

# **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



#### Matching SCE trainer packages for these training curriculums

- 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) Order no.: 6ES7822-1BA04-4YA5
- SIMATIC STEP 7 Professional V14 SP1 Upgrade license (up to 6 users) Order no.: 6ES7822-1AA04-4YE5
- SIMATIC STEP 7 Professional V14 SP1 Student license (up to 20 users) Order no.: 6ES7822-1AC04-4YA5

Note that these trainer packages are replaced with successor packages when necessary. An overview of the currently available SCE packages is provided at: <u>siemens.com/sce/tp</u>

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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.

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# 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



1 Engineering station



3 SIMATIC S7-300 controller



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

# 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
- 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

- 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
- 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
- MAC address and 2D bar code
- 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	_ED 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.

✓ CPU operator	rpanel					
devicename_station_001 [192.16						
Error						
RUN	RUN					
STOP	STOP					
FORCE	MRES					
Mode selector:	RUN_P					

#### 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)	Х	Х	Х	
<ul> <li>Retentive behavior of the DBs for CPU with Firmware &lt; V2.0.12</li> </ul>	Х	X	-	
<ul> <li>Retentive behavior of the DBs for CPU with Firmware &gt; V2.0.12 or higher</li> </ul>	Can be set in the prop STEP 7 V5.2 + SP1 o	erties of the DBs in r higher	-	
as retentively configured bit memories, timers and counters	Х	X	-	
Diagnostics buffer, runtime meter	Х	Х	Х	
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 Ethernetbased 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 <u>TIA Selection Tool</u> (Select automation technology  $\rightarrow$  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.
- $\rightarrow$  In the project view, select the  $\rightarrow$ "Options" menu and then  $\rightarrow$  "Settings".

VA Siemens			_ 🗆 🗙
Project Edit View Insert Online	Options Tools Window Help	e 🖉 Go offline 🔥 🖪 🕼 🛠 🖃 🛄	Totally Integrated Automation PORTAL
Project tree	Support packages		Tasks 🖬 🛽 🕨
Devices	Manage general station description files (GSD) Start Automation License Manager		Options
	Show reference text		
In Online access	🛄 Global libraries 🛛 🛛		<ul> <li>Find and replace</li> </ul>
Card Reader/USB memory			Find:
			Whole words only
			Match case
			Find in substructures
			Find in hidden texts
			Use wildcards
			Use regular expressions
			O Whole document
			From current position
	5		O Selection
			Down
			Oup
			Find
			Replace with:
			· · · · · · ·
> Details view	Q Propertie	s 🚺 Info 🚯 😨 Diagnostics 🔹 💷 🖃	Languages & resources
Portal view     Over	view	💙 Pro	ject closed.

- → 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.

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



 $\rightarrow$  In the open Network and Sharing Center window, click  $\rightarrow$  "Change adapter settings".



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



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

Local Area Connection Properties
Networking Sharing
Connect using:
Intel(R) 82578DC Gigabit Network Connection
Configure
This connection uses the following items:
✓       Client for Microsoft Networks         ✓       ✓         ✓       ØoS Packet Scheduler         ✓       🕞 File and Printer Sharing for Microsoft Networks         ✓       →         ✓       →         Internet Protocol Version 6 (TCP/IPv6)         ✓       →         ✓       →         Internet Protocol Version 6 (TCP/IPv4)         ✓       →         ✓       →         Internet Protocol Version 4 (TCP/IPv4)         ✓       →         ✓       →         Link-Layer Topology Discovery Mapper I/O Driver         ✓       →         ✓       →         Link-Layer Topology Discovery Responder
Install Uninstall Properties Description Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
OK Cancel

→ 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 ( $\rightarrow$  "OK")

You can get IP settings assigned this capability. Otherwise, you r for the appropriate IP settings.	automatically if your network support leed to ask your network administrator
🔘 Obtain an IP address auto	matically
• Use the following IP addres	ss:
IP address:	192.168.0.99
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	
Obtain DNS server address	automatically
O Use the following DNS serv	er addresses:
Preferred DNS server:	4 4 B
Alternate DNS server:	
Validate settings upon exi	Advanced

#### 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)



 $\rightarrow~$  Select  $\rightarrow$  "Online & Diagnostics" and open the  $\rightarrow$  "project view".

VA Siemens		_ ¤ ×
		Totally Integrated Automation PORTAL
Start		
Devices & 🔹	Show all devices	
PLC programming		
Motion & technology	*	
Drive parameterization	Accessible devices	
Visualization		
Online & Diagnostics	<u>^</u>	
	C Help	
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  $\rightarrow$  "Info" window under  $\rightarrow$  "General".

í.	Ropert	ties 🛄	nfo	🕑 Diagnost	tics	
0	eneral Cross-references Compile					
٢	Show all messages					
	La presente	1-	1.	-	Lerona .	
1	Message	Go to	?	Date	Time	
0	Scanning for devices completed for interface Intel(R) Ethernet Conner	ction		2/23/2015	4:45:45 PM	~
3	<ul> <li>The IP address could not be assigned.</li> </ul>		?	2/23/2015	4:49:00 PM	=
0	The set command could not be executed.			2/23/2015	4:49:00 PM	*
<					2 1	>

#### 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  $\rightarrow$  "Reset of PROFINET interface parameters" function and click  $\rightarrow$  "Reset".

