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SCE Training Curriculum

Siemens Automation Cooperates with Education | 05/2017

TIA Portal Module 013-101

Specified Hardware Configuration
with SIMATIC S7 CPU 314C-2 PN/DP

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- **SIMATIC S7 CPU 314C-2 PN/DP**
  Order no.: 6ES7314-6EH04-4AB4
- **SIMATIC STEP 7 Professional V14 SP1 - Single license**
  Order no.: 6ES7822-1AA04-4YA5
- **SIMATIC STEP 7 Professional V14 SP1 - Classroom license (up to 6 users)**
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- **SIMATIC STEP 7 Professional V14 SP1 - Upgrade license (up to 6 users)**
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We wish to thank the TU Dresden, particularly Prof. Dr.-Ing., the Michael Dziallas Engineering orporation and all other involved persons for their support during the preparation of this training curriculum.

Table of contents

SPECIFIED HARDWARE CONFIGURATION – SIMATIC S7 CPU 314C-2 PN/DP

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.

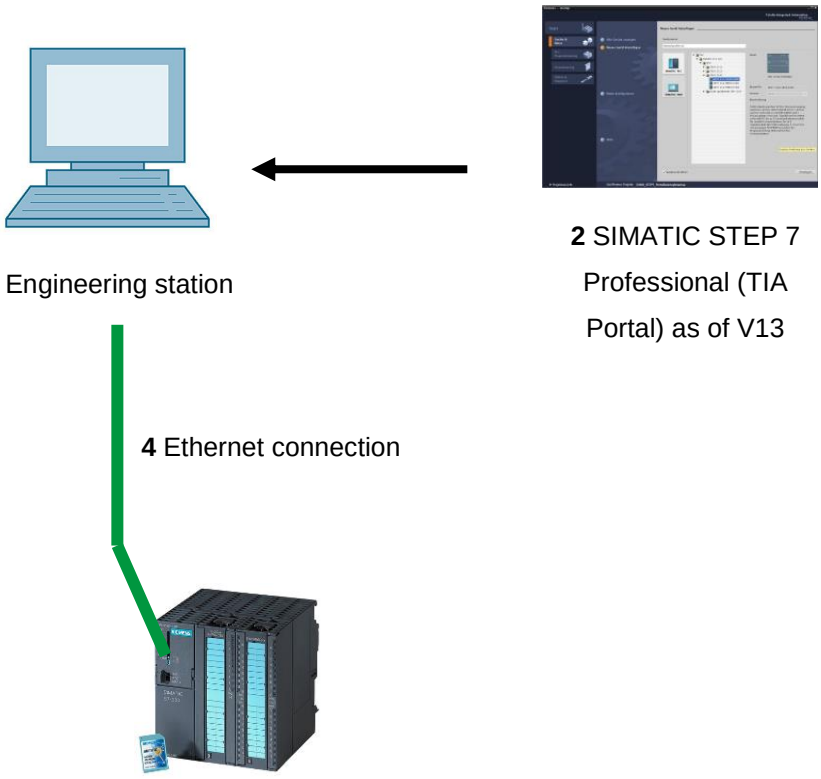
3 Required hardware and software

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 S7-300 controller, e.g. CPU 314C-2 PN/DP – Firmware as of V3.3 with MMC memory card

4 Ethernet connection between engineering station and controller



4 Theory

4.1 SIMATIC S7-300 automation system

The SIMATIC S7-300 automation system is a modular microcontroller system for the low and medium performance range. A comprehensive range of modules is available to optimally adapt the system to the automation task.

The S7 controller consists of a power supply, a CPU and input and output modules for digital and analog signals. If necessary, communication processors and function modules are also used for special tasks such as stepper motor control.

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 I/O modules via input addresses (%I) and addresses their output addresses (%Q).

The system is programmed with the STEP 7 software.

4.2 Design and operation of the SIMATIC S7-300

4.2.1 Range of modules:

The SIMATIC S7-300 is a modular automation system and offers the following range of modules:

Central processing units (CPUs) with different performance capacities, in some cases with integrated inputs/outputs (e.g. CPU 314C) or integrated PROFINET interface (e.g. CPU 315F-2 PN/DP)

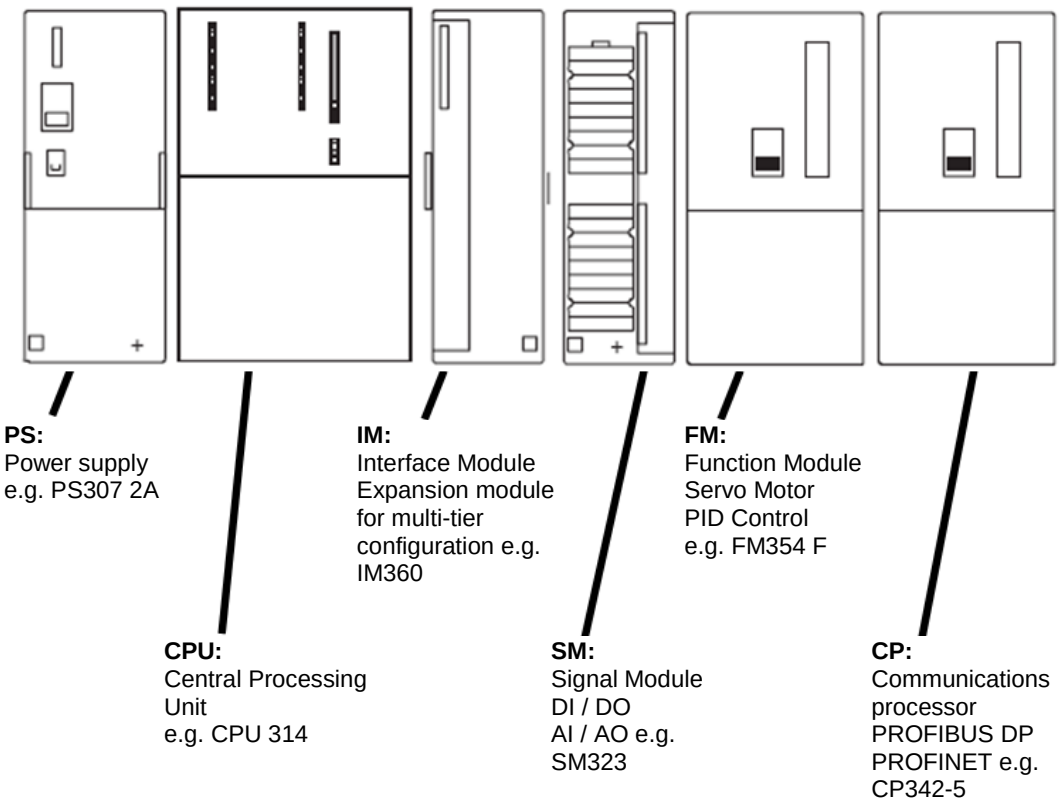
Power supply modules PS with 2A, 5A or 10A

Expansion modules (IMs) for multi-tier configuration of SIMATIC S7-300

Signal modules (SM) for digital and analog I/O

Functional modules FM for specific functions (e.g. stepper motor control)

Communication processors CP for network connection



Note: *For this module, only a power supply module, any CPU as well as any signal modules for digital inputs and digital outputs are required.*

4.2.2 Maximum configuration of SIMATIC S7-300 with 4 racks

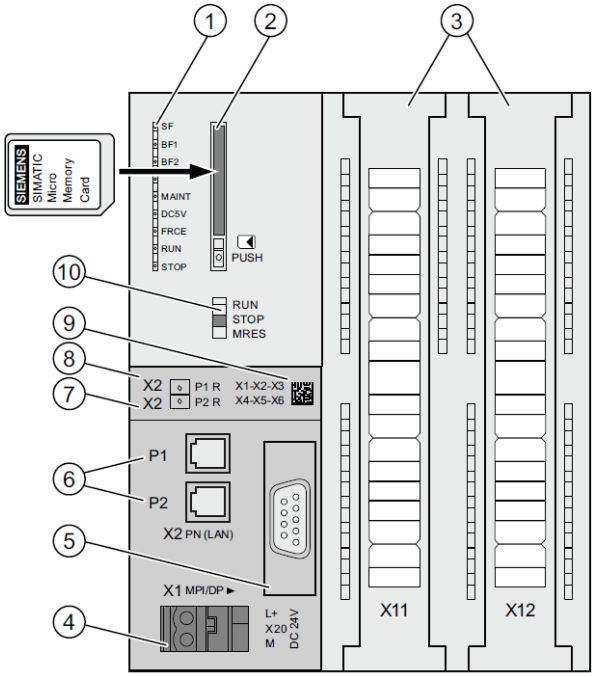
The following graphic shows the arrangement of the modules in a configuration with 4 racks.

Number	Description
①	Rack 0 (central controller)
②	Rack 1 (expansion unit)
③	Rack 2 (expansion unit)
④	Rack 3 (expansion unit)
⑤	Connecting cable 368
⑥	Limitation for the CPU 31 xC If you are using this CPU, you may not insert signal module 8 in rack 4.

4.2.3 Operator controls and display elements of the CPU

The figure below shows the operator control and display elements of a CPU 314C-2 PN/DP.

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



Number	Description
①	Status and error displays
②	Slot for SIMATIC Micro Memory Card including ejector
③	Connections of integrated inputs and outputs
④	Connection for the power supply
⑤	1st interface X1 (MPI/DP)
⑥	2nd interface X2 (PN), with 2-port switch
⑦	PROFINET port 2 The status of port 2 is signaled by a two-color LED (green/yellow): • LED lit green: LINK to a partner is available • LED changes to yellow: Active data traffic (RX/TX) R: Ring port for configuring a ring topology with media redundancy
⑧	PROFINET port 1 The status of port 1 is signaled by a two-color LED (green/yellow): • LED lit green: LINK to a partner is available • LED changes to yellow: Active data traffic (RX/TX) R: Ring port for configuring a ring topology with media redundancy
⑨	MAC address and 2D bar code
⑩	Mode switch

Status and error displays

The CPU comes with the following LED displays:

LED designation	Color	Meaning
SF	red	Hardware or software error
BF1	red	Bus fault on 1st interface (X1)
BF2	red	Bus fault on 2nd interface (X2)
MAINT	Yellow	Maintenance required
DC5V	Green	The 5 V supply for CPU and S7-300 bus is OK
FRCE	Yellow	LED is lit: Active Force job LED flashes at 2 Hz: Node flash test function
RUN	Green	CPU In RUN LED flashes at startup with 2 Hz and at hold with 0.5 Hz.
STOP	Yellow	CPU in STOP or in HOLD or Startup The LED flashes at a memory reset request with 0.5 Hz and at a memory reset with 2 Hz.

Slot for SIMATIC Micro Memory Card (MMC)

A SIMATIC Micro Memory Card (MMC) is used as the memory module for the CPUs. The MMC can be used as load memory and as portable data media. The MMC **must** be inserted to operate the CPU as the CPUs have no integrated load memory.

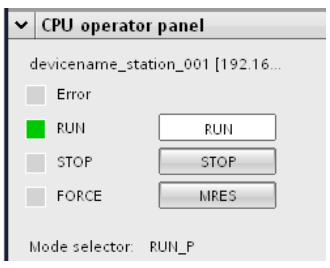
4.2.4 Mode switch

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.

The positions of the operating mode switch are explained in the order they occur on the CPU.

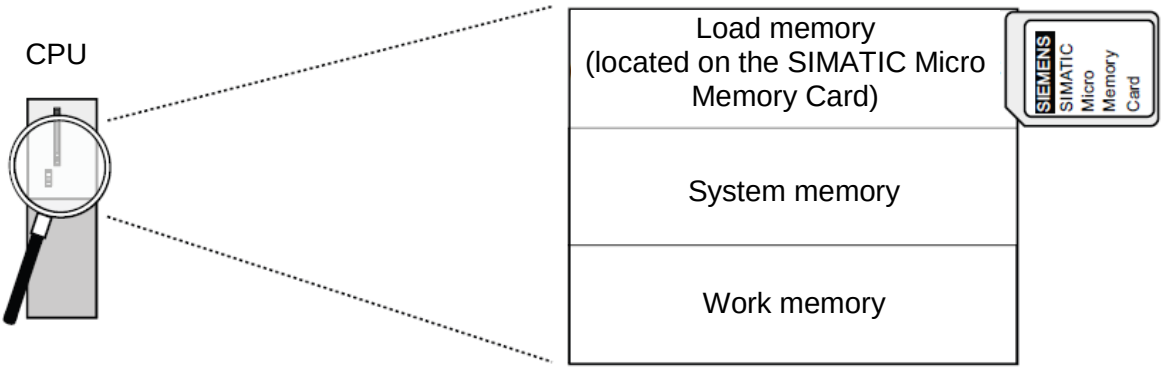
Position	Meaning	Explanations
RUN	RUN mode	The CPU processes the user program.
STOP	STOP mode	The CPU is not executing any user program.
MRES	Memory reset	Position of the mode switch for CPU memory reset. A specific operating sequence is required to reset the memory using the mode switch.

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.



4.2.5 Memory areas of the CPU and the SIMATIC memory card

The memory of the S7-300 CPU can be divided into three areas:



Note:** Loading of user programs and thus operation of the CPU 31xC is possible **only with inserted MMC.

Load memory

The load memory is on a SIMATIC Micro Memory Card (MMC). It is used to store code blocks, data blocks and system data (configuration, connections, module parameters, etc.). Blocks that are identified as not runtime-relevant are stored exclusively in the load memory. You can also store all the configuration data for your project on the MMC.

Work memory

The work memory is integrated in the CPU and cannot be expanded. It is used to execute the code and process user program data. Program processing takes place exclusively in the work memory and system memory areas. The work memory of the CPU is retentive with inserted MMC.

System memory

The system memory is integrated in the CPU and cannot be extended.

It contains

- The bit memory, timer and counter operand areas
- The process image of the inputs and outputs
- The local data

4.2.6 Retentivity

Your S7-300 CPU has retentive memory. The retentivity is implemented on the MMC and on the CPU. As a result of the retentivity, the content of the retentive memory is retained even after a POWER OFF and warm restart.

Load memory

Your program in the load memory (MMC) is always retentive. It is stored on the MMC where it is protected after loading against power failures or memory resets.

Work memory

Your data in the work memory is saved on the MMC at a Power Off. This makes the contents of data blocks retentive.

System memory

For bit memory, timers and counters, you decide via configuration (CPU properties, retentivity tab) which parts should be retentive and which should be initialized to "0" at restart (warm restart). The diagnostic buffer, IP address, PROFIBUS address (and baud rate) and operating hours counter are generally stored in the retentive memory area on the CPU. Retentivity of the MPI address and baud rate ensures that your CPU can continue to communicate, even after a power failure, memory reset or loss of communication parameters (e.g. due to removal of the MMC or deletion of communication parameters).

Retentive behavior of the memory objects

The following table shows the retentive behavior of the memory objects in the various operating mode transitions.

Memory object	**Operating mode transition**		
	POWER OFF/ POWER ON	**STOP - RUN**	**Memory reset**
User program / data (load memory)	X	X	X
• Retentive behavior of the DBs for CPU with Firmware < V2.0.12	X	X	-
• Retentive behavior of the DBs for CPU with Firmware > V2.0.12 or higher	Can be set in the properties of the DBs in STEP 7 V5.2 + SP1 or higher		-
as retentively configured bit memories, timers and counters	X	X	-
Diagnostics buffer, runtime meter	X	X	X
MPI address, baud rate of an MPI interface DP address, baud rate of an MPI/DP interface if this is set as a DP node in the parameter assignment Note: The parameters of a pure DP interface are only retentive at Power Off/On or memory reset if the parameter assignment (SDBs) is also loaded.	X	X	X
• IP Suite/device name of PROFINET interface	Dependent on the type of assignment of the IP address parameters and device name	X	Dependent on the type of assignment of the IP address parameters and device name
x = retentive; - = non-retentive			

4.3 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.

4.3.1 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 structure and internetworking of devices as well as the programs. Configuration of the visualization and the drives is also included, where applicable.

4.3.2 Hardware configuration

The *hardware configuration* includes the configuration of the devices, consisting of the hardware of the automation system, 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 processors, and interface modules (CP, IM). Power supply and voltage 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.

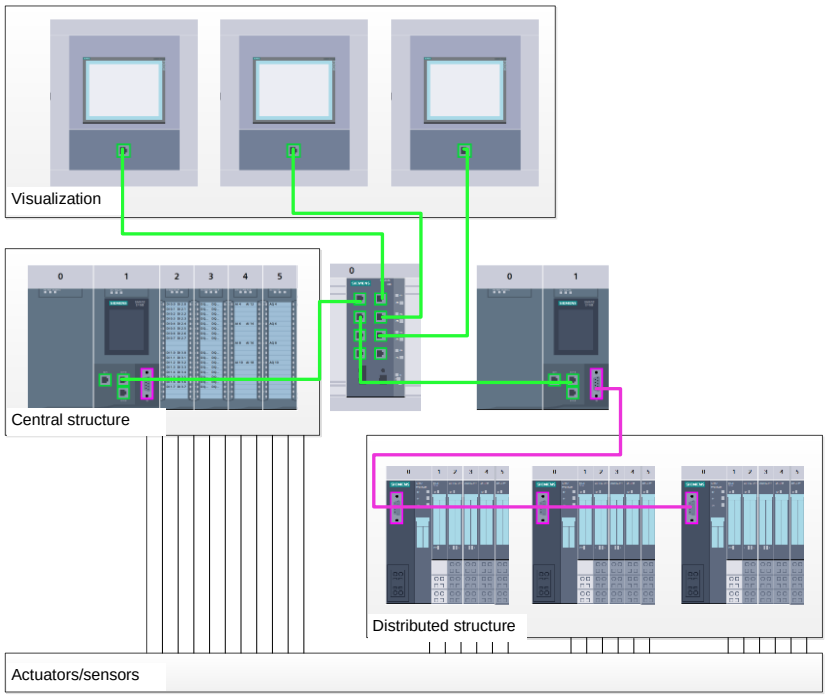


Figure 1: Example of hardware configuration with central and distributed structures

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.

