

# **SCE Training Curriculum**

Siemens Automation Cooperates with Education | 05/2017

TIA Portal Module 012-201 Decentral Hardware configuration with SIMATIC S7-1500 and ET 200SP via PROFINET



### Matching SCE trainer packages for these training curriculums

#### **Decentral Periphery SIMATIC ET 200SP**

- SIMATIC ET 200SP Digital Order no.: 6ES7155-6AU00-0AB0
- SIMATIC ET 200SP Digital with input module ENERGY METER Ordner no.: 6ES7155-6AU00-0AB1
- SIMATIC ET 200SP Digital with communication module IO-LINK MASTER V1.1 Ordner no.: 6ES7155-6AU00-0AB2
- SIMATIC ET 200SP Digital with communication module CM AS-i MASTER ST Ordner no.: 6ES7155-6AU00-0AB3
- SIMATIC ET 200SP Analoge expansion module Order no.: 6ES7155-6AU00-0AB6

#### **SIMATIC Controllers**

- SIMATIC ET 200SP Open Controller CPU 1515SP PC F and HMI RT SW Order no.: 6ES7677-2FA41-4AB1
- SIMATIC ET 200SP Distributed Controller CPU 1512SP F-1 PN Safety Order no.: 6ES7512-1SK00-4AB2
- SIMATIC CPU 1516F PN/DP Safety Order no.: 6ES7516-3FN00-4AB2
- SIMATIC S7 CPU 1516-3 PN/DP Order no.: 6ES7516-3AN00-4AB3
- SIMATIC CPU 1512C PN with Software and PM 1507 Order no.: 6ES7512-1CK00-4AB1
- SIMATIC CPU 1512C PN with Software, PM 1507 and CP 1542-5 (PROFIBUS) Order no.: 6ES7512-1CK00-4AB2
- SIMATIC CPU 1512C PN with Software Order no.: 6ES7512-1CK00-4AB6
- SIMATIC CPU 1512C PN with Software and CP 1542-5 (PROFIBUS) Order no.: 6ES7512-1CK00-4AB7

#### SIMATIC STEP 7 Software for Training

- 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

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# DECENTRAL HARDWARE CONFIGURATION – SIMATIC S7-1516F PN/DP WITH ET 200SP VIA PROFINET

# 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 S7-1500 controller, e.g. CPU 1516F-3 PN/DP Firmware as of V1.6 with memory card
- ET 200SP distributed IO for PROFINET with 16DI/16DO and 2AI/1AO Configuration example
   Interface module IM155-6PN HF with Bus Adapter BA 2xRJ45
   2x IO module 8x digital input DI 8x24VDC HF
   2x IO module 8x digital output DQ 8x24VDC/0.5A HF
   2x IO module 2x analog input AI 2xU/I 2, 4-wire HS
   IO module 2x analog output AQ 2xU/I HS
   Server module
- 5 Ethernet connection between engineering station and controller and between controller and ET 200SP distributed IO



1 Engineering station





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



# 4 Theory

# 4.1 SIMATIC S7-1500 automation system

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

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

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

The S7-1500 controller consists of a power supply (1), a CPU with integrated display (2) and input and output modules for digital and analog signals (3). The modules are mounted on a mounting rail with integrated DIN rail profile (4). 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 IO modules via input addresses (%I) and addresses their output addresses (%Q).

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

## 4.1.1 Range of modules

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

#### Central processing units (CPUs) with integrated display

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

Additional properties and functions of the CPU:

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



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

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



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

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



#### IO modules

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



#### **Technology modules (TM)**

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



#### **Communication modules (CM)**

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



#### SIMATIC memory card

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



# 4.1.2 Example configuration

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



- Load current supply module (PM) with 120/230 V AC, 50 Hz / 60 Hz, 190 W input and 24 V DC / 8 A output
- ② Central processing unit CPU 1516F-3 PN/DP with integrated PROFIBUS and PROFINET interfaces

# 4.2 Operator control and display elements of the CPU 1516F-3 PN/DP

The figure below shows the operator control and display elements of a CPU 1516F-3 PN/DP.

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

# 4.2.1 Front view of the CPU 1516F-3 PN/DP with integrated display



- ① LED displays for the current operating mode and diagnostic status of the CPU
- ② Display
- ③ Control keys

## 4.2.2 Status and error displays

The CPU comes with the following LED displays:



- RUN/STOP LED (yellow/green LED)
- ② ERROR LED (red LED)
- ③ MAINT LED (yellow LED)
- ④ LINK RX/TX LED for port X1 P1 (yellow/green LED)
- (5) LINK RX/TX LED for port X1 P2 (yellow/green LED)
- 6 LINK RX/TX LED for port X2 P1 (yellow/green LED)

4.2.3 Operator control and connection elements of the CPU 1516F-3 PN/DP behind the front flap



- ① LED displays for the current operating mode and diagnostic status of the CPU
- ② Display connection
- ③ Slot for the SIMATIC memory card
- ④ Mode switch
- (6) LED displays for the 3 ports of the PROFINET interfaces X1 and X2
- 6 MAC addresses of the interfaces
- ⑦ PROFIBUS interface (X3)
- (8) PROFINET interface (X2) with 1 port
- PROFINET interface (X1) with 2-port switch
- 10 Connection for supply voltage
- 1 Fastening screws

Note: The front flap with the display can be removed and inserted during operation.

**Note:** The PROFINET field devices (ET 200SP in this case) should be connected to the PROFINET interface(X1) with the 2 ports.

