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SCE Training Curriculum

Siemens Automation Cooperates with Education | 05/2017

TIA Portal Module 012-105

Specified Hardware Configuration
with SIMATIC S7-1500
CPU 1512C-1 PN

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SPECIFIED HARDWARE CONFIGURATION – SIMATIC S7-1512C-1 PN

1 Goal

In this chapter, you will first learn how to ***create a project***. You are then shown how the ***hardware is configured***.

The SIMATIC S7 controllers listed in Chapter 3 can be used.

2 Prerequisite

You do not need any previous knowledge from other chapters to successfully complete this chapter.

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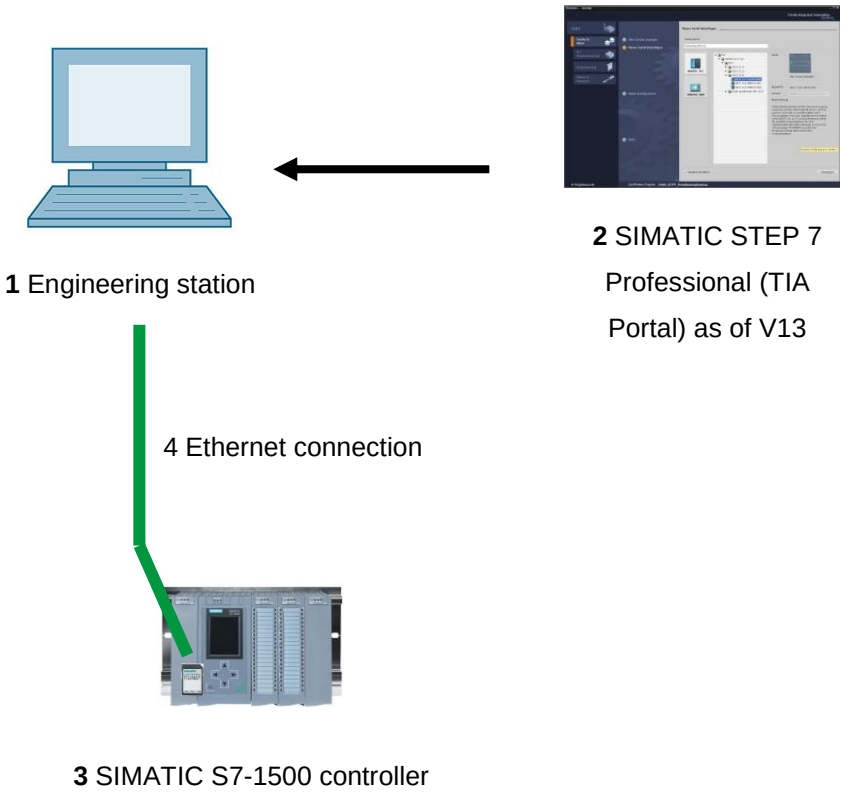
3 Required hardware and software

1 Engineering station: requirements include hardware and operating system (for additional information, see Readme on the TIA Portal Installation DVDs)

2 SIMATIC STEP 7 Professional software in TIA Portal – as of V13

3 SIMATIC S7-1500 controller, e.g. CPU 1512C-1 PN – Firmware as of V1.6 with memory card

4 Ethernet connection between engineering station and controller



1 Engineering station

2 SIMATIC STEP 7 Professional (TIA Portal) as of V13

3 SIMATIC S7-1500 controller

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4 Theory

4.1 SIMATIC S7-1500 automation system

The SIMATIC S7-1500 automation system is a modular controller system for the middle to upper performance range. A comprehensive range of modules is available to optimally adapt the system to the automation task.

SIMATIC S7-1500 is the next generation of the SIMATIC S7-300 and S7-400 automation systems with the following new performance features.

- Increased system performance
- Integrated motion control functionality
- PROFINET IO IRT
- Integrated display for machine-level operation and diagnostics
- STEP 7 language innovations while maintaining proven functions

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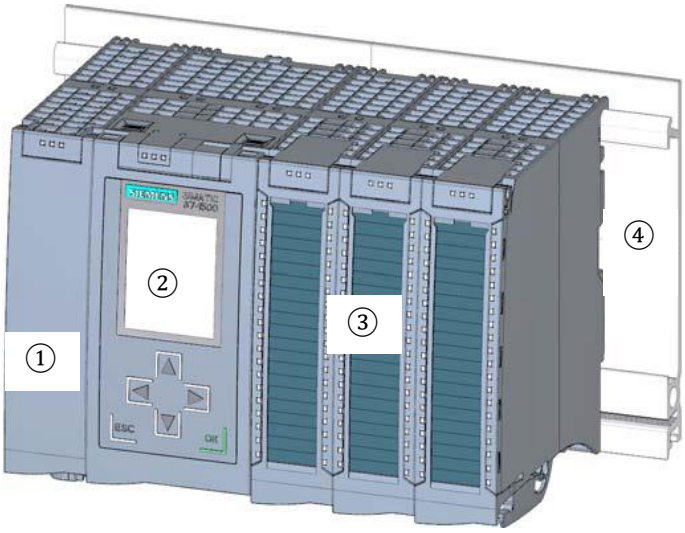
The S7-1500 controller consists of a power supply ①, a CPU with integrated display ② and, in the case of compact CPUs, integrated inputs and outputs. In addition, there are input and output modules for digital and analog signals ③. If necessary, communication processors and function modules are also used for special tasks such as PROFIBUS communication or stepper motor control. The up to 32 modules are mounted on a mounting rail with integrated DIN rail profile ④.



The programmable logic controller (PLC) uses the S7 program to monitor and control a machine or process. In doing so, the S7 program scans the IO modules via input addresses (%I) and addresses their output addresses (%Q).

The system is programmed with the STEP 7 Professional V13 software.

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4.1.1 Range of modules

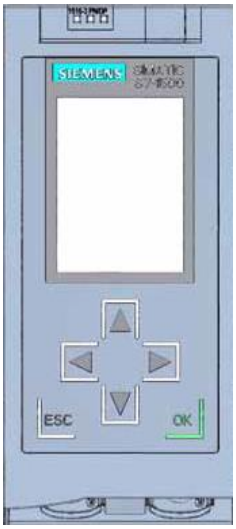
The SIMATIC S7-1500 is a modular automation system and offers the following range of modules:

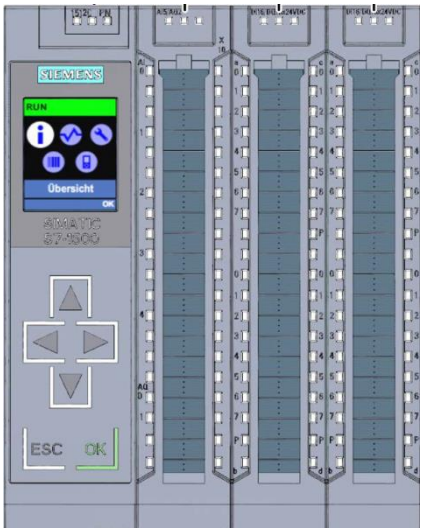
Central processing units (CPUs) with integrated display

The CPUs have different performance capability and execute the user program. In addition, the other modules are supplied power via the backplane bus with the integrated system power supply.

Additional properties and functions of the CPU:

- Communication via Ethernet
- Communication via PROFIBUS/PROFINET
- HMI communication for HMI devices
- Web server
- Integrated technology functions (e.g. PID controller, motion control, etc.)
- System diagnostics
- Integrated security (e.g. know-how, copy, access, integrity protection)
- Integrated digital and analog inputs and outputs (for compact CPUs)





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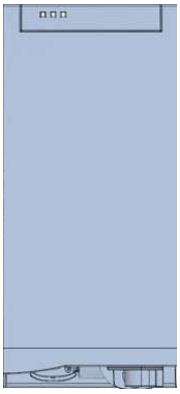
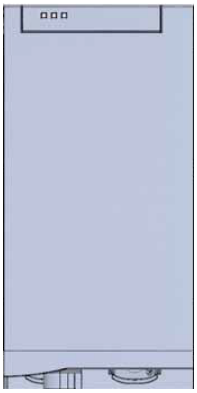
System power supply modules (PS) (rated input voltages 24 V DC to 230 V AC/DC)

with connection to the backplane bus supply the configured modules with the internal supply voltage.



Load current supply modules (PM) (rated input voltages 120/230 V AC)

do not have a connection to the backplane bus of the S7-1500 automation system. The load current supply is used to supply 24 V DC to the system power supply of the CPU, the input and output circuits of IO modules and the sensors and actuators.



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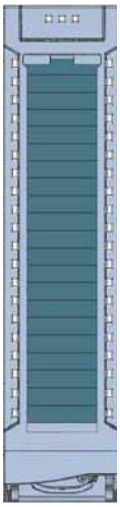
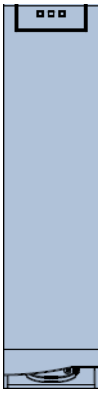
IO modules

for digital input (DI) / digital output (DQ) / analog input (AI) / analog output (AQ)



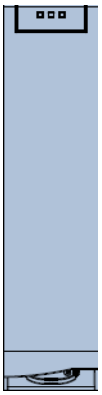
Technology modules (TM)

as incremental encoders and pulse encoders with/without direction signal.



Communication modules (CM)

for serial communication RS232 / RS422 / RS485, PROFIBUS and PROFINET.



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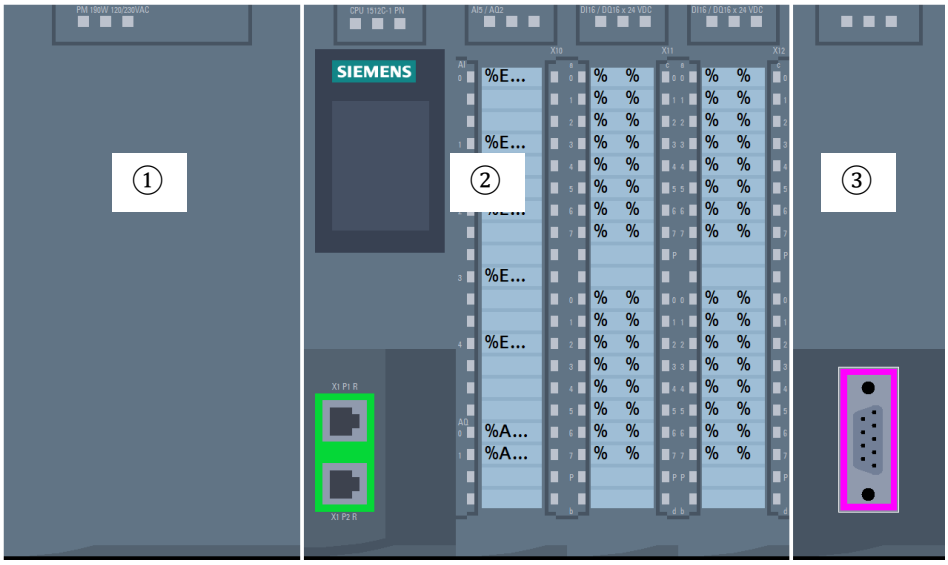
SIMATIC memory card

up to a maximum of 32 GB for storing program data and for easy replacement of CPUs during maintenance.

4.1.2 Example configuration

The following configuration of an S7-1500 automation system will be used for the program example in this curriculum.



① Load current supply module PM 1507 with input 120/230 V AC, 50 Hz / 60 Hz, 190 W and output 24 V DC / 8 A

② Central module compact CPU 1512C-1 PN with integrated PROFINET interfaces

③ Communications processor CP 1542-5 for connection to PROFIBUS DP

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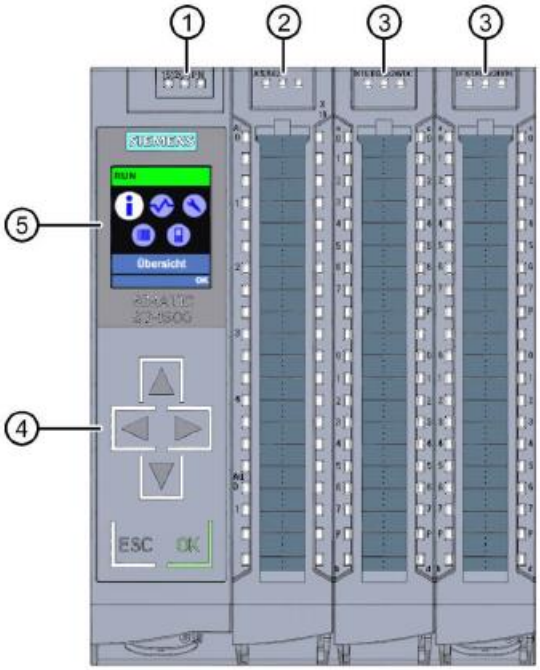
4.2 Operator control and display elements of the CPU 1512C-1 PN

The figure below shows the operator control and display elements of a CPU 1512C-1 PN.

The arrangement and number of elements differ from this figure for other CPUs.

4.2.1 Front view of the CPU 1512C-1 PN with integrated display



① LED displays for the current operating mode and diagnostic status of the CPU

② Status and error displays RUN/ERROR of the analog on-board I/O

③ Status and error displays RUN/ERROR of the digital on-board I/O

④ Control keys

⑤ Display

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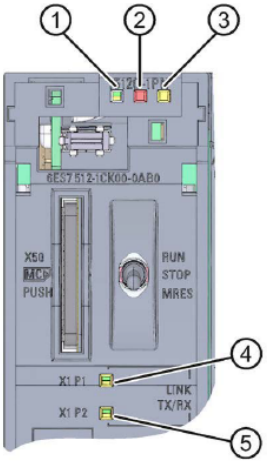
4.2.2 Status and error displays

The CPU comes with the following LED displays:



① RUN/STOP LED (yellow/green LED)
② ERROR LED (red LED)
③ MAINT LED (yellow LED)
④ LINK RX/TX LED for port X1 P1 (yellow/green LED)
⑤ LINK RX/TX LED for port X1 P2 (yellow/green LED)

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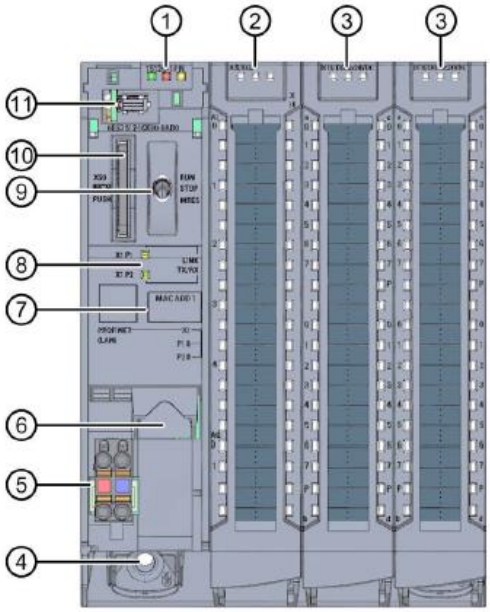
4.2.3 Operator control and connection elements of the CPU 1512C-1 PN behind the hinged front cover



① LED displays for the current operating mode and diagnostic status of the CPU
② Status and error displays RUN/ERROR of the analog on-board I/O
③ Status and error displays RUN/ERROR of the digital on-board I/O
④ Fastening screw
⑤ Connection for supply voltage
⑥ PROFINET interface (X1) with 2 ports (X1 P1 and X1 P2)
⑦ MAC address
⑧ LED displays for the 2 ports (X1 P1 and X1 P2) of the PROFINET interface X1
⑨ Mode switch
⑩ Slot for the SIMATIC memory card
⑪ Display connection

Note: *The hinged front cover with the display can be removed and inserted during operation.*

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4.2.4 SIMATIC memory card

A SIMATIC Micro Memory Card is used as the memory module for the CPUs. This is a preformatted memory card that is compatible with the Windows file system. It is available with various storage capacities and can be used for the following purposes:

- Transportable data storage medium
- Program card
- Firmware update card

The MMC **must** be inserted to operate the CPU as the CPUs have no integrated load memory. A commercially available SD card reader is needed to write/read the SIMATIC memory card with the programming device or PC. This allows files to be copied directly to the SIMATIC memory card using Windows Explorer, for example.

> ***Note:*** *It is recommended that the SIMATIC memory card only be removed or inserted when the CPU is in the POWER OFF state.*

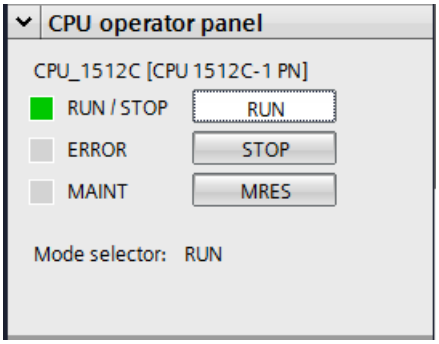
4.2.5 Mode switch

The mode switch allows you to set the operating mode of the CPU.
The mode switch is designed as a toggle switch with 3 switch positions.

Position	Meaning	Explanation
RUN	RUN mode	The CPU is executing the user program.
STOP	STOP mode	The CPU is not executing the user program.
MRES	Memory reset	Position for CPU memory reset.

You can also use the button on the CPU operator panel of the STEP 7 Professional V13 software in Online & Diagnostics to switch the operating mode (**STOP** or **RUN**).

The operator panel also contains an **MRES** button for performing a memory reset and displays the status LEDs of the CPU.



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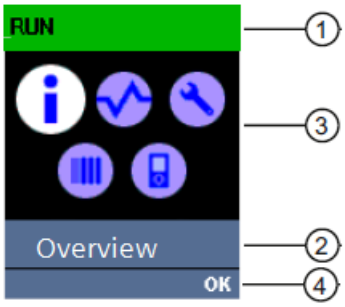
4.2.6 Display of the CPU

The S7-1500 CPU has a hinged front cover with a display and control keys. Control data and status data can be displayed in various menus on the display and numerous settings can be made. You use the control keys to navigate through the menus.

The display of the CPU offers the following functions:

- 6 different display languages can be selected.
- Diagnostic messages are displayed in plain text.
- The interface settings can be changed locally.
- Password assignment for display operation is possible through the TIA Portal.

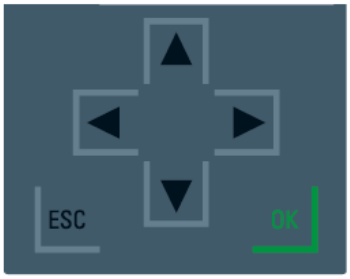
View of the display of an S7-1500:



① CPU status information
② Submenu name
③ Information display field
④ Navigation aid, e.g. OK/ESC or the page number

Control keys of the display

- Four arrow keys: "up", "down", "left", "right"
- An ESC key
- An OK key



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Functions of the "OK" and "ESC" keys

→ For menu commands in which an input can be made:

- OK → valid access to the menu command, confirmation of input and exit from editing mode
- ESC → restoration of original content (which means changes are not saved) and exit from editing mode

→ For menu commands in which no input can be made:

- OK → to next submenu command
- ESC → back to previous menu command

Available submenus of the display:

Main menu commands	Meaning	Explanation
	Overview	The "Overview" menu contains information about the properties of the CPU.
	Diagnostics	The "Diagnostics" menu contains information about diagnostic messages, the diagnostic description and the indication of interrupts. There is also information about the network properties of each interface of the CPU.
	Settings	In the "Settings" menu, IP addresses of the CPU are assigned, the date, time of day, time zones, operating modes (RUN/STOP) and protection levels are set, a memory reset and reset to factory settings of the CPU can be performed and the status of firmware updates is displayed.
	Modules	The "Modules" menu contains information about the modules that are used in your configuration. The modules can be used as central or distributed modules. Distributed modules are connected to the CPU via PROFINET and/or PROFIBUS. You have the option here to set the IP addresses for a CP.
	Display	In the "Display" menu, settings are made for all aspects of the display, such as the language setting, brightness setting and Energy-saving mode. (Energy-saving mode darkens the display. Standby mode switches off the display.)