VA	🖞 Siemens 🛛 📃 🗖 🗙								
Pr	roject Edit View Insert Online Options Tools Window Help Totally Integrated Automation								
	🦉 🔄 Save project 🏭 🐰 💷 🗋 🗙 🔊 🛎 (**	* 10	🖞 🛄 🔛 🔛 🖉 Go online 🖉 Go offline 👬 🛄 👫 📇 🛄	PORTAL					
	Project tree	1 (	tel(R) Ethemet Connection I217-LM 🕨 cpu_314c [192.168.0.11] 🕨 CPU_314C [192.168.0.11]	_ # = × 4					
	Devices			0					
	1 O O III		Diagnostics     Reset of PROFINET interface parameters	alin					
			Functions	t					
1	Online access		Assign IP address	0					
	🍸 Display/hide interfaces	1	Set time						
8	COM [RS232/PPI multi-master cable]	1	Firmware update MAC address: 00 - 18 - 18 - 2E - E2 - E7						
	Intel(R) Ethernet Connection I217-LM	1	Assign name IP address: 192.168.0.11	1					
	Update accessible devices		Reset of PROFINE I Interfac PROFINET device name: cpu_314c	ask					
	cpu_314c [192.168.0.11]			in .					
	Online & diagnostics		Reset						
	🕨 🔂 Program blocks								
	Technology objects		Reset	ibr					
	Dell Wireless 1550 802.11ac	1		3.					
	VMware Virtual Ethernet Adapter for VMnet1	1		es					
	VMware Virtual Ethernet Adapter for VMnet8	1							
	PC Adapter [MPI]	1							
	PC internal [Local]	100		>					
	LCSIM [PN/IE]	1.							
	PLCSIM \$7-1200/\$7-1500 [PN/IE]	1.	S. Properties Diagnostics						
	USB [S7USB]		General Cross-references Compile						
	TeleService [Automatic protocol detection]		🕄 🚹 🚯 Show all messages						
	Card Reader/USB memory			_					
			L Marrana						
			Message Go to / Date Inne	45 044					
			Scanning for devices completed for interface inter(K) Ethemet Connection     2/23/2015 4:45						
			The readers could not be assigned. [2/23/2015 4:49						
			1 Ine sei command could not de executed. 2/23/2015 4:49	:00 PM					
	> Details view			>					
	Portal view     Diagram      Diagram     Overview     Diagram     Diagram	line &	dia 🎗 The set command could not be exe	ecuted.					

 $\rightarrow$  Confirm the prompt asking if you really want to reset the module with  $\rightarrow$  "Yes".



 $\rightarrow$  If necessary, stop the CPU. ( $\rightarrow$  "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-	2	DI 02 / DO 01 / AI 6473 /
	0AB0		AO 6467
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)



 $\rightarrow$  In the portal view under the "Start" menu, select the command  $\rightarrow$  "Create new project".



 $\rightarrow$  Modify Project name, Path, Author and Comment as appropriate and click  $\rightarrow$  "Create".

Project name:	013_101_CPU314C	
Path:	D:Automation	
Author:	spe	
Comment:		^
		~

→ 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".

VA si	emens - D:\Automation\013_1	01_CPU314C\013_101_CPU314C		_ # X
				Totally Integrated Automation PORTAL
s	tart		First steps	
	Devices &	Open existing project		··
	PLC programming	Create new project	Start	
	Motion & 🗱	Close project	Devices & Configure a device	
	parameterization	Welcome Tour	PLC programming 😵 Write PLC program	
÷	Visualization	Frist steps	Motion & Configure technology	-
	Diagnostics	Installed software	Drive parameterization The Parameterize drive	
		Melp	Visualization D Configure an HMI screen	
		🚯 User interface language		
			Project view     Open the project view	~
	Project view	Opened project: D:\Automation\01	_101_CPU314Cl013_101_CPU314C	

- $\rightarrow~$  The "Show all devices" menu opens in the "Devices & Networks" portal.
- $\rightarrow$  Switch to the "Add new device" menu.

M Siemens - D:\Automation\013_101_CPU314	4C/013_101_CPU314C				_ # X
					Totally Integrated Automation PORTAL
Start 🦓		Add new device _			
Devices &	Show all devices	Device name:		_	^
PLC programming 🗇 Motion & 🚓 technology	Add new device	Controllers	Controllers     Cin SIMATIC 57-1200     Cin SIMATIC 57-1200     Cin SIMATIC 57-300     Cin SIMATIC 57-300	Device:	
Urive parameterization Visualization	Configure networks	HM	Terrice Proxy	Article no.:	
Online & Diagnostics		PC systems		Description:	
	Help	Drives			
	and the second second	<		m	>
Project view	Opened project: D:\Automation\013	_101_CPU314C\013_	_101_CPU314C		

 $\rightarrow$  The specified model of the CPU will now be added as a new device.

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

M Siemens - D:\Automation\013_101_CP	U314C\013_101_CPU314C					_ # X
					Totally Integrated Auto	PORTAL
Start		Add new device _				
Devices &	Show all devices	Device name:				^
PLC programming Motion &	🥚 Add new device	Controllers	Controllers     Gardinal S7-1200     Gardinal S7-1500     Gardinal S7-1500     Gardinal S7-1500     Gardinal S7-300	Device:		
Drive parameterization <b>in</b>	Configure networks	HM	<ul> <li>↓ □ CPU 312</li> <li>↓ □ CPU 312</li> <li>↓ □ CPU 312C</li> <li>↓ □ CPU 313C</li> <li>↓ □ CPU 313C2 DP</li> <li>↓ □ CPU 313C2 PP</li> <li>↓ □ CPU 313C2 PP</li> </ul>		00 CPU 314C2 PNDP	=
Online & Diagnostics		PC systems	CPU 314-C2 DP     CPU 314-C2 DP     CPU 314-C2 PNDP     GE57 314-GEH04-0AB0     D     GE7 0314-C2 PP     Fin CPU 314-C2 PP     Fin CPU 314-C2 PP	Article no.: Version: Description:	6E57 314-6EH04-0A80	
	C Help	Drives	Cu 3152 PNOP     Cu 3152 PNOP     Cu Cu 3152 PNOP     Cu Cu 3172 PNOP     Cu Cu 3172 PNOP     Cu Cu 3173 PNOP     Cu Cu 3175 PNOP     Cu Cu 315F2 PNOP     Cu Cu S15F2 PNOP     Cu Cu S15F2 PNOP     Cu Cu S17F2 DP	Work memo DI24/DO16; (2.5kH2); 4 c with 24 V (6i integrated p interface an PROFINET CB combined N DP slave); m modules; ca	ry 1924, au Udems 1000 instructions; JASIAO2 integrated: 4 pulse outputs hannels: counting and measuring lokit-ji nicremental encoders; ositioning function; PROFINET d 2 Porsy, IMP; PROFINET CBA; A Proy, ICTIPI transport protocol; IMPO interface (UMP) or DP master or ulti-Eiter configuration up to 31 pable of sending and receiving in	
			CPU 317F-2 PN/DP     CPU 319F-3 PN/DP	direct data e routing; firm	exchange; constant bus cycle time; ware V3.3	~
Project view	Opened project: D:\Automation\013	3_101_CPU314C\013_	101_CPU314C			

 $\rightarrow$  Assign a device name (device name  $\rightarrow$  "CPU\_314C").



