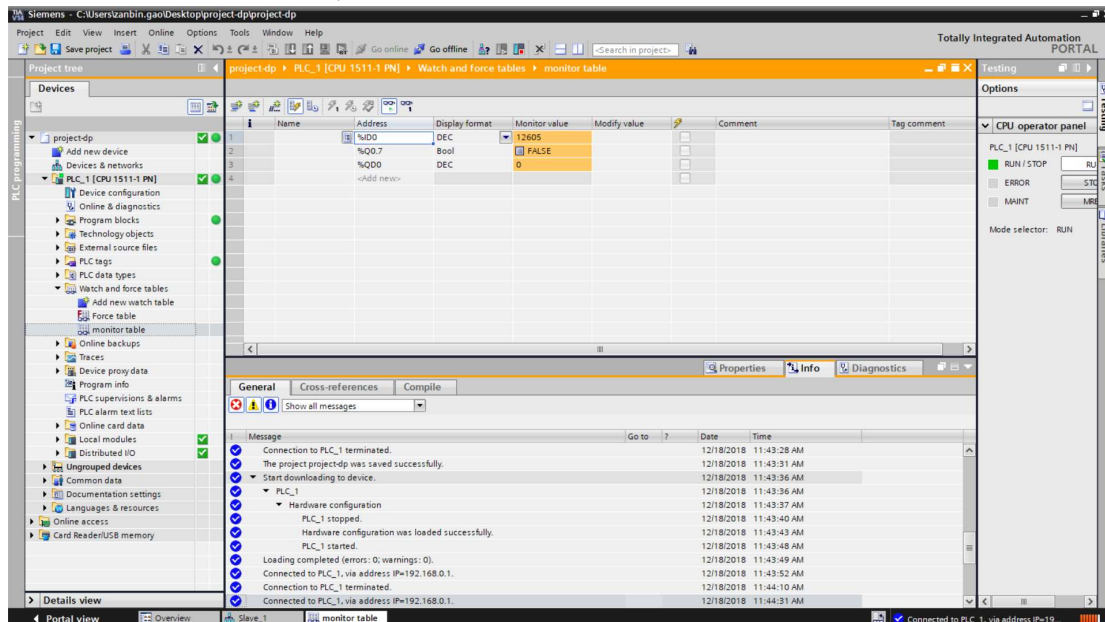


4.4 Use of monitoring tables

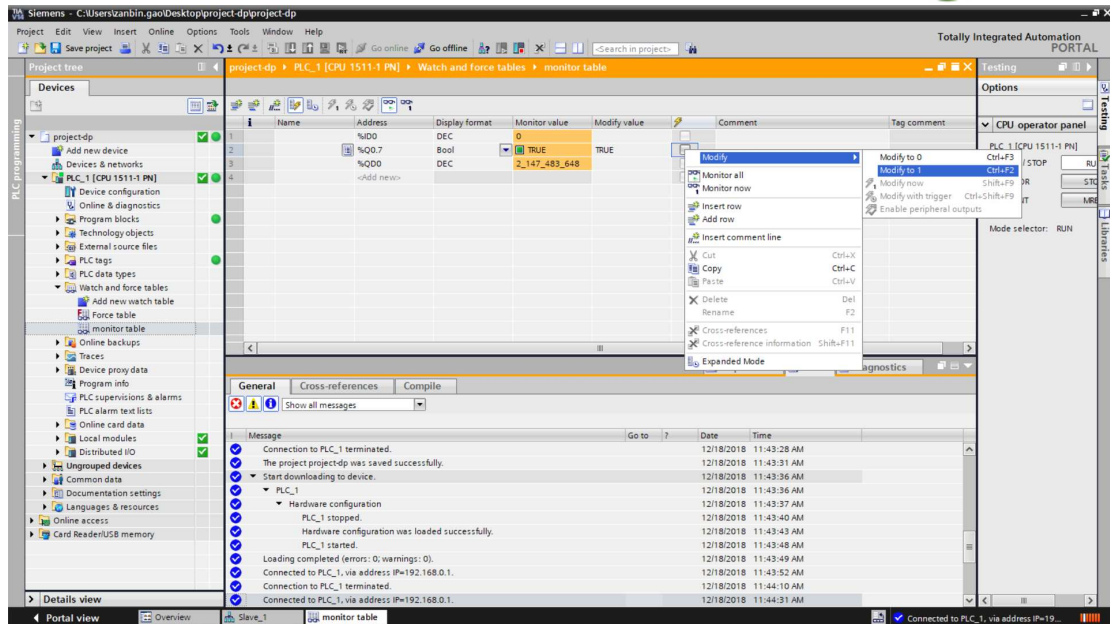
Double-click "Add New Monitoring Table" in the drop-down menu of "Monitoring and Mandatory Table" on the left side of TIA Portal V14 software, and set the encoder data input and output address in the pop-up window.