4.3.3 Central and distributed automation structure

Figure 1 shows an automation structure that contains both central and distributed structures.

In central 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 distributed 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.

4.3.4 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.*

4.3.5 TIA Portal – Project view and portal view

The TIA Portal has two important views. When started, the TIA Portal displays the portal view 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.

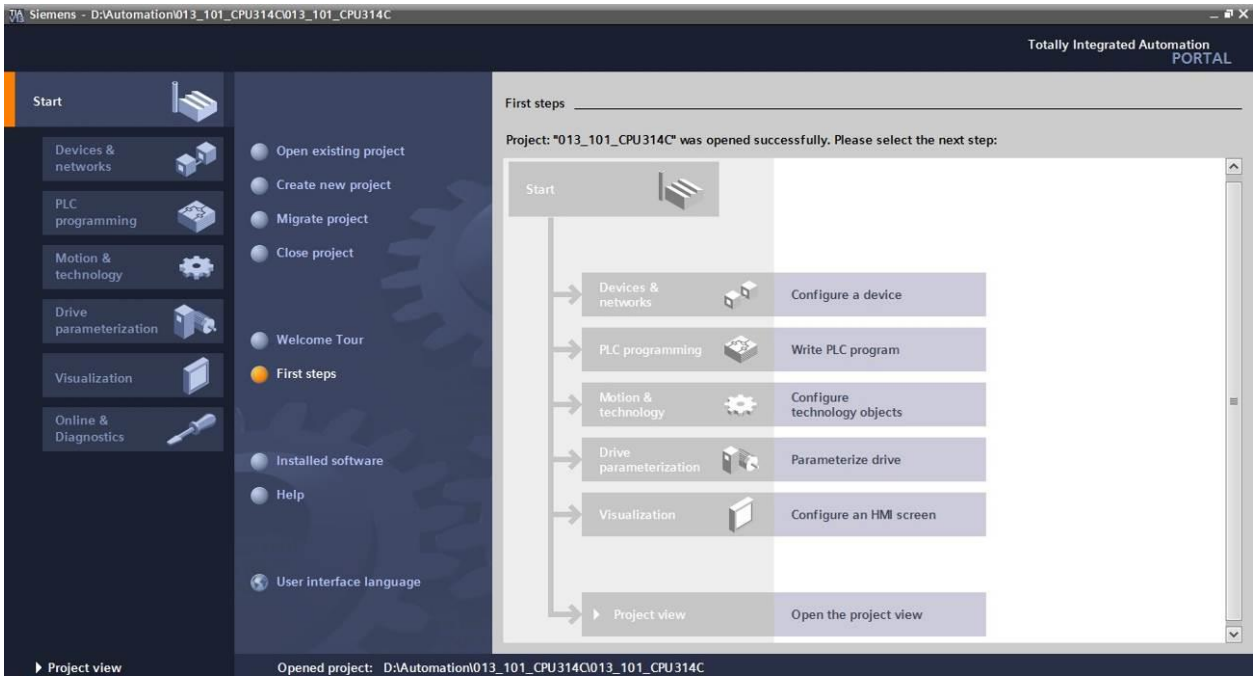


Figure 2: Portal view

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.

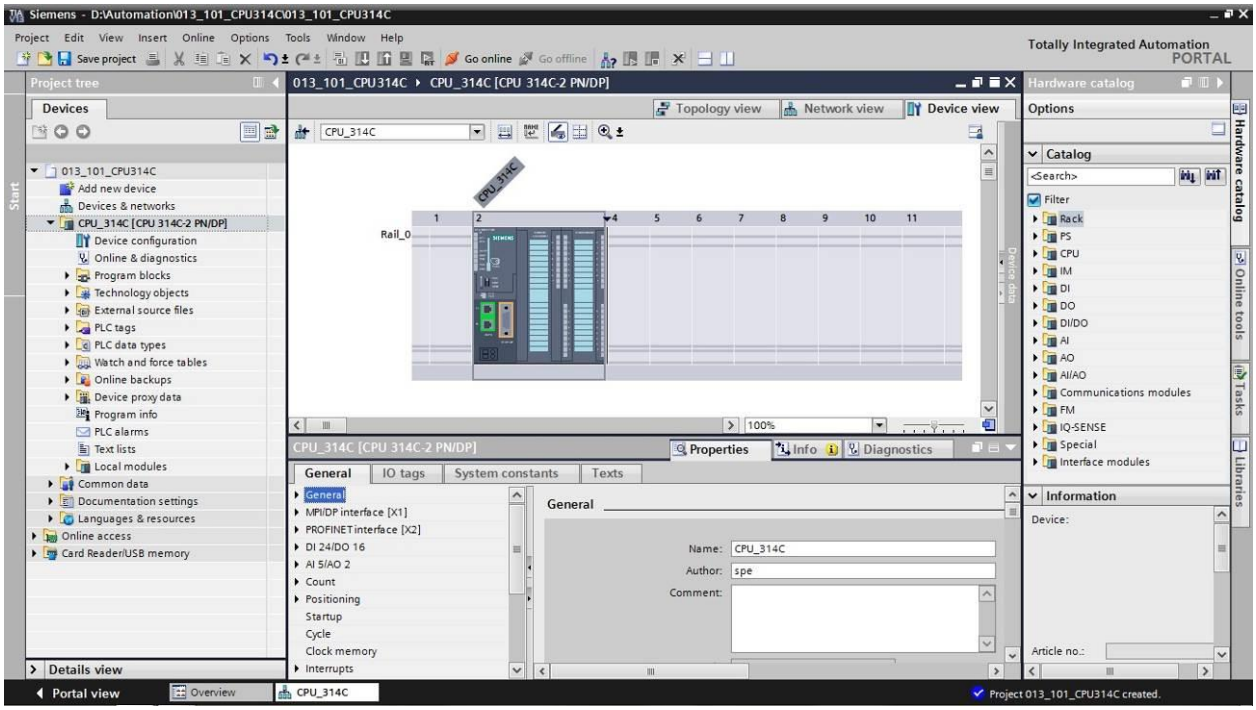
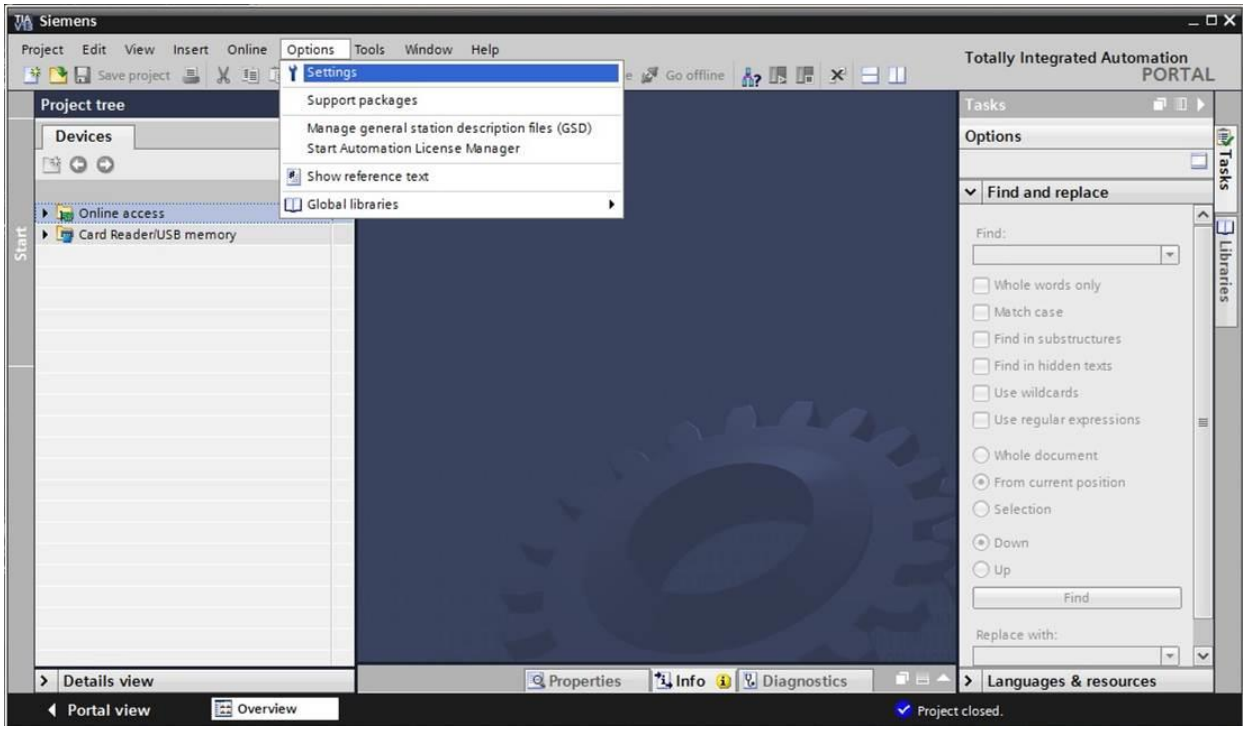


Figure 3: Project view

4.3.6 Basic settings for the TIA Portal

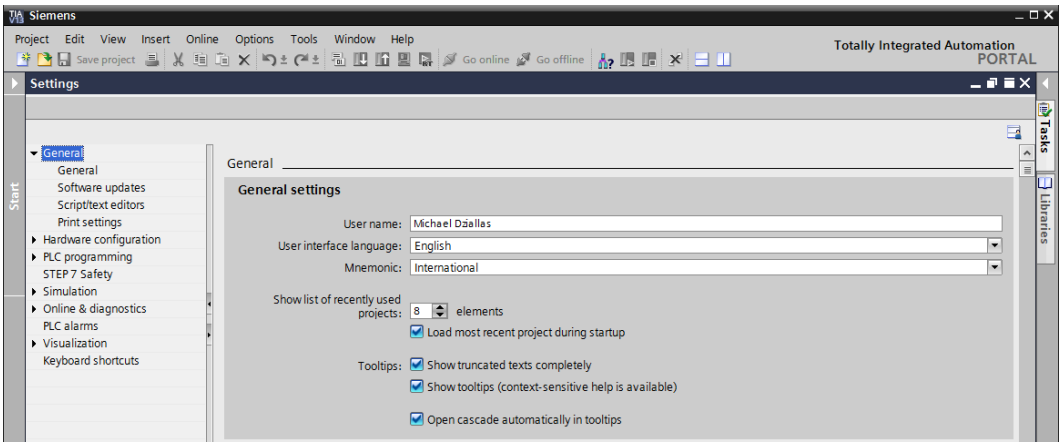
→ Users can specify their own default settings for certain settings in the TIA Portal. A few important settings are shown here.

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



→ 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.

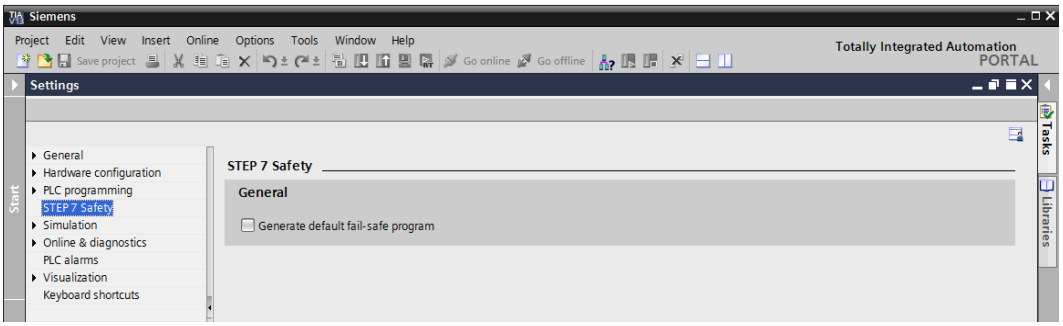
→ Under → "General" in "Settings", select "User interface language → English" and "Mnemonic → International".



Note: *These settings can always be changed.*

→ When Safety CPUs are used (e.g. CPU 315F-2 PN/DP) without the use of safety engineering, it is recommended that automatic creation of the safety program be deactivated before creating a project.

→ In "Settings" under the → "STEP 7 Safety" item, deactivate → "Generate default fail-safe program".



4.3.7 Setting the IP address on the programming device

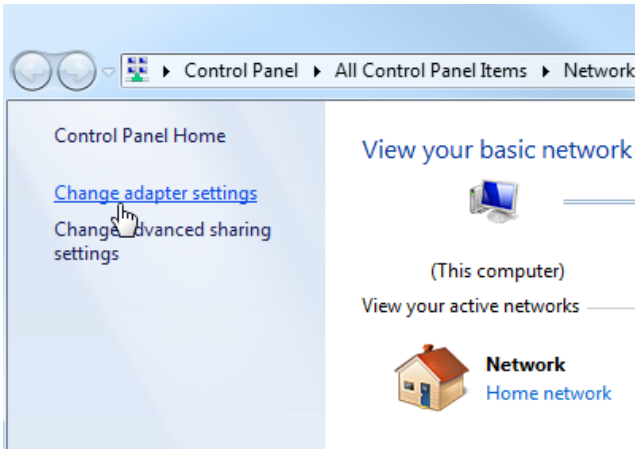
To program SIMATIC S7-300 from the PC, the programming device or a laptop, you need a TCP/IP connection or an optional PROFIBUS connection.

For the PC and SIMATIC S7-300 to communicate with each other via TCP/IP, it is important that the IP addresses of both devices match.

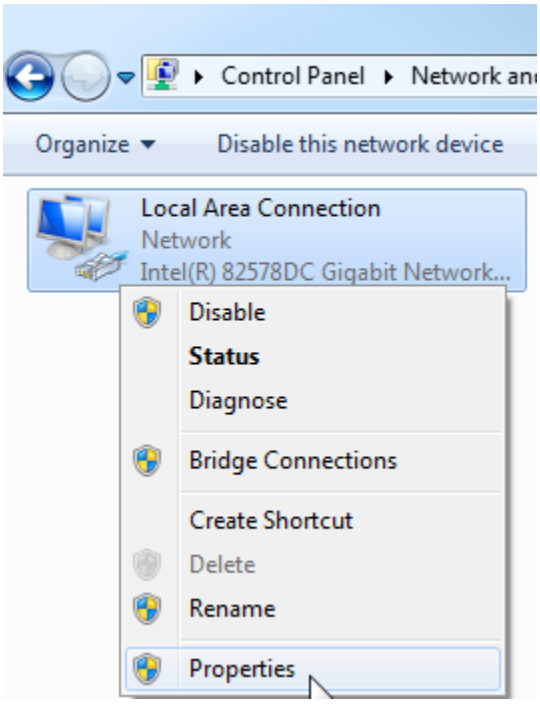
First, we show you how to set the IP address of a computer with the Windows 7 operating system.

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

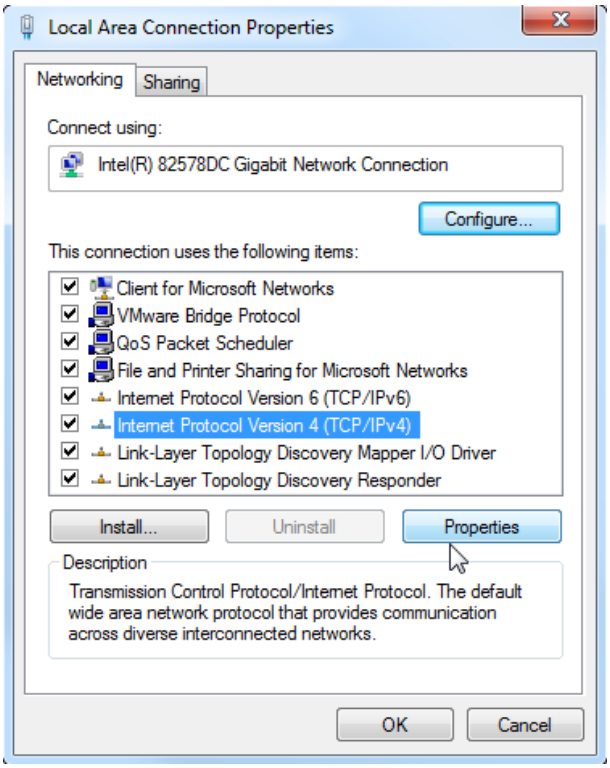
→ In the open Network and Sharing Center window, click → "Change adapter settings".



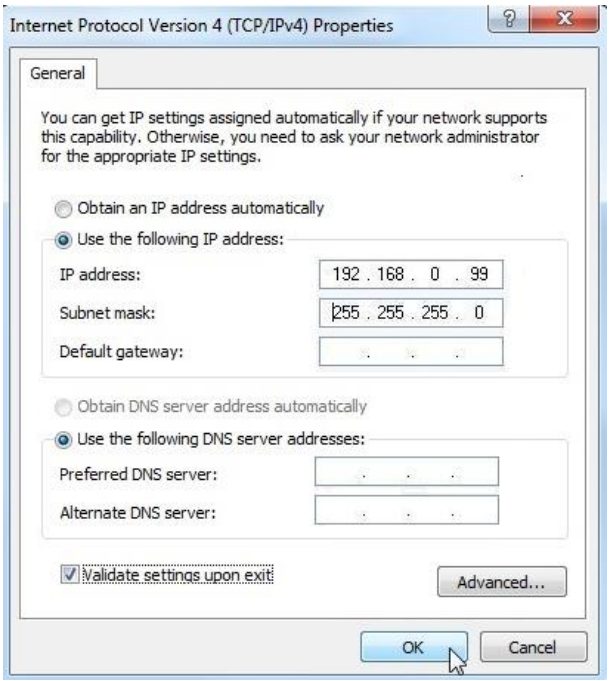
→ Select the desired → "Local Area Connection" that you want to use to connect to the controller and click → "Properties".