 $\rightarrow$  Select "Open device view".

	Open device view
<	

 $\rightarrow$  Click "Add".

iemens - D:\Automation\013_101_	CPU314Cl013_101_CPU314C					Totally Integrate	d Automation
Start		Add new device					PORTAL
Devices &	<ul> <li>Show all devices</li> <li>Add new device</li> </ul>	Controllers	Im SIMATIC \$7-1200     Im SIMATIC \$7-1200     Im SIMATIC \$7-1500     Im SIMATIC \$7-300     Im CPU	De	vice:		
programming			<ul> <li>iiii CPU 312</li> <li>iiiii CPU 312C</li> <li>iiiiii CPU 313C</li> <li>iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii</li></ul>		c	PU 314C-2 PN/DP	
Drive parameterization		нм	<ul> <li>Im CPU 313C-2 PtP</li> <li>Im CPU 314</li> <li>Im CPU 314</li> <li>Im CPU 314C-2 DP</li> <li>Im CPU 314C-2 PN/DP</li> </ul>	Art = Ver	ticle no.: E rsion: \	5ES7 314-6EH04-0AB0 /3.3	
Visualization	Configure networks	PC systems	6ES7 314-6EH04-0AB0 () CPU 314C-2 PtP ) () CPU 315-2 DP ) () CPU 315-2 PN/DP	Wo DI2 (2.) wit	ork memory 19 24/DO16; AI5/A 5kHz); 4 chanr th 24 V (60kHz	22KB; 0.6ms/1000 instructions; AO2 integrated; 4 pulse outputs nels counting and measuring ) incremental encoders;	
Online & Jiagnostics		Drives	<ul> <li>CPU 317-2 DP</li> <li>CPU 317-2 PMOP</li> <li>CPU 317-2 PMOP</li> <li>CPU 319-3 PMOP</li> <li>CPU 315F-2 PP</li> <li>CPU 315F-2 PN/DP</li> </ul>	int PR( CO DP mc din	egrated positi erface and 2 P OFINET CBA Pro mbined MPI/DF slave); multi-t odules; capabl ect data excha	ioning function; PROFINET Ports; MRP; PROFINET CBA; oxy; TCP/IP transport protocol; P interface (MPI or DP master or tier configuration up to 31 le of sending and receiving in ange; constant bus cycle time;	
	💮 Неір		CPU 317F-2 DP     CPU 317F-2 PN/DP     CPU 317F-2 PN/DP     CPU 319F-3 PN/DP     Unspecified CPU 300	rou	uting; firmware	e V3.3	
		Open device view					Add
Project view	Opened project: D:\Automatic	on\013 101 CPU314C\013	101 CPU314C	_	_		

**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

- $\rightarrow$  Select the CPU with a double-click
- → Under → "Properties", open the → "PROFINET-interface [X1]" menu and select the → "Ethernet addresses" entry there.

013_101_CPU314C   CPU_314C [CPU 3	114C-2 PN/DP]	logu view		
🔶 CPU 314C		abgy view 1000 liter	MOIN VIEW	
CPU_314C [CPU 314C-2 PN/DP]	Q Pro	operties *i Info	Diagnostics	
General IO tags System const	tants Texts			
General	Ethernet addresses			
PROFINET interface [X2]	Interface networked with			i i
General	interface networked with			
Ethernet addresses	Subnet:	Not networked		
Time synchronization		Add new subnet		( and
Operating mode		Add new subnet		
Advanced options	IP protocol			
Diagnostics addresses	ir protocol			
DI 24/DO 16		Set IP address in the	project	
AI 5/AO 2		•		
Count		IP address:	192.168.0.1	
Positioning		Subnet mask:	255 . 255 . 255 . 0	
Startup		Use router		
Cycle		Router address:	0 0 0 0	
Clock memory		O IP addrars is sat dire	ethuat the device	
Interrupts		O ir address is set dire	cuyar the bevice	
Diagnostics system	PROFINIET			
System diagnostics	PROFINET			
Time of day			un in ant discut unt the d	
Web server			ne is secorecuy at the ut	evice
Retentive memory			device name automatical	lle:
Protection		Generote mormer	service nume automotical	
Connection resources	PROFINET device name	cpu_314c		
Overview of addresses	Converted name:	cpuxb314cc364		
	Device number:	0		

- $\rightarrow$  Under "Interface connected with", only the "Not connected" entry is available.
- $\rightarrow~$  Add an Ethernet subnet with the  $\rightarrow$  "Add new subnet" button.

Interface networked with		
Subnet:	Not networked	-
	Add new subnet	

 $\rightarrow~$  Keep the pre-assigned "IP address" and "Subnet mask".