## 4.2.4 SIMATIC Memory Card

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

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

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

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

#### 4.2.5 Mode switch

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

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

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

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

Pres	s Control [CPU	1516-3 PN/DP
	RUN / STOP	RUN
	ERROR	STOP
	MAINT	MRES

# 4.2.6 Display der CPU

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

#### The display of the CPU offers the following functions:

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

#### View of the display of an S7-1500:



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

#### Control keys of the display

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



#### Functions of the "OK" and "ESC" keys

- $\rightarrow$  For menu commands in which an input can be made:
  - $\mbox{OK} \rightarrow$  valid access to the menu command, confirmation of input and exit from editing mode
  - ESC  $\rightarrow$  restoration of original content (which means changes are not saved) and exit from editing mode
- $\rightarrow$  For menu commands in which no input can be made:
  - $OK \rightarrow$  to next submenu command
  - ESC  $\rightarrow$  back to previous menu command

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

#### Available submenus of the display:

# 4.3 Memory areas of the CPU 1516F-3 PN/DP and the SIMATIC memory card

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

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



#### Load memory

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

#### Work memory

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

- $\rightarrow$  Code work memory:
  - The code work memory contains runtime-relevant parts of the program code.
- $\rightarrow$  Data work memory:
  - The data work memory contains the runtime-relevant parts of the data blocks and technology objects.

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

#### **Retentive memory**

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

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

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

- Memory reset
- Reset to factory settings

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

# 4.4 Configuration and operation of the SIMATIC ET 200SP

#### 4.4.1 SIMATIC ET 200SP Distributed IOIO

SIMATIC ET 200SP Distributed IO is a modular distributed IO system for connecting process signals to a central automation system such as SIMATIC S7-1500. A comprehensive range of modules is available to optimally adapt the system to the automation task.

Distributed IO are often used when signals must be transmitted over a larger distance and the associated wiring overhead is too high. The signals can be collected locally at the remote location and connected to the central controller via a bus system. In the case of the ET 200SP system, devices can be connected via PROFINET or PROFIBUS.

The ET 200SP distributed IO is mounted on a standard mounting rail (7) and is composed of an interface module (1) with bus adapter (6), up to 32/64 IO modules (4) inserted on BaseUnits (2), (3) and a terminating server module (5).



The distributed IO provide inputs and outputs locally for the process connection, which can be read and written by the central processing unit via a bus protocol. In doing so, the IO modules are scanned in the S7 program using input addresses (%I) and addressed using output addresses (%Q) in the usual way.

Because the distributed IO are an extension of the central controller, the system is also configured with the STEP 7 Professional V13 software.

# 4.4.2 Range of modules

The SIMATIC ET 200SP is a modular distributed IO system and offers the following range of modules:

#### Interface modules with pluggable bus adapter

for connection of distributed IO to a central processing unit.

The bus adapter enables selection of any type of connection system. Interface modules have their own power supply, which is not connected via the backplane bus.



#### BaseUnits

as universal basic modules for electrical and mechanical connection of the IO modules.

They are available in a light version BU..D that opens a new potential group for the voltage supply over the backplane bus and in a dark version BU..B that continues the potential group. At least one light BaseUnit BU..D must always be used in order to supply at least one potential group with voltage. The IO modules are inserted on the BaseUnits.



#### IO modules

for digital input (DI) / digital output (DQ) / analog input (AI) / analog output (AQ). They are available in versions for 24 V DC (1) and 400 V AC (2)



#### **Communication modules (CM)**

for a point-to-point (PtP) connection (1) or connection to the IO-Link (2) and AS-i (3) communication systems.



#### Server module

as a termination for the configuration of the ET 200SP system.

It can be used as a holder for 3 spare fuses. It serves as a terminating resistor for the backplane bus and is thus a mandatory component.



# 4.4.3 Example configuration

The following configuration of an ET 200SP distributed IO system will be used for the program example in this curriculum.



- ① Interface module IM155-6PN HF with Bus Adapter BA 2xRJ45
- (2) IO module 8x digital input DI 8x24VDC HF (2x)
- ③ IO module 8x digital output DQ 8x24VDC/0.5A HF (2x)
- ④ IO module 2x analog input AI 2xU/I 2, 4-wire HS (2x)
- (5) IO module 2x analog output AQ 2xU/I HS (1x)
- 6 Server module

# 4.5 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.

## 4.5.1 Project

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

## 4.5.2 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.





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.

#### 4.5.3 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.

#### 4.5.4 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.

# 4.5.5 TIA Portal – Project view and portal view

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

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

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



Figure 2: Portal view

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

# 4.5.6 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".

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📢 Portal view 🔛 Ove	rview	😪 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".

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	<ul> <li>Visualization</li> <li>Keyboard shortcuts</li> </ul>	• Tooltips:	Show truncated texts completely Show tooltips (context-sensitive help is available)	
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Note: These settings can always be changed.

- → When Safety CPUs are used (e.g. CPU 1516F-3 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 failsafe program".

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Þ	Settings		_ # = X <
Start	General Hardware configuration PLC programming STE 77 Solety Simulation Online & diagnostics PLC alarms Visualization Keyboard shortcuts	STEP 7 Safety General Generate default fail-safe program	Tasks Libraries

### 4.5.7 Setting the IP address on the programming device

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

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

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

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

Not connected	47
Connections are available	
Wireless Network Connection	^
	.atl
Open Network and Sharing Cer	iter

 $\rightarrow$  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  VMware Bridge Protocol				
<ul> <li>GoS Packet Scheduler</li> <li>File and Printer Sharing for Microsoft Networks</li> </ul>				
<ul> <li>Link-Layer Topology Discovery Mapper I/O Driver</li> <li>Link-Layer Topology Discovery Responder</li> </ul>				
Install Uninstall Properties				
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 (→ "OK")

General		
You can get IP settings assigned this capability. Otherwise, you n for the appropriate IP settings.	automatically if your network suppor eed to ask your network administrato	ts r
Obtain an IP address autor	natically	
• Use the following IP addres	s:	
IP address:	192.168.0.99	
Subnet mask:	255 . 255 . 255 . 0	
Default gateway:		
Obtain DNS server address	automatically	
<ul> <li>Obtain one server address</li> <li>O Use the following DNS server</li> </ul>	er addresses:	
Preferred DNS server:		
Alternate DNS server:		
Validate settings upon exi	Advanced.	