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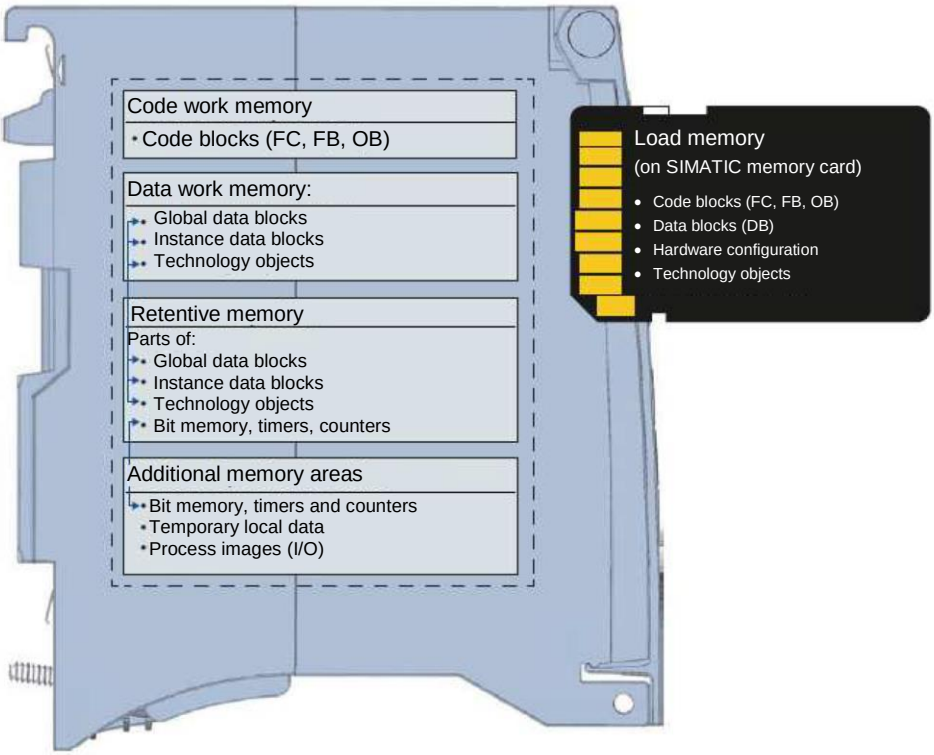
4.3 Memory areas of the CPU 1512C-1 PN and the SIMATIC memory card

The following figure shows the memory areas of the CPU and the load memory on the SIMATIC memory card.

In addition to the load memory, other data can be loaded onto the SIMATIC memory card using Windows Explorer. This includes recipes, data logs, project backups and additional documentation for the program.



Load memory

Load memory is non-volatile memory for code blocks, data blocks, technology objects and the hardware configuration. When these objects are downloaded to the CPU, they are first stored in the load memory. This memory is located on the SIMATIC memory card.

Work memory

Work memory is volatile memory that contains the code and data blocks. The work memory is integrated into the CPU and cannot be expanded. In S7-1500 CPUs, the work memory is divided into two areas:

→ Code work memory:

– The code work memory contains runtime-relevant parts of the program code.

→ Data work memory:

– The data work memory contains the runtime-relevant parts of the data blocks and technology objects.

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At the operating mode transitions from POWER ON to startup and from STOP to startup, tags of global data blocks, instance data blocks and technology objects are initialized with their start values. Retentive tags retain their actual values that were saved in the retentive memory.

Retentive memory

Retentive memory is non-volatile memory for saving certain data in the event of power failure. The tags and operand areas that have been defined as retentive are saved in the retentive memory. This data is retained beyond power-off or power failure.

All other program tags are set to their start values at the operating mode transitions from POWER ON to startup and from STOP to startup.

The content of retentive memory is deleted by the following actions:

● Memory reset

● Reset to factory settings

Note: *Certain tags of technology objects are also stored in the retentive memory. These tags are not deleted by a memory reset.*

4.4 STEP 7 Professional V13 (TIA Portal V13) programming software

STEP 7 Professional V13 (TIA Portal V13) software is the programming tool for the following automation systems:

- SIMATIC S7-1500
- SIMATIC S7-1200
- SIMATIC S7-300
- SIMATIC S7-400
- SIMATIC WinAC

STEP 7 Professional V13 provides the following functions for plant automation:

- Configuration and parameter assignment of the hardware
- Specification of the communication
- Programming
- Testing, commissioning and servicing with operational/diagnostic functions
- Documentation
- Creation of visualizations for SIMATIC Basic Panels using the integrated WinCC Basic software
- Visualization solutions for PCs and other panels can also be created with other WinCC software packages

Support is provided for all functions through detailed online help.

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4.4.1 Project

To implement a solution for an automation and visualization task, you create a project in the TIA Portal. A project in the TIA Portal contains the configuration data for the configuration and networking of devices as well as the programs and the configuration of the visualization.

4.4.2 Hardware configuration

The *hardware configuration* includes the configuration of the devices, consisting of the hardware of the automation systems, the intelligent field devices and the hardware for visualization. The configuration of the networks specifies the communication between the various hardware components. The individual hardware components are *inserted in the hardware configuration* from catalogs.

The hardware of automation systems comprises controllers (CPUs), signal modules for input and output signals (SMs) and communication and interface modules (CP, IM). Other power supply and current supply modules (PS, PM) are also available to supply the modules.

The signal modules and intelligent field devices connect the input and output data of the process to be automated and visualized to the automation system.

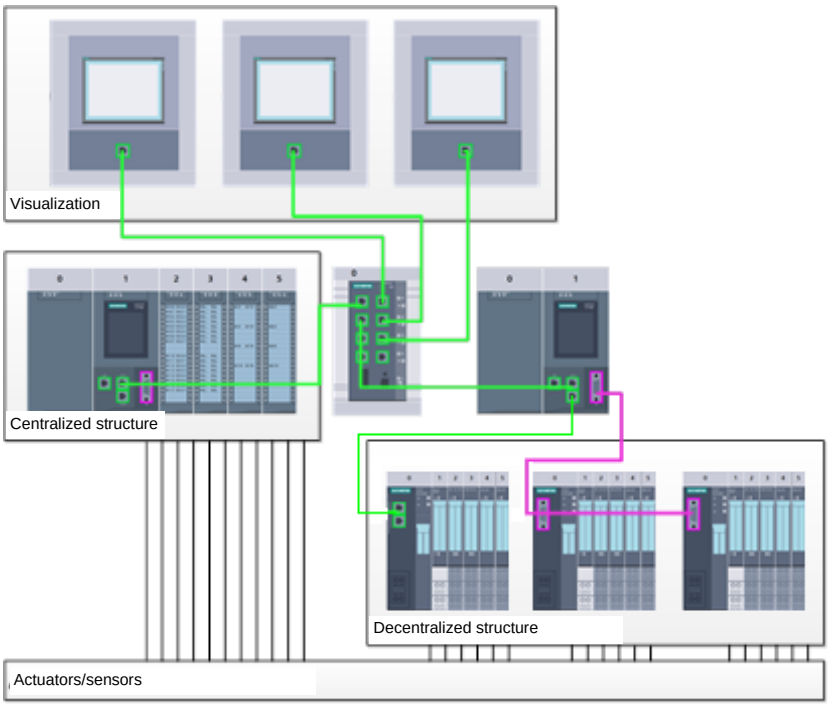

Figure 1: Example of hardware configuration with centralized and decentralized structures

The hardware configuration enables the downloading of automation and visualization solutions to the automation system and access to the connected signal modules by the controller.

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4.4.3 Centralized and decentralized automation structure

Figure 1 shows an automation structure that contains both centralized and decentralized structures.

In centralized structures, the input and output signals of the process are transmitted by way of conventional wiring to the signal modules, which are connected directly to the controller. Conventional wiring refers to the connection of sensors and actuators using 2-wire or 4-wire cables.

The decentralized structure is the predominant structure used today. Here, the sensors and actuators are wired conventionally only as far as the signal modules of the field devices. The signal transmission from the field devices to the controller is implemented using an industrial communication system.

Both classic fieldbuses such as PROFIBUS, Modbus and Foundation Fieldbus as well as Ethernet-based communication systems such as PROFINET can be used as the industrial communication system.

In addition, intelligent field devices in which stand-alone programs run can also be connected via the communication system. These programs can also be created with the TIA Portal.

4.4.4 Planning the hardware

Before you can configure the hardware, you must plan it (hardware planning). In general, you begin by selecting which controllers are needed and how many. Next you select the communication modules and signal modules. The selection of signal modules is based on the number and type of inputs and outputs needed. As the final step, a power supply that ensures that the necessary power is supplied must be selected for each controller or field device.

The functionality required and the ambient conditions are of vital importance for planning the hardware configuration. For example, the temperature range in the application area sometimes limits the devices available for selection. Fail-safe operation might be another requirement, for example.

The TIA Selection Tool (Select automation technology → TIA Selection Tool and follow the instructions) provides you support.
Note: TIA Selection Tool requires Java.

> ***Note for online research:*** *If more than one manual is available, you should look for the description "Device Manual", "Product Manual" or simply "Manual" (as opposed to "Function Manual", "List Manual", "System Manual", etc.) in order to find the device specifications.*

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4.4.5 TIA Portal – Project view and portal view

The TIA Portal has two important views. When started, the portal view appears by default. This view makes getting started easier, especially for beginning users.

The portal view provides a task-oriented view of the tools for working on the project. Here, you can quickly decide what you want to do and open the tool for the task at hand. If necessary, a change to the project view takes place automatically for the selected task.

Figure 2 shows the portal view. At the bottom left, there is an option to switch between this view and the project view.

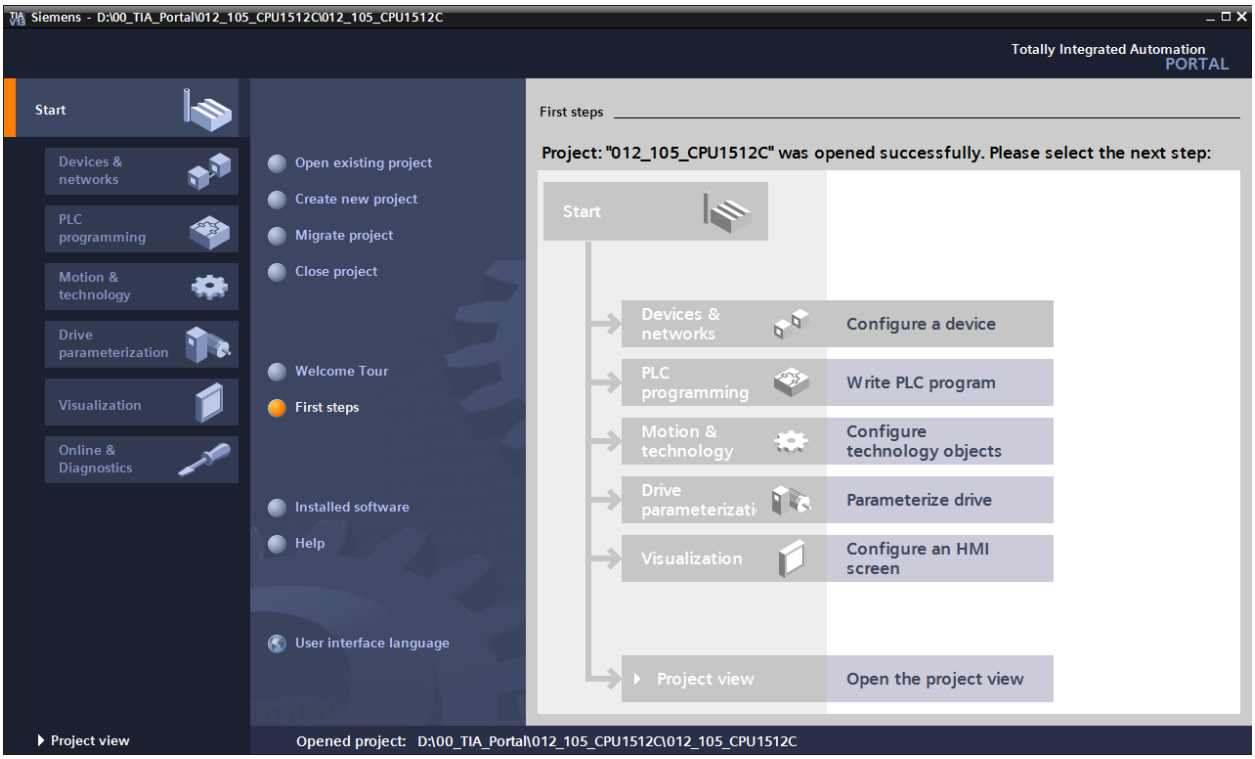

Figure 2: Portal view

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The project view, as shown in Figure 3, is used for hardware configuration, programming, creation of the visualization and many other tasks.

By default, the project view displays the menu bar with the toolbars at the top, the project tree with all components of a project on the left and the so-called task cards with instructions and libraries, for example, on the right.

If an element (for example, the device configuration) is selected in the project tree, it is displayed in the center and can be worked on there.

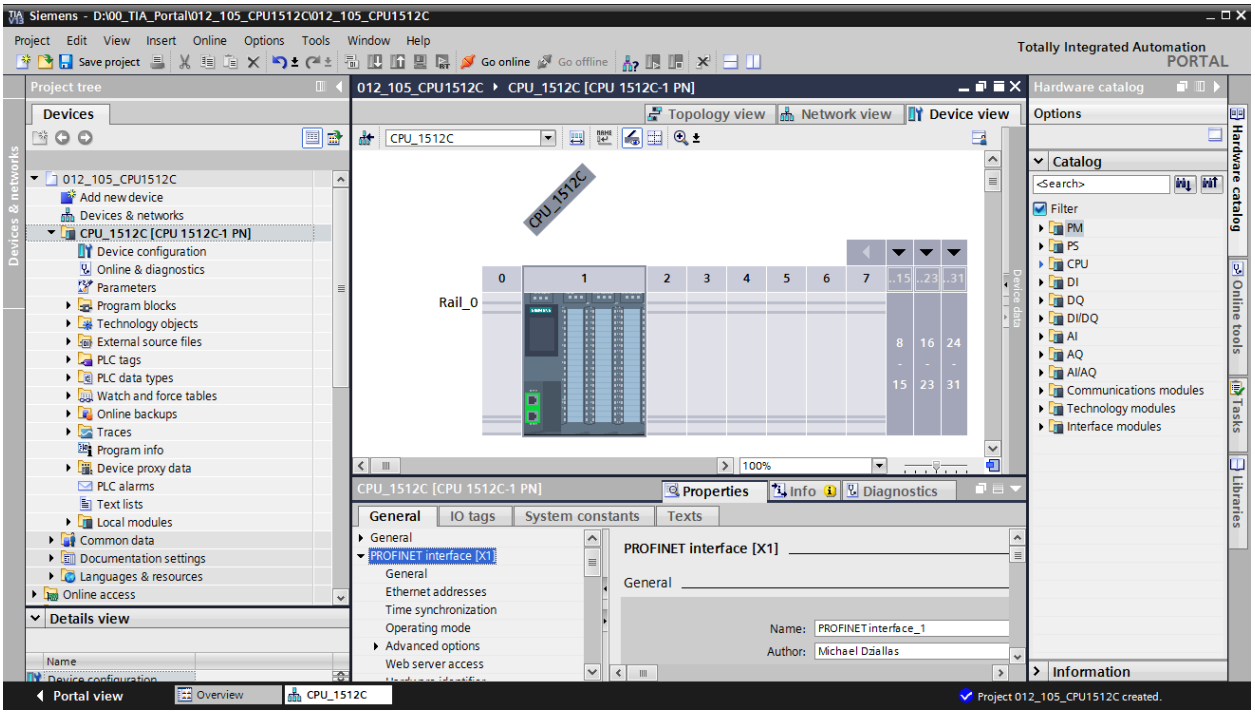

Figure 3: Project view

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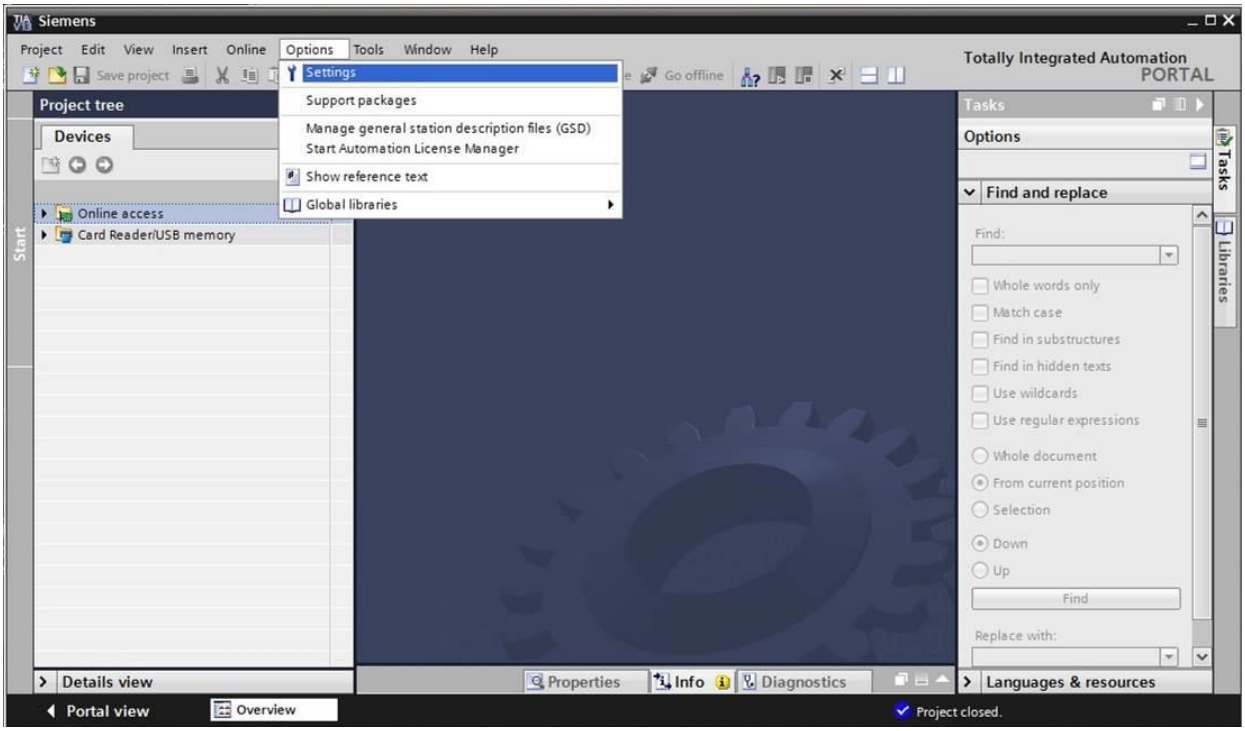
4.4.6 Basic settings for the TIA Portal

→ Users can specify their own default settings for certain settings in the TIA Portal. A few important settings are shown here.

→ In the project view, select the →"Options" menu and then → "Settings".



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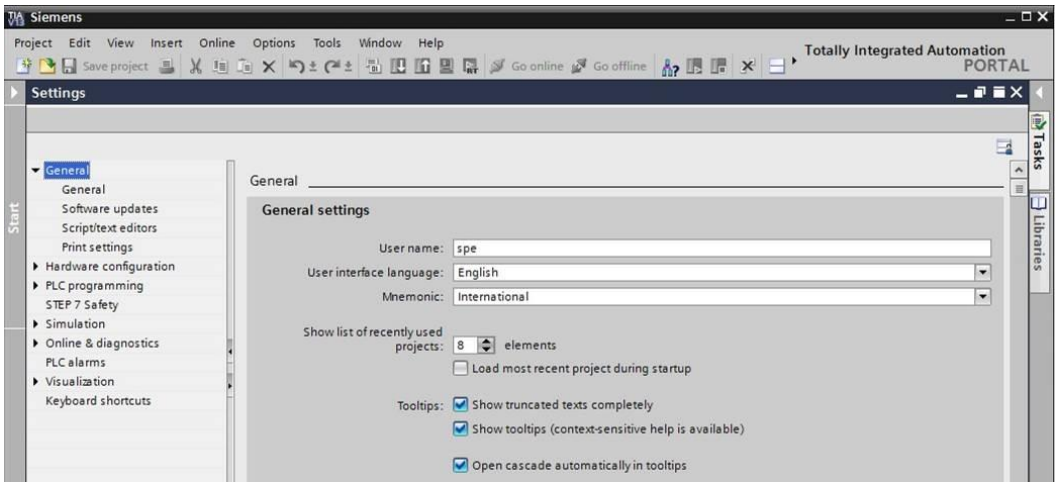
→ One basic setting is the selection of the user interface language and the language for the program display. In the curriculums to follow, "English" will be used for both settings.