013_101_CPU314C    CPU_314C [CPU 314	C-2 PN/DP]	logy view	A Network view	ice view
# CPU_314C	<b>4</b> ⊞ Q ±			
CPU_314C [CPU 314C-2 PN/DP]	S. Pro	operties	🗓 Info 🚺 🗓 Diagnostics	
General IO tags System constan	ts Texts			
General     MPI/DP interface [X1]	Ethemet addresses			
PROFINET interface [X2]     General     Ethernet addresses     Time synchronization     Operating mode	Interface networked with Subnet:	PN/IE_1 Add n	ewsubnet	T
<ul> <li>Advanced options Diagnostics addresses</li> <li>DI 24/DO 16</li> <li>Al 5/AO 2</li> <li>Count</li> <li>Positioning Startup Cycle</li> <li>Clock memory</li> <li>Interrupts</li> </ul>	IP protocol	<ul> <li>Set IP add</li> <li>IP a</li> <li>Subne</li> <li>Use route</li> <li>Router a</li> <li>IP address</li> </ul>	ress in the project address: 192.168.0.1 et mask: 255.255.255.0 r address: 0.0.0.0 is set directly at the device	
Diagnostics system  System diagnostics  Time of day  Web server Retentive memory Protection Connection resources Overview of addresses	PROFINET PROFINET device name Converted name: Device number:	PROFINET Generate cpu_314c cpuxb314cc	device name is set directly at the de PROFINET device name automatical 364	vice ly

## 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" in 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".

013_101_CPU314C > 0	CPU_314C [CPU_31	4C-2 PN/DP]								Hardware catalog	1	∎ ►	
		🚽 Te	pology	view	B N	etwork v	iew	Device	view	Options			
d+ CPU_314C	· 📰 🖾	🖌 🗄 🍳 ±											Har
									^	✓ Catalog			dwa
55-	mac									6ES7 307-1EA01-0AA0	ini (	ini†	re ci
639	pu?								11	🛃 Filter			atal
Rail 0		<b>√</b> 4 5	6	7	8	9	10	11		▶ 📴 Rack ▼ 🛅 PS		^	go
- Cha Star	nge device device tool									<ul> <li>PS 307 2A</li> <li>PS 307 5A</li> </ul>			⇒ On
U. X Cut	r e	Ctrl+X Ctrl+C Ctrl+V								6ES7 307-1EA00-	DAAD DAAD DAAD	III	line tool:
X Dele Renz	te me	Del F2							Devit	CPU     Im			°
Pack	addresses ack addresses								ce data	▶ [] DI ▶ [] DO			Tasks
Com	pile									DI/DO			

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

Current device:	New device:	- Controllar
PS 307 5A Article no.: 6ES7 307-1EA01-0AA0 Version: Description: Load supply voltage 120/230VAC:24VDC/5A	PS 307 5A PS 307 5A Article no.: 6E57 307-1EA00-0/ Version: Description: Load supply voltage 120/230VAC:24VDC/5A	<ul> <li>Controllers</li> <li>SIMATIC S7-300</li> <li>SIMATIC S7-300</li> <li>PS 307 2A</li> <li>PS 307 5A</li> <li>GEST 307-1EA00-0AA0</li> <li>GEST 307-1EA80-0AA0</li> <li>PS 307 10A</li> </ul>
Compatibility information		
Information		

# 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

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

Save project button. To compile your CPU with the device configuration, first select

the  $\rightarrow$  "CPU\_314C [CPU314C-2 PN/DP]" folder and click the  $\rightarrow$   $\boxed{=}$  "Compile" icon.

Siemens - D:\Automation\013_101_CPU31	14C\013_101_CPU314C					- 0
Project Edit View Insert Online Option	s Tools Window Help				Totally Integrated Aut	omation
📑 🎦 🖬 Save project 📑 🐰 🏥 🗐 🗙	う き (ぞ き 🖥 🛄 🖬 🖉 💋	Go online 🖉 Go offline 🦙 🖪 📕 🔆 🚽 🛄				PORTAL
Project tree	II 4 013 101_CPU3140	C + CPU_314C [CPU 314C-2 PN/DP]		_ # = ×	Hardware catalog	
Devices	Compile	📑 Topology vie	w 🔥 Network view	Device view	Options	E
000	🔟 📄 👉 CPU_314C	💽 🖽 🖾 🖽 🍳 ±				
				^	✓ Catalog	
• 013_101_CPU314C		2		=		iri jiri
Add new device		Sh and			Filter	
Devices & networks		4.3 <sup>0</sup> ' 00 <sup>2</sup>			Pitt Pack	
▼ []] CPU_314C [CPU 314C-2 PN/DP]		¢, 6				
Device configuration		1 2 4 5	6 7 8	9 10	CPU	
Colline & diagnostics	Rail					
Program blocks						
Technology objects				1		
External source files						
PLC tags				18		
Le PLC data types						
Watch and force tables						
Online backups					Communications m	dulas
<ul> <li>Device proxy data</li> </ul>					Communications me	Julies
2E Program info						
PLC alarms					IQ-SENSE	
Text lists					Special	μ
Local modules				24	Interface modules	
Common data		5	100%	<b></b>		
Documentation settings						1
Languages & resources		<u>9</u> Properties	Info 🚺 🖞 Diagno	ostics	Device:	<u> </u>
Online access	General 🚯 Cr	oss-references Compile				=
Card Reader/USB memory	🕄 🚹 🚺 Show al	l messages				
	1 Path	Description	Go to	D ? Errors	Ĩ	
> Details view	<	m		>	< "	~
Portal view     Portal view	CPU 314C			Project	t 013 101 CPU314C opened	hi ni si je

**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.

 $\rightarrow$  If the project was compiled without errors, you see the following screen.

			<b>Properties</b>	🗓 Info 🔒 🗄	Diagnostic	s	
(	General 🚺 Cross-refere	ences Compile					
0	🔥 🜖 Show all messages						
C	ompiling completed (errors: 0;	warnings: 0)					
1	Path	Description			Go to	?	Errors
0	▼ CPU_314C				7		0
0	Hardware configuration	on			7		
0	<ul> <li>Program blocks</li> </ul>				7		0
0	Main (OB1)	Block was succes	sfully compiled.		~		
0	1	Compiling comple	ted (errors: 0; warning	(s:0)			

## 7.8 Download the hardware configuration to the device

 $\rightarrow$  To download your entire CPU, select the  $\rightarrow$  "CPU\_314C [CPU314C-2 PN/DP]" folder and

click the  $\blacksquare extsf{D} o$  "Download to device" icon.