The real-time position data input address is ID0, the preset bit is Q0.7, and the preset value is set to QD0.

Real-time location data, as follows:



The encoder is set to 0 by modifying Q0.7



Siemens - C:\Users\zanbin.gao\Desktop\project-dp\project-dp

Project Edit View Insert Online Options Tools Window Help

Go online Go offline Search in projects

Project tree project-dp > PLC1 [CPU 1511-1 PN] > Watch and force tables > monitor table

Devices

- project-dp
 - Add new device
 - Devices & networks
 - PLC1 [CPU 1511-1 PN]
 - Device configuration
 - Online & diagnostics
 - Program blocks
 - Technology objects
 - External source files
 - PLC tags
 - PLC data types
 - Watch and force tables
 - Add new watch table
 - Force table
 - monitor table
 - Traces
 - Device proxy data
 - Program info
 - PLC supervisions & alarms
 - PLC alarm text lists
 - Online card data
 - Local modules
 - Distributed I/O
 - Ungrouped devices
 - Common data
 - Documentation settings
 - Languages & resources
 - Online access
 - Card Reader/USB memory

General Cross-references Compile

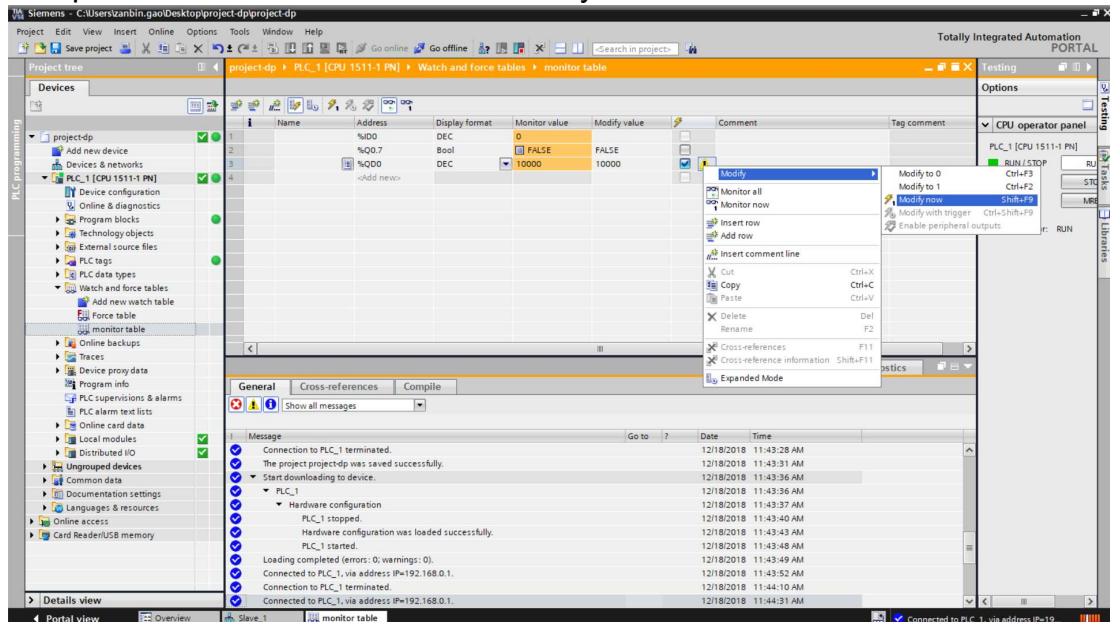
Show all messages

Message	Go to	Date	Time
Connection to PLC1 terminated.		12/18/2018	11:43:28 AM
The project project-dp was saved successfully.		12/18/2018	11:43:31 AM
Start downloading to device.		12/18/2018	11:43:36 AM
PLC1		12/18/2018	11:43:36 AM
Hardware configuration		12/18/2018	11:43:37 AM
PLC1 stopped.		12/18/2018	11:43:40 AM
Hardware configuration was loaded successfully.		12/18/2018	11:43:43 AM
PLC1 started.		12/18/2018	11:43:48 AM
Loading completed (errors: 0; warnings: 0).		12/18/2018	11:43:49 AM
Connected to PLC1, via address IP=192.168.0.1.		12/18/2018	11:43:52 AM
Connection to PLC1 terminated.		12/18/2018	11:44:10 AM
Connected to PLC1, via address IP=192.168.0.1.		12/18/2018	11:44:31 AM