→ 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")

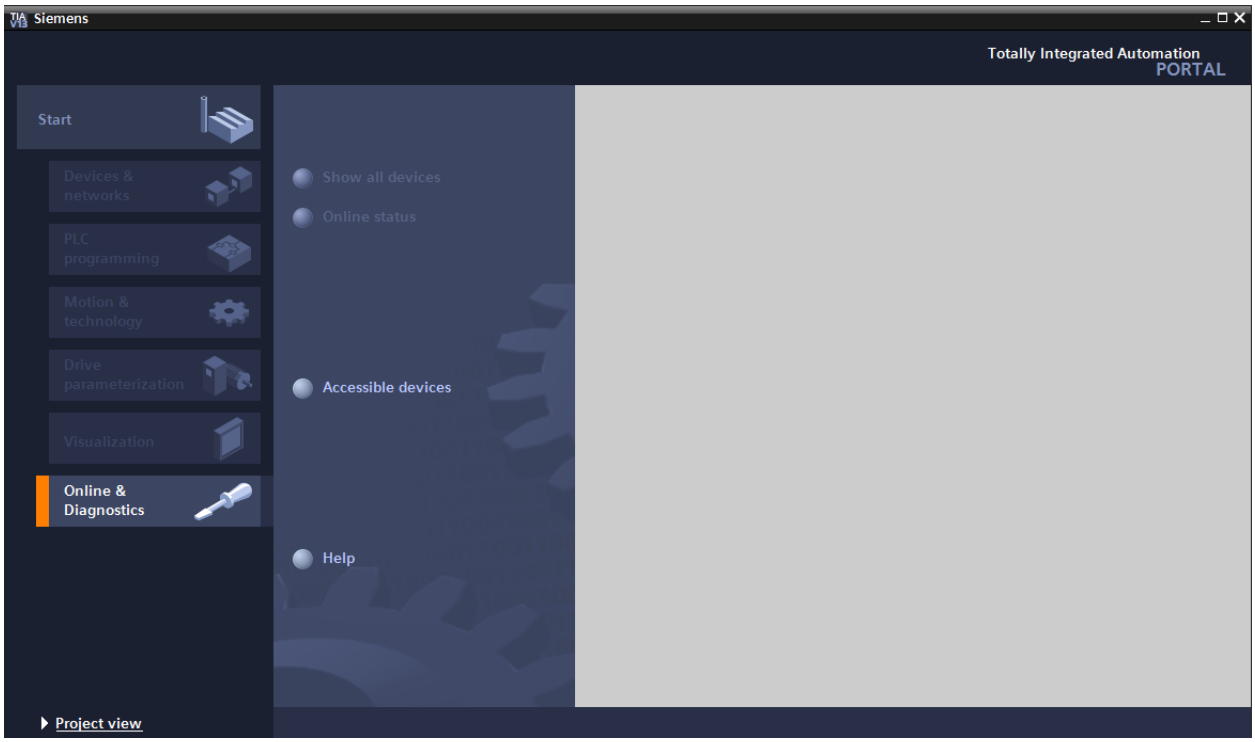


4.3.8 Setting the IP address in the CPU

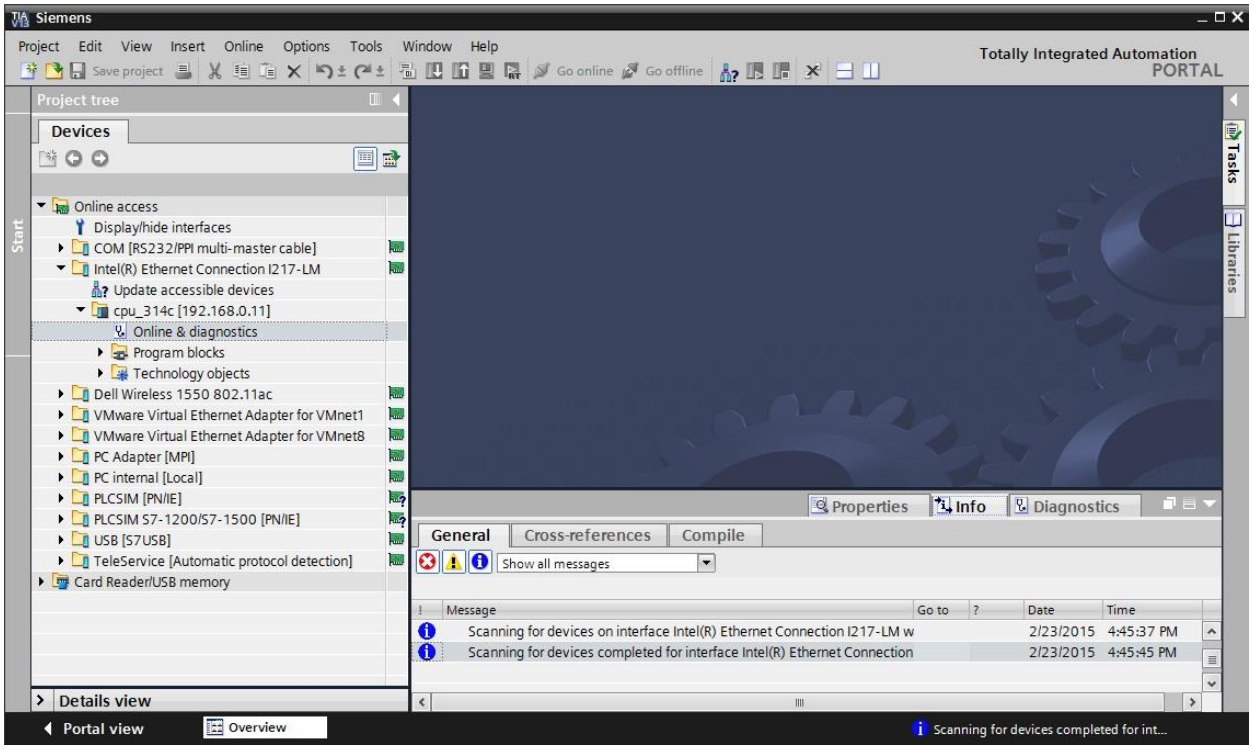
The IP address of a SIMATIC S7-300 with CPU 314C-2 PN/DP is set as follows.

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

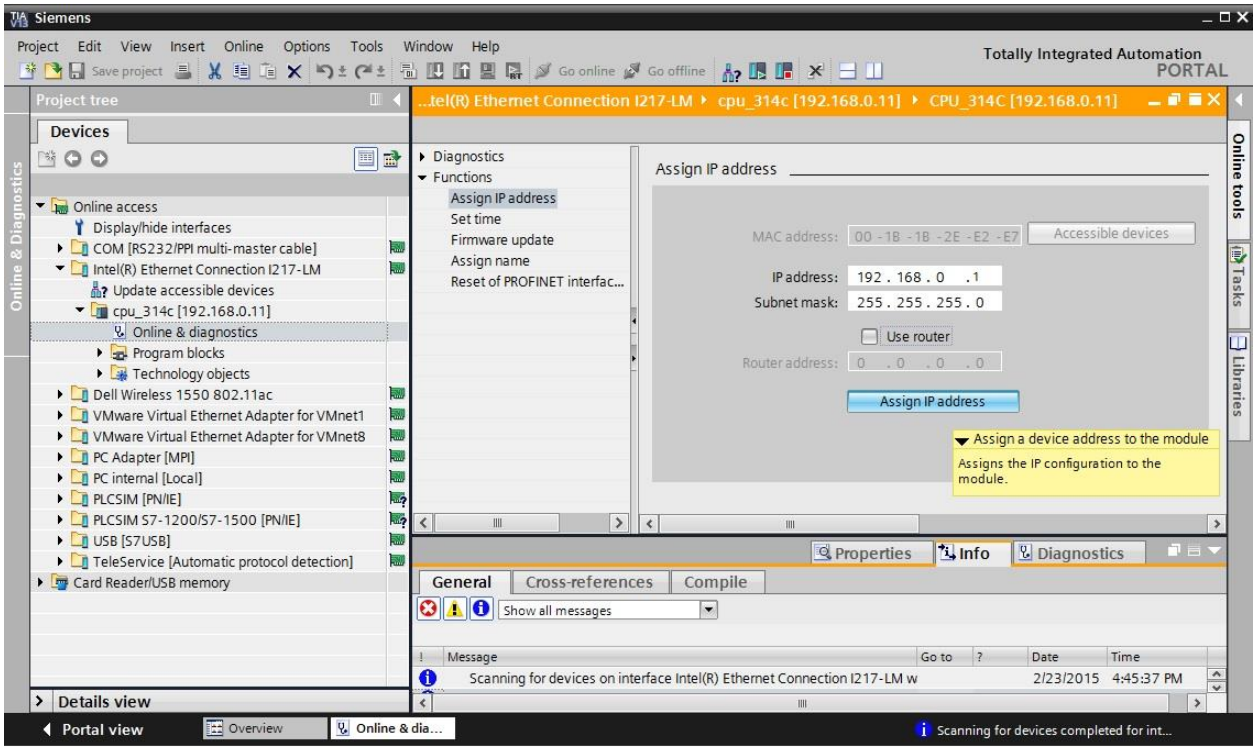
→ Select → "Online & Diagnostics" and open the →"project view".



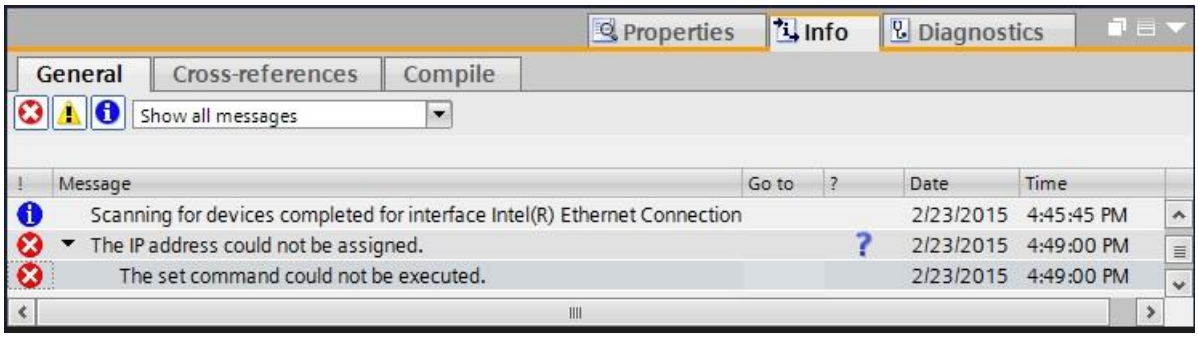
→ In the project tree under → "Online access", select the network adapter that was set previously. If you click → "Update accessible devices" here, you will see the IP address (if previously set) or the MAC address (if IP address not yet assigned) of the connected SIMATIC S7-300. Select → "Online & Diagnostics" here.



→ 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 S7-300.

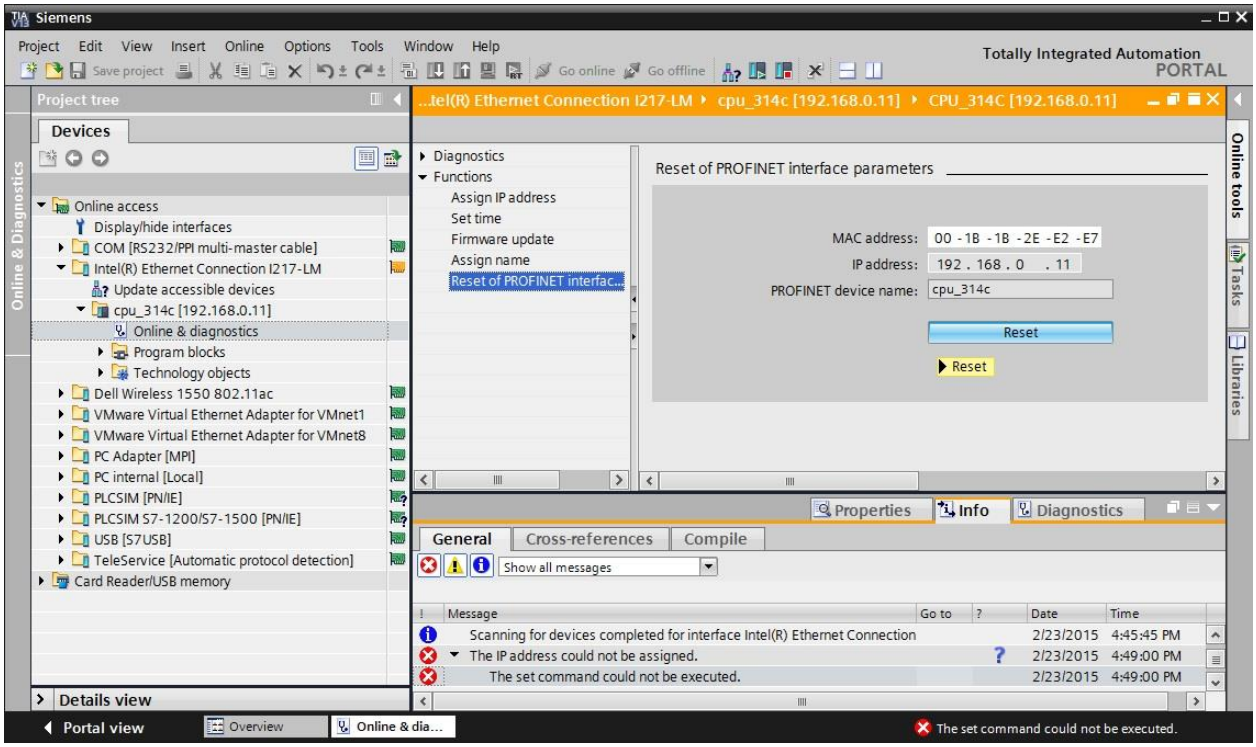


→ If the IP address was not successfully assigned, you will receive a message in the → "Info" window under → "General".

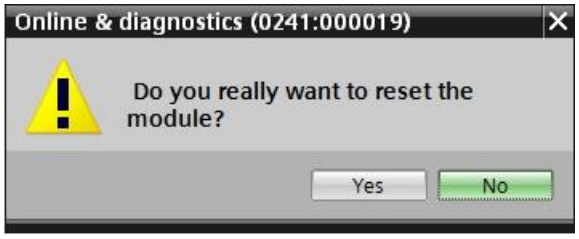


4.3.9 Resetting the PROFINET interface parameters

If the IP address could not be assigned, the PROFINET interface parameters must be reset. For this, select the → "Reset of PROFINET interface parameters" function and click → "Reset".



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



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

5 Task

Create a project und configure the following modules of your hardware, which correspond to one part of the Trainer Package SIMATIC S7 CPU 314C-2 PN/DP.

- 1X SIMATIC S7-300 STABILIZED POWER SUPPLY PS307 INPUT: 120/230 V AC OUTPUT: 24 V DC/5 A (order number: 6ES7307-1EA01-0AA0)
- 1X SIMATIC S7-300, CPU314C-2PN/DP COMPACT CPU WITH 192 KB WORK MEMORY, 24 DI/16 DO, 4AI, 2AO, 1 Pt100, 4 FAST COUNTERS (60 KHZ), 1.INTERFACE MPI/DP 12MBIT/S, 2.INTERFACE ETHERNET PROFINET, WITH 2 PORT SWITCH, INTEGR. 24V DC POWER SUPPLY, FRONT CONNECTOR (2 X 40PIN) AND MICRO MEMORY CARD REQURIED (order number: 6ES7314-6EH04-0AB0)

6 Planning

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

The hardware for this project is already specified with the SIMATIC S7 SIMATIC S7 CPU 314C-2 PN/DP Trainer Package. Therefore, a selection does not have to be made. Instead, the listed modules of the Trainer Package only have to be inserted in the project. To ensure that the correct modules are inserted, the order numbers from the task should be re-checked directly on the installed device.

The following sequence is chosen for this:

- CPU
- Power supply module (PS)

Optional steps for swapping a module are then shown.

The Ethernet interface must be set for the configuration of the CPU. The address areas are set for the integrated input and outputs of the CPU 314C-2 PN/DP.

Module	Order number	Slot	Address area
CPU 314C-2 PN/DP	6ES7314-6EH04-0AB0	2	DI 0..2 / DO 0..1 / AI 64..73 / AO 64..67
PS307 120/230VAC	6ES7307-1EA01-0AA0	1	

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)*.

The tested project must be saved.

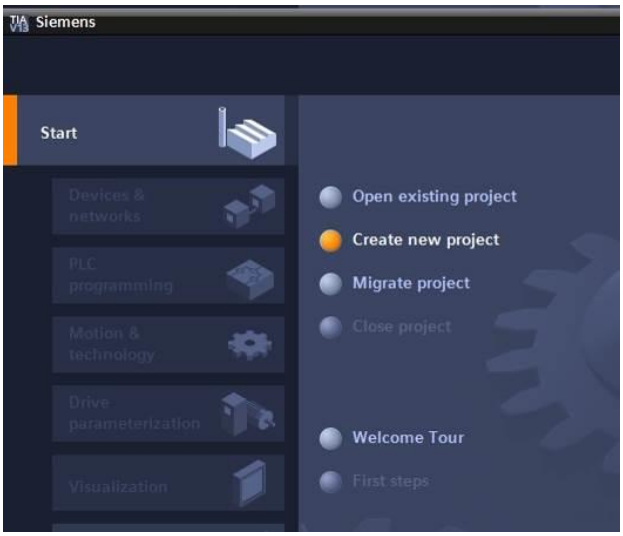
7 Structured step-by-step instructions

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.