 $\rightarrow$  The manager for configuring the connection properties (extended download) opens.

	Device	Device type	Slot	Type	Address	Subnet
	CPU 314C	CPU 314C-2 PN/DP	2 X2	PN/IE	192,168,0,1	PN/IE 1
		CPU 314C-2 PN/DP	2 X1	MPI	2	
		Type of the PG/PC inter	rface:	Please select.	£	
		PG/PC inter	rface:	1		-
		Connection to interface/su	bnet:			-
		1st gate	ewav:	1		-
	Compatible devic	ces in target subnet: Device type	Туре		Show all compat	ible devices Target device
E sue	Compatible devic	ces in target subnet: Device type	Туре		Show all compat	ible devices Target device
	Compatible devic	ces in target subnet: Device type	Туре		Show all compat	ible devices Target device
lash LED	Compatible devic	ces in target subnet: Device type	Туре		Show all compat	ible devices Target device
ash LED	Compatible device	ces in target subnet: Device type	Туре		Show all compat	ible devices
iash LED	Compatible devie	ces in target subnet: Device type	Туре		Show all compat	Target devices
Flash LED	Compatible devie	ces in target subnet: Device type	Туре		Show all compat	Target devices         Target device         Start st
Flash LED	Compatible devie	ces in target subnet: Device type	Туре		Show all compat	ible devices Target device
Flash LED	Compatible devie	ces in target subnet: Device type	Туре		Show all compat	ible devices Target device

 $\rightarrow$  First, the interface must be correctly selected. This happens in three steps.

 $\rightarrow$  Type of the PG/PC interface  $\rightarrow$  PN/IE

Extended download	to device		_				×
	Configured acces	ss nodes of "CPU_314C"					
	Device	Device type	Slot	Туре	Address	Subnet	
	CPU_314C	CPU 314C-2 PN/DP	2 X2	PN/IE	192.168.0.1	PN/IE_1	
		CPU 314C-2 PN/DP	2 X1	MPI	2		
		Type of the PG/PC inte	face:	Please select.			
		PG/PC inte	face:	Please select.			d
			1000 a	PN/IE			
		Connection to interrace/su	onet:	PROFIBUS			
		1st gate	eway:	PL MPI		1	
				🐔 Automati	c protocol detection		
	Compatible devic	ces in target subnet:		TeleServic	e paratra antipara		

 $\rightarrow$  PG/PC interface  $\rightarrow$  here: Intel(R) Ethernet Connection I217-LM

Device	Device type	Slot	Туре	Address	Subnet
CPU_314C	CPU 314C-2 PN/DP	2 X2	PN/IE	192.168.0.1	PN/IE_
2	CPU 314C-2 PN/DP	2 X1	MPI	2	
			10		
	Type of the PG/PC inte PG/PC inte	rface: rface:	Please select.	ĸ	
	Type of the PG/PC inte PG/PC inte Connection to interface/su 1st gat	rface: rface: ubnet: eway:	Please select Please select Intel(R) Et	- - hernet Connection I217-L	M
Compatible de	Type of the PG/PC inte PG/PC inte Connection to interface/su 1st gat vices in target subnet:	rface: .lbnet: eway:	Please select Please select Please select. Intel(R) Et Dell Wirele VMware V VMware V Pl CSIM	hernet Connection I217-L ess 1550 802.11ac irtual Ethernet Adapter fo irtual Ethernet Adapter fo	M r VMnet1 r VMnet8

 $\rightarrow$  Connection to interface/subnet  $\rightarrow$  "PN/IE\_1"

Extended download	to device		_			
	Configured acces	ss nodes of "CPU_314C"				
	Device	Device type	Slot	Туре	Address	Subnet
	CPU_314C	CPU 314C-2 PN/DP	2 X2	PN/IE	192.168.0.1	PN/IE_1
		CPU 314C-2 PN/DP	2 X1	MPI	2	
		Type of the PG/PC inte	rface:	PN/IE		
		PG/PC inte	rface:	Intel(R) Et	nernet Connection I217-LM	л 🔻 🖲 🖸
		Connection to interface/su	ubnet:	Please selec	t	- 0
		1st gat	eway:	Please selec	t	
				Direct at slo	t 2 X2	

 $\rightarrow$  The  $\rightarrow$  "Show all compatible devices" check box must be selected. The search for

Extended download to device × Configured access nodes of "CPU\_314C" Device Device type Slot Туре Address Subnet CPU\_314C CPU 314C-2 PN/DP 2 X2 PN/IE 192.168.0.1 PN/IE\_1 CPU 314C-2 PN/DP 2 X1 2 MPI Type of the PG/PC interface: PN/IE -PG/PC interface: Im Intel(R) Ethernet Connection I217-LM - 🖲 🖸 - 🕝 Connection to interface/subnet: PN/IE\_1 - 0 1st gateway: Show all compatible devices Compatible devices in target subnet: Device Device type Type Address Target device PN/IE Access address ----Flash LED Start search Online status information: Start search Display only error messages Load Cancel

devices in the network is started by clicking the  $\rightarrow$  **Start search** button.