→ Under → "General" in "Settings", select "User interface language → English" and "Mnemonic → International".



Note: *These settings can always be changed.*

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4.4.7 Setting the IP address on the programming device

To program SIMATIC S7-1500 from the PC, the programming device or a laptop, you need a TCP/IP connection or an optional PROFIBUS connection.

For the PC and SIMATIC S7-1500 to communicate with each other via TCP/IP, it is important that the IP addresses of both devices match.

First, we show you how to set the IP address of a computer with the Windows 7 operating system.

→ Locate the network icon in the taskbar at the bottom and click → "Open Network and Sharing Center".

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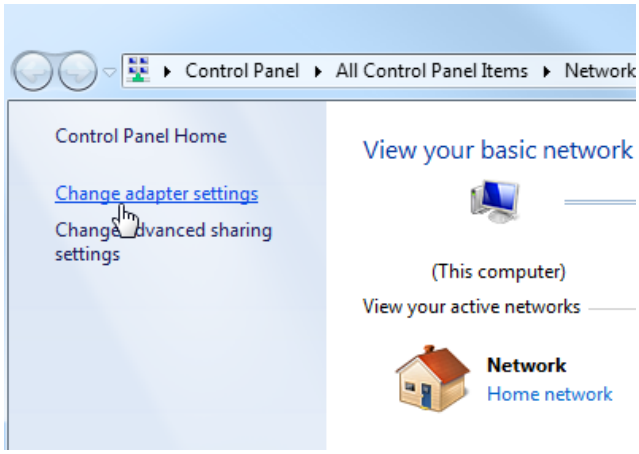
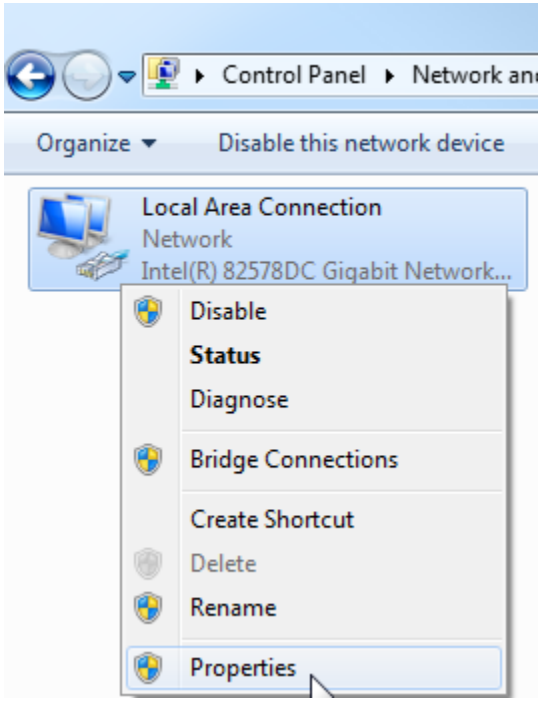
→ In the open Network and Sharing Center window, click → "Change adapter settings".



→ Select the desired → "Local Area Connection" that you want to use to connect to the controller and click → "Properties".



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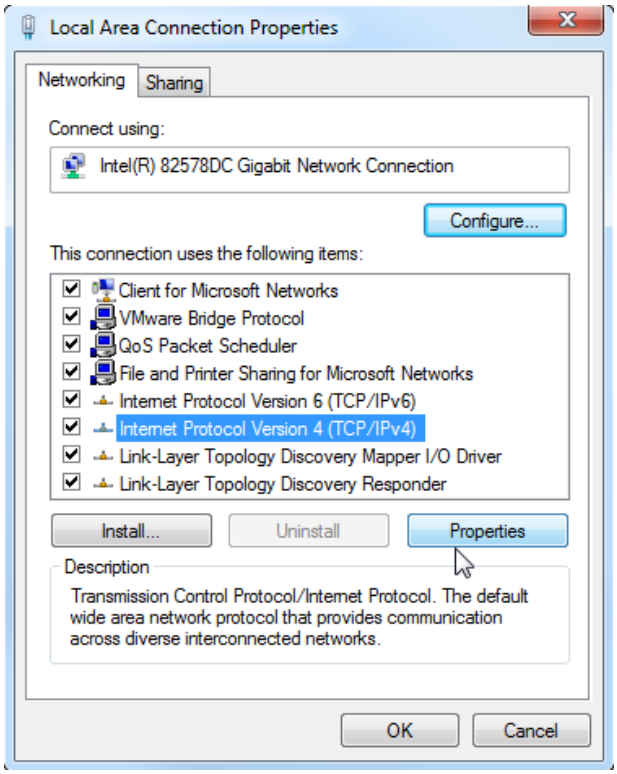
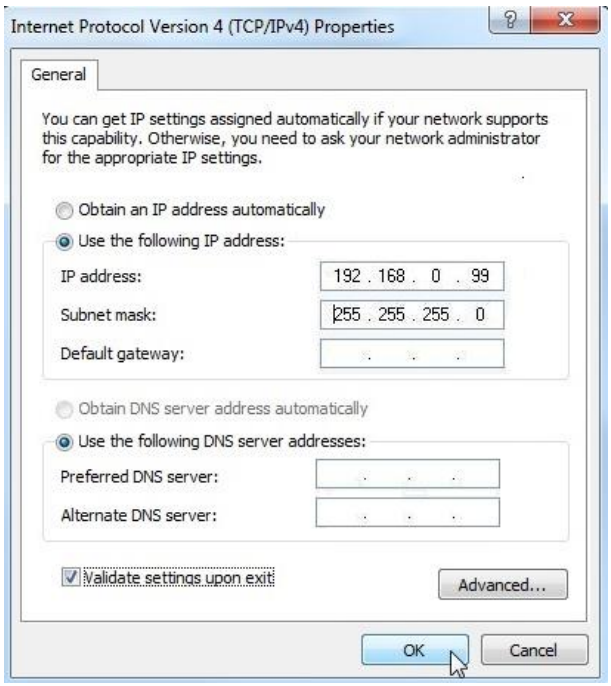
→ Next, select → "Properties" for → "Internet Protocol Version 4 (TCP/IP)".



→ You can use the following IP address, for example → IP address: 192.168.0.99 → Subnet mask 255.255.255.0 and accept the settings (→ "OK")



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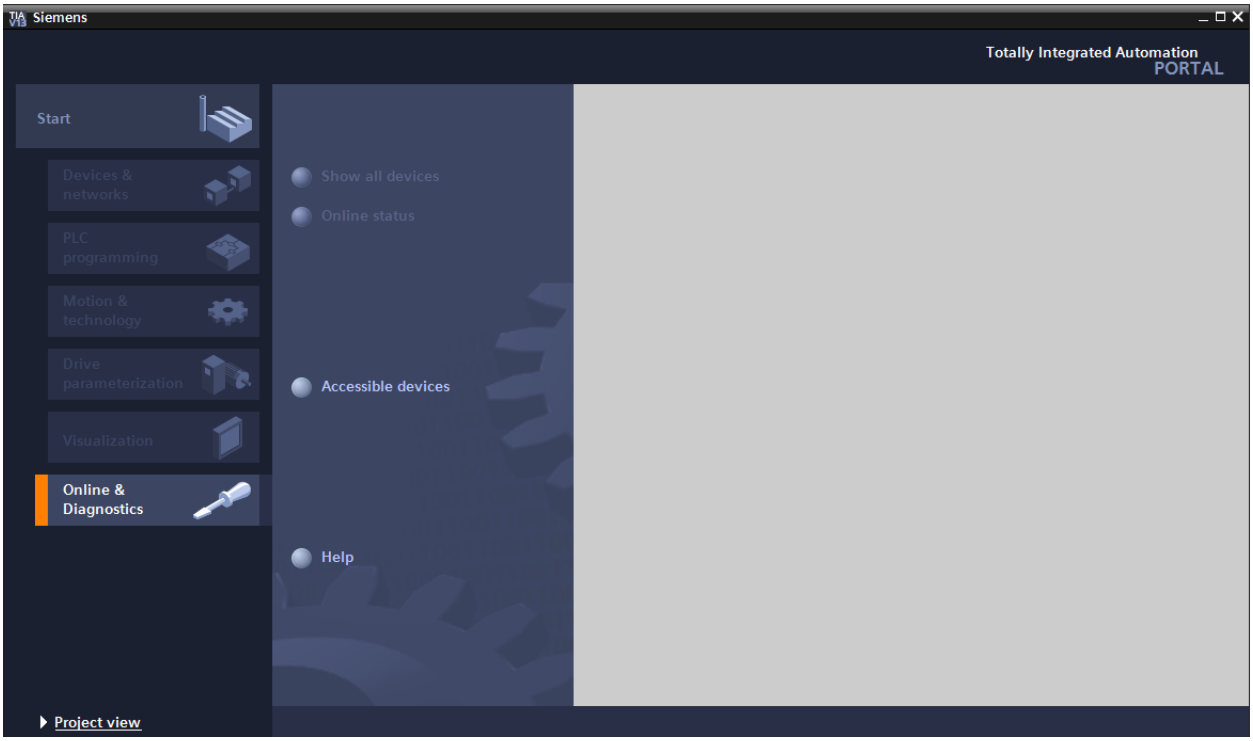
4.4.8 Setting the IP address in the CPU

The IP address of SIMATIC S7-1500 is set as follows.

→ Select the Totally Integrated Automation Portal for this, which is opened here with a double-click. (→ TIA Portal V13)

→ Select → "Online & Diagnostics" and open the →"project view".



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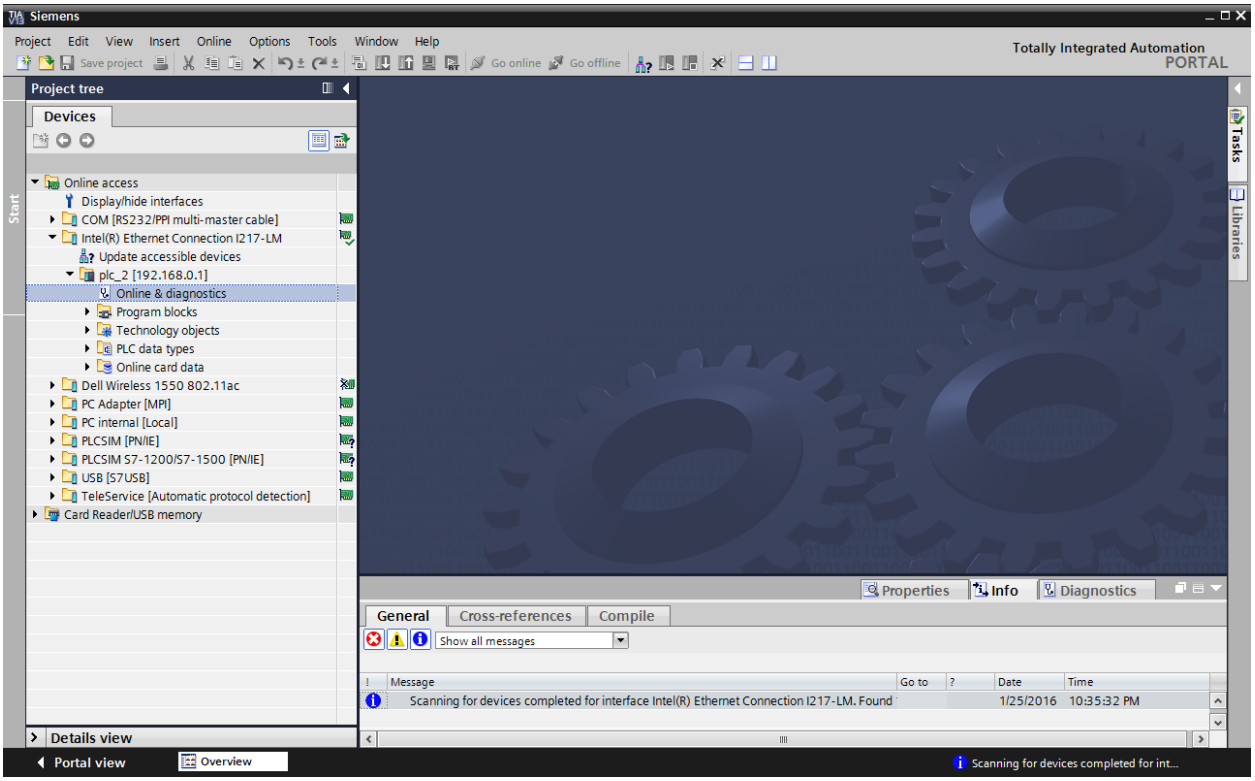
→ In the project tree under → "Online access", select the network adapter that was set previously. If you click → "Update accessible devices" here, you will see the IP address (if previously set) or the MAC address (if IP address not yet assigned) of the connected SIMATIC S7-1500. Select → "Online & Diagnostics" here.



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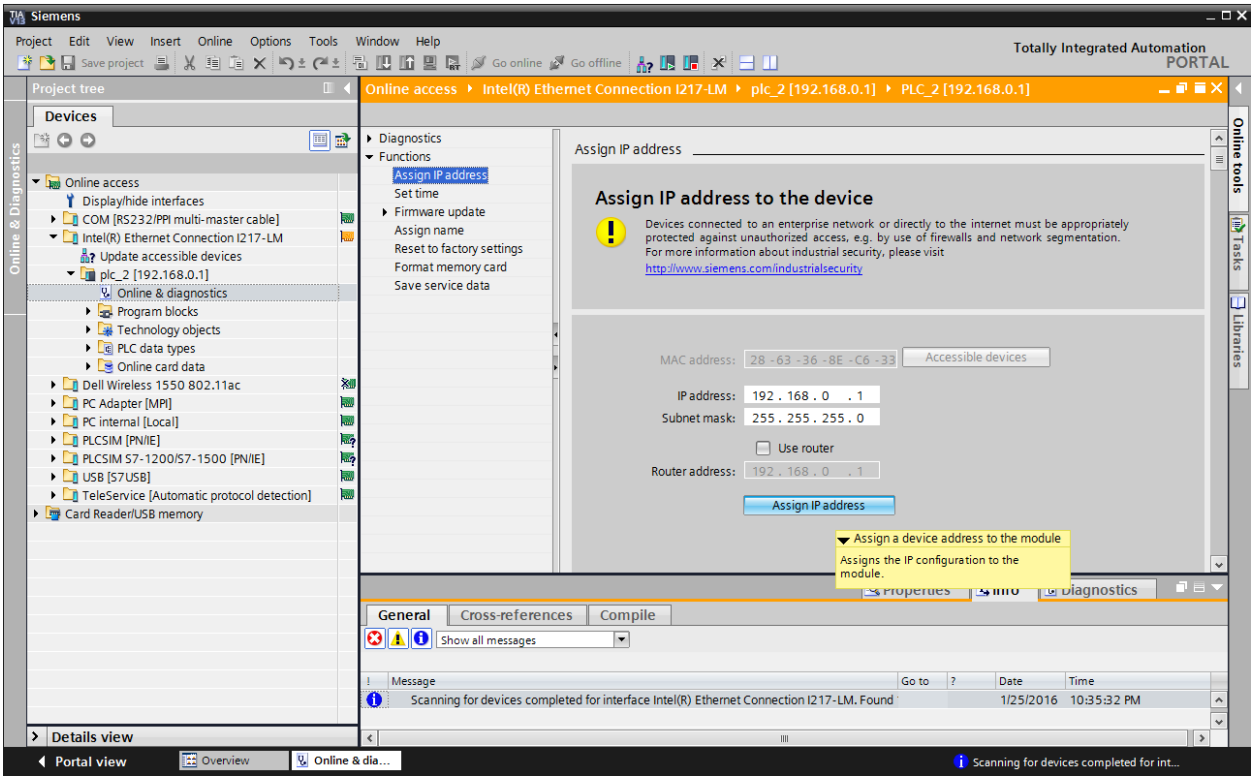
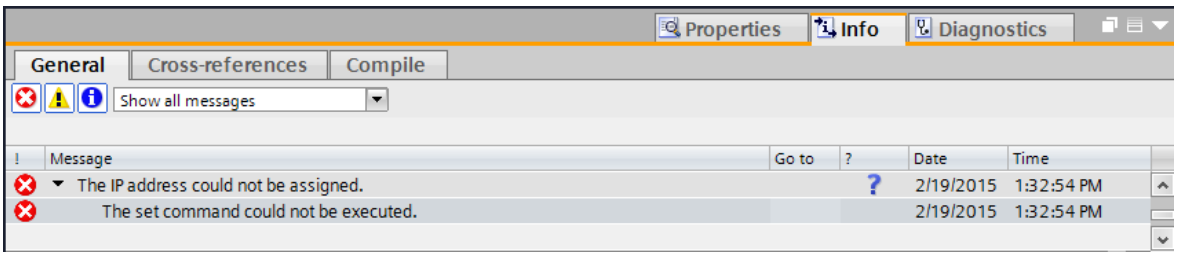
→ Under→ "Functions", you now find the → "Assign IP address" item. Enter the following IP address here (example): → IP address: 192.168.0.1 → Subnet mask 255.255.255.0. Next, click → "Assign IP address" and this new address will be assigned to your SIMATIC S7-1500.



Note: *The IP address of the SIMATIC S7-1500 can also be set via the display on the CPU, provided this is enabled in the hardware configuration.*

→ If the IP address was not successfully assigned, you will receive a message in the → "Info" window under → "General".



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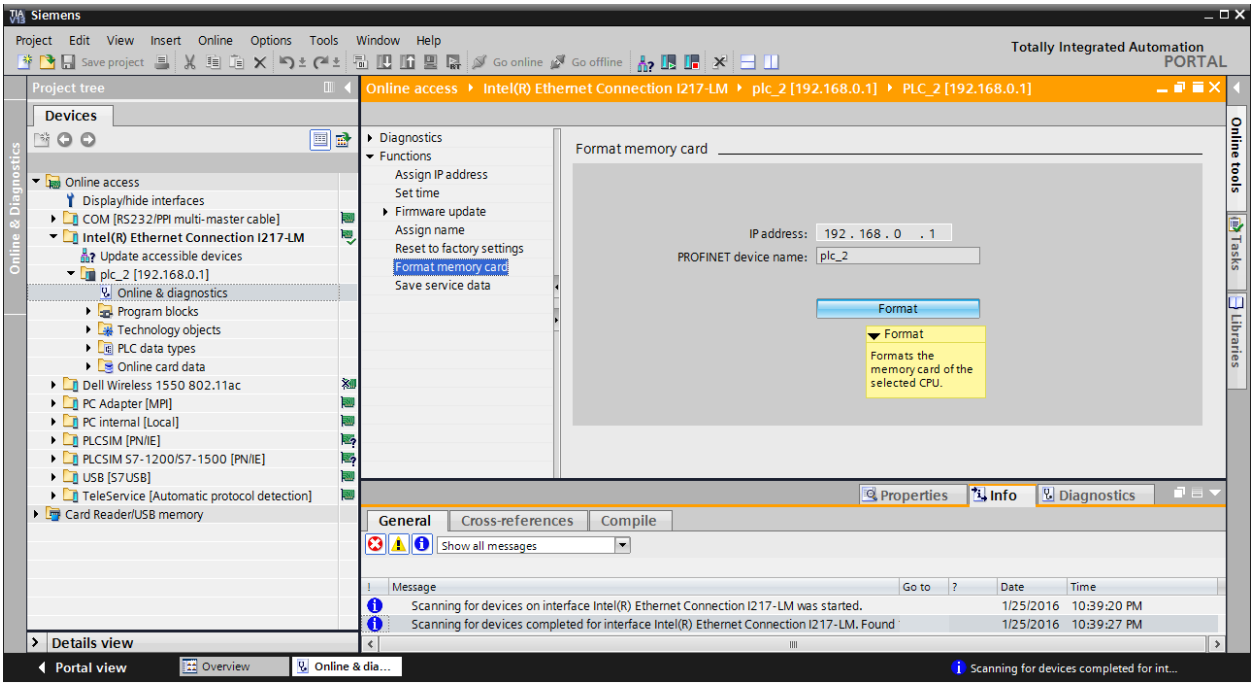
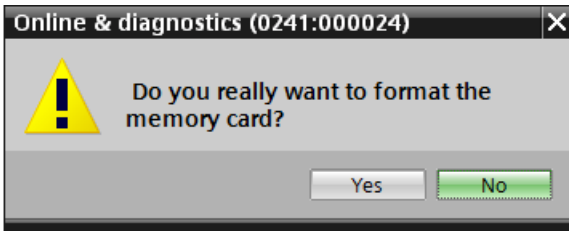
4.4.9 Formatting the memory card in the CPU

→ If the IP address could not be assigned, the program data on the CPU must be deleted. This is accomplished in 2 steps: → "Format memory card" and →"Reset to factory settings".