### 4.5.8 Setting the IP address in the CPU

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

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



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

VA Siemens		_ □ X
		Totally Integrated Automation PORTAL
Start 🦓		
Devices &	Show all devices Online status	
PLC programming		
Motion & technology		
Drive parameterization	Accessible devices	
Visualization		
Online & Diagnostics		
	Help	
N Desis et view		
FIDJECT 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 S7-1500. 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 S7-1500.

VA Siemens		_ = ×
Project Edit View Insert Online Options Tools Wi	indow Help Totally Integrated A	utomation
📑 📑 🖬 Save project 📑 🐰 🏥 🛍 🗶 🍤 ± (**± 🖥	🛄 🖬 🖳 🖾 Goonline 🧟 Gooffline 🍶 🎚 🖪 🗶 🚍 🛄	PORTAL
Project tree	/-LM + cpu_1516f.profinet-schnittstelle_1 [192.168.0.1] + cpu_1516f.profinet-schnittstelle_1 [192.168.0.1]	_ 🖬 🖬 🗙 🖪
Devices		0
· · · · · · · · · · · · · · · · · · ·	Diagnostics     Assign IP address	alin
, ži	▼ Functions	et
🖹 🔻 🔚 Online access	Assign IP address	0
Display/hide interfaces	Set time	
🗧 🕨 🛄 COM [RS232/PPI multi-master cable] 🛛 📓	Firmware update     Minc address: 00 - 16 - 16 - 71 - 50 - CD     Minc address	
💿 🔻 🛄 Intel(R) Ethernet Connection I217-LM 🛛 🐱	Assign name	
🗄 Update accessible devices	Reset to factory settings a dedication of the de	ask
<ul> <li>Time cpu_1516f.profinet-schnittstelle_1 [192.168.0</li> </ul>	Formal memory card Subnet mask: 255, 255, 255, 0	S.
Online & diagnostics	Save service data Use router	
<ul> <li>Program blocks</li> </ul>	Router address: 192, 168, 0 , 1	
Technology objects	•	bra
PLC data types	Assign IP address	rie
Online card data	Assists a device address to the module	s
Dell Wireless 1550 802.11ac	Assign a device address to the module	
VMware Virtual Ethernet Adapter for VMnet1	Assigns the IP configuration to the module	
VMware Virtual Ethernet Adapter for VMnet8	incore.	
C Adapter [MPI]		
Carternal [Local]		
LI PLCSIM 57-1200/57-1500 [PN/IE]		
Tale Casulas (Automatia autosa) datestica)	Properties 🗓 Info 🕑 Diagnostics	
Card Reader/USR memory	General Cross-references Compile	
Card Readenois memory		
	Show all messages	
	! Message Go to ? Date Time	
< III >		
> Details view		>

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

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

	Rroperties	🔁 Ir	nfo	🛚 🔁 Diagno	stics	-
General Cross-references Compile						
😢 🛕 🚺 Show all messages						
! Message	Go	to ?		Date	Time	
😢 🔻 The IP address could not be assigned.			?	2/19/2015	1:32:54 PM	^
The set command could not be executed.				2/19/2015	1:32:54 PM	
						*

#### 4.5.9 Formatting the memory card in the CPU

- → If the IP address could not be assigned, the program data on the CPU must be deleted. This is accomplished in 2 steps: → "Format memory card" and →"Reset to factory settings".
- $\rightarrow$  First, select the  $\rightarrow$  "Format memory card" function and press the  $\rightarrow$  "Format" button.



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



 $\rightarrow$  If necessary, stop the CPU. ( $\rightarrow$  "Yes")



#### 4.5.10 Resetting the CPU to factory settings

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

Siemens					_
ect Edit View Insert Online Options	Tools Wine	ow Help	Totally Integrate	d Automat	tion
🞦 🔚 Save project 🚇 🐰 🗉 🖆 🗙 沟 ±	C# ± 🗐	] 🚹 🖳 🙀 🕼 Go online 🖉 Go offline h 🖪 🖪 🖪 🛃 🚽 🛄	, , , , , , , , , , , , , , , , , , ,	PO	RTA
Project tree		ernet Connection I217-LM ⊁ cpu_1516f.profinet-schnittstelle_1 [192.168.0.1] → CPUcom	nmon [192.168.0	.1] 💶 🗖	
Devices					
1 0 0		Diagnostics Functions Assign Paddress			_
Display/hide interfaces     COM [RS232/PPI multi-master cable]		Set time Firmware update Assign pame Incidence 103 100 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
<ul> <li>Intel(R) Ethernet Connection I217-LM</li> <li>Update accessible devices</li> <li>Cpu_1516f.profinet-schnittstelle_1 [19</li> </ul>	2.168.0	Reset to factory settings Format memory card Save service data	tell		
<ul> <li>Online &amp; diagnostics</li> <li>Program blocks</li> <li>Technology objects</li> </ul>		Retain IP address     O Delete IP address			
Lee PLC data types     Second data		Reset	-		
Li Dell Wireless 1550 802.11ac     Li VMware Virtual Ethernet Adapter for VMme     VMware Virtual Ethernet Adapter for VMme	et1 🗃				
PC Adapter [MPI]     D1 PC internal [Local]					
<ul> <li>PLCSIM [PN/IE]</li> <li>D PLCSIM S7-1200/S7-1500 [PN/IE]</li> </ul>	₩? ₩	🖳 Properties 🚺 Inf	fo 🛽 🗓 Diagnos	tics	1 8
USB [S7USB]		General Cross-references Compile			
Log TeleService (Automatic protocol detection     Log Card Reader/USB memory	.] Re -	3 A O Show all messages			
		Message Go to 2	Date	Time	
		Scanning for devices completed for interface Intel(R) Ethernet Connection I217-LM. No dev	2/19/2015	1:35:02 PM	
		Scanning for devices on interface Intel(R) Ethernet Connection I217-LM was started.	2/19/2015	1:35:20 PM	
	>	Scanning for devices completed for interface Intel(R) Ethernet Connection I217-LM. Found	2/19/2015	1:35:29 PM	
0.1.11.1		f			