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

	Configured acces	s nodes of "CPU_314C"				
	Device	Device type	Slot	Туре	Address	Subnet
	CPU_314C	CPU 314C-2 PN/DP	2 X2	PN/IE	192.168.0.1	PN/IE_1
<b></b>		CPU 314C-2 PN/DP	2 X1	MPI	2	
		Type of the PG/PC inter	ace:	PN/IE		
		PG/PC inter	ace:	Intel(R) Et	hernet Connection I217	-LM 🔻 🖲
		Connection to interface/sub	onet:	PN/IE_1		•
		1st gate	way:			
	compatible devic	<u>,</u>				
	Compatible devic	2				
	Device CPU_314C	Device type CPU 314C-2 PN/DI	Type PN/IE		Address 192.168.0.1	Target device CPU_314C
	COMpatible device CPU_314C	Device type CPU 314C-2 PN/DI	Type PN/IE PN/IE		Address 192.168.0.1 Access address	Target device CPU_314C
Flash LED	Device CPU_314C	Device type CPU 314C-2 PN/DI	Type PN/IE PN/IE		Address 192.168.0.1 Access address	Target device CPU_314C 
Flash LED	Companye device CPU_314C 	Device type CPU 314C-2 PN/DI	Type PN/IE PN/IE		Address 192.168.0.1 Access address	Target device CPU_314C  <u>S</u> tart searc
Flash LED	On:	Device type CPU 314C-2 PN/DI	Type PN/IE PN/IE		Address 192.168.0.1 Access address	Target device CPU_314C  Start search
Flash LED	on:	Device type CPU 314C-2 PN/DI	Type PN/IE PN/IE		Address 192.168.0.1 Access address	Target device CPU_314C  Start search
Flash LED	Onpatible device Device CPU_314C on: information tion retrieval complete	CPU 314C-2 PN/DI	Type PN/IE PN/IE		Address 192.168.0.1 Access address	Target device CPU_314C
Flash LED	on: information messages	Device type CPU 314C-2 PN/DI  ed.	Type PN/IE PN/IE		Address 192.168.0.1 Access address	Target device CPU_314C <u>Start search</u>

 $\rightarrow$  You first obtain a preview. Continue with  $\rightarrow$  "Load".

tatus	1	Target	t 91 314C	Message Ready for loading	Action
	-	CI	0_5140	Ready for folding.	
	0	•	Stop modules	The modules are stopped for downloading to device.	Stop all
	0	•	Device configurati	Delete and replace system data in target	Download to device
	0			Delete and replace existing device configuration for "CPU_314C" in the target system?	
	0	,	Software	Download software to device	Consistent download
1				10	

**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".

Load re	sults			×
<b>?</b>	Status	and actions after down	oading to device	
Status	1	Target	Message	Action
1	<b>\$</b>	▼ CPU_314C	Downloading to device completed without error.	
		<ul> <li>Start modules</li> </ul>	Start modules after downloading to device.	Start all
	4		The module "CPU_314C" can be started.	Start
4			m	
			Finish	Load Cancel

→ 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.

₩ Siemens - D:\00_TIA_Portal\013_101_CPU31	4C\013_101_CPU314C	_ = ×
Project Edit View Insert Online Options	s Tools Window Help	Totally Integrated Automation
📑 📑 🔚 Save project 📕 🔏 💷 🗐 🗙 🕷	) ± (* ± 🖥 🛄 🖆 🔡 🛃 🖉 Goonline 🖉 Gooffline 🏭 🗓 📑 🎽 🔲	PORTAL
Project tree 🔲 🖣	013_101_CPU314C + CPU_314C [CPU 314C-2 PN/DP]	🗕 🖬 🖬 🗙 Hardware ca 🗊 💷 🕨
Devices	🛃 Topology view 📠 Network view 🔢 Dev	rice view Options
🖻 🖻 🖸 🖸 🖬	🔐 CPU_314C 🔍 🕎 🕎 🏹 🗐 🍭 ±	그 글
ž		↑ Y Catalog
Ž ▼ 1 013_101_CPU314C		
Add new device	1 3 <sup>15</sup> 3 <sup>16</sup> 6 <sup>10</sup>	
😤 🚠 Devices & networks	Por Bor On	Filter 🖉
🗧 🔽 CPU_314C [CPU 314C-2 PN/DP]		Rack 🗳
Device configuration		
Online & diagnostics		• 2 • 🛄 CPU
Program blocks		
Technology objects		
External source files		DO e
PLC tags		
E PLC data types		AI M
Watch and force tables		
Online backups		
Device proxy data		Communications m
Program info	X Ⅲ > 100%	
PLC alarms	🔍 Properties 🔼 Info 🕓 Diagnostics	
Text lists	Conorol Cross references Compile	Special
Line Local modules		Interface modules
Common data	😢 🚹 🚺 Show all messages 🔹	ar.
Documentation settings		
Languages & resources	! Message Go to ? Date Time	
Online access	<ul> <li>Hardware configuration was loaded successfully.</li> <li>2/28/2015 5:04:11</li> </ul>	AM 🔦
<ul> <li>Lag Card Reader/USB memory</li> </ul>	Main (OB1) was loaded successfully. 2/28/2015 5:04:11	AM
	CPU_314C started. 2/28/2015 5:04:13	AM 📃
	Loading completed (errors: 0; warnings: 0). 2/28/2015 5:04:13	AM 🗸 🤇 🔟 🗡
> Details view	K	> > Information
Portal view 🖽 Overview	🚠 CPU_314C	ding completed (errors: 0; warnings

# 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  $\rightarrow$  "CPU\_314C [CPU314C-2 PN/DP]" folder and clicking the  $\blacksquare \rightarrow$  "Start simulation" icon.