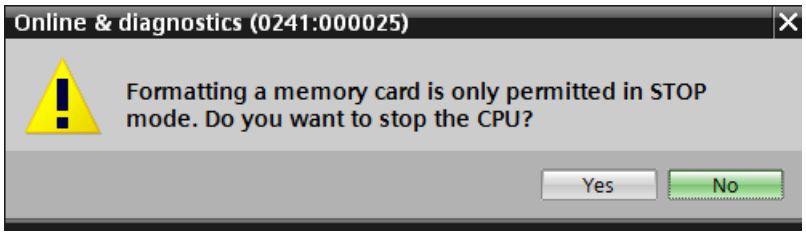
→ First, select the → "Format memory card" function and press the → "Format" button.



→ Confirm the prompt asking if you really want to format the memory card with → "Yes".



→ If necessary, stop the CPU. (→ "Yes")



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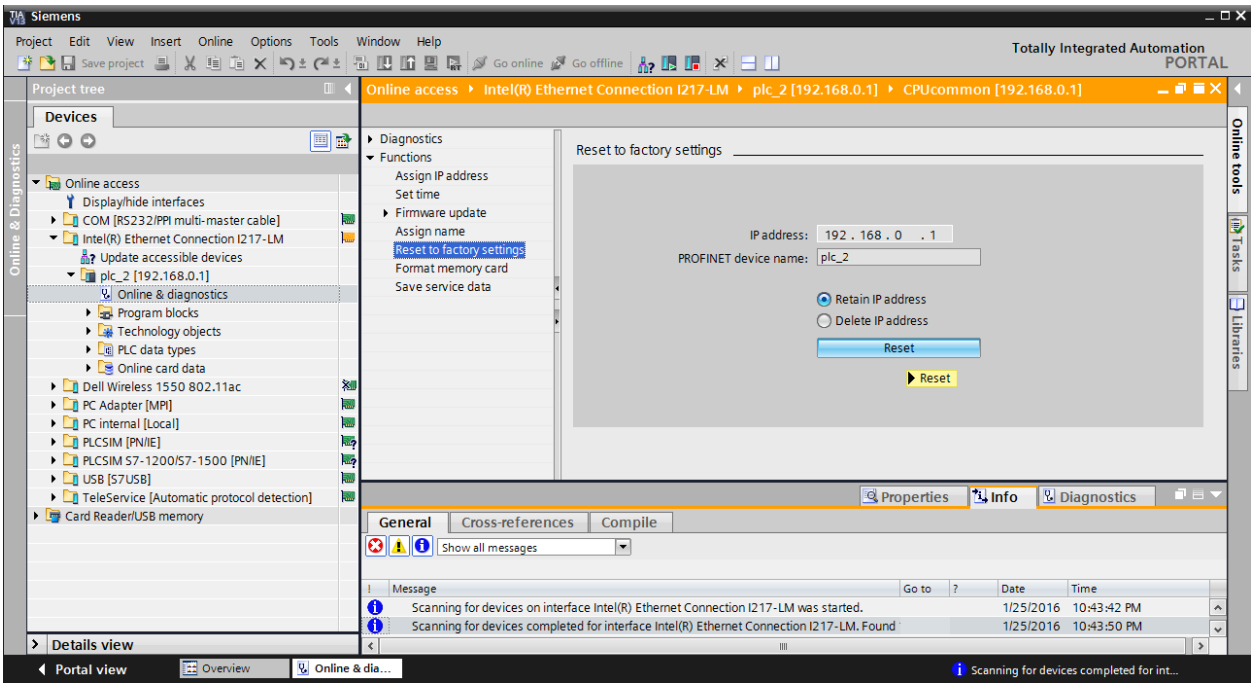
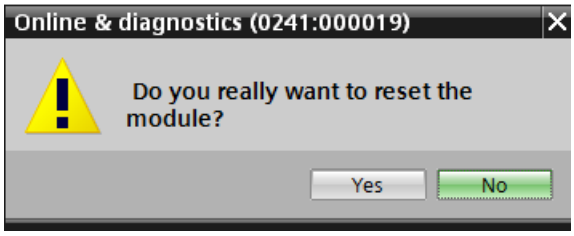
4.4.10 Resetting the CPU to factory settings

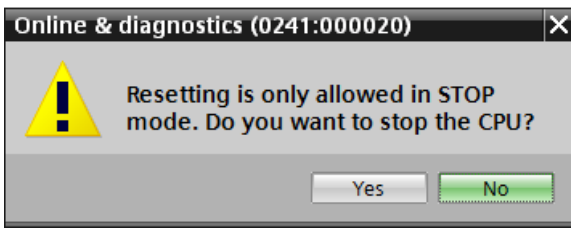
→ Before you can reset the CPU, you must wait until the formatting in the CPU has finished. Then you must select → "Update accessible devices" and → "Online & diagnostics" of your CPU again. To reset the controller, select the → "Reset to factory settings" function and click → "Reset".



→ Confirm the prompt asking if you really want to reset the module with → "Yes".



→ If necessary, stop the CPU. (→ "Yes")



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5 Task

Create a project and configure the following modules of your hardware, which correspond to one part of the Trainer Package **SIMATIC CPU 1512C PN with Software**, **PM 1507 and CP 1542-5 (PROFIBUS)**.

- 1X SIMATIC PM 1507 24 V/8 A STABILIZED POWER SUPPLY INPUT: 120/230 V AC OUTPUT: 24 V DC/8 A (ORDER NUMBER: 6EP1333-4BA00)
- SIMATIC S7-1500 COMPACT CPU, CPU 1512C-1 PN, CENTRAL PROCESSING UNIT WITH WORKING MEMORY 250 KB FOR PROGRAM AND 1 MB FOR DATA, 32 DIGITAL INPUTS, 32 DIGITAL OUTPUTS, 5 ANALOG INPUTS, 2 ANALOG OUTPUTS, 6 HIGH SPEED COUNTERS, 1. INTERFACE: PROFINET IRT WITH 2 PORT SWITCH, 48 NS BIT PERFORMANCE, INCL. FRONT CONNECTOR, SIMATIC MEMORY CARD REQUIRED (ORDER NUMBER: 6ES7 512-1CK00-0AB0)

6 Planning

Because this is a new system, a new project must be created.

The hardware is already specified for this project with the trainer package SIMATIC CPU 1512C PN with Software, PM 1507 and CP 1542-5 (PROFIBUS) Therefore, no selection needs to be made. Instead, the listed modules of the Trainer Package are simply inserted in the project.

To ensure that the correct modules are inserted, re-check the order numbers from the task directly on the installed devices. Normally, the CPU is inserted first. Other signal modules for the compact CPU are not needed here. Then add the power supply. See Table 1.

The Ethernet interface must be set for the configuration of the CPU. In addition, the address areas of the digital and analog inputs and outputs must be adapted.

Module	Order number	Slot	Address area
PM 190W 120/230VAC	6EP1333-4BA00	0	
CPU 1512C-1 PN	6ES7 512-1CK00-0AB0	1	DI 0…3 DQ 0…3 AI 64…73 AQ 64…67

Table 1: Overview of the planned configuration

As the final step, the hardware configuration must be compiled and downloaded. Any errors present can be detected during compilation and incorrect modules can be detected when the controller is started *(only possible when hardware is present and structured identically)*. Now, back up the checked project.

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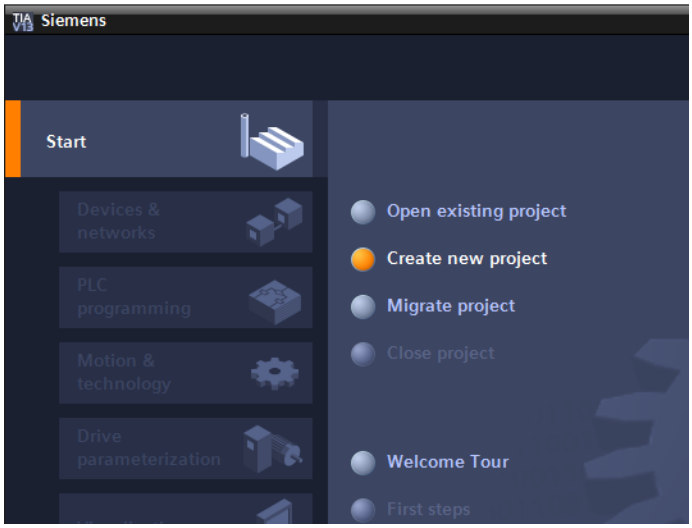
7 Structured step-by-step instructions

You can find instructions on how to carry out planning below. If you already have a good understanding of everything, it is sufficient to focus on the numbered steps. Otherwise, simply follow the steps of the instructions illustrated below.

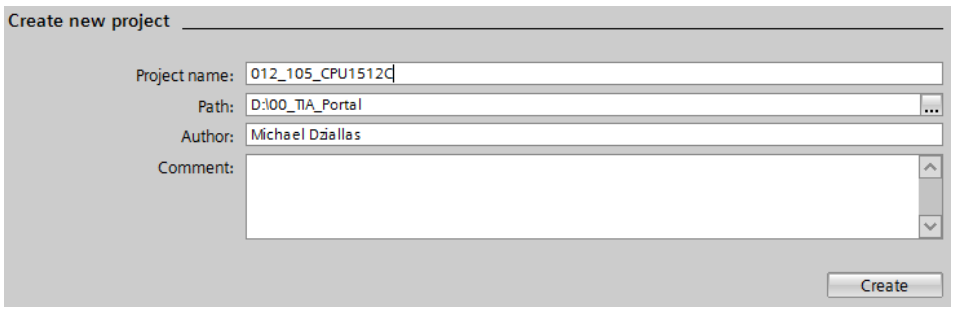
7.1 Create a new project

→ Select the Totally Integrated Automation Portal for this, which is opened here with a double-click. (→ TIA Portal V13)

→ In the portal view under the "Start" menu, select → "Create new project".



→ Modify Project name, Path, Author and Comment as appropriate and click → "Create".



→ The project will be created and opened and the menu "Start", "First steps" will open automatically.

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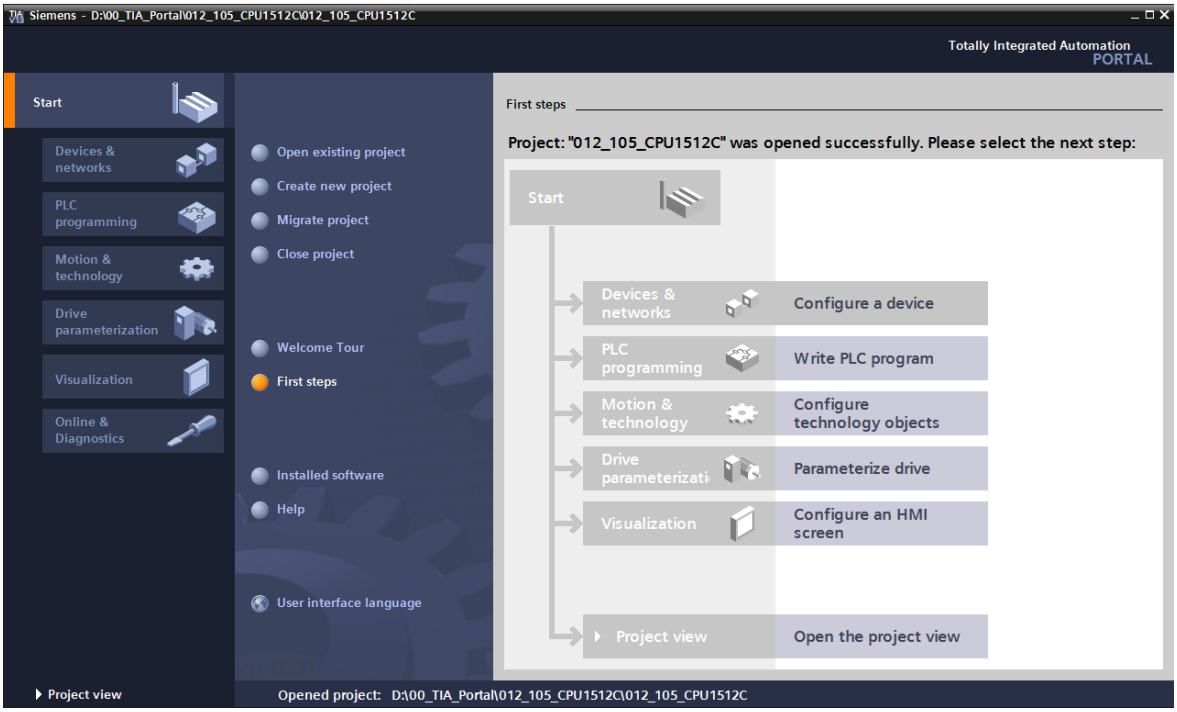
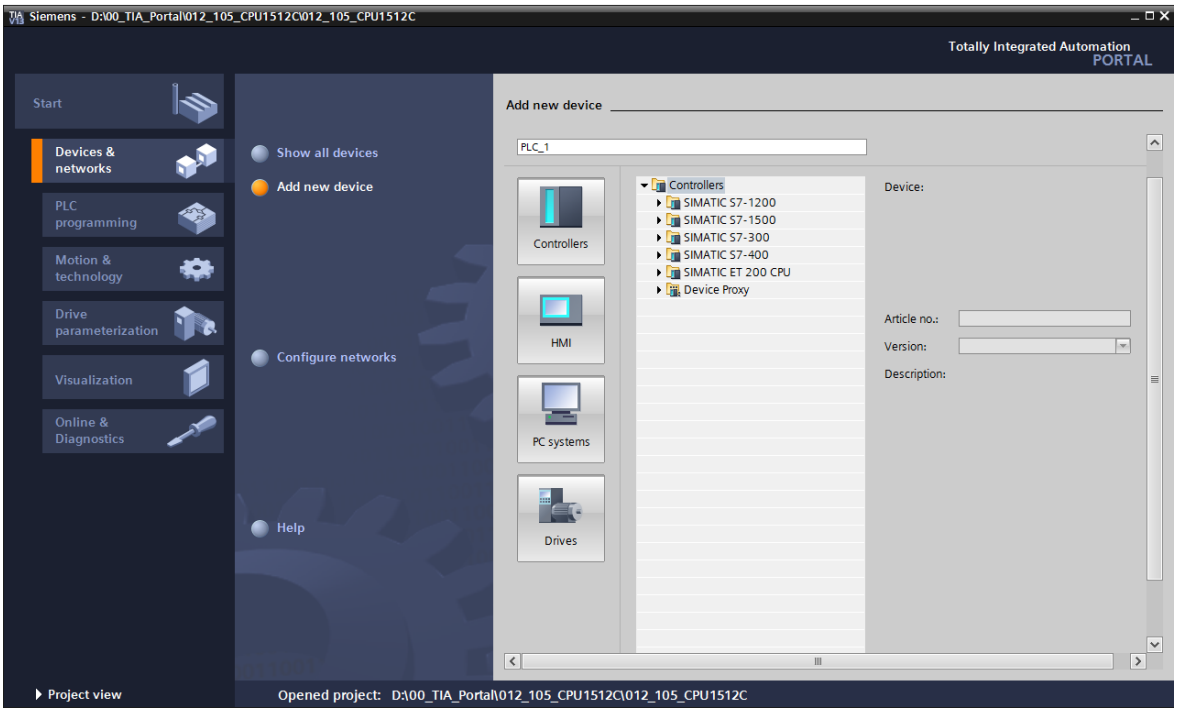
7.2 Inserting the CPU 1512C-1 PN

→ In the portal, select → "Start" → "First steps" → "Devices & networks" → "Configure a device".



→ In the portal, "Devices & networks" opens the "Show all devices" menu.

→ Switch to the "Add new device" menu.



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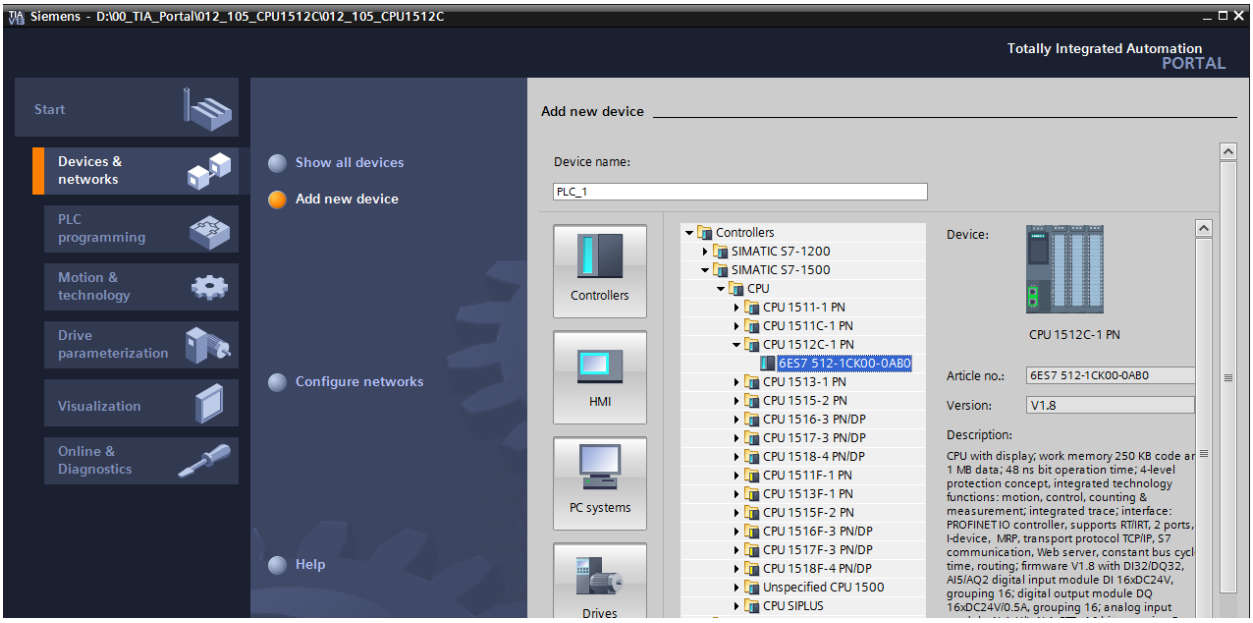
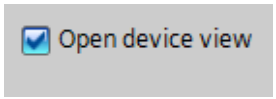
→ The specified model of the CPU will now be added as a new device.

(Controller → SIMATIC S7-1500 → CPU → CPU 1512C-1 PN → 6ES7512-1CK00-0AB0 → V1.8)



→ Assign a device name. (device name → "CPU_1512C")

→ Select "Open device view".