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



 $\rightarrow$  If necessary, stop the CPU. ( $\rightarrow$  "Yes")



#### 4.5.11 Setting the IP address in the ET 200SP

The IP address of the ET 200SP 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		X
		Totally Integrated Automation PORTAL
Start 💦		
Devices &	Show all devices	
PLC programming		
Motion & technology		
Drive parameterization	Accessible devices	
Visualization 🗐		
Online & Diagnostics		
	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 the IP address is not yet assigned) of the connected ET 200SP. Select → "Online & Diagnostics" here.



→ Under→ "Functions", you now find the → "Assign IP address" item. Enter the following IP address here (example): → IP address: 192.168.0.2 → Subnet mask 255.255.255.0.
 Next, click → "Assign IP address" and this new address will be assigned to your ET 200SP.

M Siemens			_ 0 }
Project Edit View Insert Online Options Tools V	Window Help	Total	ly Integrated Automation
📑 🛅 🖬 Save project 📕 👗 🏥 🛍 🗙 🏷 ± 🥶 ± 🖣	🗄 🗓 🏠 🖳 🗛 🚿 Go online 🖉	🛿 Go offline 🔚 🖪 🖪 🛄	PORTAL
Project tree	ection I217-LM + Accessit		📲 🖬 🗙 Online 🗐 🔳 🕨
Devices			Options
, 🖻 🖸 🖸 🗐 🗐	<ul> <li>Diagnostics</li> </ul>	Assign IP address	
o sti	General Functions		CPU operato
<ul> <li>Display/bide interfacer</li> </ul>	Assign IP address	Assign IP address to the device	Not supported
■ Intel(R) Ethernet Connection I217-LM	Assign name	Devices connected to an enterprise network or directly to the internet must be	appropr
2 Update accessible devices	Reset to factory settings	protected against unauthorized access, e.g. by use of firewalls and network seg	imentat
Accessible device [28-63-36-42-82-16]		http://www.siemens.com/industrialsecurity	sks
Dell Wireless 1550 802.11ac			
PC Adapter [MPI]	9		
PC internal [Local]			Dra
PLCSIM (FIVIE)     PLCSIM S7-1200/S7-1500 [PN/IE]	?	MAC address: 28 - 63 - 36 - 42 - 82 - 16 Accessible devices	✓ Cycle time
• 🛄 USB [S7USB]	9	IP address: 192 168 0 2	Not supported
TeleService [Automatic protocol detection]		Subnet mask: 255, 255, 255, 0	Not supported
Card Readenois memory			
		Bouter address:	
		Assign IP address	~
		Assign a device address to the module	>
		Assigns the IP configuration to the S	
	General Cross-referen	ces Compile	
	Show all messages	•	
	1 Message	Go to ? Date	т
	<ul> <li>Scanning for devices complexity</li> </ul>	oleted for interface Intel(R) Ethernet Connection I217-LM. Found 2/21/2016	1 🐴
> Details view	<	III	> > Memory
Portal view Overview Overview Online &	dia	🚺 Scanning for d	levices completed for int

→ A feedback message for the assignment of the IP address is provided in the  $\rightarrow$  "Info" window under  $\rightarrow$  "General".

	Properties	🗓 Info	<b>B</b> Diagnostics	
General Cross-references Compile				
Show all messages				
! Message	Go to ?	Date	Time	
Scanning for devices completed for interface Intel(R) Ethernet Connection I217-LM. Four	nd '	2/21/20	16 12:24:49 AM	
Scanning for devices on interface Intel(R) Ethernet Connection I217-LM was started.		2/21/20	16 12:24:57 AM	
Scanning for devices completed for interface Intel(R) Ethernet Connection I217-LM. Four	nd '	2/21/20	16 12:25:04 AM	
The parameters were transferred successfully.		2/21/20	16 12:27:28 AM	
< III				>

**Note:** If a communication connection already exists between the ET 200SP (as device) and a higher-level controller (as controller), the IP address cannot be changed.

#### 4.5.12 Reading the firmware version of the ET 200SP

→ Before you can read the firmware version of the ET 200SP, you must select → "Update accessible devices" and → "Online & diagnostics" of your ET 200SP again. You can read the Short description, Article number, Hardware version and Firmware version in menu item → "Diagnostics" → "General".