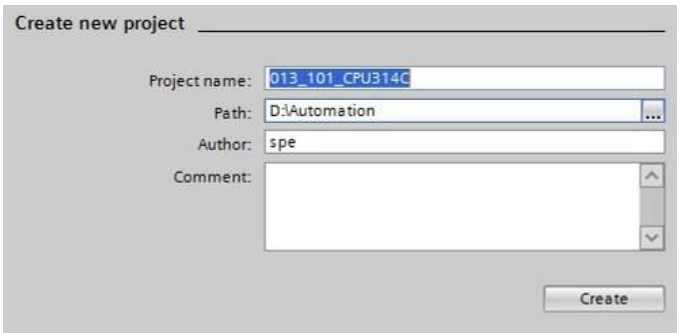
7.1 Create a new project

→ 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 the command → "Create new project".



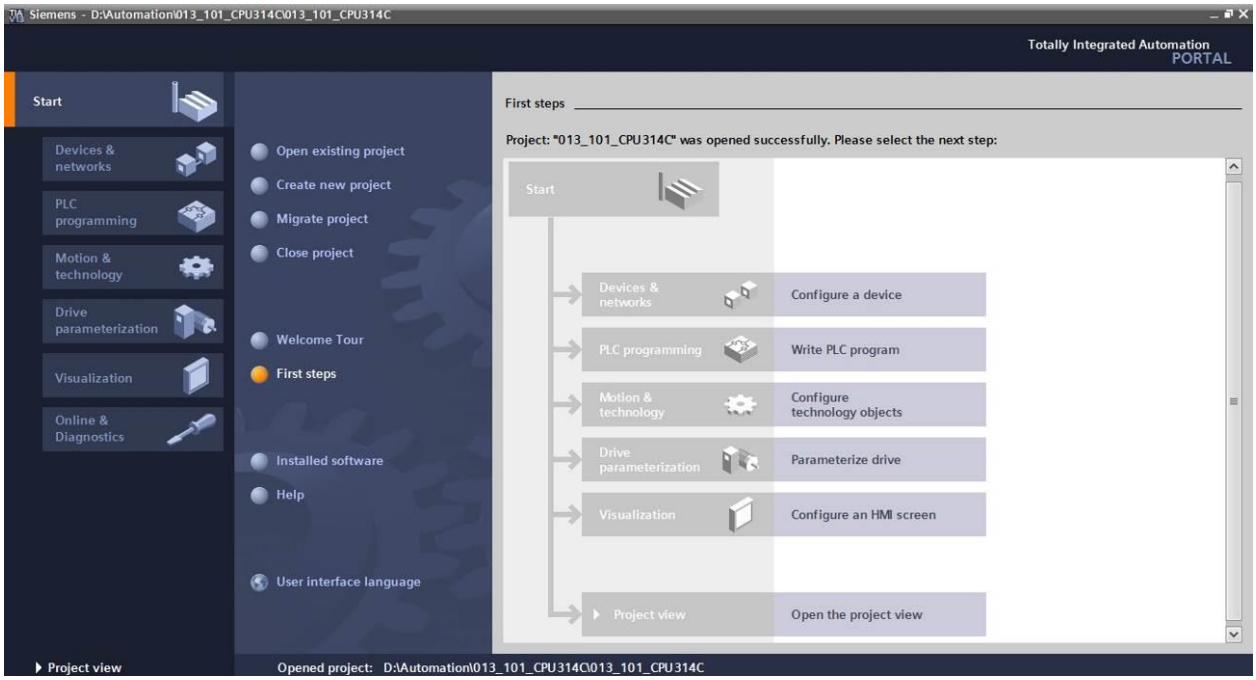
→ Modify Project name, Path, Author and Comment as appropriate and click → "Create".



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

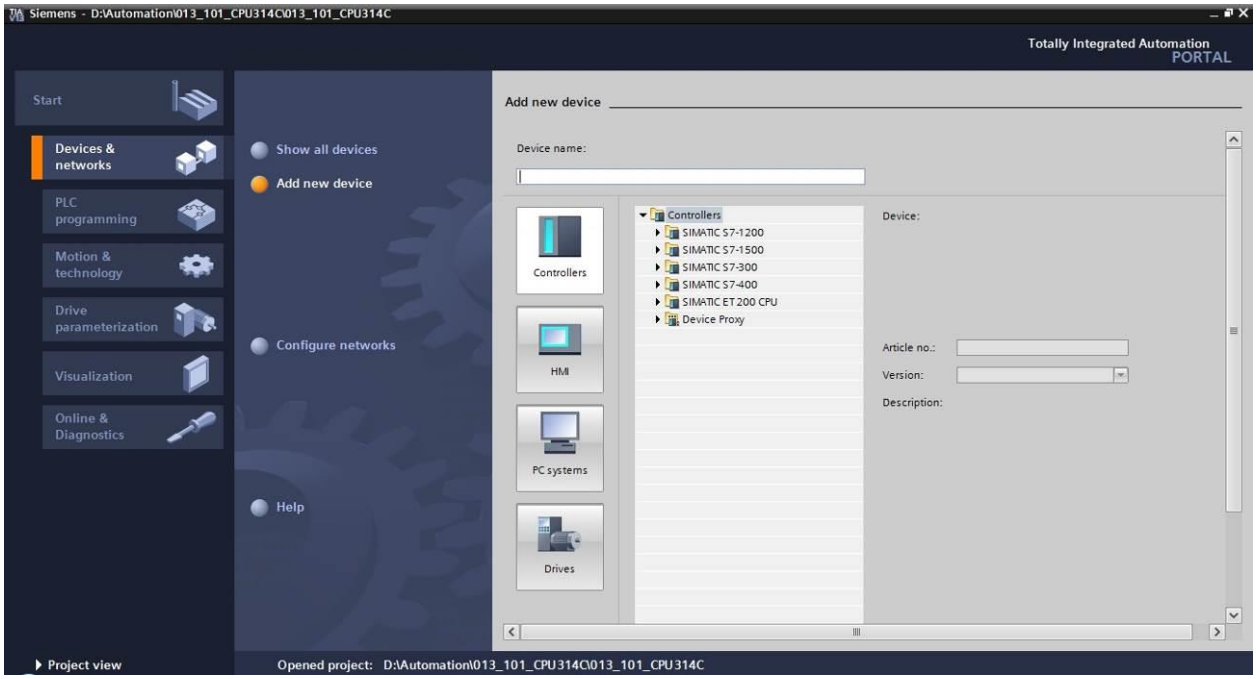
7.2 Insert the CPU 314C-2 PN/DP

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



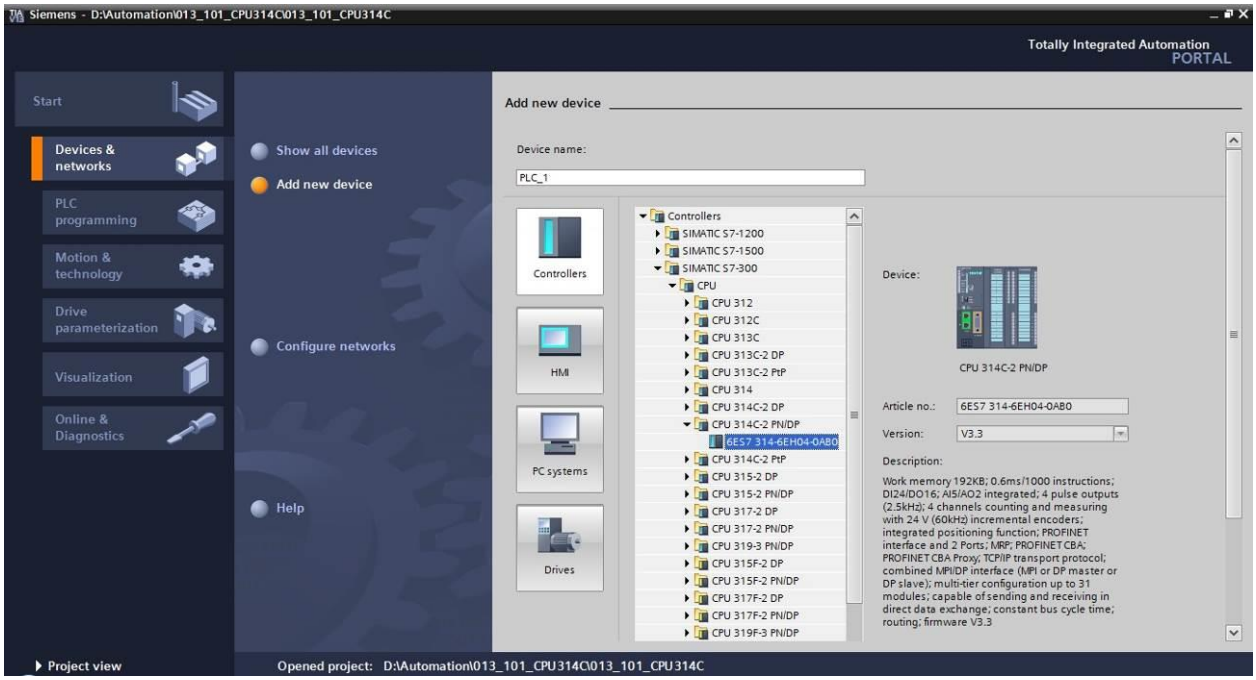
→ The "Show all devices" menu opens in the "Devices & Networks" portal.

→ Switch to the "Add new device" menu.



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

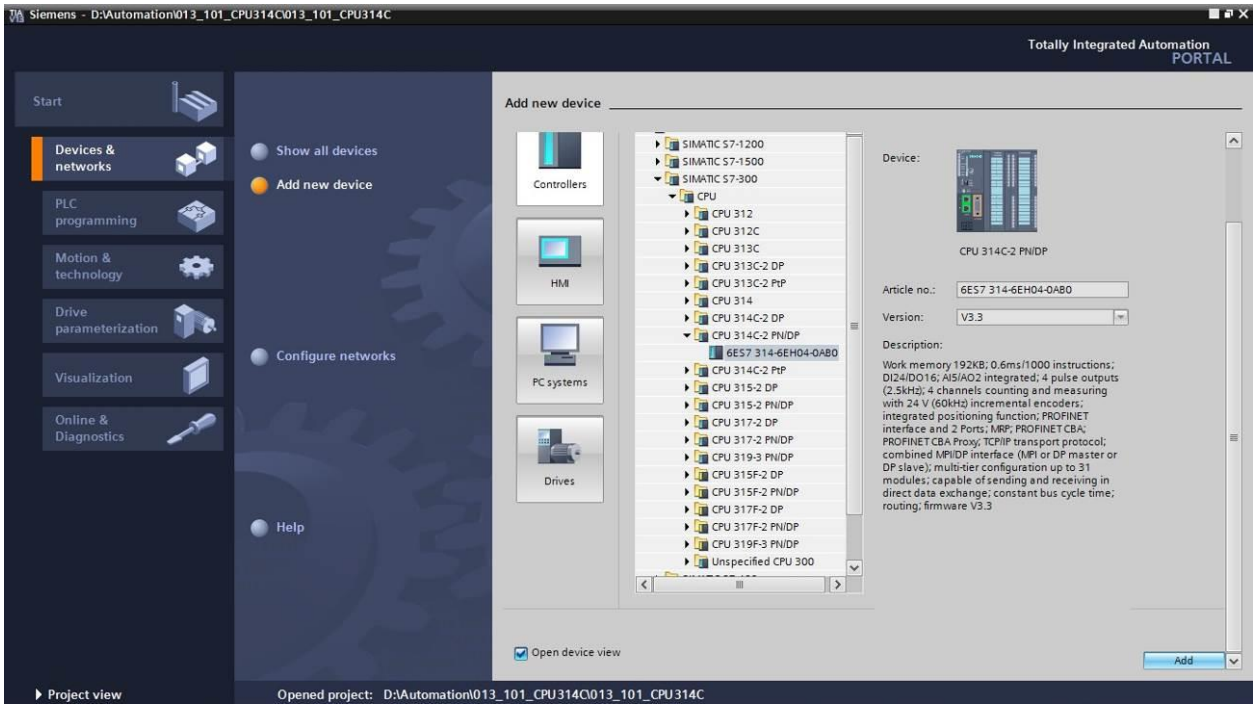
(Controllers → SIMATIC S7-300 → CPU → CPU 314C-2 PN/DP → 6ES7 314-6EH04-0AB0 → V3.3)



→ Assign a device name (device name → "CPU_314C").

→ Select "Open device view".

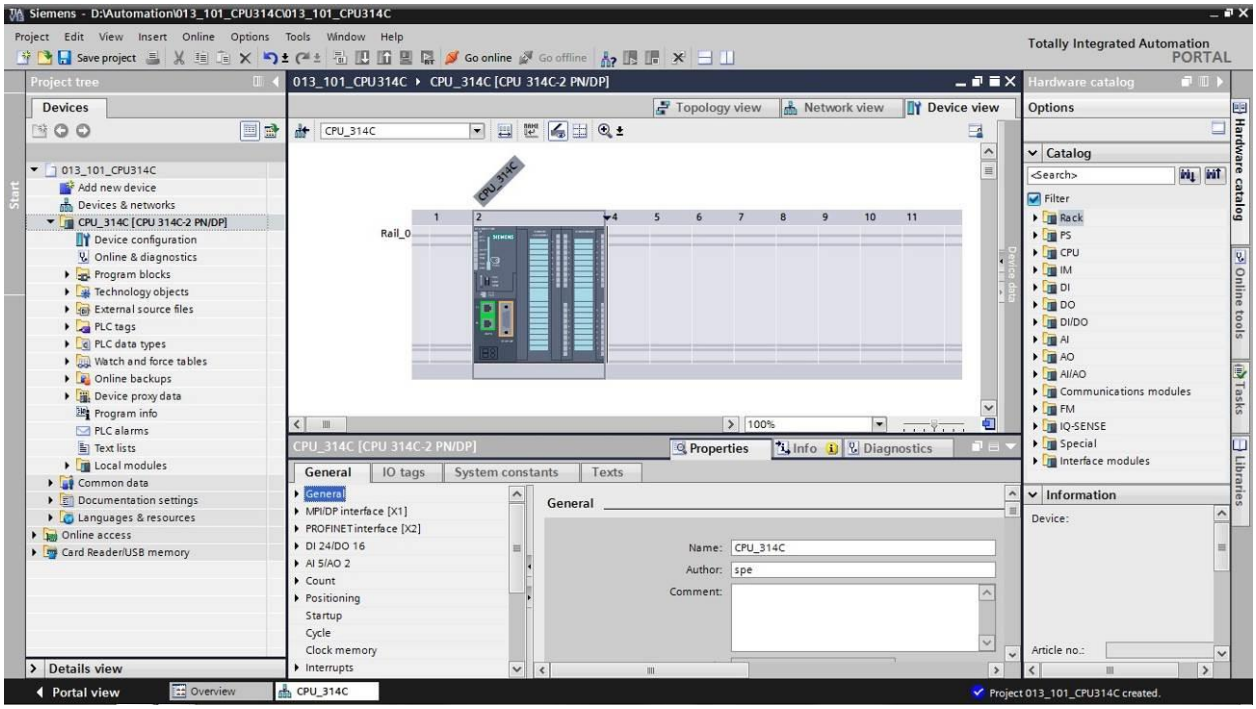
→ Click "Add".



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 meets the requirements placed on it.*

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

→ The TIA Portal now changes automatically to the project view and displays the selected CPU on slot 2 of a rail in the device configuration.