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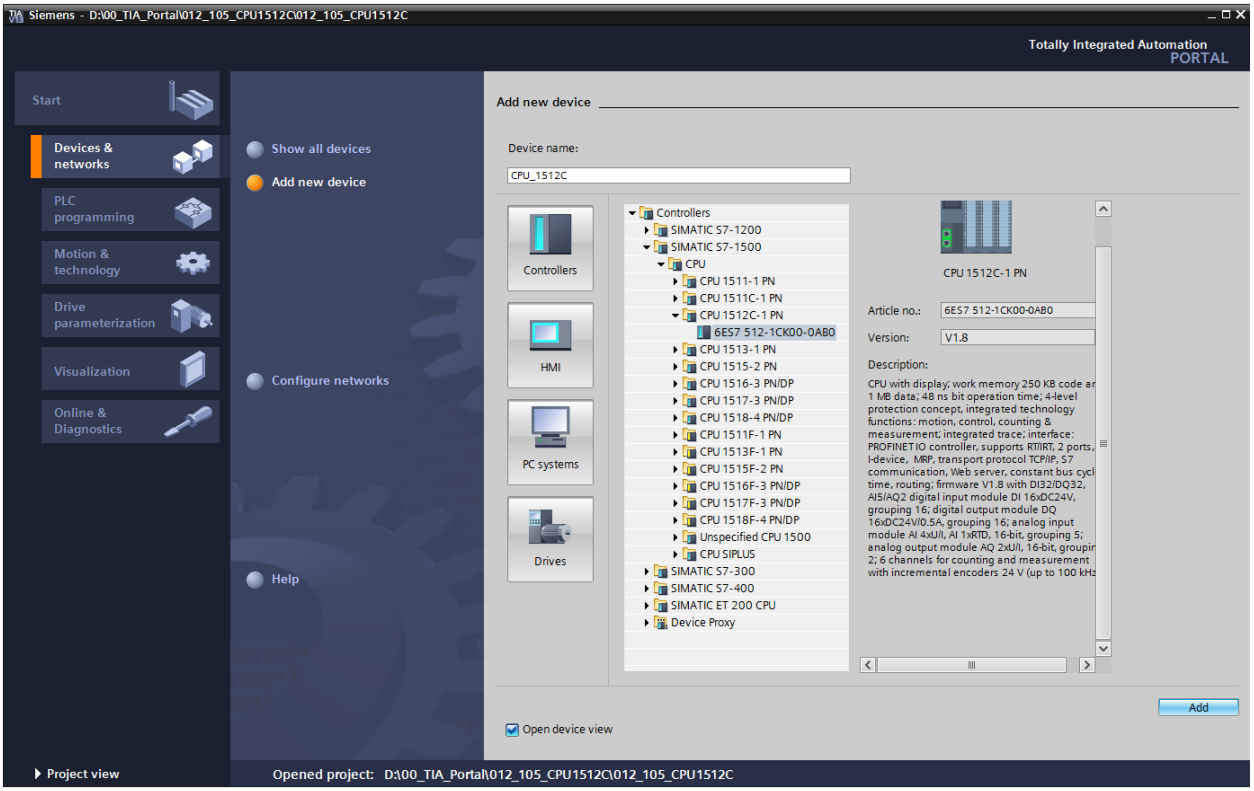
→ Click "Add".



Note: *The desired CPU may have multiple versions that differ in functionality (work memory, integrated memory, technology functions, etc.). In this case, you should ensure that the selected CPU corresponds to the existing hardware.*

Note: *Different firmware versions are often offered for the hardware. In this case, it is recommended to use the latest firmware (selected by default) and to upgrade the CPU, if necessary.*

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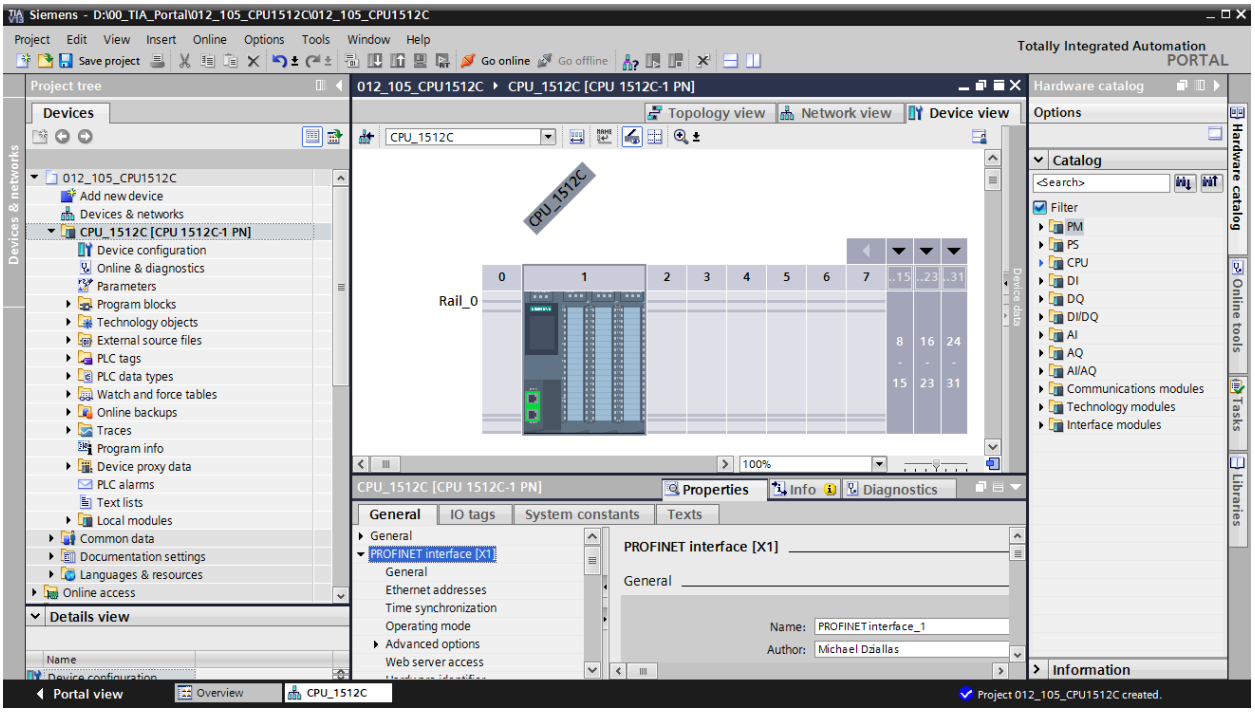
→ The TIA Portal now changes automatically to the project view and displays the selected CPU in the device configuration in slot 1 of a rail.



Note: *You can now configure the CPU there according to your specifications. Possible settings include the PROFINET interface, startup characteristics, cycle, communication load and many others.*

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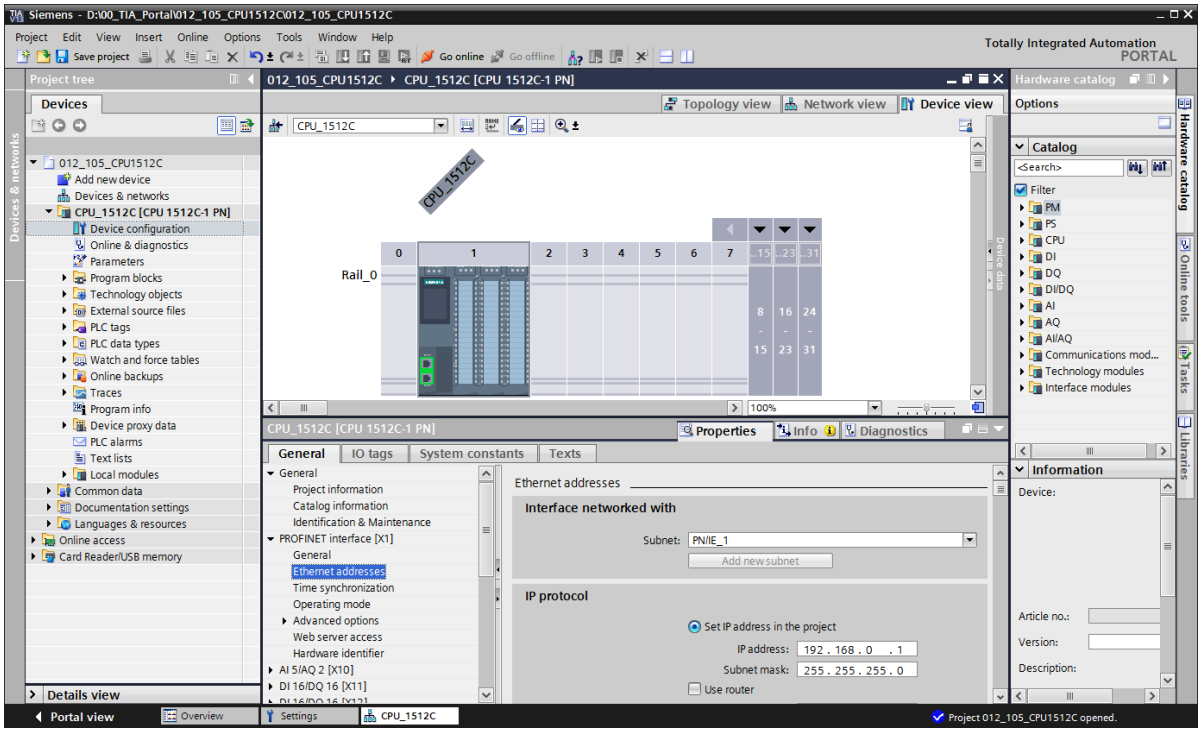
7.3 Configure Ethernet interface of the CPU 1512C-1 PN

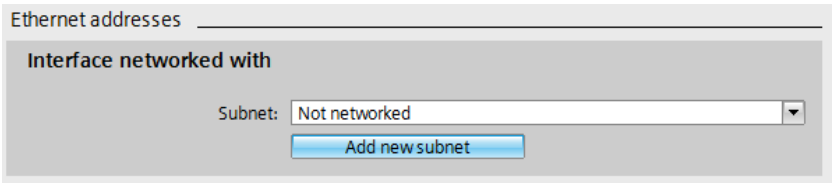
→ Select the CPU with a double-click

→ Under → "Properties", open the → "PROFINET interface [X1]" menu and select the → "Ethernet addresses" entry there.



→ Under "Interface networked with", only the "Not networked" entry is available.

→ Add an Ethernet subnet with the → "Add new subnet" button.



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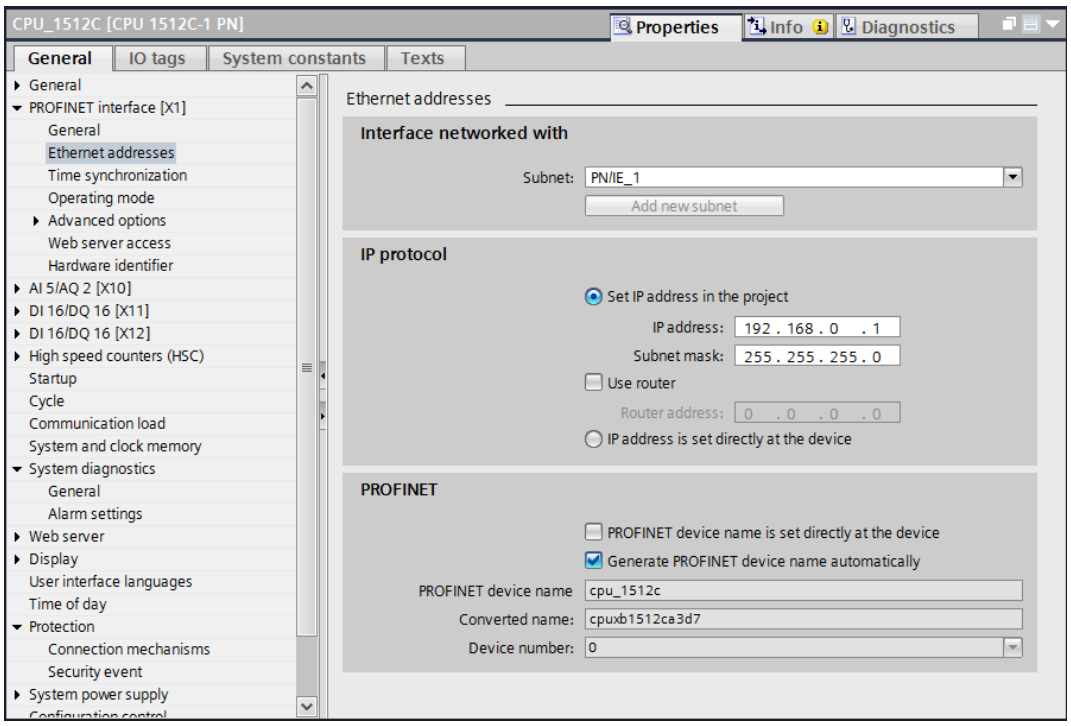
→ Keep the preassigned "IP address" and "Subnet mask".



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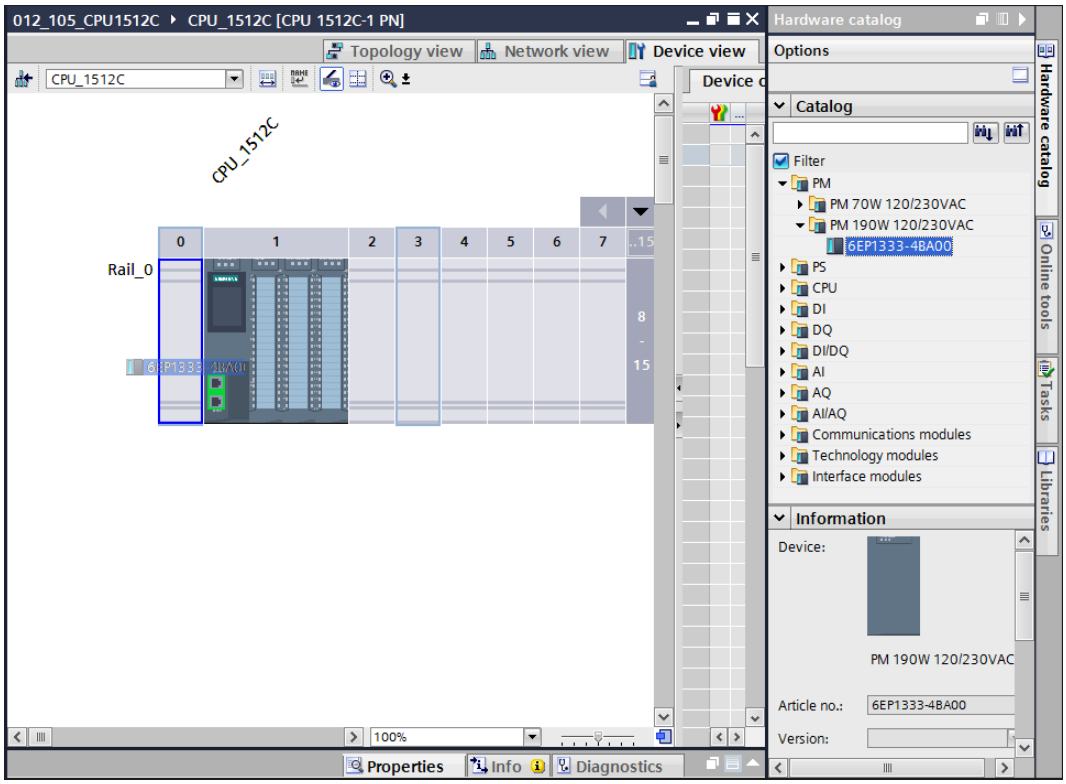
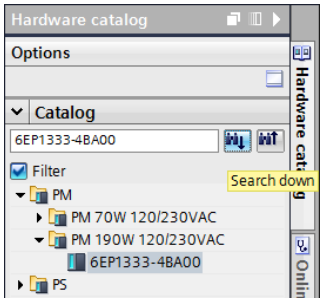
7.4 Insert power module PM 190W 120/230VAC

→ Find the correct module in the hardware catalog and insert the power module in slot 0.
(→ Hardware Catalog → PM → PM 190W 120/230VAC (order number 6EP1333-4BA00) → Slot 0)



Note: *To select the power module, you can simply enter the order number in the Search field and then click the "Search down" icon. The hardware catalog will open at the correct position.*



Notes: *When you double-click a module in the hardware catalog, you insert it at the next available compatible slot.*

If a module such as the power module is planned only for one slot, it is not possible to place it at another position even in the device configuration.

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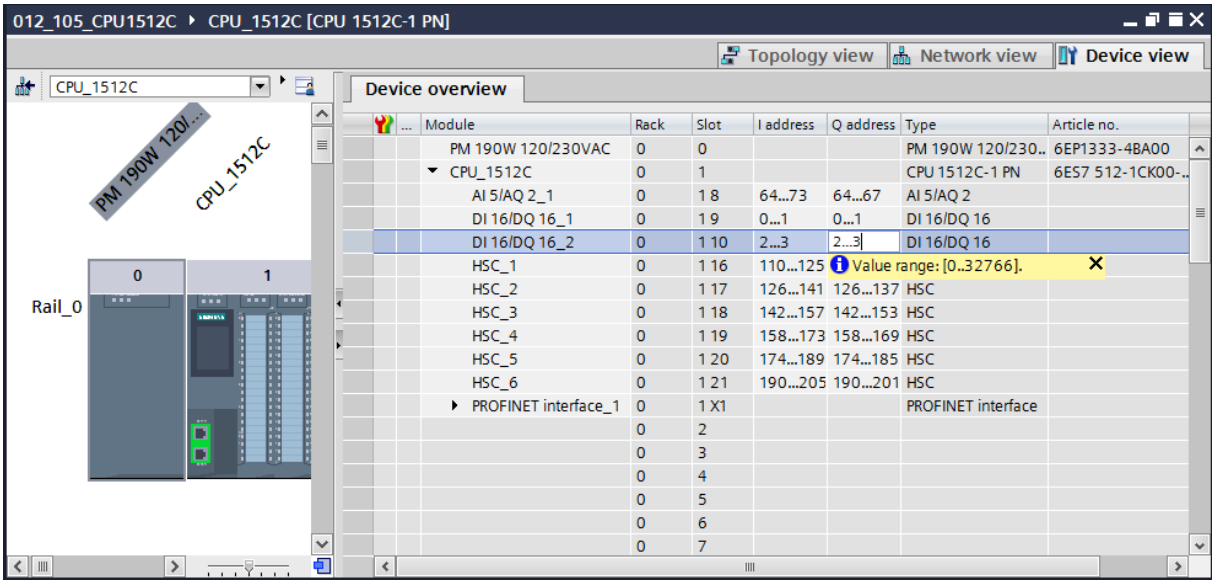
7.5 Configure the address areas for the digital and analog inputs and outputs

The address areas for the signals used in the process are specified by the plant designer to correspond to the plant documentation. See Section 5 Planning.

→ In the "Device overview" section, ensure that the address areas of the high-speed counters (HS) not used here are above 100.
(→ Device overview→ HSC_1 to HSC_6 → I address → 110… 205 → Q address → 110…201)

→ Set the analog inputs and outputs to the correct address areas starting at 64....
(→ Device overview→ AI5/AQ2 → Slot 1 8→ I address → 64…73 → Q address → 64…67)

→ Set the digital inputs and outputs to the correct address areas starting at 0.... (→ Device overview→ DI16/DQ16 → Slot 1 9 → I address → 0…1 → Q address → 0…1 → DI16/DQ16 → Slot 1 10 → I address → 2…3 → Q address → 2…3)



Note: *To show and hide the Device overview, you must click the small arrow next to "Device data" on the right side of the hardware configuration.*

Note: *To set the address areas for the digital and analog inputs and outputs as desired, the address areas for the high-speed counters (HSC) must first be moved to higher areas.*

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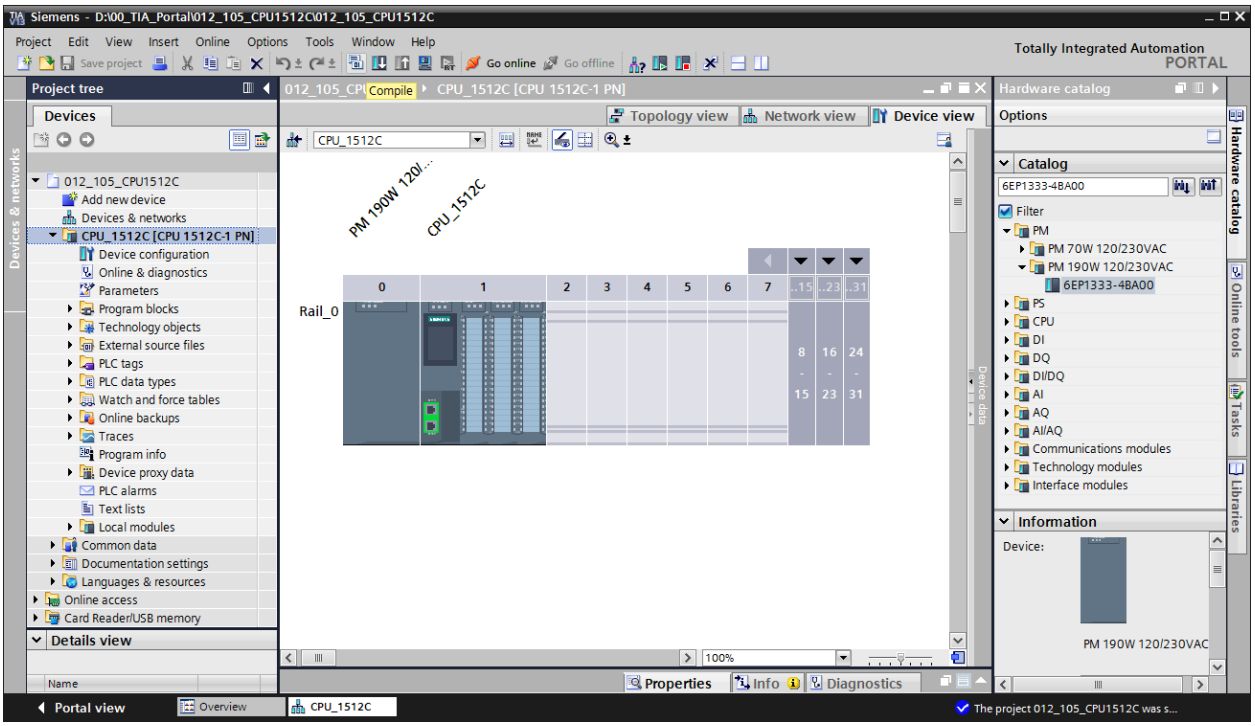
7.6 Save and compile the hardware configuration

→ Before you compile the configuration, you should save your project by clicking the → Save project button. To compile your CPU with the device configuration, first select the → "CPU_1512C [CPU1512C-1 PN]" folder and click the → "Compile" icon.