Siemens - D:\Automation\013_101_CPU3140	0013_101_CPU314C		- 1
Project Edit View Insert Online Options	Tools Window Help		Totally Integrated Automation
📑 📑 🔒 Save project 📕 💥 🏥 🗊 🗙 🍤	🛨 (🎮 🖞 🔢 🕼 🖳 💋 Go online 🖉 Go offline 🔚 🖪 📑 💥 🚽 📗		PORTAL
Project tree	□	_ # # X	🗙 Hardware catalog 🛛 🗊 🗈 🕨
Devices	🖉 Topology view 🛔 Network	k view 🛛 🏦 Device view	Options
1 O O 1	🗐 🔿 🏕 CPU_314C 💌 🗒 🖾 🍕 😫 🍳 ±		
		^	✓ Catalog
▼ 013_101_CPU314C		=	fini nini
📑 Add new device			
📥 Devices & networks	207.5		Filter
CPU_314C [CPU 314C-2 PN/DP]	¢2 09		Rack
Device configuration	1 2 +4 5 6 7	8 9 10	U PS
V Online & diagnostics	Rail O		🛛 🕨 🛄 CPU
Program blocks			🗟 🕨 🛅 IM
Technology objects			🗄 🕨 🛅 DI
External source files			▶ 🛅 DO
PLC tags			DI/DO
PLC data types			I AI
Watch and force tables			🕨 🛅 AO
Online backups			IIAO
Device proxy data		~	Communications modules
Program info	<ul> <li>III</li> <li>100%</li> </ul>	💌	🕨 🛅 FM
PLC alarms	@ Properties 71 Info 1	P. Diagnostics	🚽 🕨 🕅 IQ-SENSE
Text lists		S chagneses 1	Image: Special
Local modules	General (1) Cross-references Compile		Interface modules
Common data	🕄 🛕 🚺 Show all messages 💌		
Documentation settings	Compiling completed (errors: 0; warnings: 0)		✓ Information
Languages & resources	1 Path Description	Go to ? Errors	Device:
Online access	✓ CPU 314C	× 0	
Card Reader/USB memory	Hardware configuration	2	
	Program blocks	A 0	
	Main (OB1) Block was successfully compiled		
	Compiling completed (errors: 0; warnings: 0)		
> Details view			×
/ Details view			

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



 $\rightarrow$  The "S7 PLCSIM" software is started in a separate window.



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

		is nodes of "CPU_314C"					
	Device	Device type	Slot	Туре	Address	Subnet	
	CPU_314C	CPU 314C-2 PN/DP	2 X2	PN/IE	192.168.0.1	PN/IE_1	
		CPU 314C-2 PN/DP	2 X1	MPI	2		
		Type of the PG/PC interfac	e: Ple	ase select			
		PG/PC interfac	:e: 🗌			- •	
	Co	nnection to interface/subn	et:			- •	
		1st gatewi	sy:			- 🐨	
	Compatible devic	es in target subnet:	7.44		Show all compati	ble devices	
The second second second	Device	Device type	Туре		Address	Target device	
9							
Flash LED							
Flash LED							
Flash LED							arch
Flash LED	ion:					<u>Start se</u>	arch
Flash LED	ion:					Start se	arch
Flash LED	ion:					<u>Start se</u>	arch
Flash LED	ion: messages					Start se	arch

 $\rightarrow$  First, the interface must be correctly selected. This happens in three steps.

 $\rightarrow$  Type of the PG/PC interface  $\rightarrow$  PN/IE

Extended download to	device					×
	Configured acces	s nodes of "CPU_314C"				
	Device	Device type	Slot	Туре	Address	Subnet
	CPU_314C	CPU 314C-2 PN/DP	2 X2	PN/IE	192.168.0.1	PN/IE_1
		CPU 314C-2 PN/DP	2 X1	MPI	2	
		Type of the PG/PC interfa	ce: Pl	ease select		
		PG/PC interfa	ce: Pl	ease select		
	Con	nection to interface/subn	et: 🧧	_PN/IE _PROFIBUS		•
		1st gatew	ay: 🛃	MPI		1

#### $\rightarrow$ PG/PC interface $\rightarrow$ PLCSIM

Device CPU_314C	Device type	Slot	The second secon		
CPU_314C		5101	туре	Address	Subnet
	CPU 314C-2 PN/DP	2 X2	PN/IE	192.168.0.1	PN/IE_1
	CPU 314C-2 PN/DP	2 X1	MPI	2	
	Type of the PG/PC interfa	ce: 🖳	_PN/IE		•
	PG/PC interfa	ce: Ple	ase select		- 0
Cor	nection to interface/subn	et: Pl	ease select		
			PLCSIM		0
	Cor	Type of the PG/PC interfa PG/PC interfa Connection to interface/subn	Type of the PGIPC interface: PGIPC interface: Ple Connection to interface/subnet:	Type of the PG/PC interface: PN/IE PG/PC interface: Please select Connection to interface/subnet: Please select	Type of the PG/PC interface: PG/PC interface: Please select Connection to interface/subnet: Please select

 $\rightarrow$  Connection to interface/subnet  $\rightarrow$  "PN/IE\_1"

Configured acces	s nodes of "CPU_314C"				
Device	Device type	Slot	Туре	Address	Subnet
CPU_314C	CPU 314C-2 PN/DP	2 X2	PN/IE	192.168.0.1	PN/IE_1
	CPU 314C-2 PN/DP	2 X1	MPI	2	
	Type of the PG/PC interfa	ce: 🖳	PN/IE		•
					11 - 52
	PG/PC interfa	te: 💹	PLCSIM		▼ 🖲 📕
Cor	PG/PC interfa	ce: 💹 et: Ple	PLCSIM ease select		

 $\rightarrow$  The  $\rightarrow$  "Show all compatible devices" check box must be selected. The search for

	Device	Device type	Slot	Type	Address	Sub	net
	CPU 314C	CPU 314C-2 PN/DP	2 X2	PN/IE	192 168 0 1	PN	IF 1
	0.0_0.40	CPU 314C-2 PN/DP	2 X1	MPI	2		
					-		
		Type of the PG/PC interfac	:e: [	PN/IE			1
		PG/PC interfac	:e:				- - - -
	CC	nnection to interface/subn	et [	PN/IF 1			
		intection to interfaces doin					
		ist gatewa	ay. [				
	Compatible devi	ces in target subnet:			Show all comp	atible devices	
							11 .
	Device	Device type	Тур	e	Address	Target	device
	Device —	Device type —	Typ PN/I	e	Address Access address	Target	device
Flash LED	–	Device type —	Typ PN/I	E	Address Access address	Target	device
Flash LED	-	Device type —	Typ PN/I	E	Address Access address	Target	device tart sear
Flash LED	Device 	Device type —	Typ PN/I	E	Address Access address	Target	device tart sean
Flash LED	Device 	Device type —	Typ PN/I	E	Address Access address	Target	device tart sean start sean
Flash LED	Device 	Device type —	Typ PN/I	E	Address Access address	Target	device tart sear start sear
Flash LED	Device	Device type —	Typ PN/I	E	Address Access address	Target	device tart sear start sear

devices in the network is started by clicking the  $\rightarrow$  **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")