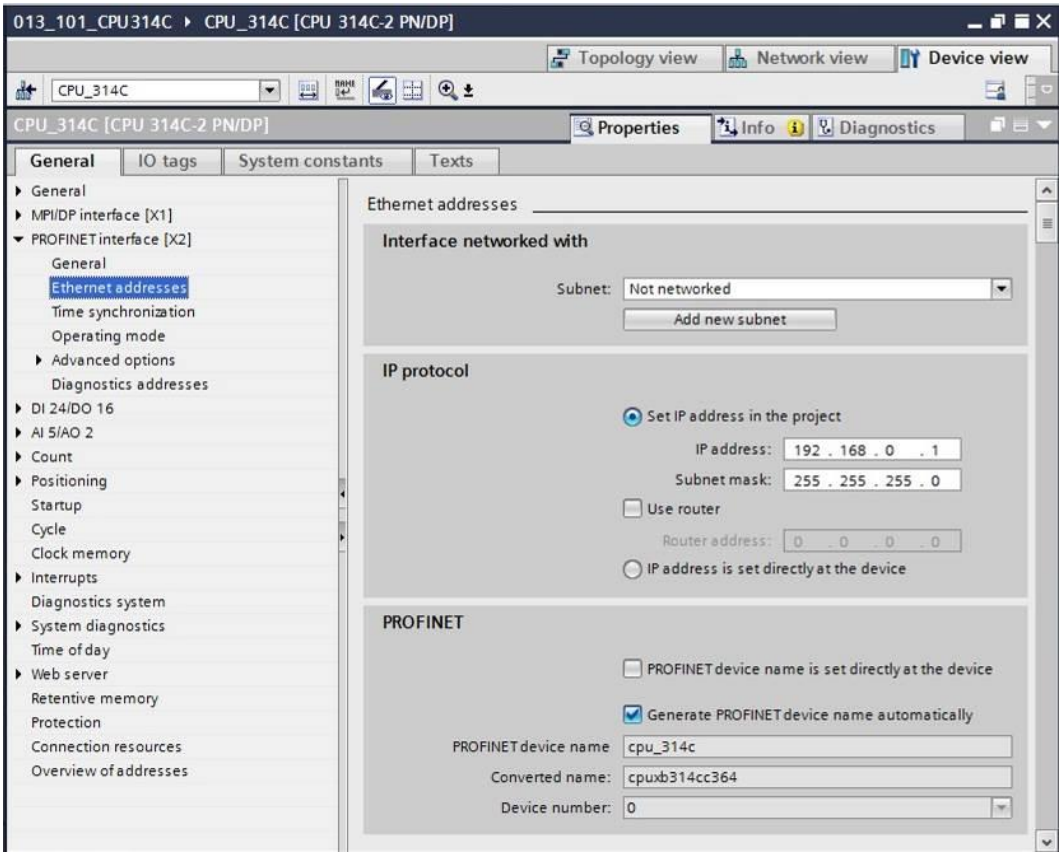


Note: *You can now configure the CPU there according to your specifications. Possible settings include the PROFINET and PROFIBUS DP interfaces, startup characteristics, cycle, communication load and many others.*

7.3 Configure the Ethernet interface of the CPU 314C-2 PN/DP

→ Select the CPU with a double-click

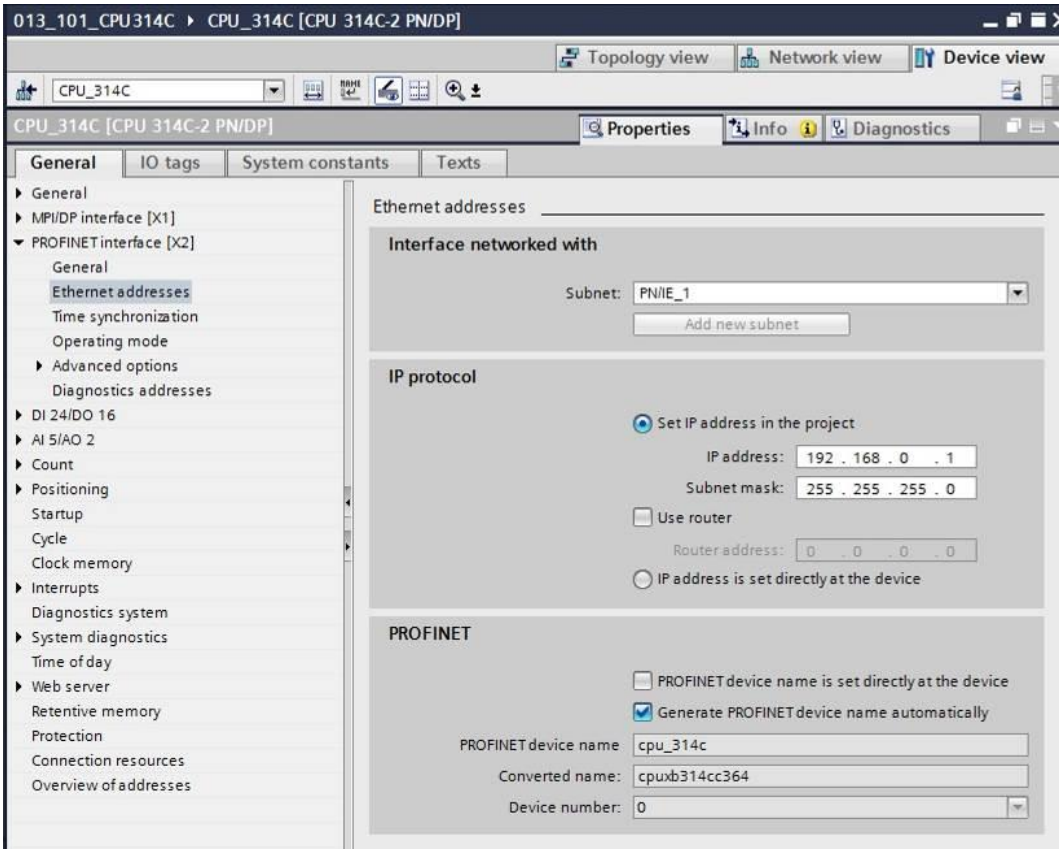
→ Under → "Properties", open the → "PROFINET-interface [X1]" menu and select the → "Ethernet addresses" entry there.



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

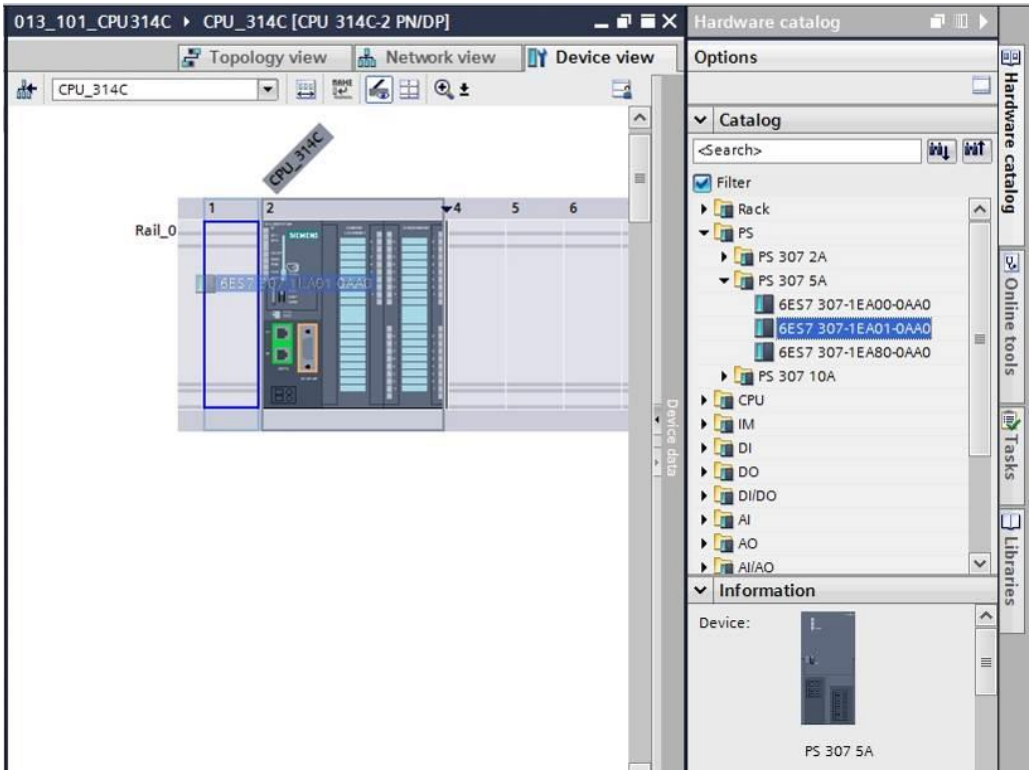
→ Add an Ethernet subnet with the → "Add new subnet" button.

→ Keep the pre-assigned "IP address" and "Subnet mask".

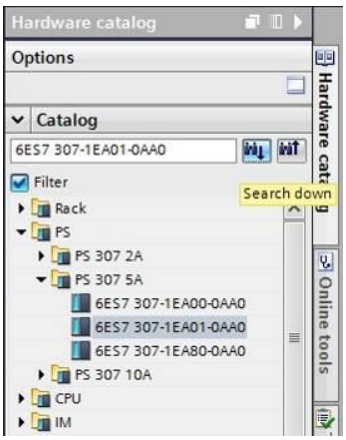


7.4 Insert the load current supply PS 307 5A AC120/230V:DC24V/5A

→ Find the correct module in the hardware catalog and insert the load current supply into slot 1. (→ Hardware Catalog → PS → PS 307 5A (order number 6ES7 307-1EA01-0AA0) → Slot 1)



Note: *To select the modules 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.*



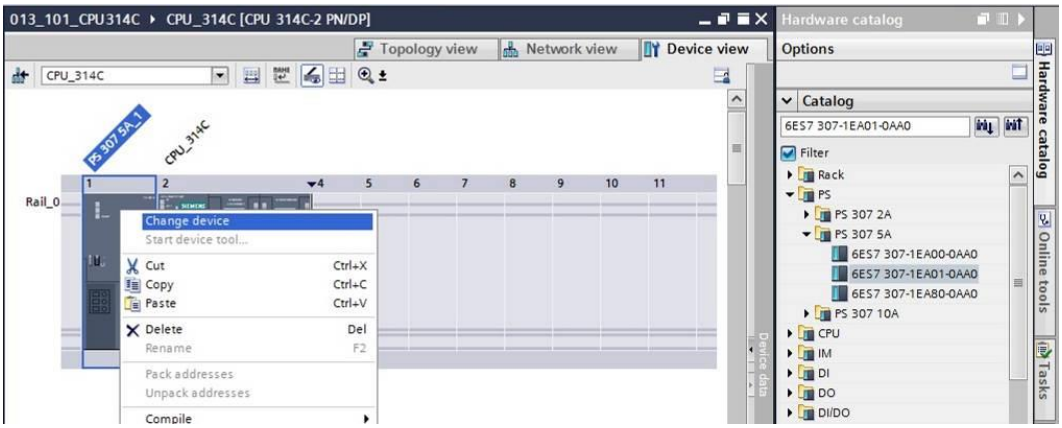
Note: *When you double-click a module in the hardware catalog, you insert it at the next available compatible slot.*

7.5 Optional: Replace a module

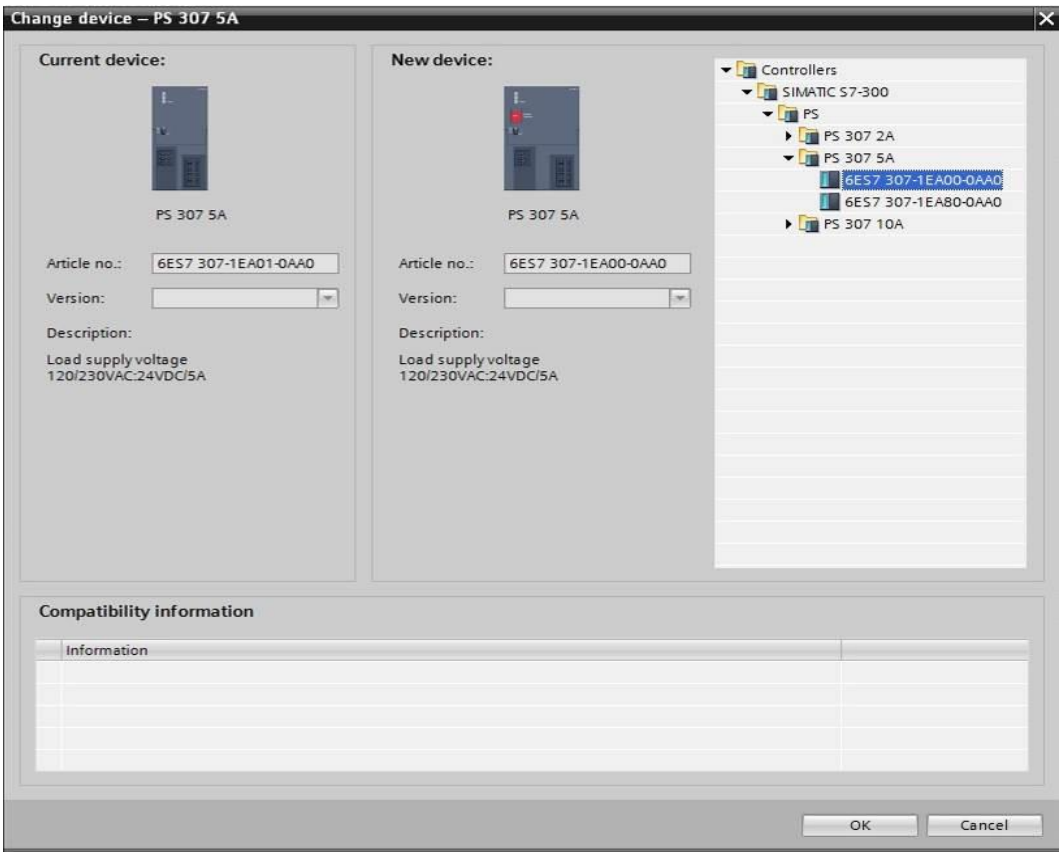
→ If an incorrect module has been entered in the hardware configuration, there are two options:

→ 1. Select the correct module in the hardware catalog and move it using drag-and-drop onto the module to be changed.

→ 2. Right-click the module to be changed to open the shortcut menu and select "Change device".



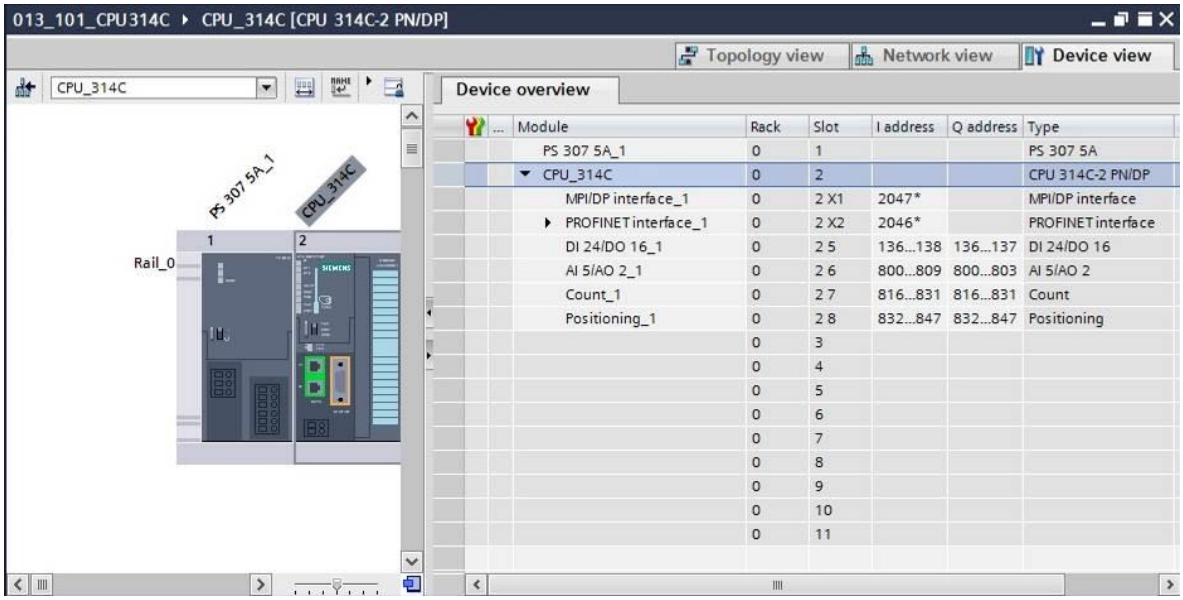
→ You can select the desired module on the right in a selection window and confirm the change with "OK". (→ "OK")



7.6 Configure the address area of the digital and analog inputs and outputs

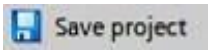
→ In the "Device overview" area, make certain that the integrated digital inputs have the address area 0…2 and the digital outputs have the address area 0…1. (→ Device overview → DI24/DO 16_1 → I address → 0…2 → Q-address → 0…1)

→ In the "Device overview" area, also set the integrated analog inputs to address area 64…73 and the analog outputs to address area 64…67. (→ Device overview → AI5/AO 2_1 → I-address → 64…73 → Q-address → 64…67)

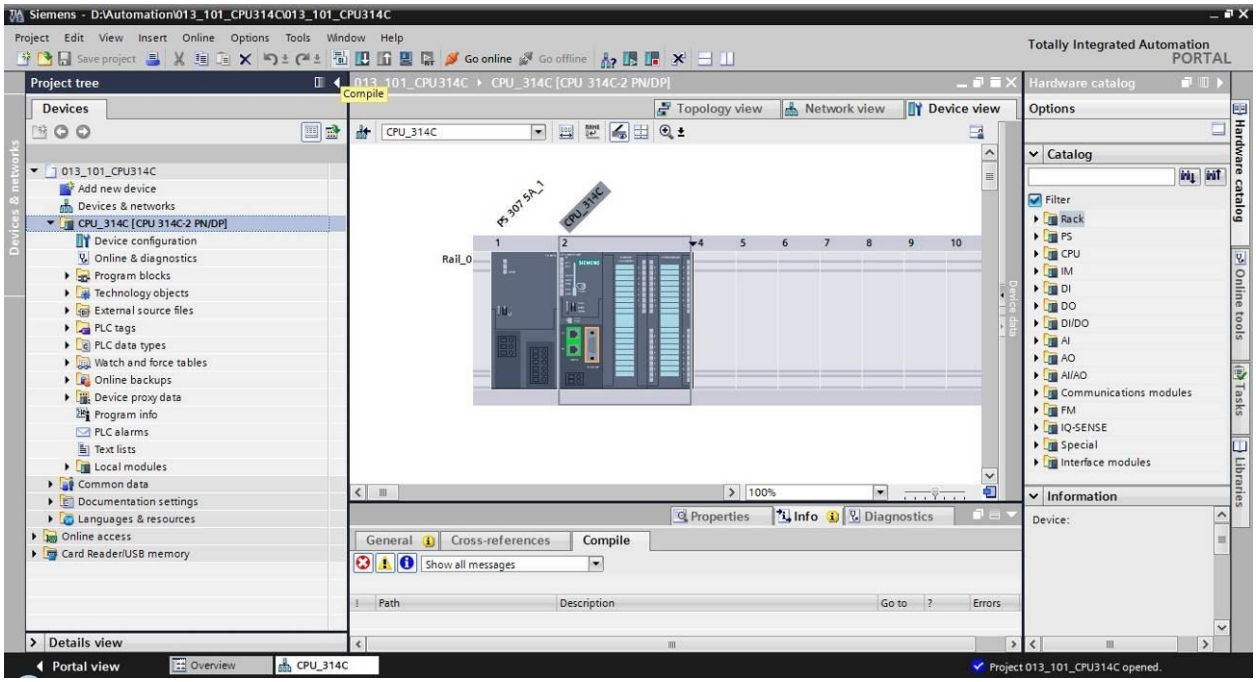


Note: *To show and hide the Device overview, you must click the small arrow next to "Device data" on the right side of the hardware configuration.*

7.7 Save and compile the hardware configuration

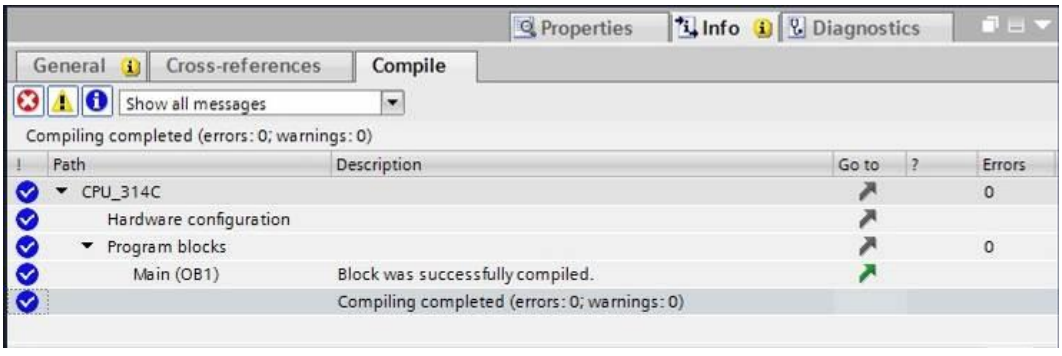
→ Before you compile the configuration, you should save your project by clicking the → 

button. To compile your CPU with the device configuration, first select the → "CPU_314C [CPU314C-2 PN/DP]" folder and click the →  "Compile" icon.