Note: *"Save project" should be used repeatedly when working on a project since this does not happen automatically. A prompt to save the project only occurs when the TIA Portal is closed.*

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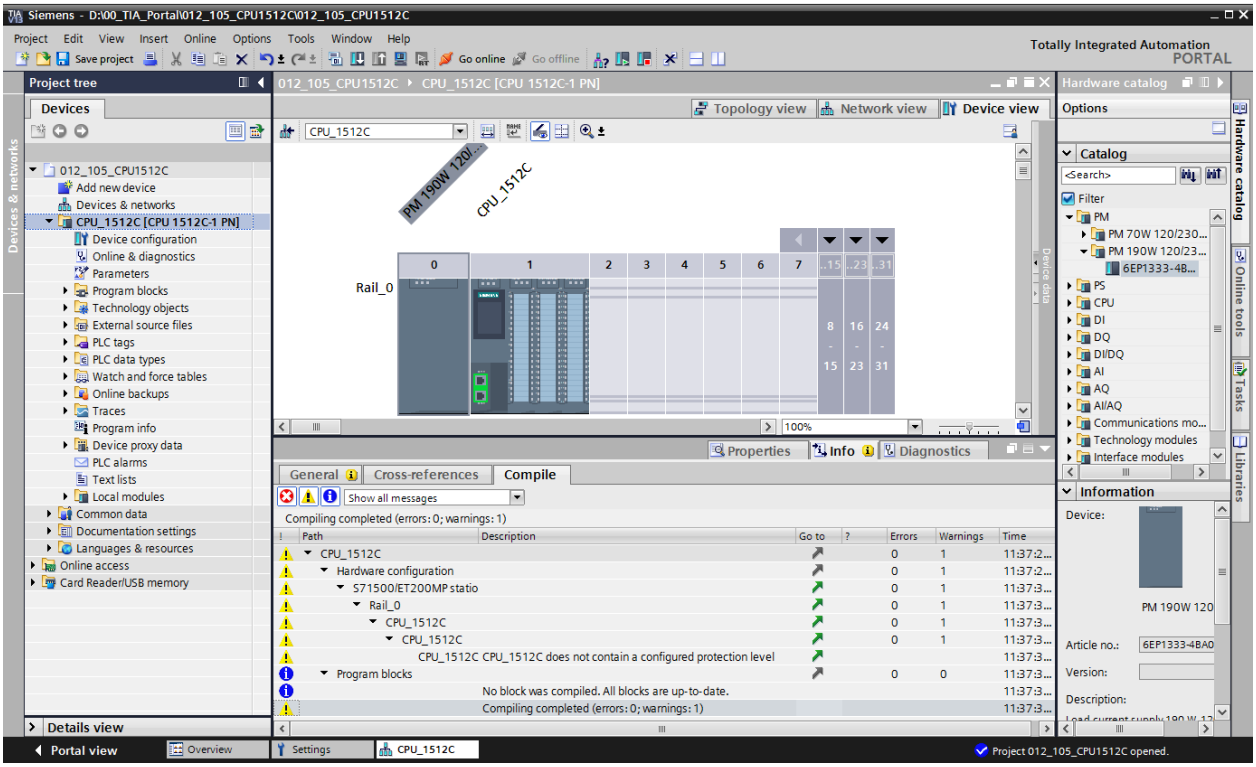
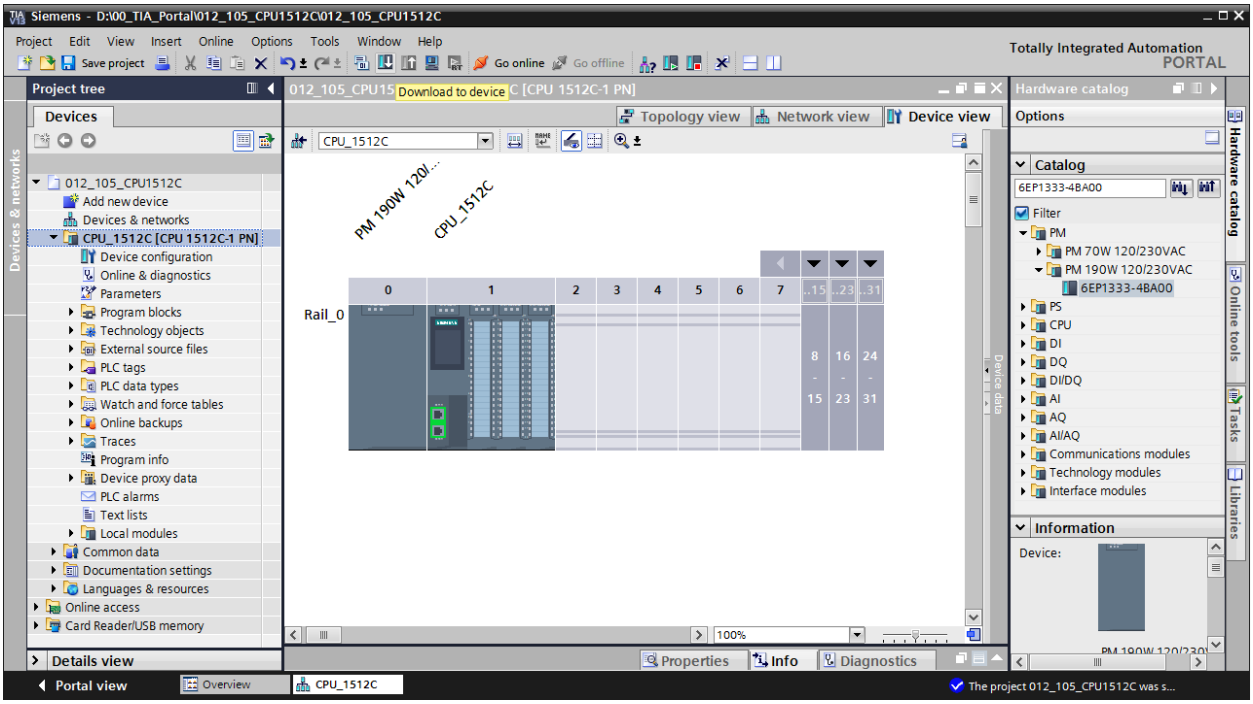
→ If the project was compiled without errors, you see the following screen.

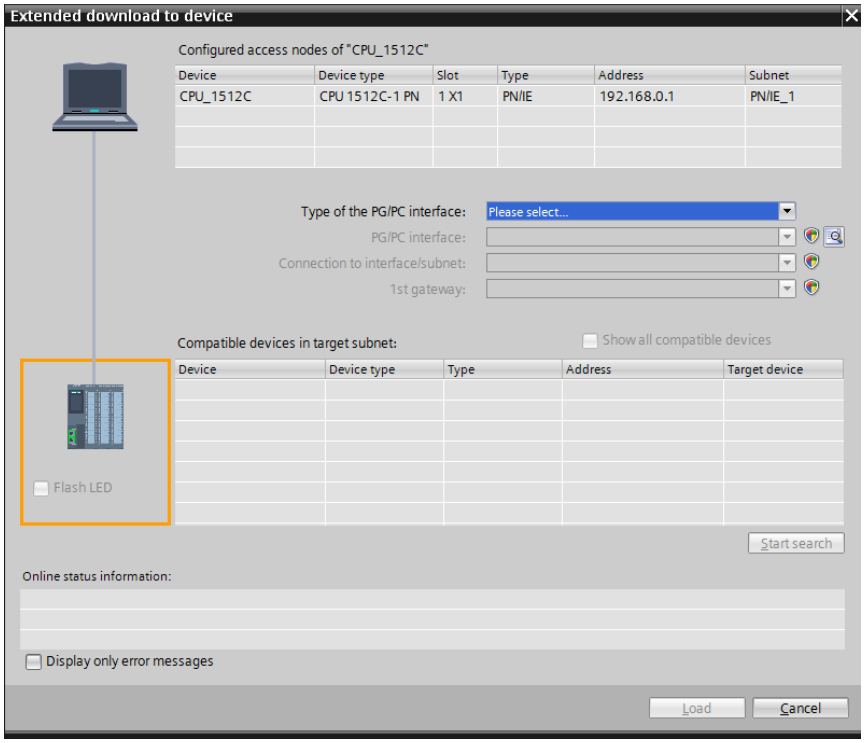


7.7 Download the hardware configuration to the device

→ To download your entire CPU, select the → "CPU_1512C [CPU1512C-1 PN]" folder and click the → "Download to device" icon.



→ The manager for configuring the connection properties (extended download) opens.



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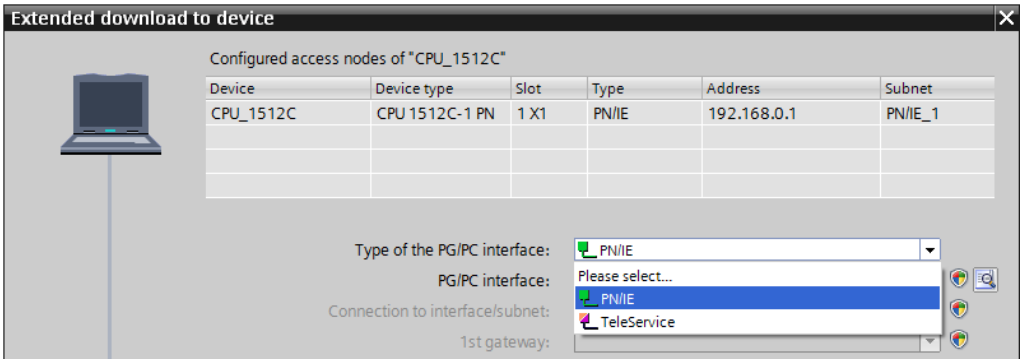
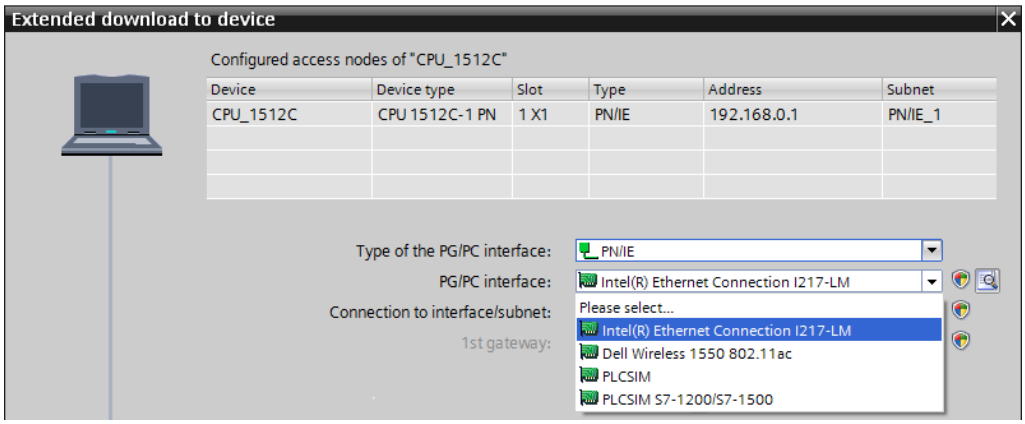
→ First, the interface must be correctly selected. This happens in three steps.

→ Type of the PG/PC interface → PN/IE

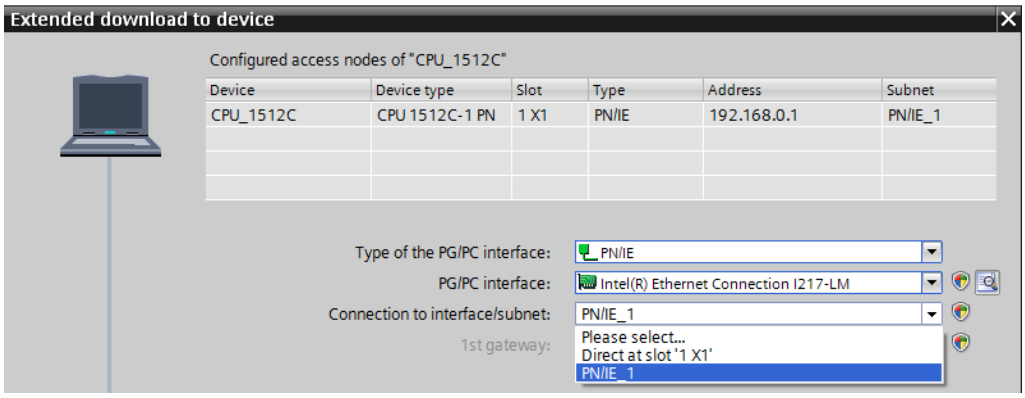


→ PG/PC interface → here, for example: Intel(R) Ethernet Connection I217-LM



Note: *The PG/PC interface used here depends on the ETHERNET interface adapter installed in the programming device*

→ Connection to interface/subnet → "PN/IE_1"



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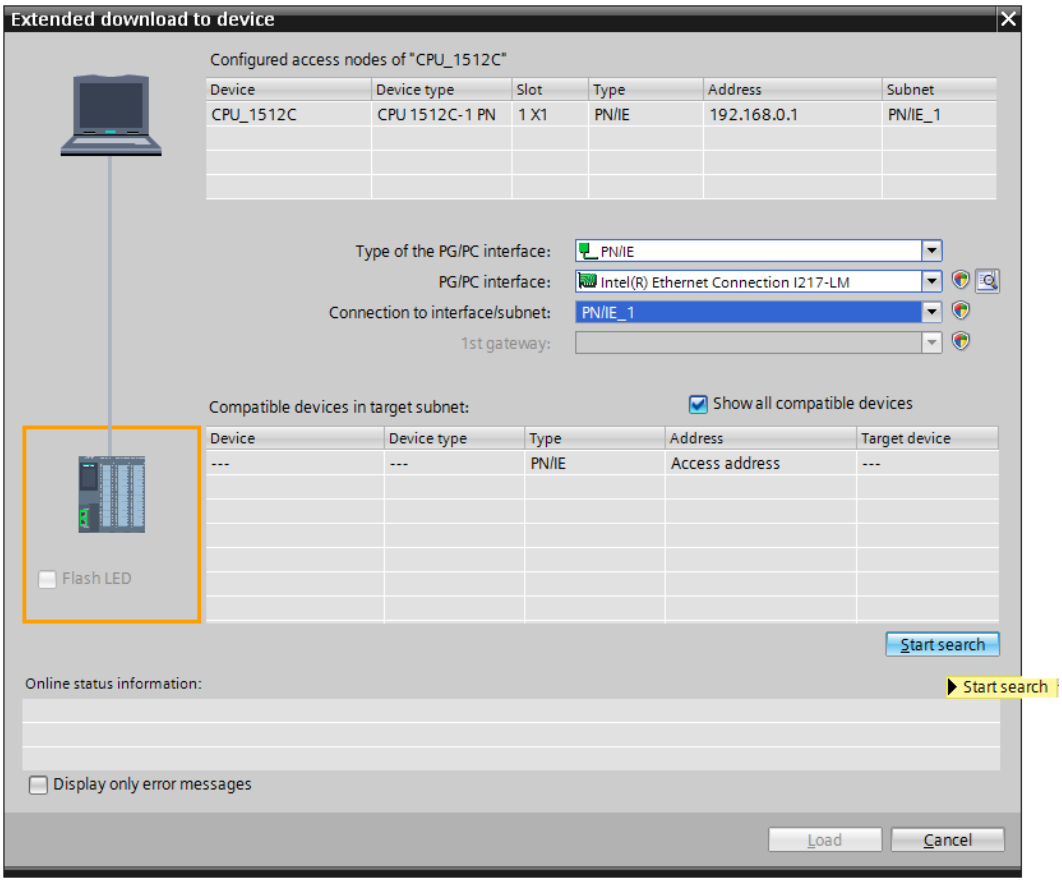
→ The → "Show all compatible devices" check box must then be selected. The search for devices in the network is started by clicking the → Start search button.



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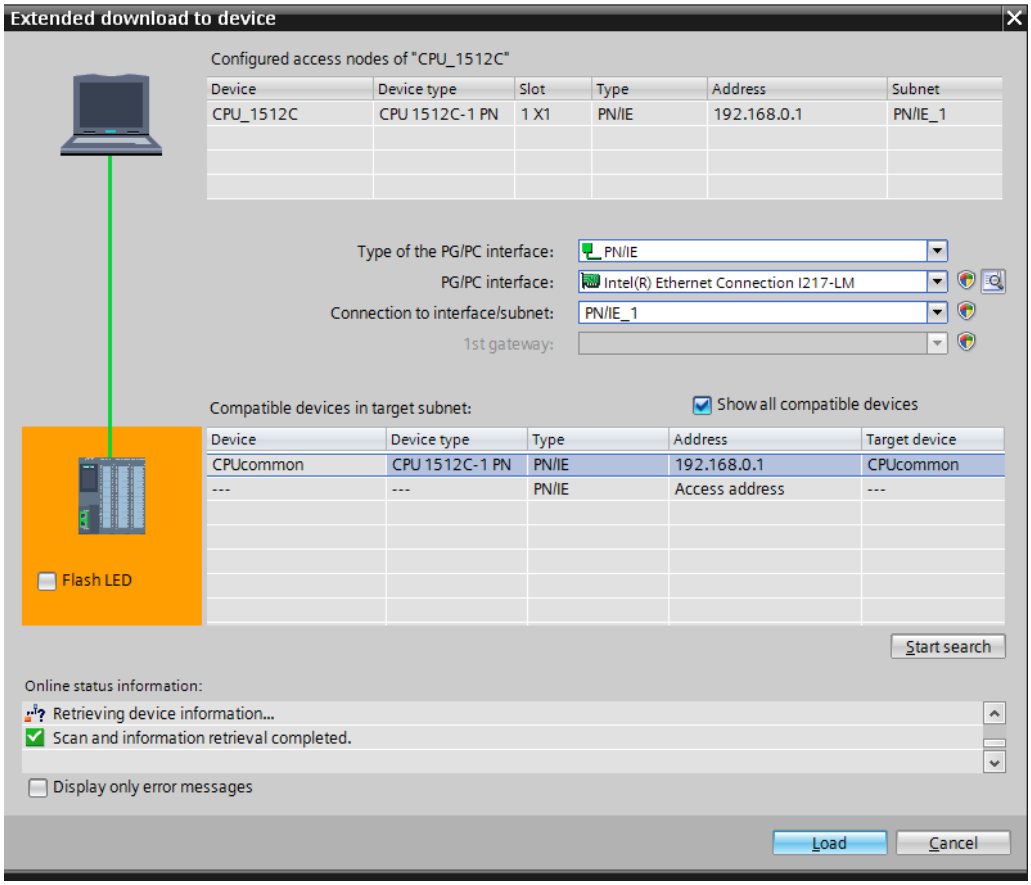
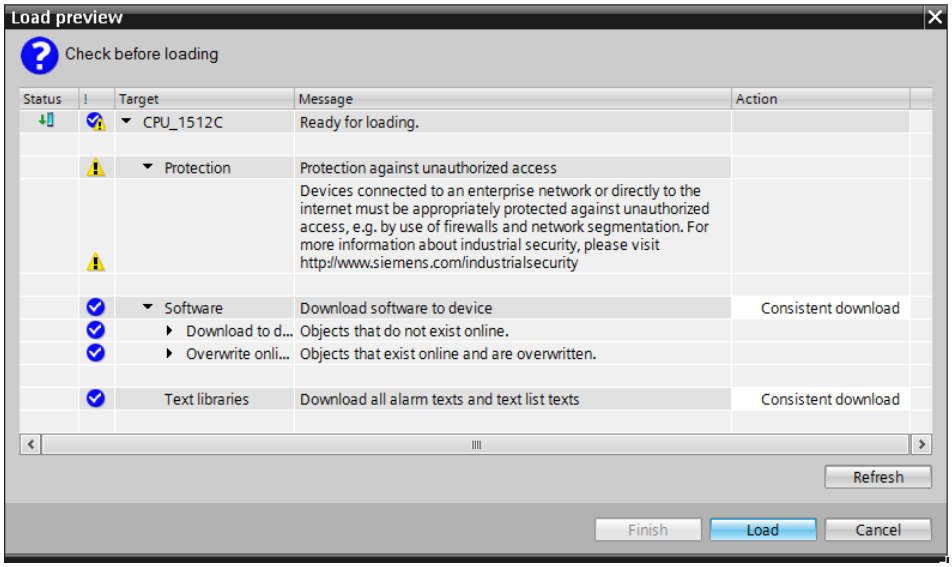
→ If your CPU is shown in the "Compatible devices in target subnet" list, it must be selected and the download started. (→ CPU 1512C-1 PN → "Load")



→ You first obtain a preview. Confirm the prompt → "Overwrite all" and continue with → "Load".