M Siemens				_ 🗆 ×
Project Edit View Insert Online Options Tools	Window Help		Totally Integrated Au	tomation
📑 📑 🔒 Save project 🚇 🐰 🏥 🏛 🗙 🍤 ± (半 ±	🖥 🗓 🚹 🖳 🗛 🚿 Goonline 🙀	🕈 Go offline 🛛 🛔 📭 🗶 📃 🛄	i otanij integratea na	PORTAL
Project tree	□> Intel(R) Ethernet Conne			_ 🖬 🖬 🗙 📢
Devices				0
	<ul> <li>Diagnostics</li> </ul>	Π		^ E
	General	General		I I
🗧 🖛 Online access	Functions	Module		00
Display/hide interfaces				v
🗧 🔽 Intel(R) Ethernet Connection I217-LM		Short designation:		
2 bpdate accessible devices		Article number: 6ES7 155-6AU0	0-0CN0	
<ul> <li>Accessible device [192.168.0.2]</li> </ul>		Hardware: 4		Iska
<ul> <li>Online &amp; diagnostics</li> </ul>		Firmware: V3.1.0		<b>v</b>
Dell Wireless 1550 802.11ac		Eirmuoro oxpansion		
PC Adapter [MPI]		Finnware expansion:		Ē
PC internal [Local]				bra
PLCSIM (PN/IE)	17	Rack: 0		ries
	27	Slot: 0		
TeleService [Automatic protocol detection]				
Card Reader/LISB memory				
		Module information		
		Device areas		
		Device name:		
		Module name:		
		Plant designation		×
			Properties Info Diagnostics	
	General Cross-referen	ices Compile		
	Show all messages			
	1 Message		Go to ? Date Time	
	The parameters were tran	sferred successfully.	2/21/2016 12:49:06 AM	^
> Details view				>

# 5 Task

Create a project and configure the following modules of your hardware, which correspond to one part of the trainer packages SIMATIC CPU 1516F PN/DP Safety and SIMATIC ET 200SP Digital.

- SIMATIC S7-1500F, CPU 1516F-3 PN/DP, WORK MEMORY 1.5 MB PROGRAM, 5 MB DATA,1. INTERFACE, PROFINET IRT WITH 2 PORT SWITCH, 2. INTERFACE, ETHERNET, 3. INTERFACE, PROFIBUS, 10 NS BITPERFORMANCE, SIMATIC MEMORY CARD REQUIRED (order number: 6ES7 516-3FN01-0AB0)
- 1X SIMATIC PM 1507 24 V/8 A STABILIZED POWER SUPPLY INPUT: 120/230 V AC OUTPUT: 24 V DC / 8 A (order number: 6EP1333-4BA00)
- 1X INTERFACE MODULE IM155-6PN HF (order number: 6ES7 155-6AU00-0CN0)
- 1X BUS ADAPTER BA 2XRJ45 (order number: 6ES7 193-6AR00-0AA0)
- 2X DI 8X24VDC/0.5A HF (order number: 6ES7 131-6BF00-0CA0
- 2X DQ 8X24VDC/0.5A HF (order number: 6ES7 132-6BF00-0CA0)
- Server module (order number: 6ES7 193-6PA00-0AA0)

# 6 Planning

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

The hardware for this project is already specified by the existing hardware (in this case, part of the trainer packages SIMATIC CPU 1516F PN/DP Safety and SIMATIC ET 200SP Digital. Therefore, a selection does not have to be made. Instead, the listed modules of the trainer packages only have to be inserted in the project and connected. The order numbers (see Table 1 and Table 2) can be used to check that the correct modules are inserted.

Module	Order number	Slot	Address area
PM 190W 120/230VAC	6EP1333-4BA00	0	
CPU 1516F-3 PN/DP	6ES7516-3FN01-0AB0	1	

Table 1: Modules of the S7-1500

Module	Order number	Slot	Address area
IM155-6PN HF	6ES7155-6AU00-0CN0	0	
DI 8x24VDC HF	6ES7131-6BF00-0CA0	1	0
DI 8x24VDC HF	6ES7131-6BF00-0CA0	2	1
DQ 8x24VDC/0.5A HF	6ES7132-6BF00-0CA0	3	0
DQ 8x24VDC/0.5A HF	6ES7132-6BF00-0CA0	4	1
Server module	6ES7193-6PA00-0AA0	5	

Table 2: Modules of the ET 200SP

The Base Units are relevant for additional handling of the ET 200SP modules. These determine whether the potential is taken from the left terminal (dark Base Unit) or whether a new voltage supply must be connected and thus a new potential group is created (light Base Unit). The applicable rule here is that a new potential must always be provided on slot 1.

All Base Units included in the trainer packages are type BU15-P16+A0+2D (6ES7193-6BP00-0DA0). As a result, the light Base Unit version is set by default.

As the final step, the hardware configuration is saved, compiled, downloaded and started.

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 result is archived to back up the working version.

# 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  $\rightarrow$  "Create new project".



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

Create new project	
Project name:	012_201_CPU1516F_ET200SP_PN
Path:	D:100_TIA_Portal
Author:	Michael Dziallas
Comment:	×
	×
	Create

→ The project is created and opened and the menu "Start", "First steps" opens automatically.