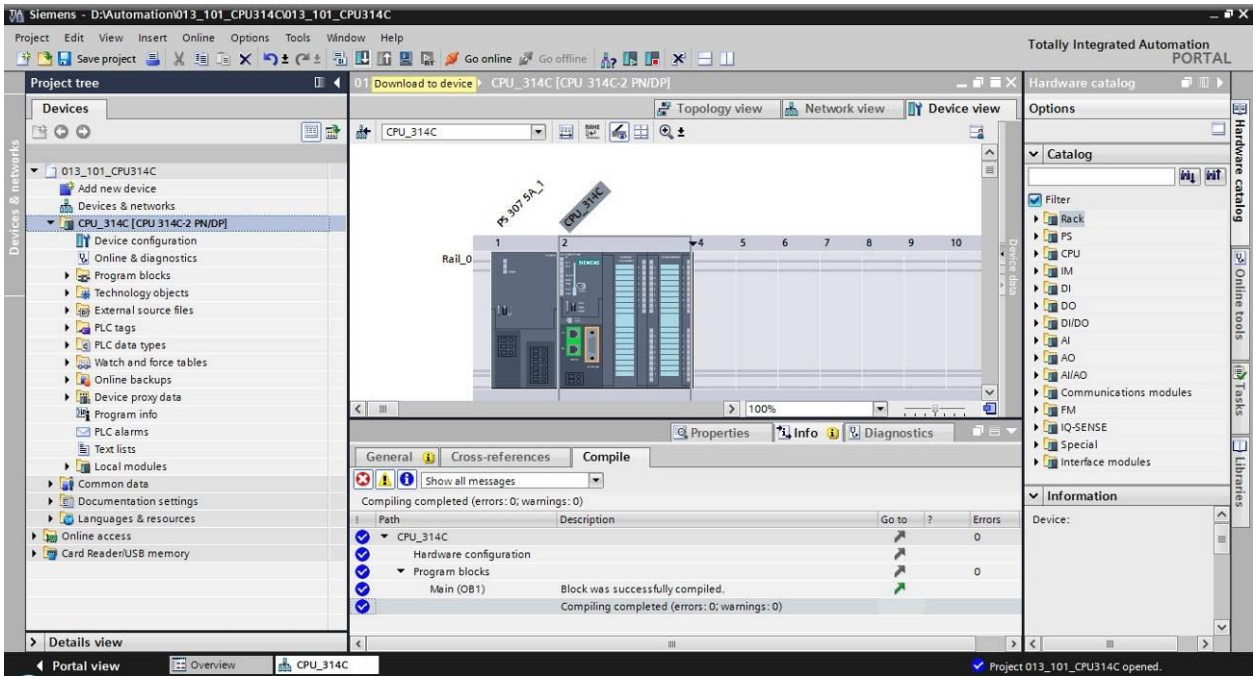
Note: *"Save project" should be used repeatedly when working on a project since this does not happen automatically. A prompt to save the project only occurs when the TIA Portal is closed.*

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

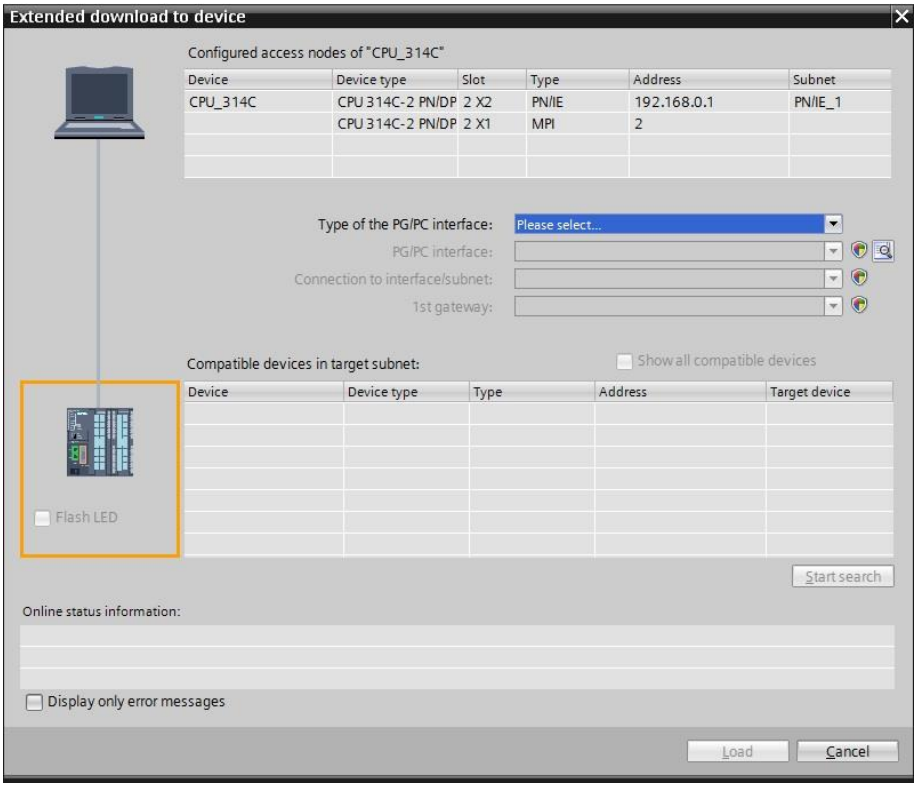


7.8 Download the hardware configuration to the device

→ To download your entire CPU, select the → "CPU_314C [CPU314C-2 PN/DP]" folder and click the → "Download to device" icon.

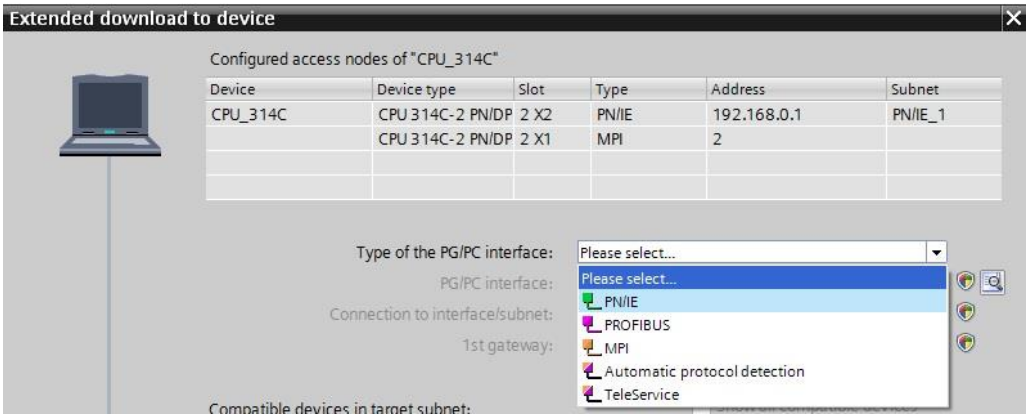


→ The manager for configuring the connection properties (extended download) opens.

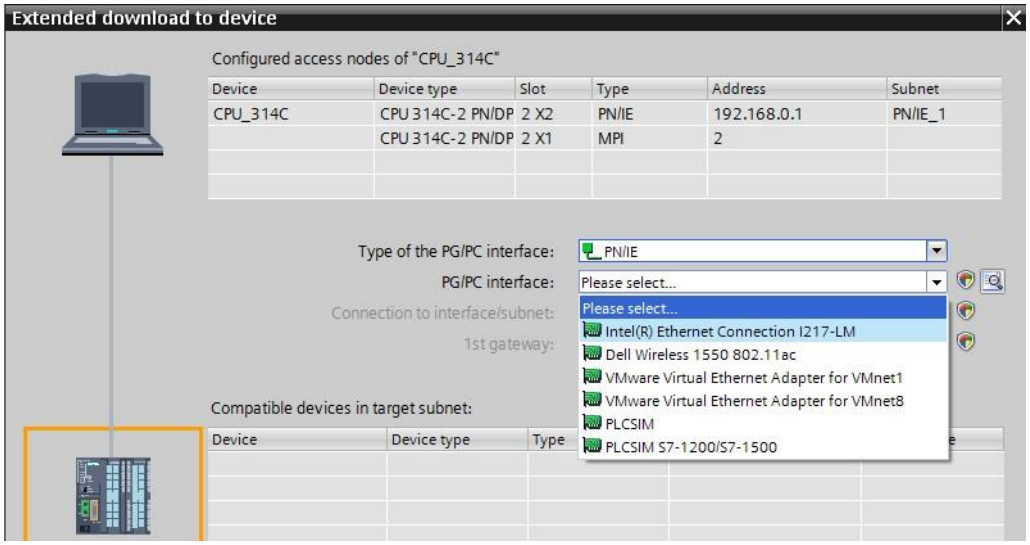


→ First, the interface must be correctly selected. This happens in three steps.

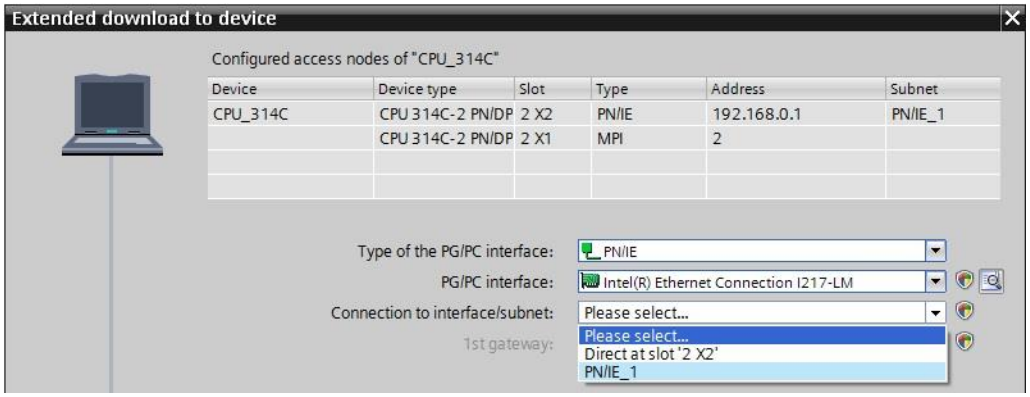
→ Type of the PG/PC interface → PN/IE



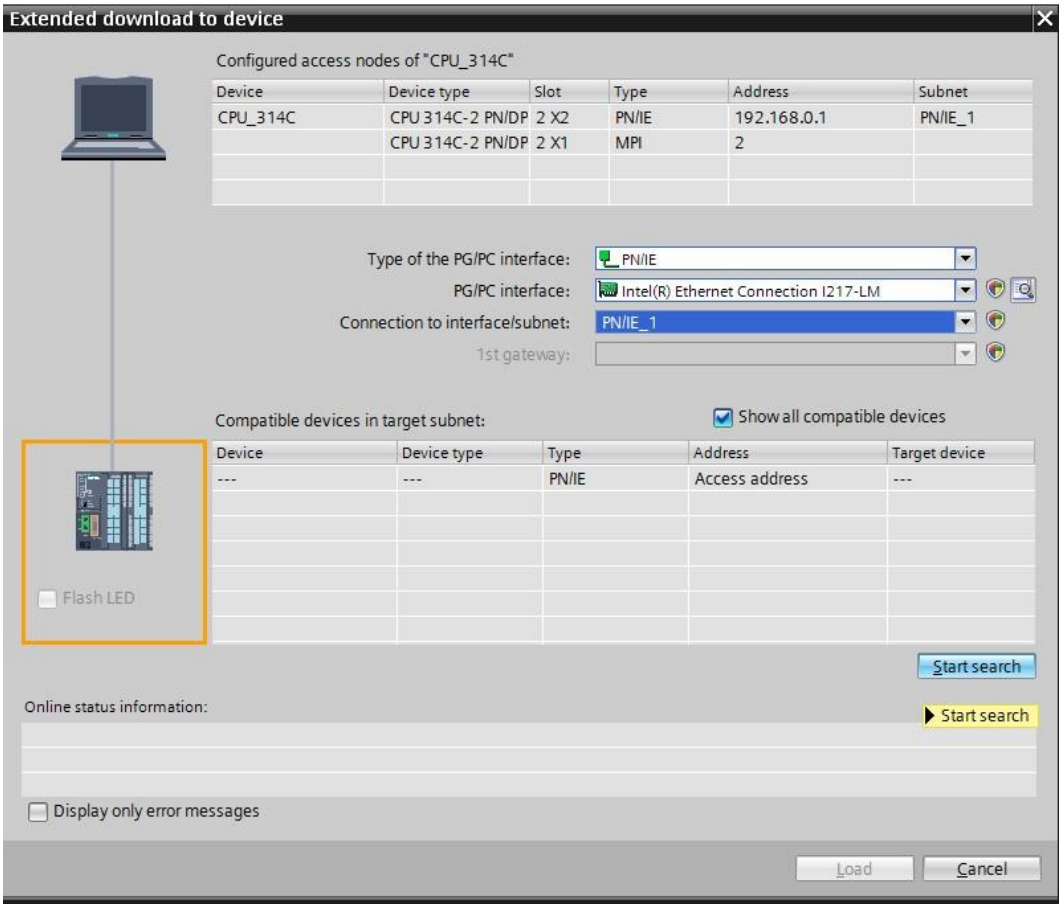
→ PG/PC interface → here: Intel(R) Ethernet Connection I217-LM



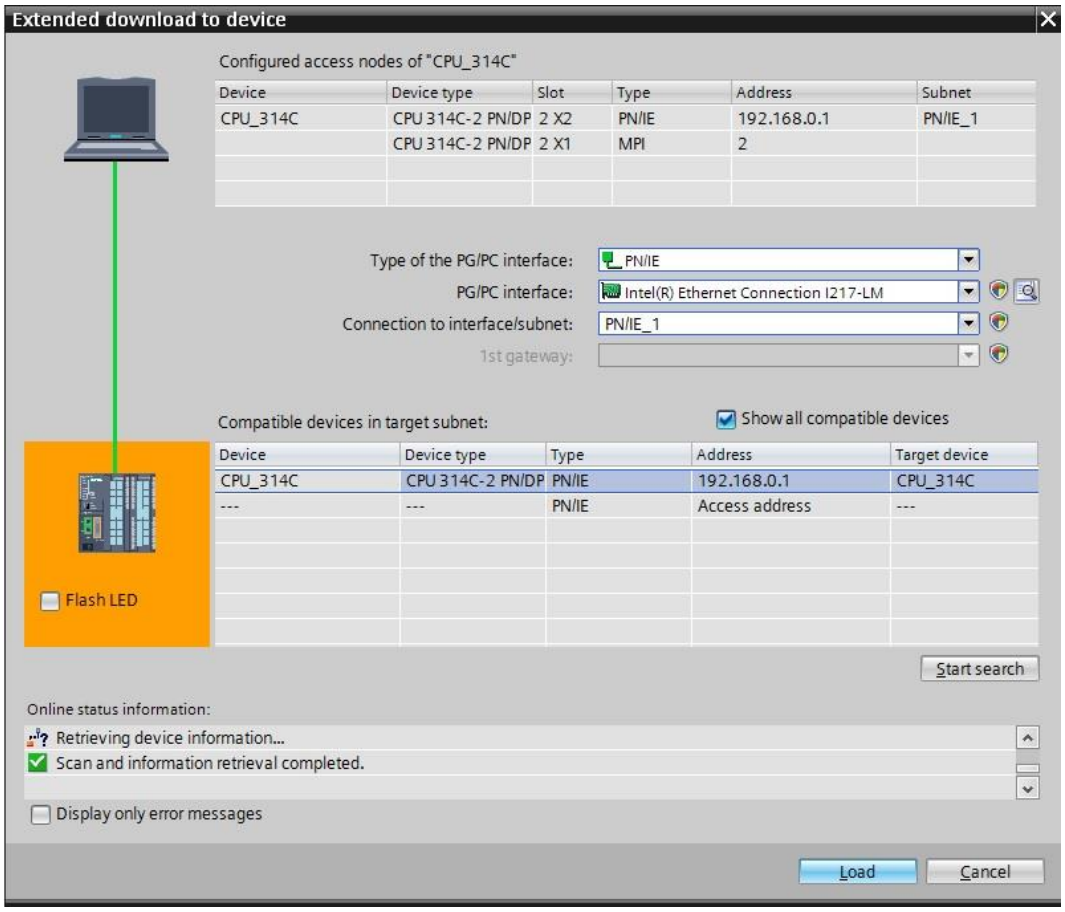
→ Connection to interface/subnet → "PN/IE_1"



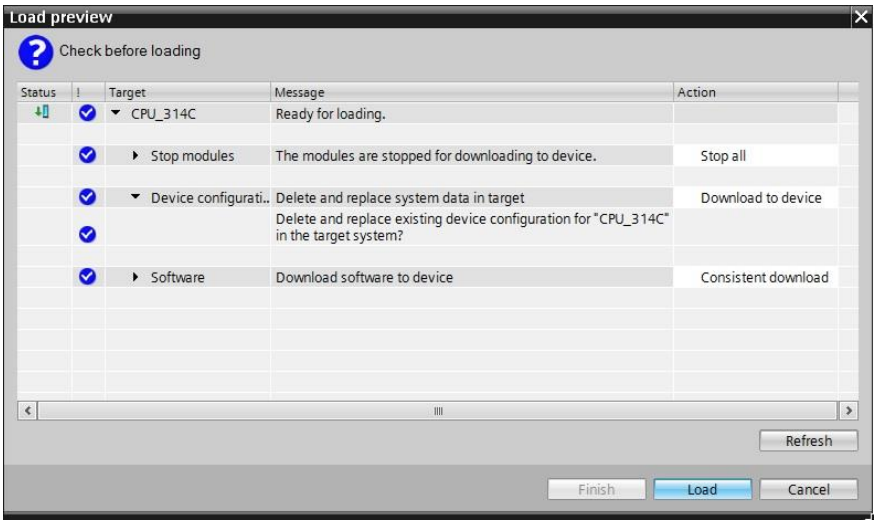
→ The → "Show all compatible devices" check box must be selected. The search for devices in the network is started by clicking the → Start search button.