Note: *The* ✔ *symbol should be visible in every line of the "Load preview". You can find additional information in the "Message" column.*

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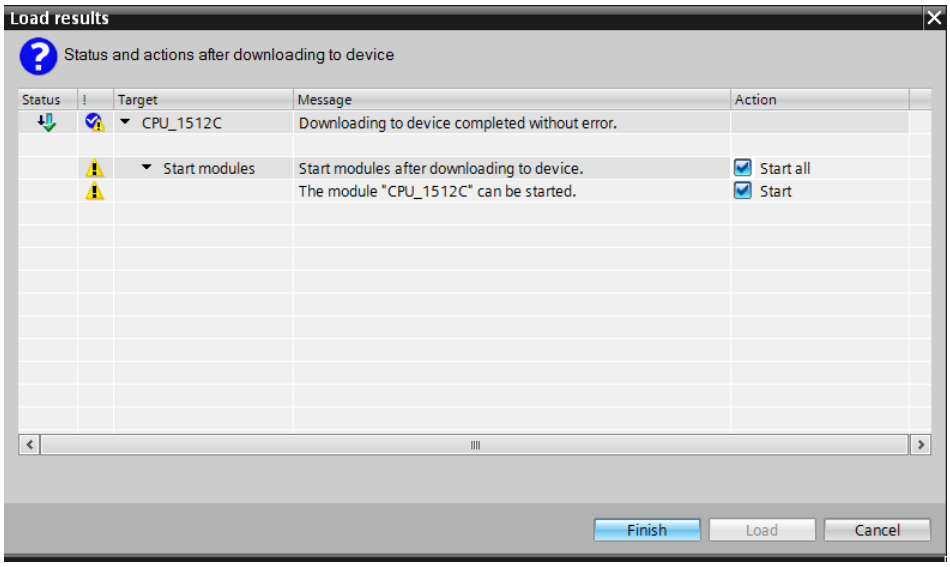
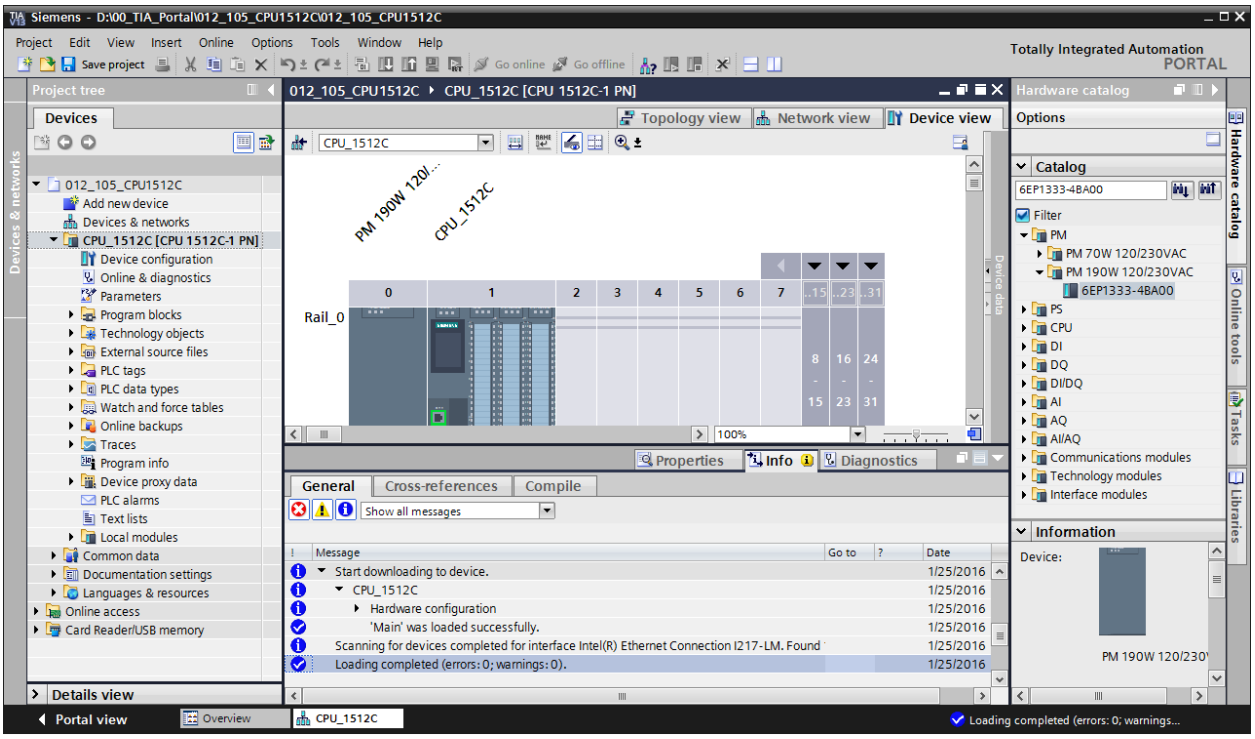
→ The → "Start all" option will be selected next before the download operation can be completed with → "Finish".



→ After a successful download, the project view will open again automatically. A loading report appears in the information field under "General". This can be helpful when troubleshooting an unsuccessful download.



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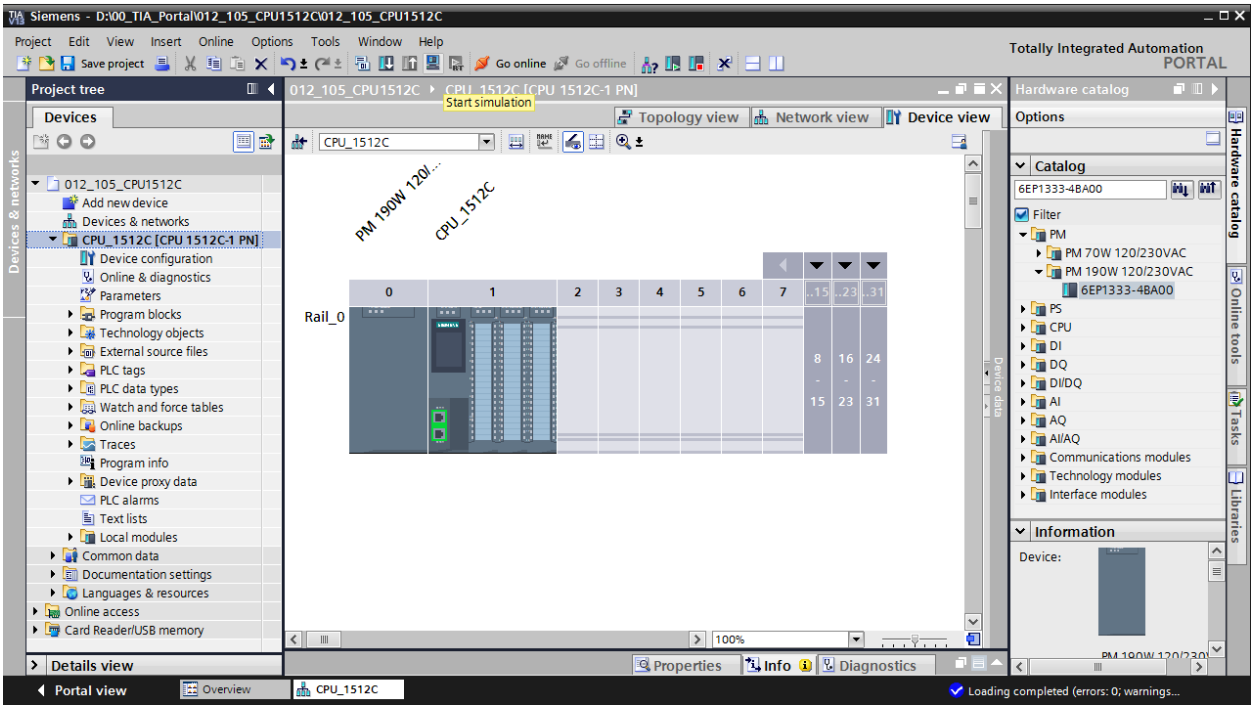
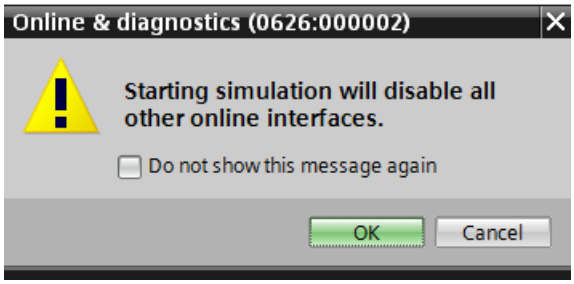
7.8 Download the hardware configuration to the PLCSIM simulation (optional)

→ If no hardware is present, the hardware configuration can **alternatively** be downloaded to a PLC simulation (S7-PLCSIM).

→ To do so, you must first start the simulation by selecting the → "CPU_1512C [CPU1512C-1 PN]" folder and clicking the → "Start simulation" icon.



→ The prompt that all other online interfaces will be disabled is confirmed with → "OK".



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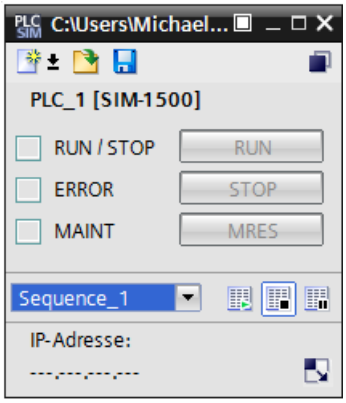
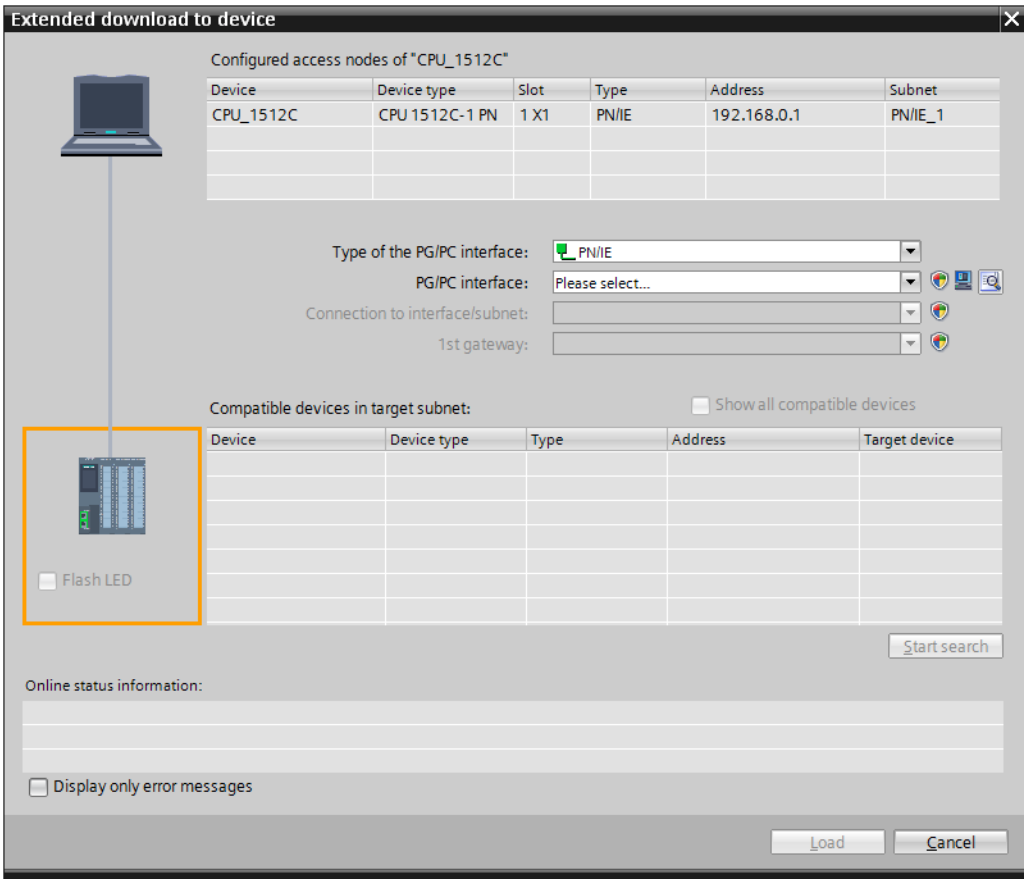
→ The "S7 PLCSIM" software is started in a separate window in the compact view.



→ The manager for configuring the connection properties (extended download) opens shortly thereafter.



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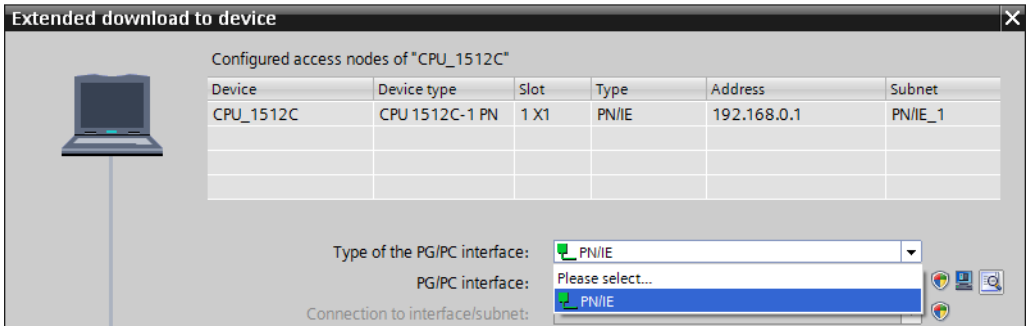
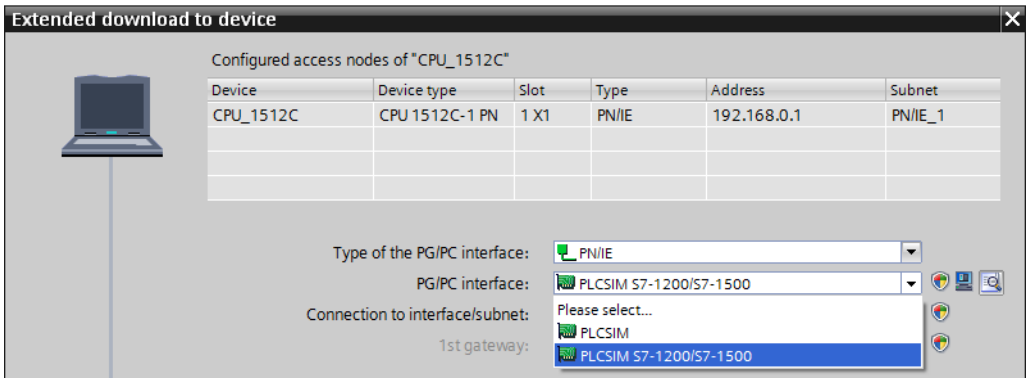
→ First, the interface must be correctly selected. This happens in three steps.

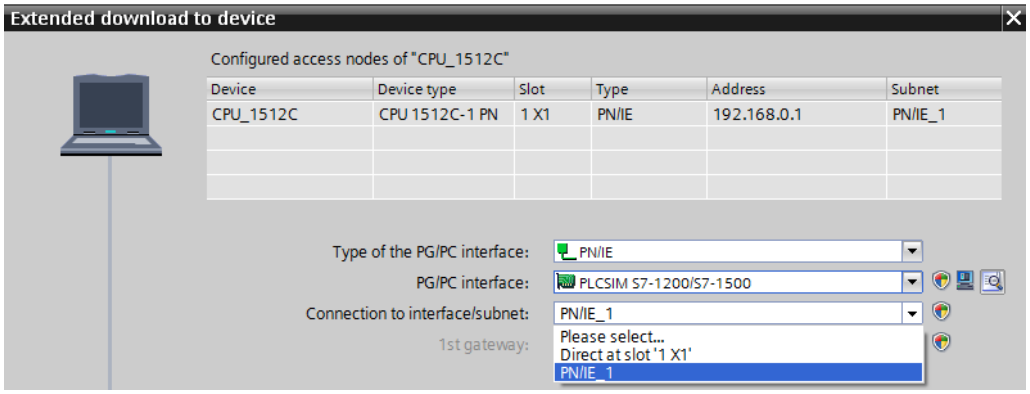
→ Type of the PG/PC interface → PN/IE



→ PG/PC interface → PLCSIM S7-1200/S7-1500



→ Connection to interface/subnet → "PN/IE_1"



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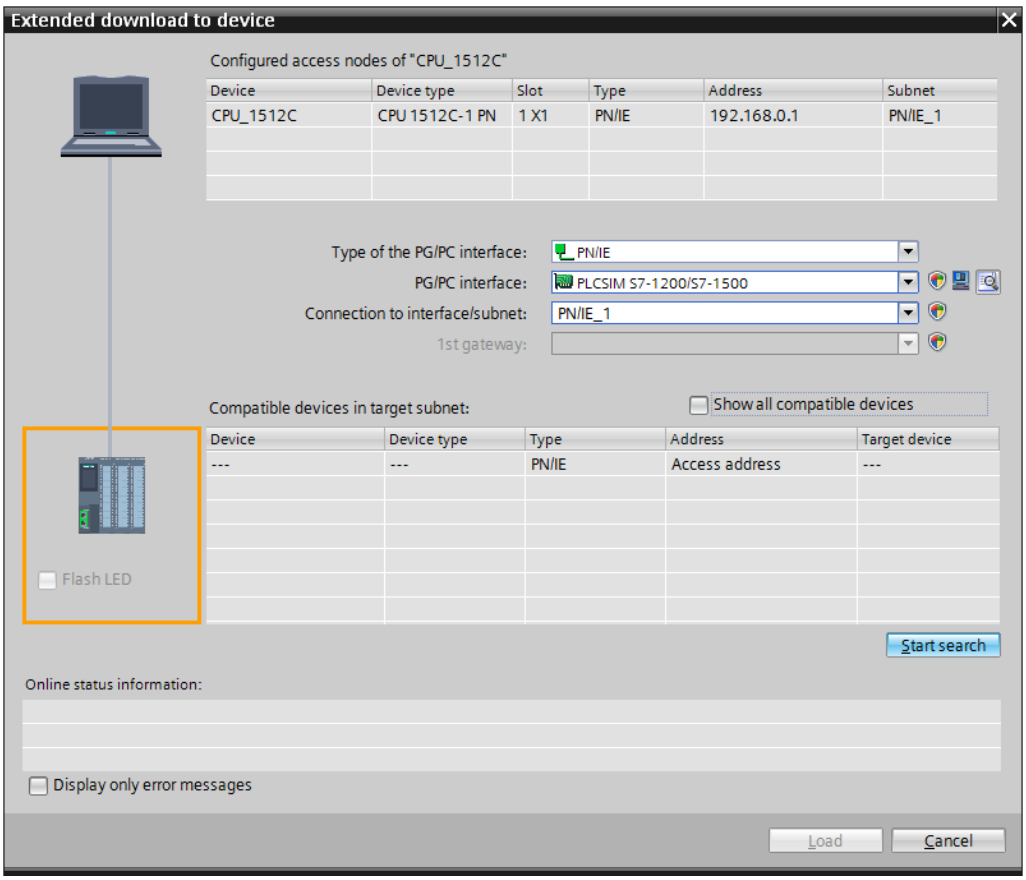
→ The → "Show all compatible devices" check box must then be selected. The search for devices in the network is started by clicking the → Start search button.