## 7.2 Insert the CPU 1516F-3 PN/DP

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

VA Si	emens - D:\00_TIA_Portal\012_2	01_CPU1516F_ET200SP_PN\012_201_CPU1516F	_ET200SP_PN				-	. <b></b> x
						T	otally Integrated Automation	AL.
s	tart 🦾		First steps	12 201 CPU1516	E ET200		fully Please select the n	_
	Devices &	Open existing project	noject. u	12_201_0101010	1_01200	SI_IN Was opened success	runy. Hease select the h	<u>^</u>
	PLC programming	Create new project           Migrate project	Start					
	Motion &	Close project						
	Drive		⊢	Devices & networks	Q.Q.	Configure a device		
		Welcome Tour     First steps	╞	PLC programming	٢	Write PLC program		
	Online & Diagnostics		╞	Motion & technology	÷	Configure technology objects		=
		Installed software	⊢	Drive parameterizati		Parameterize drive		
		- Help	╞	Visualization	Ø	Configure an HMI screen		
		🚱 User interface language						
			L 4	Project view		Open the project view		~
Þ	Project view	Opened project: D:\00_TIA_Port	al\012_201_CPU	1516F_ET200SP_PN\(	012_201_0	PU1516F_ET200SP_PN		

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

Siemens - D:\00_TIA_Po	rtal\012_201	_CPU1516F_ET200SP_PN\012_201	_CPU1516F_ET200SP_PN			_ ¤ ×
					Totally I	ntegrated Automation PORTAL
			Add new device _			
Devices & networks		Show all devices	Device name:			<u>^</u>
		Add new device		Controllers     Im SIMATIC 57-1200	Device:	
Motion & technology			Controllers	[]] SIMATIC 57-1500     []] SIMATIC 57-300     []] SIMATIC 57-400		
		Configure networks		La SIMATIC ET 200 CPU     La SIMATIC ET 200 CPU     La SIMATIC ET 200 CPU	Article no.:	<b>=</b>
			нмі		Version: Description:	<b>x</b>
Online & Diagnostics	~~		PC systems			
		Melp				
			Drives			
			<			×
Project view		Opened project: D:\00		_ET200SP_PN\012_201_CPU1516F_E	ET200SP_PN	

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

(Controllers  $\rightarrow$  SIMATIC S7-1500  $\rightarrow$  CPU  $\rightarrow$  CPU 1516F-3 PN/DP  $\rightarrow$  6ES7516-3FN01-0AB0  $\rightarrow$  V1.8)

MA Sie	mens - D:\00_TIA_Po	rtal\012_201	_CPU1516F_ET200SP_PN\012_201	_CPU1516F_ET200SP_PN				_ 🗆 ×
							Totally Integrated Automat PC	tion ORTAL
Sta				Add new devic	e			
	Devices & networks		Show all devices	Device name: PLC_1		1		^
	PLC programming Motion &	۲			<ul> <li>✓ ☐ Controllers</li> <li>▶ ☐ SIMATIC 57-1200</li> <li>✓ ☐ SIMATIC 57-1500</li> </ul>			
	technology Drive			Controllers	<ul> <li></li></ul>	Device:		
			Configure networks	НМІ	CPU 1513-1 PN CPU 1515-2 PN CPU 1516-3 PN/DP		CPU 1516F-3 PN/DP	≡
ĺ		10			CPU 1518-4 PN/DP	Article no.: Version:	6ES7 516-3FN01-0AB0	
			Help	PC systems	CPU 1515F-2 PN	CPU with disp and 5 MB da applications	play; work memory 1.5 MB program ta; can be used for safety , supports PROFIsafe V2; 10 ns bit ime; 5-level protection concept.	
				Drives	CPU 1517F-3 PN/DP     CPU 1517F-3 PN/DP     CPU 1518F-4 PN/DP     CPU 1518F-4 PN/DP     CPU Unspecified CPU 1500     CPU SIPLUS	integrated te loop control, trace; 1st int supports RT/I protocol TCP	echnology functions: motion, closed- , counting&measuring integrated terface: PROFINET IO controller, IRT, 2 ports, IO device, MRP, transport /IP, S7 communication, Web server,	
					SIMATIC 57-300     SIMATIC 57-400     SIMATIC ET 200 CPU	constant bus PROFINET ba TCP/IP, Web s PROFIBUS DF routing; firm	s cycle time, routing; 2nd interface: sic services / transport protocol ierver, routing; 3rd interface: <sup>9</sup> master, constant bus cycle time, ware V1.8	~

 $\rightarrow~$  Assign a device name (Device name  $\rightarrow~$  "CPU\_1516F").

Add new device	
CPU_1516F	

 $\rightarrow$  Select "Open device view".



 $\rightarrow$  Click "Add".

Siemens - D:\00_TIA_Portal\012_201	I_CPU1516F_ET200SP_PN\012_201_CPU1516F_	ET200SP_PN			_ ¤ ×
					Totally Integrated Automation PORTAL
Start		Add new device			
Devices & networks	Show all devices	Device name: CPU_1516F			
PLC programming Motion & technology	2	Controllers	Controllers	Device:	
Drive parameterization Visualization	Configure networks	HMI	CPU 151C-1 PN     CPU 151C-1 PN     CPU 151C-1 PN     CPU 151C-2 PN     CPU 151C-2 PN     CPU 151C-3 PN/DP     CPU 151C-3 PN/DP     CPU 151C-3 PN/DP	Article no.: Version:	CPU 1516F-3 PN/DP 6ES7 516-3FN01-0AB0 V1.8
Online & Jagnostics		PC systems	<ul> <li>↓ □□ CPU 15115-4 FMUDP</li> <li>↓ □□ CPU 15115-1 PN</li> <li>↓ □□ CPU 1513F-1 PN</li> <li>↓ □□ CPU 1515F-2 PN</li> <li>↓ □□ CPU 1515F-2 PNIDP</li> <li>↓ □□ CPU 1516F-3 PNIDP</li> </ul>	CPU with disp and 5 MB data applications, instruction tin integrated tec loop control, o	lay, work memory 1.5 MB program a; can be used for safety supports RPOFIsiafe V2; 10 ns bit ne; 5-level protection concept, chnology functions: motion, closed- counting&measuring integrated
		Drives	6ES7 516-3FN01-0AB0     CPU 1517F-3 PN/DP     CPU 1517F-3 PN/DP     CPU 1518F-4 PN/DP     Unspecified CPU 1500	trace; 1st inte supports RT/IR protocol TCP/I constant bus PROFINET bas TCP/IP, Web se	erface: FROFINET IO controller, XT, 2 ports, IO device, MRP, transport P, S7 communication, Web server, cycle time, routing; 2nd interface: is services / transport protocol errer, routing; 3rd interface:
	e Help		(m) CPU SIPLUS     (m) SIMATIC S7-300     (m) SIMATIC S7-400     (m) SIMATIC S7-400     (m) SIMATIC ET 200 CPU     (m) SIMATIC ET 200 CPU     (m) (k) SIMATIC ET 200 (k) SIMATIC ET	routing; firmw	master, constant ous cycle ume, vare V1.8
▶ Project view	Opened project: D:\00 TIA Porta	Open device view     Open 201 CPU1516F E	12005P PM012 201 CPU1516F ET20	DSP PN	Add