Portal view Overview Slave,1 monitor table

Connected to PLC1, via address IP=192.168.0.1

The preset value data can be modified by QD0



Siemens - C:\Users\zanbin.gao\Desktop\project-dp\project-dp

Project Edit View Insert Online Options Tools Window Help

Go online Go offline Search in projects

Project tree project-dp > PLC1 [CPU 1511-1 PN] > Watch and force tables > monitor table

Devices

- project-dp
 - Add new device
 - Devices & networks
 - PLC1 [CPU 1511-1 PN]
 - Device configuration
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 - PLC tags
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 - Add new watch table
 - Force table
 - monitor table
 - Traces
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 - PLC alarm text lists
 - Online card data
 - Local modules
 - Distributed I/O
 - Ungrouped devices
 - Common data
 - Documentation settings
 - Languages & resources
 - Online access
 - Card Reader/USB memory

General Cross-references Compile

Show all messages

Message	Go to	Date	Time
Connection to PLC1 terminated.		12/18/2018	11:43:28 AM
The project project-dp was saved successfully.		12/18/2018	11:43:31 AM
Start downloading to device.		12/18/2018	11:43:36 AM
PLC1		12/18/2018	11:43:36 AM
Hardware configuration		12/18/2018	11:43:37 AM
PLC1 stopped.		12/18/2018	11:43:40 AM
Hardware configuration was loaded successfully.		12/18/2018	11:43:43 AM
PLC1 started.		12/18/2018	11:43:48 AM
Loading completed (errors: 0; warnings: 0).		12/18/2018	11:43:49 AM
Connected to PLC1, via address IP=192.168.0.1.		12/18/2018	11:43:52 AM
Connection to PLC1 terminated.		12/18/2018	11:44:10 AM
Connected to PLC1, via address IP=192.168.0.1.		12/18/2018	11:44:31 AM

Portal view Overview Slave,1 monitor table

Connected to PLC1, via address IP=192.168.0.1

By modifying Q0.7 state 1, when displaying TURE, the ID0 data is 10000

Siemens - C:\Users\zanbin.gao\Desktop\project-dp\project-dp

Project Edit View Insert Online Options Tools Window Help

Totally Integrated Automation PORTAL

Project tree: project-dp > PLC_1 [CPU 1511-1 PN] > Watch and force tables > monitor table

Devices

Name	Address	Display format	Monitor value	Modify value	Comment
%I0.0	DEC	10000			
%Q0.7	Bool	TRUE			
%Q0.0	DEC	2,147,493,648	10000		

Options

PLC_1 [CPU 1511-1 PN]

RUN / STOP RUN

ERROR STOP

MAINT MRES

Mode selector: RUN

General Cross-references Compile

Show all messages

Message	Date	Time
Connection to PLC_1 terminated.	12/18/2018	11:43:28 AM
The project project-dp was saved successfully.	12/18/2018	11:43:31 AM
Start downloading to device.	12/18/2018	11:43:36 AM
PLC_1	12/18/2018	11:43:36 AM
Hardware configuration	12/18/2018	11:43:37 AM
PLC_1 stopped.	12/18/2018	11:43:40 AM
Hardware configuration was loaded successfully.	12/18/2018	11:43:43 AM
PLC_1 started.	12/18/2018	11:43:48 AM
Loading completed (errors: 0; warnings: 0).	12/18/2018	11:43:49 AM
Connected to PLC_1, via address IP=192.168.0.1.	12/18/2018	11:43:52 AM
Connection to PLC_1 terminated.	12/18/2018	11:44:10 AM
Connected to PLC_1, via address IP=192.168.0.1.	12/18/2018	11:44:31 AM

Details view

Portal view Overview Slave_1 monitor table

Connected to PLC_1, via address IP=192.168.0.1