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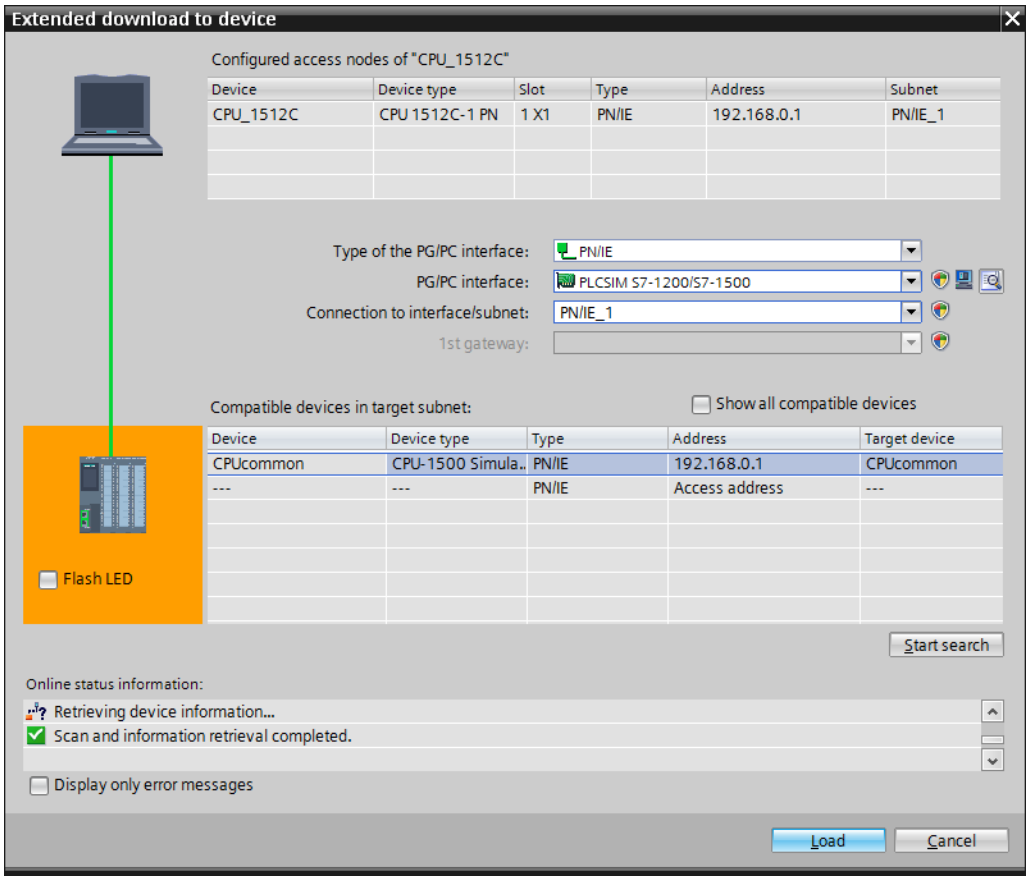
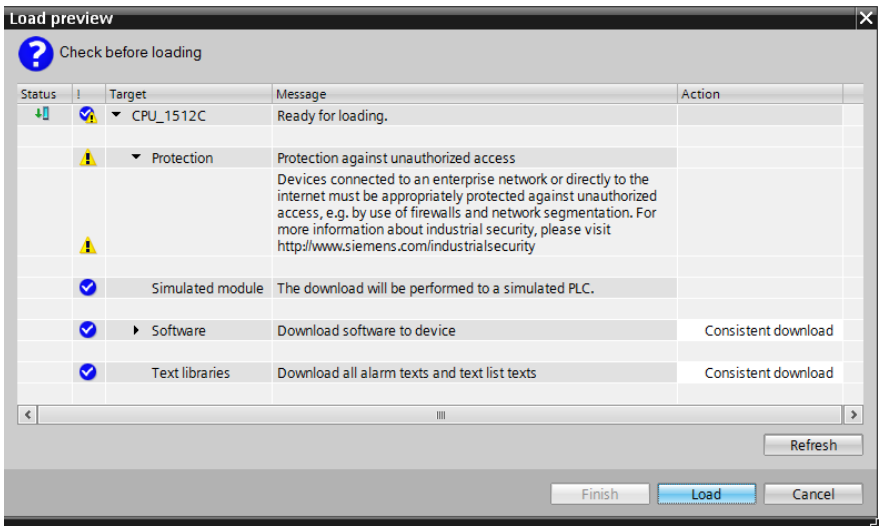
→ If the simulation is shown in the "Compatible devices in target subnet" list, it must be selected before the download can be started.
(→ "CPU-1500 Simulation" → "Load")



→ You first obtain a preview. Confirm the prompt → "Overwrite all" and continue with → "Load".



Note: *The* ✔ *symbol should be visible in every line of the "Load preview". You can find additional information in the "Message" column.*

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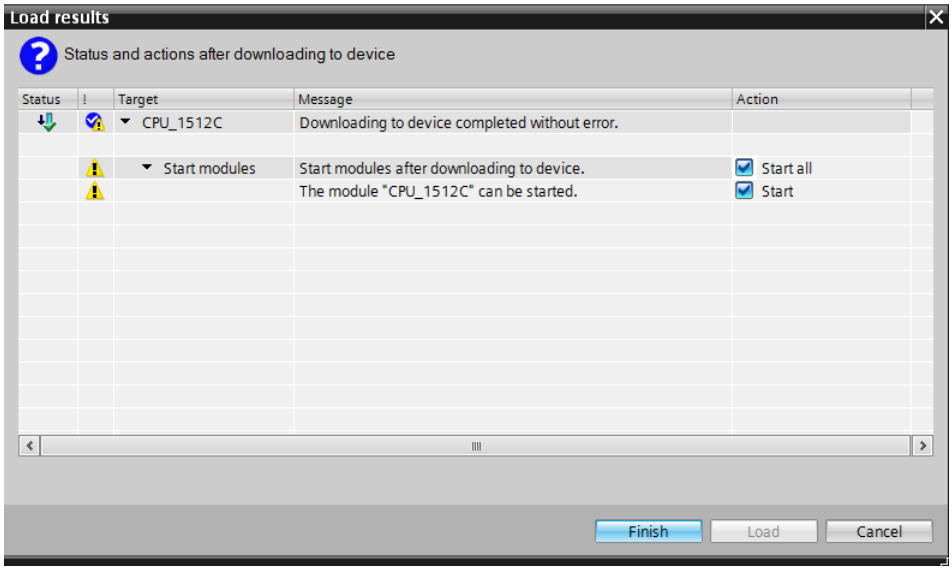
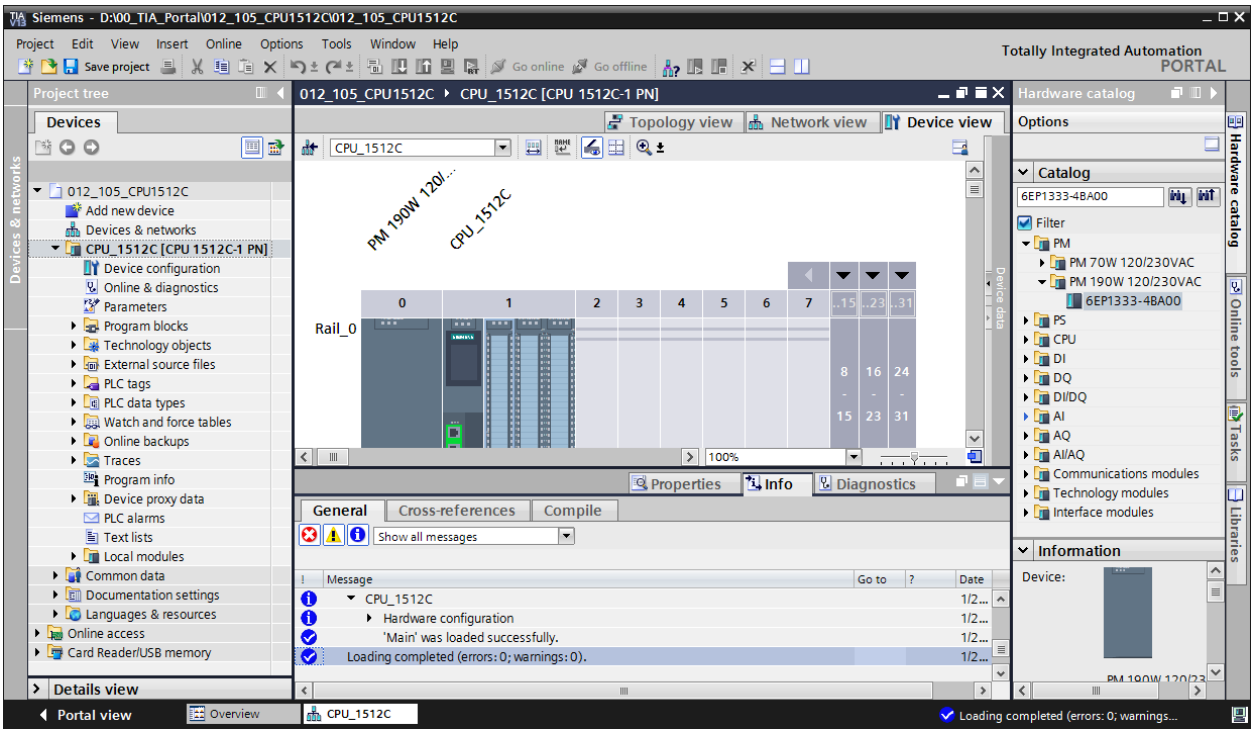
→ The → "Start all" option will be selected next before the download operation can be completed with → "Finish".



→ After a successful download, the project view will open again automatically. A loading report appears in the information field under "General". This can be helpful when troubleshooting an unsuccessful download.



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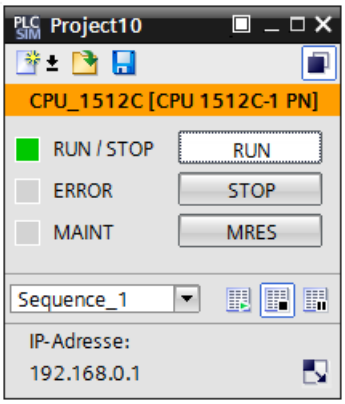
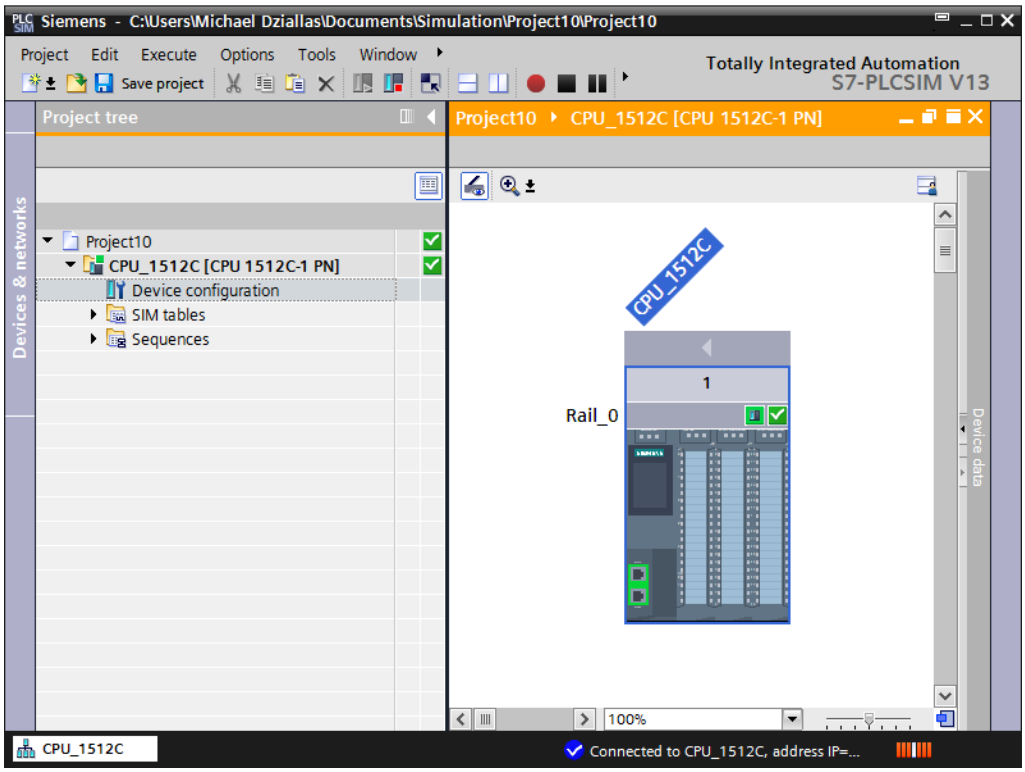
→ The compact view of the PLCSIM simulation has the following appearance. You can switch back to the project view by clicking the → icon.



The PLCSIM simulation has the following appearance in the project view.

→ You can see the downloaded configuration in the project view by double-clicking → "Device configuration". You can switch to the compact view of the simulation by clicking the → icon in the menu bar.



Note: *Because this is a simulation, you cannot detect errors in the hardware configuration in this case.*

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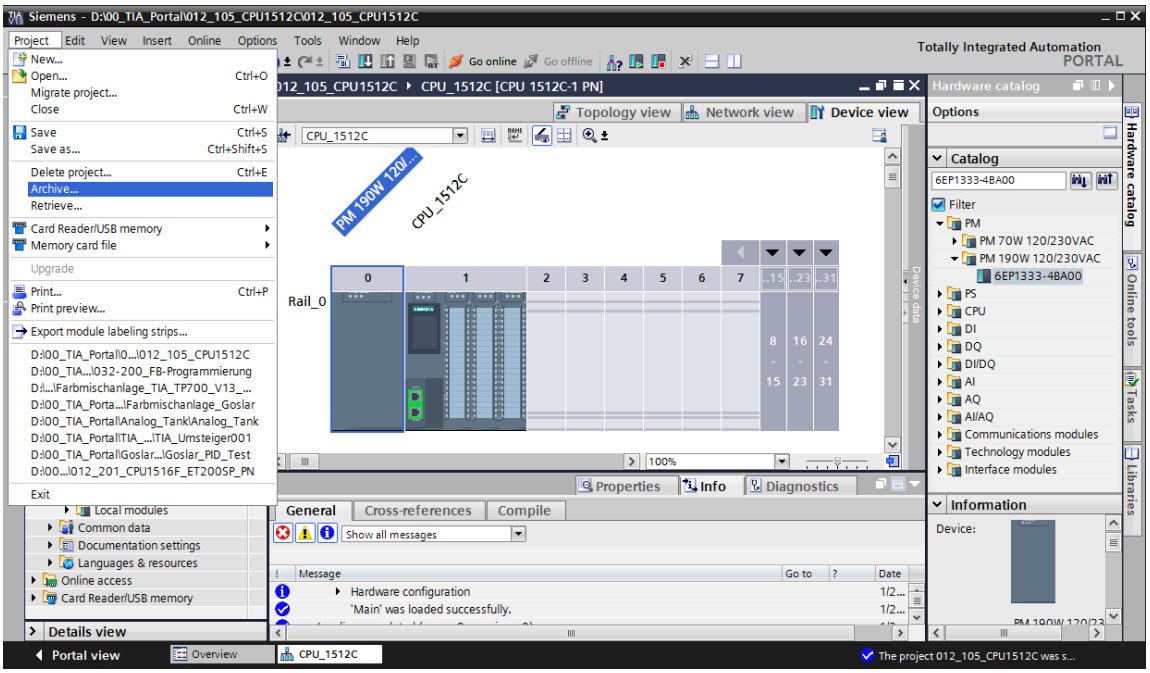
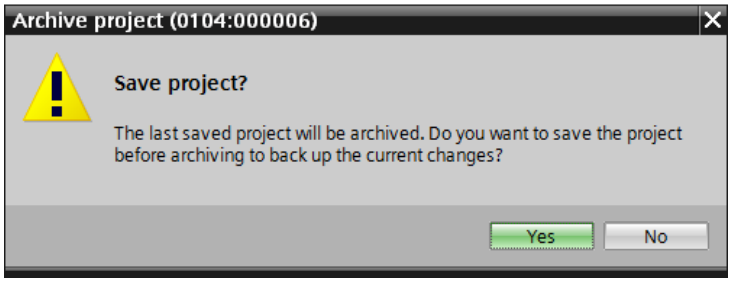
7.9 Archive the project

→ To archive the project, select the → "Archive ..." command in the → "Project" menu.



→ Confirm the prompt to save the project with → "Yes".



→ Select a folder where you want to archive your project and save it as a "TIA Portal project archive" file type. (→ "TIA Portal project archive" → "SCE_EN_012-105_Hardware configuration_S7-1512C..." → "Save")

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→ Checklist

No.	Description	Completed
1	Project was created	
2	Slot 0: Power module with correct order number	
3	Slot 1: CPU with correct order number	
4	Slot 1: CPU with correct firmware version	
5	Slot 1: Address area of the digital inputs correct	
6	Slot 1: Address area of the digital outputs correct	
7	Slot 1: Address area of the analog inputs correct	
8	Slot 1: Address area of the analog outputs correct	
9	Hardware configuration was compiled without error message	
10	Hardware configuration was downloaded without error message	
11	Project was successfully archived	

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8 Exercise

8.1 Task – Exercise

The hardware configuration of the trainer package SIMATIC CPU 1512C PN with Software, PM 1507 and CP 1542-5 (PROFIBUS) is not yet fully complete. Insert the following missing module. Select slot 2 for the communications processor. Set the PROFIBUS address 2 in the properties of the PROFIBUS interface and network this interface with a "PROFIBUS_1" subnet.

- 1X COMMUNICATION PROCESSOR CP 1542-5 FOR CONNECTING SIMATIC S7-1500 TO PROFIBUS DP, DPV1-MASTER OR DP-SLAVE, S7 AND PG/OP COMMUNICATION, TIME SYNCHRONIZATION, DIAGNOSTICS, LESS DATA (ORDER NUMBER: 6GK7542-5FX00-0XE0)

8.2 Planning

Plan the implementation of the task on your own.

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8.3 Checklist – Exercise

No.	Description	Completed
1	Slot 2: Communications processor with correct order number	
2	Slot 2: Communications processor with correct firmware version	
3	Slot 2: PROFIBUS interface networked with subnet	
4	Slot 2: PROFIBUS address correct	
5	Hardware configuration was compiled without error message	
6	Hardware configuration was downloaded without error message	
7	Project was successfully archived	

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9 Additional information

You can find additional information as an orientation aid for initial and advanced training, for example: Getting Started, videos, tutorials, apps, manuals, programming guidelines and trial software/firmware, at the following link:

www.siemens.com/sce/s7-1500

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