→ If your CPU is shown in the "Compatible devices in target subnet" list, it must be selected and the download started. (→ CPU 314C-2 PN/DP → "Load")

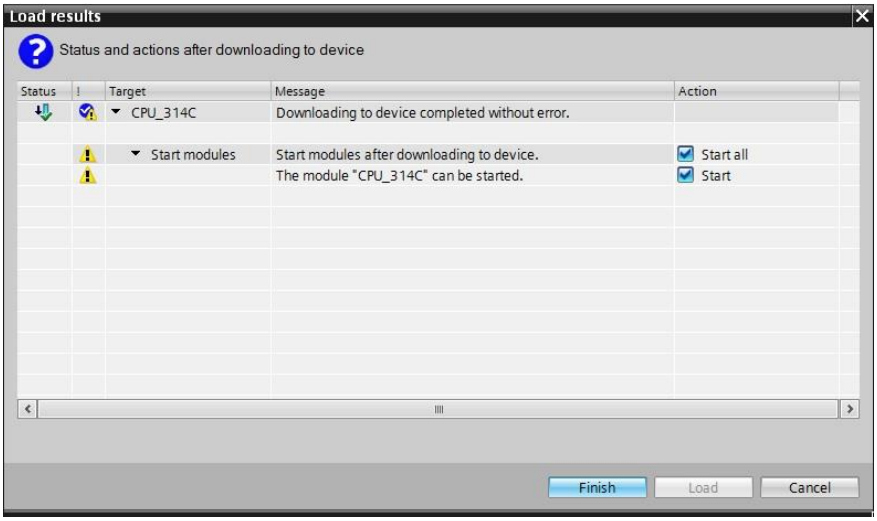


→ You first obtain a preview. Continue with → "Load".

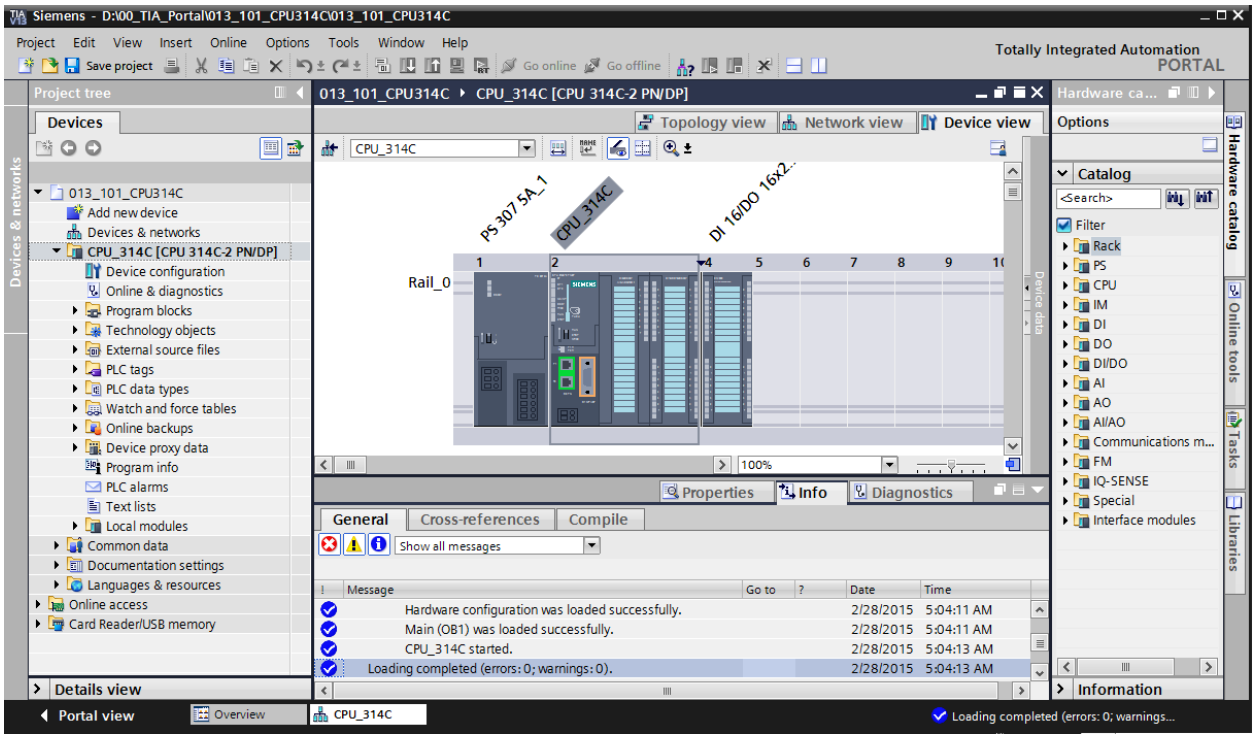


Note: *The* ✔ *symbol should be visible in every line of the "Load preview". You can find additional information in the "Message" column.*

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



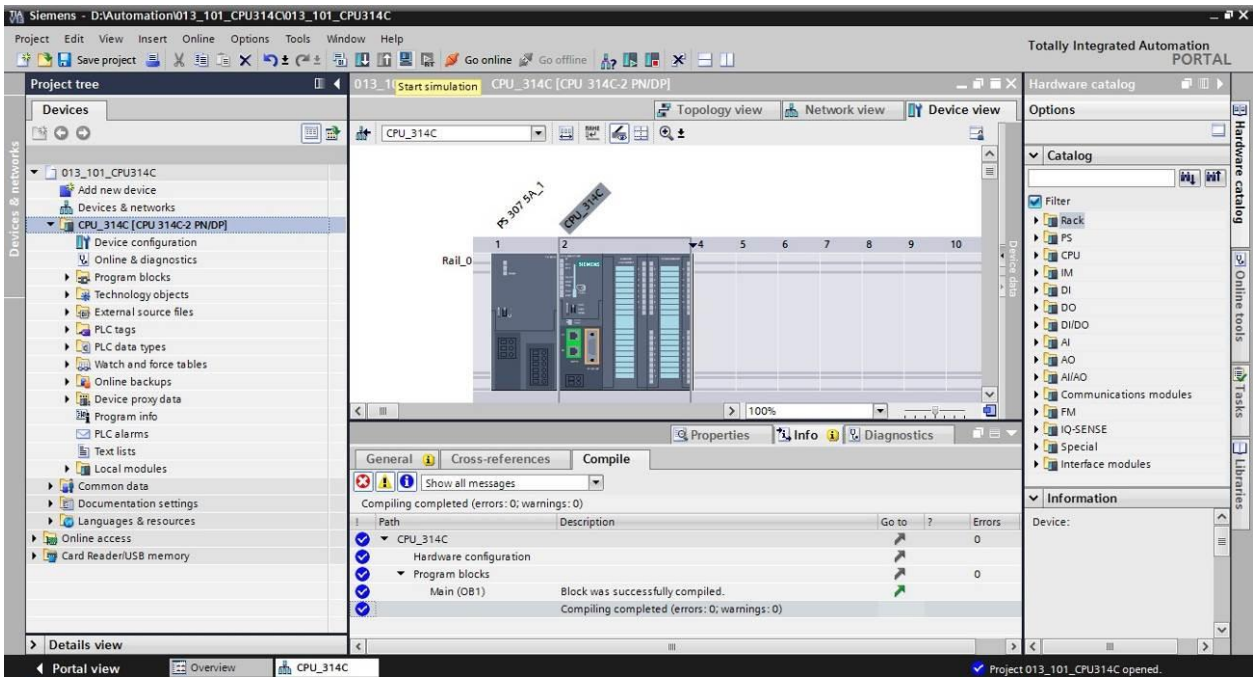
→ After a successful download, the project view will open again automatically. A loading report appears in the information field under "General". This can be helpful when troubleshooting an unsuccessful download.



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

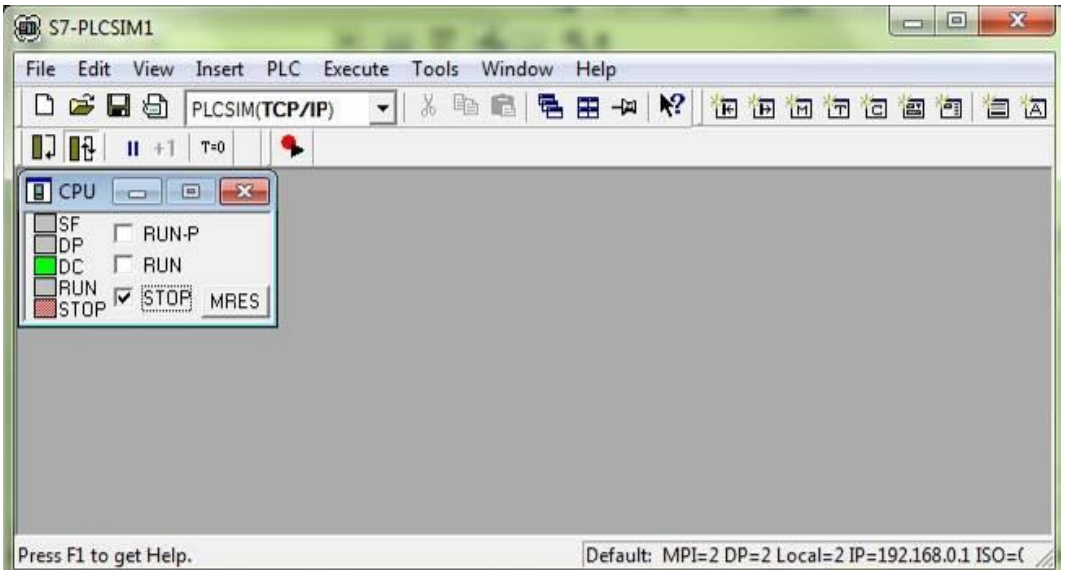
→ If no hardware is present, the hardware configuration can **alternatively** be downloaded to a PLC simulation (S7PLCSIM).

→ To do so, you must first start the simulation by selecting the → "CPU_314C [CPU314C-2 PN/DP]" folder and clicking the  → "Start simulation" icon.

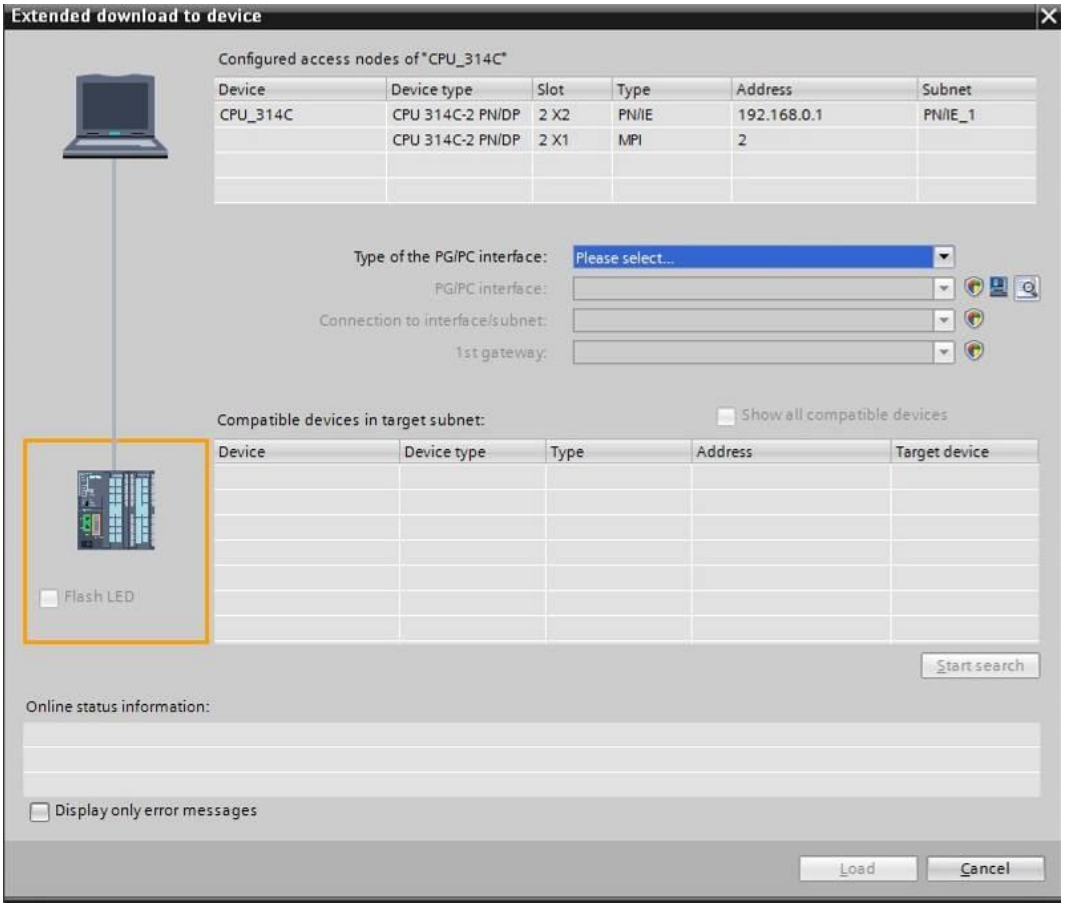


→ The prompt that all other online interfaces will be disabled is confirmed with → "OK".

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

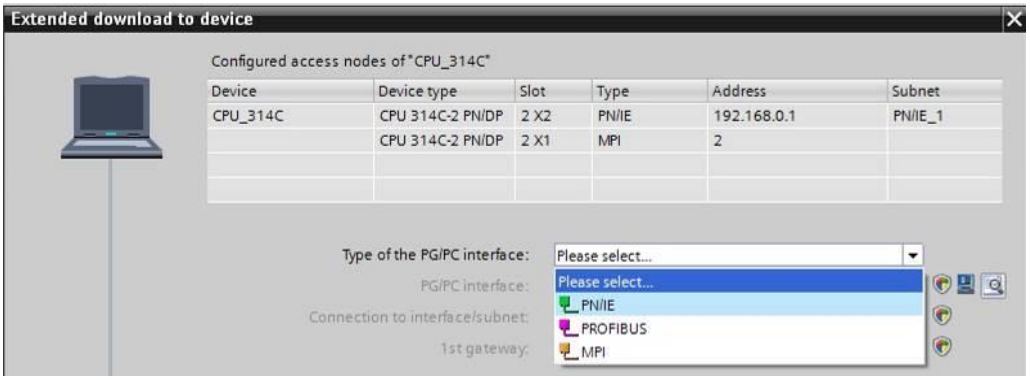


→ The manager for configuring the connection properties (extended download) opens shortly thereafter.

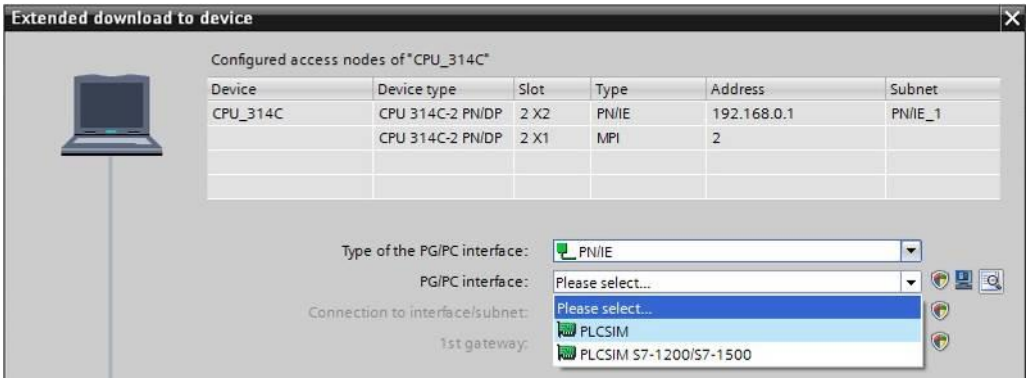


→ First, the interface must be correctly selected. This happens in three steps.