	Device	Device type	Slot	Туре	Address	Subnet
	CPU_314C	CPU 314C-2 PN/DP	2 X2	PN/IE	192.168.0.1	PN/IE_1
		CPU 314C-2 PN/DP	2 X1	MPI	2	
	Ţ	ype of the PG/PC interfac	:e: 📜	,PN/IE		
		PG/PC interfac	:e: 💹	PLCSIM		
	Conne	ection to interface/subn	et: PN	//IE_1		- 0
		1st gatewa	iv:			- 0
	Device	1 Unspecified CPU	PN/IE		192,168.0.1	Target device
		1 Unspecified CPU	PN/IE		192,168.0.1	
e sini	default: 192.168. 0	onspectice cro.			The Service Control and Control of Control o	
	default: 192.168. 0	-	PN/IE		Access address	-
	default: 192.168. 0 -	-	PN/IE		Access address	-
		-	PN/IE		Access address	-
lash LED	default: 192,168, 0 	-	PN/IE		Access address	-
Flash LED	default: 192.168. 0 —	-	PN/IE		Access address	-
Flash LED	default: 192.168. 0	-	PN/IE		Access address	
Flash LED	default: 192.168. 0 	-	PN/IE		Access address	
Flash LED	default: 192.168. 0	-	PN/IE		Access address	
Flash LED	default: 192.168. 0  ion: information tion retrieval completed.	-	PN/IE		Access address	

 $\rightarrow$  You first obtain a preview. Continue with  $\rightarrow$  "Load".

tatus 4]	0	Target ▼ CPU_314C	Message Ready for loading.	Action
	0	Simulated module	The download will be performed to a simulated PLC.	
	0	<ul> <li>Software</li> </ul>	Download software to device	Consistent download
:			10	

**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. ())

S7-PLCSIM1			- 0	×
<u>File Edit View Insert PLC Execute Tools Window</u>	Help			
🗅 😅 🖬 🖨 PLCSIM(TCP/IP) 💽 🕹 🛍 📾 🖣	) 🎛 - 🛤  🕅 🔃 🗎		· · ·	13 13
□□				
🔲 CPU 👝 📼 🔤				
DC Set CPU to Run Program Mode				
STOP STOP MRES				
Press F1 to get Help	Default: MPI=2 DP-	-2   ocal=2 IP=19	2 168.0 1	150-( /

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

B S7-PLCSIM1	Transa .						l	-	×
<u>F</u> ile <u>E</u> dit <u>V</u> iew	Insert PLC Execute	<u>T</u> ools <u>W</u> indo	v <u>H</u> elp						
0 📽 🖬 🗐	Input Variable	F2		<b>N</b> ?	H H	10 13	10	1	首祖
1 II +1	Output Variable	F3							
CPU 👝 (	Bit Memory	F4							
DP F RUN	Timer	F11							
	Counter	F12							
STOP STOP	Generic	Ctrl+F2							
	Vertical Bits	10176-000							
Shows an Input Vari	able.	_	Default	: MPI=2	DP=21	.ocal=2	IP=19	2.168.0	1 ISO=(

 $\rightarrow$  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  $\boxed{\mathbf{N}}$ .

B S7-PLCSIM1	
File     Edit     Yiew     Insert     PLC     Execute     Iools     Windo       Image: Security of the s	w <u>H</u> elp <b>E E -¤ № 1 E E E E E E E E</b> E
B       CPU       III       +1       T*0         SF       F       RUN.P       III       IIII       IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	QB     Image: Constraint of the second
Press F1 to get Help.	Default: MPI=2 DP=2 Local=2 IP=192.168.0.1 ISO=( //

## 7.10 Archive the project

- M Siemens D:/Automation/013\_101\_CPU314C/013\_101\_CPU314C Totally Integrated Automation PORTAL ect Edit View Insert On Op Mew... Open... Migrate project... 🖥 🔃 🌇 🚆 🞇 💋 Go online 🖉 Go ± (\*± 17 IB IF × Ctrl+O Close Ctrl+W 🛃 Topology view 👗 Network view 🕅 Device view Options Save Ctrl+S H CPU\_314C 💌 🖽 🖾 🕄 🔍 ± Save as. Ctrl+Shift+S ^ ✓ Catalog Delete project.. Archive... Retrieve... Ctrl+E fini gini î \$3075A = Filter 
   Filter

   ) (1) Pack

   ) (1) Pack
   CPU.3 Tord Reader/USB memory Memory card file 9 10 7 8 Rail\_0 0 00 Print... Print preview... Ctrl+P 🖶 Export module labeling strips. D:Automation/013\_10...\013\_101\_CPU314C D:Automation/012\_10...\012\_101\_CPU1516F D:IVorlagenprojekt\_Webserv...\Tank\_V13\_SP1 D:l...\032-200\_FB-Programmierung\_S7-314... inications modules D:lAutomatisi...\012-100\_CPU1500\_V13\_SP1 Exit I IEXCIISTS Local modules
   Gommon data
   Documentation settings ✓ Information Canguages & resources
   Jon Online access
   Gard Reader/USB memory Device -> 100% • < III -Info 🛛 Diag > Details view Q Propert ostics A CPU\_314C Portal v
- $\rightarrow$  To archive the project, select the  $\rightarrow$  "Archive ..." command in the  $\rightarrow$  "Project" menu.

 $\rightarrow$  Confirm the prompt to save the project with  $\rightarrow$  "Yes".

Archive	project (0104:000006)		×
	Save project?		
	The last saved project will be arch before archiving to back up the cu	ived. Do you want to save the projec urrent changes?	t
		Yes No	

→ 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