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

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

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



 $\rightarrow$  Select the CPU with a double-click

**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 1516F-3 PN/DP

→ Double-click the CPU to select it. Then open the → "PROFINET interface [X1]" menu in → "Properties" and select the → "Ethernet addresses" entry there.

CPU_1516F [CPU 1516F-3 PN/DP]	🖳 Properties 🚺 Info 追 🗓 Diagnostics 💷	
General IO tags System co	nstants Texts	
▶ General		^
▶ Fail-safe	Ethernet addresses	- =
✓ PROFINET interface [X1]	Interface networked with	
General		
F-parameters	Subnet: Not networked	
Ethernet addresses	Add new subnet	
Time synchronization		
Operating mode	IP protocol	
Advanced options		
Web server access	Set IP address in the project	
Hardware identifier	IBaddrore 102 100 0 1	
PROFINET interface [X2]	Irauuress: 192.108.0.1	
DP interface [X3]	Subnet mask: 255 . 255 . 255 . 0	
Startup	Use router	
Cycle	Router address: 0,0,0,0	
Communication load	O IP address is set directly at the device	
System and clock memory		
System diagnostics	PROFINIT	
Webserver	PROFINET	
Display	PROFINET device pame is set directly at the device	
User interface languages	PROFINET device name is set directly at the device	
Time of day	Generate PROFINET device name automatically	
Protection		
System power supply	PROFINET device name cpu_1516f.profinet interface_1	
Configuration control	Converted name: cpuxb1516f.profinetxainterfacexb19abb	
Connection resources	Device number: 0	
Overview of addresses		

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

Ethernet addresses	
Interface networked with	
Subnet:	Not networked  Add new subnet

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



### 7.4 Configure the fail-safe operation of the CPU 1516F-3 PN/DP

→ In the → "Fail-safe" menu, select → "F-activation" and select → "Disable F-activation" there.



 $\rightarrow$  Confirm the prompt asking if you want to continue with  $\rightarrow$  "Yes".

Turning off the F-activation (2501:000020)							
	Turning off the F-activation CPU_1516F will deactivate all fail-safe blocks. Do you want to continue?						
	Yes No						

## 7.5 Configure the access level for the CPU 1516F-3 PN/DP

→ Switch to the → "Protection" menu and select access level → "Full access incl. fail-safe (no protection)".

CPU_1516F [CPU 1516F-	3 PN/DP]				🔍 F	Properties	s 🗓 In	fo 追 🗓	Diagnostics		•
General IO tags	System	constants	Texts								
General     Fail-safe     F-activation     F-parameters     PROFINET interface [X1]		Protectio Access Select th	n level	vel for the PLC.							*
<ul> <li>PROFINET interface [X2]</li> <li>DP interface [X3]</li> <li>Startup</li> </ul>		Access level		Access level		Ac	cess		Access permission		
Cycle			0 - 1		HMI	Read	Write	Fail-safe	Password		
Communication load System and clock memory	,		Full acces Full acces Pool acces Full acces	ss incl. fail-safe (no protection) ss (no protection)	× •	× •	~	~	-	-	
<ul> <li>System diagnostics</li> <li>Web server</li> </ul>	=			ss ss	~	•				~	
General Automatic update		<							•		
User management Watch tables User-defined Web page Entry page Overview of interfaces Display	25	Full acc TIA Porti No pass	cess incl. fa al users and word is requ	il-safe (no protection): HMI applications will have acci ired.	ess to all st	andard and	fail-safe fu	unctions.			
Time of day											

**Note:** The "Full access incl. fail-safe (no protection)" setting is recommended because we do not have to assign a password.

#### 7.6 Insert power module PM 190W 120/230VAC

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



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

Hardware catalog	∎ ∎ ►	
Options		
		Har
✓ Catalog		dwa
<search></search>	tini tini	Te o
🗹 Filter	Search do	H I
🕶 🛅 PM	Jearchild	
PM 70W 120/230VAC		
PM 190W 120/230VAC		Ų.
6EP1333-4BA00		ő
🕨 🧊 PS		릚
CPU		le t

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

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



 $\rightarrow$  Compare your device configuration with the following figure.