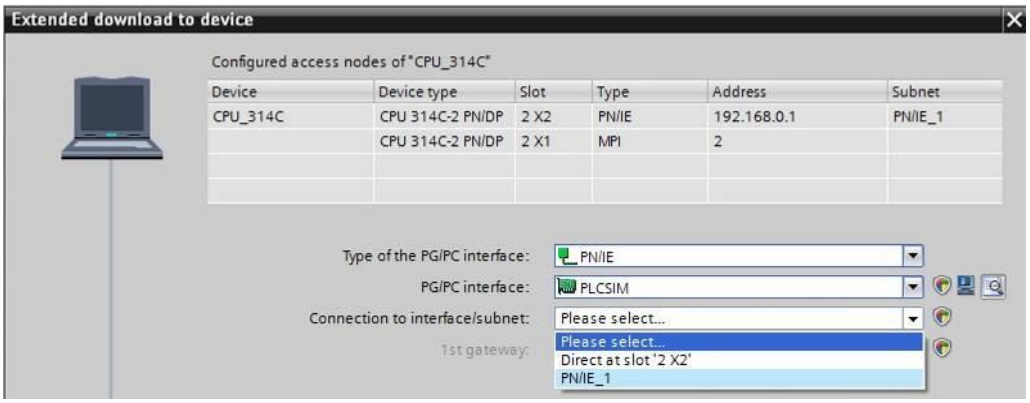
→ Type of the PG/PC interface → PN/IE



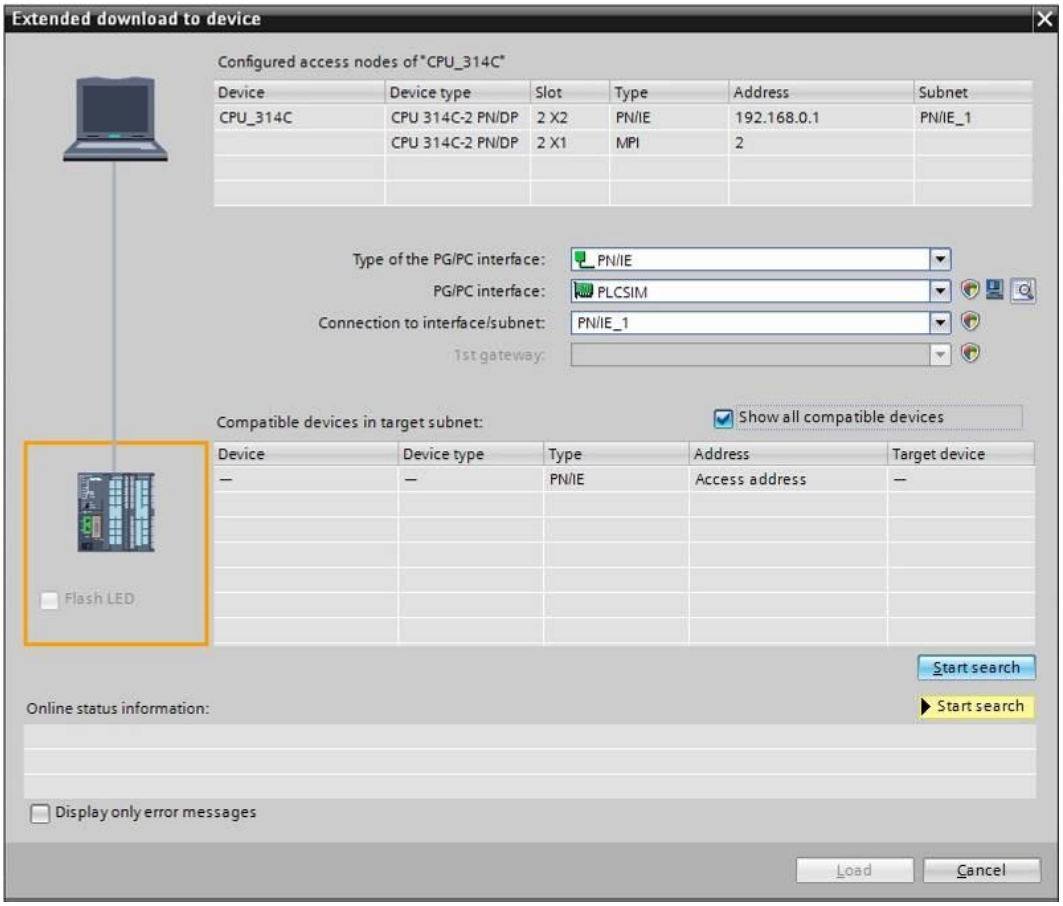
→ PG/PC interface → PLCSIM



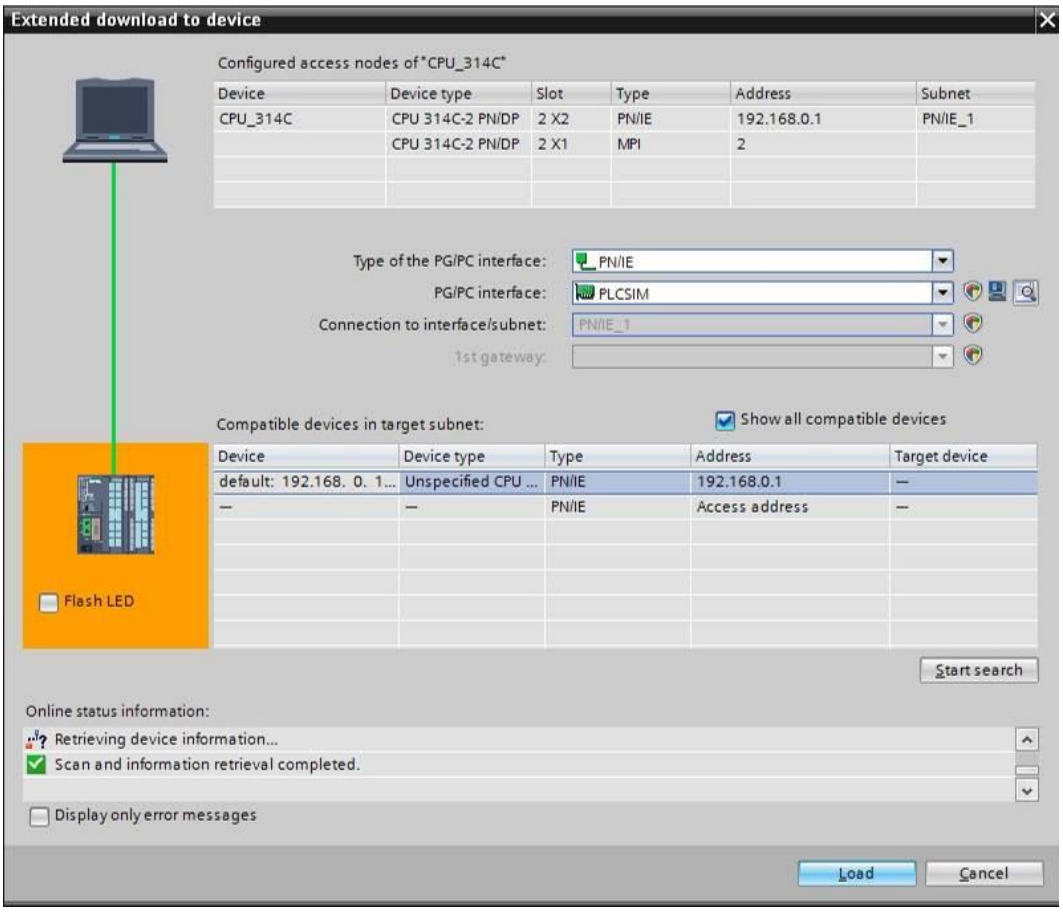
→ Connection to interface/subnet → "PN/IE_1"



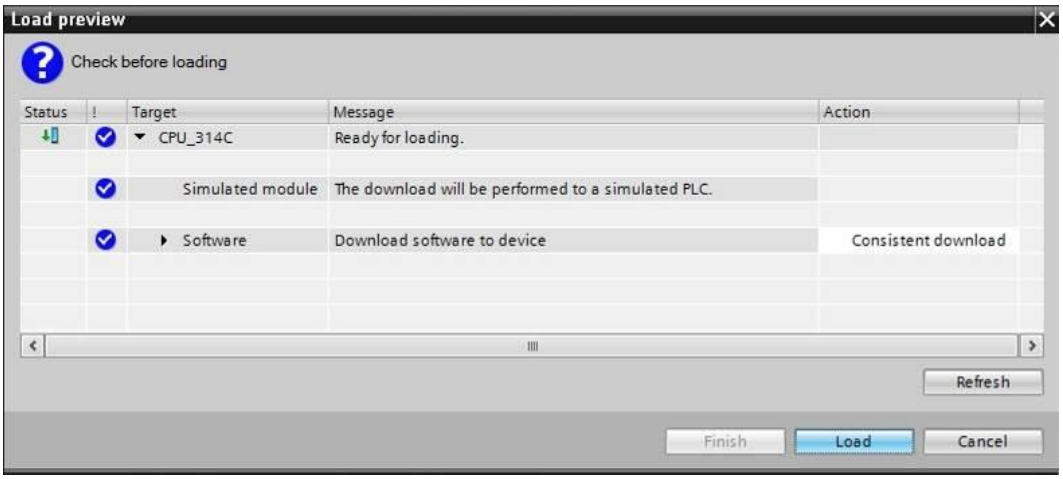
→ The → "Show all compatible devices" check box must be selected. The search for devices in the network is started by clicking the → Start search button.



→ If the simulation is shown in the "Compatible devices in target subnet" list, it must be selected before the download can be started. (→ "Unspecified CPU 300" → "Load")

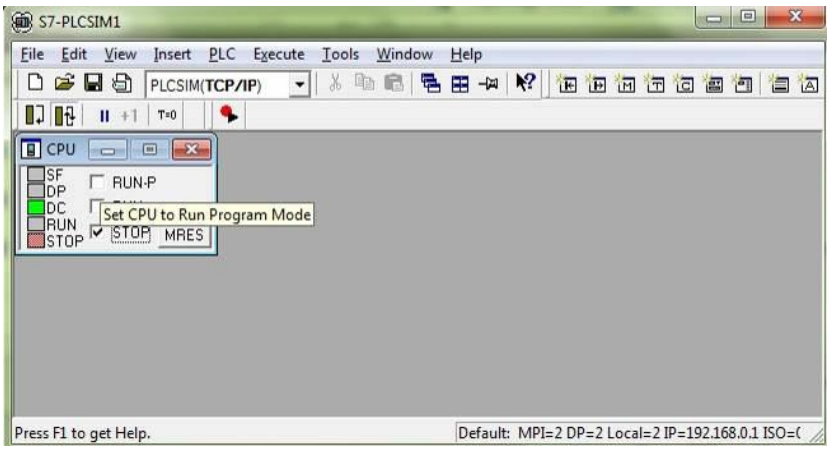


→ You first obtain a preview. Continue with → "Load".

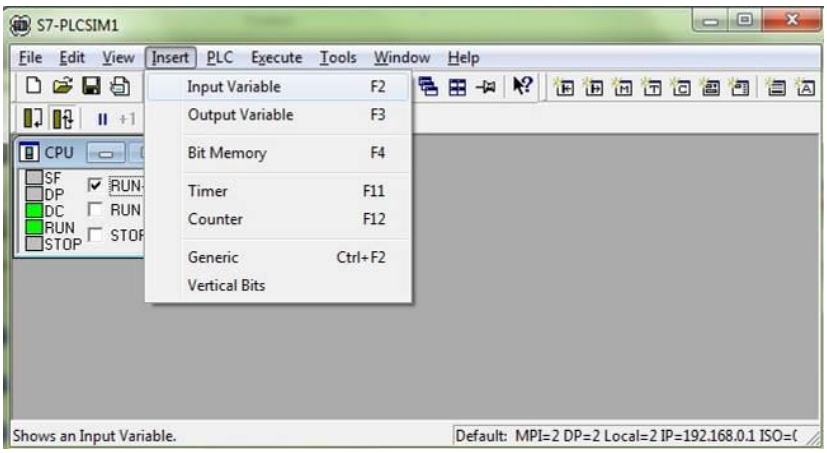


Note: *The* ✔ *symbol should be visible in every line of the "Load preview". You can find additional information in the "Message" column.*

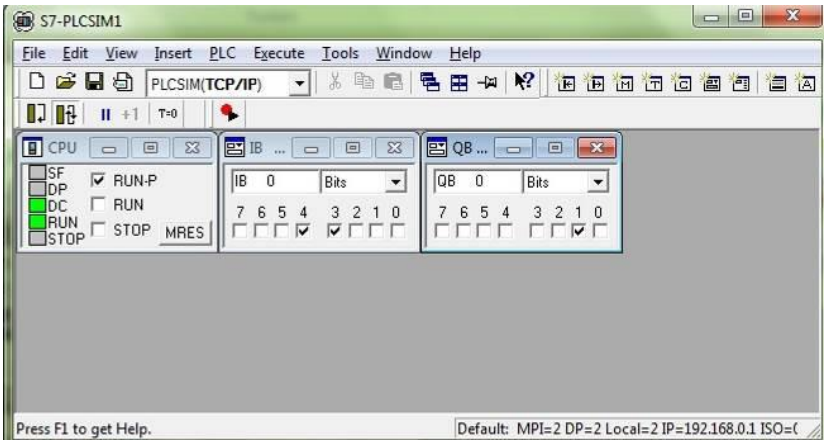
→ In PLCSIM you can now click the check box in front of "RUNP" to start the simulated PLC in PLCSIM. ( )



→ In order to control the inputs and monitor the outputs, these must also be inserted in PLCSIM. (→ Insert → Input → Output)

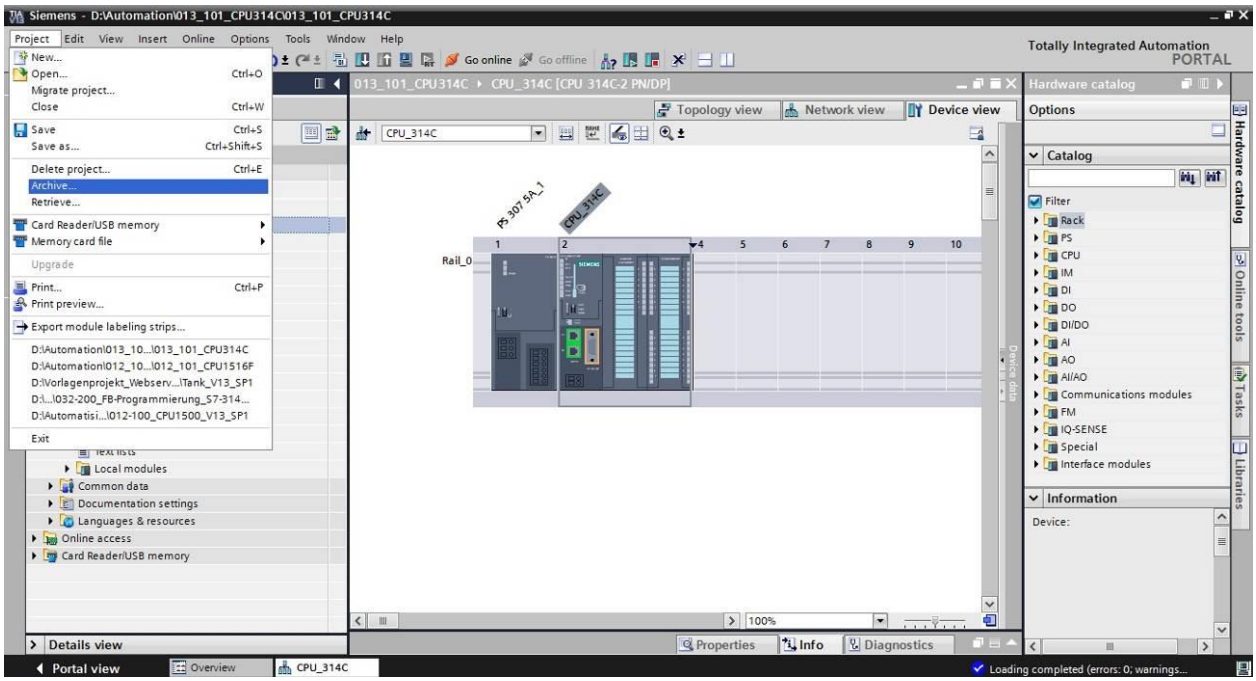


→ The inputs that are now visible can be set and reset with a mouse click. Inputs and outputs that have a 1 signal receive a check mark .

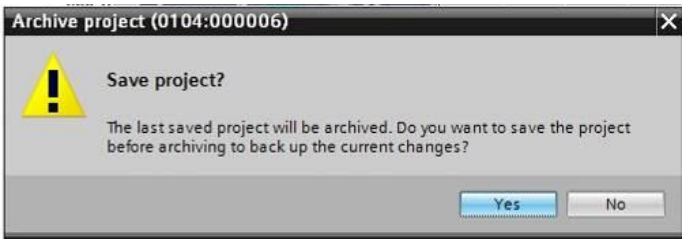


7.10 **Archive the project**

→ 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 file type "TIA Portal project archive". (→ "TIA Portal project archive" → "SCE_EN_013-101_Hardware configuration_S7-314C..." → "Save")

7.11 Checklist

No.	Description	Completed
1	Project was created	
2	Slot 1: Load current supply (PS) with correct order number	
3	Slot 2: CPU with correct order number	
4	Slot 2: CPU with correct firmware version	
5	Slot 2: Address area of the digital inputs correct	
6	Slot 2: Address area of the digital outputs correct	
7	Slot 2: Address area of the analog inputs correct	
8	Slot 2: 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	

8 Exercise

8.1 Task – Exercise

The hardware configuration of the SIMATIC CPU 314C-2 PN/DP Trainer Package is not quite complete. Insert the following lacking module. Select the next available slot for this.

- 1X SIMATIC S7-300, DIGITAL MODULE SM 323, OPTICALLY ISOLATED, 16 DI AND 16 DO, 24V DC, 0.5A, AGGREGATE CURRENT 4A, IX40 PIN (order number: 6ES7323-1BL00-0AA0)

Configure the address area relevant to your project.

8.2 Planning

Plan the implementation of the task on your own.

8.3 Checklist – Exercise

No.	Description	Completed
1	Slot 4: Digital input/output module with correct order number	
2	Hardware configuration was compiled without error message	
3	Hardware configuration was downloaded without error message	
4	Project was successfully archived	

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/s7-300