### 7.7 Insert the ET 200SP interface module IM155-6PN HF

 $\rightarrow$  Open the network view ( $\rightarrow$  Network view)



→ Find the correct IM155-6PN HF interface module in the hardware catalog and insert it by moving it to the network view using drag-and-drop. (→ Hardware Catalog → Distributed IO → ET 200SP → Interface modules → PROFINET → IM 155-6 PN HF → 6ES7 155-6AU00-0CN0 → Version: V3.1)

012_201_CPU1516F_ET200SP_PN   Devices	& networks	_∎≡×	Hardware catalog	7 🗆 🕨	
	🖉 Topology view 🔒 Network view	Device view	Options		
Network	🔽 🕎 🗮 🔍 ±				Har
		^	✓ Catalog		dwa
			<pre></pre>	ini) (init	Te l
			Eiltor	•	at
CPU 1516F			Notwork components		
	📗 6ES7 155-6AU00-0CN		Detecting & Monitoring	~	
			Distributed I/O		
		- Net	✓ 1 ET 2005P		
PN/IE_1		- WOF	🗕 📊 Interface modules		nlin
		- ÷	✓ Im PROFINET	=	let
		- 5	IM 155-6 PN BA		00
			• 🛅 IM 155-6 PN ST		S
			M 155-6 PN ST SIPLUS		
			6ES7 155-6AU00-0	CN0	as
			PROFIBUS		ŝ
		24	Communications modules		
<	> 100%			~	
671500/ET200MD station 1 [67.1500 station]				>	ibra
S71500/E1200MP station_1[S7-1500 station]	Properties Info 🖬 🖄 Diagr	iostics	✓ Information		arie
General IO tags System constants	Texts		Device	1	, °
General			Device:		1
General					
			В		
	Name: S71500/ET200MP statio	on_1	3 3	=	
	Author: Michael Dziallas		IM 155 6 PN LIE		
	Comment:		IN 155-0 FM HF		
			Article po . GEST 1EE GALIOD OCNO		
•			Afficie no.: 0237 133-0A000-0CN0		
			Version: V3.1		
			Description:		
			Interface module with PROFINET		
			interface V2.3 (RT/IRT) with cycle time		
<		>	starting at 250 µs, 64 I/O modules		/

→ Assign the field device of the CPU 1516F by first clicking on the interface of the IM155-6PN HF in the network view and then connecting it to the PROFINET interface (X1) of the CPU 1516F.

012_201_CPU1516F_ET200SP_PN  Devices & networks								
	📱 Topology view 📠 Network view	Device view						
Network Connections HMI connection	🔽 🔛 🥄 ±							
		^						
		=						
CPU 1516F	IO device 1							
СРО 1516	IM 155-6 PN							
Ethernet								
PN/IE_1		– vork						
		a a a a						
< III	> 100%	· · · · · · · · · ·						

# 7.8 Configure the ET 200SP / IM 155-6PN HF

 $\rightarrow$  To configure the IM155-6PN HF, first select the IO device. ( $\rightarrow$  IO device 1)

012_201_CPU1516F_ET200SP_PN      Devices & networks	_ • • • ×
🖉 Topology view 📠 Network view 📗	Device view
💦 Network 🔡 Connections 🛛 HMI connection 🔍 🕎 🖏 🔛 🔍 ±	
IO system: CPU_1516F.PROFINET IO-Syste	em (100) 🛆
CPU 1516F CPU 1516F CPU_1516F CPU_1516F CPU_1516F.PROFIN	
< III > 100% <	

 $\rightarrow$  In  $\rightarrow$  "Properties", open the  $\rightarrow$  "General" menu and enter the "Name"  $\rightarrow$  "SortingStation01".

SortingStation	n <b>01 [IM155</b> -	6 PN HF]		🖳 Proper	ties	🔄 Info	i 🗓 Di	iagnostic	s	78	•	
General	IO tags	System of	constants	Texts								
<ul> <li>General</li> <li>Project information</li> <li>Catalog information</li> <li>Identification &amp; Maintenance</li> <li>PROFINET interface [X1]</li> <li>General</li> <li>Project information</li> <li>Catalog information</li> <li>Ethernet addresses</li> <li>Advanced options</li> <li>Hardware identifier</li> <li>Module parameters</li> <li>Hardware identifier</li> </ul>			General Project inf	General Project information Name: SortingStation01 Author: Michael Dziallas Comment: Rack: 0 Slot: 0						<b>^</b>	* III	
			Catalog in	formation Short c I	lesignation: Description:	IM 155 Interfa	5-6 PN HF ace module v	with PROFI	INET interfac	ce V2.3		*

Note: This name is then applied as the device name for PROFINET communication.

→ Under "PROFINET device name interface[X1]", the IP address can then be set or the IO device and the "PROFINET device name" can be checked.
 (→ PROFINET interface[X1] → Ethernet addresses → IP protocol → IP address:
 192.168.0.2 → PROFINET → PROFINET device name → SortingStation01)

SortingStation01 [IM155-6 PN HF]	🖳 Properties 🚺 Info 🚺 🖳 Diagnostics 🚽 💷 🔻
General IO tags System	constants Texts
✓ General Project information	Ethernet addresses
Catalog information	Interface networked with
Identification & Maintenance	
General	Subnet: PN/IE_1
Ethernet addresses	Add new subnet
Advanced options	IP protocol
Hardware identifier	ir piotocoi
Module parameters	IP address: 192 . 168 . 0 . 2
Hardware identifier	Subnet mask: 255 . 255 . 255 . 0
	Use router
	Router address: 0 0 0 0 0
	PROFINET
	Generate PROFINET device name automatically
	PROFINET device name sortingstation01
	Converted name: sortingstation01
	Device number: 1
	<ul> <li>III</li> </ul>

→ The settings for the 'IO cycle' such as 'Update time' and 'Watchdog time' can also be set here for the device.

 $(\rightarrow \mathsf{PROFINET} \text{ interface}[X1] \rightarrow \mathsf{Advanced} \text{ options} \rightarrow \mathsf{Real time settings} \rightarrow \mathsf{IO cycle} \rightarrow \mathsf{Update time} \rightarrow 1,000 \text{ ms} \rightarrow \mathsf{Watchdog time} \rightarrow 3,000 \text{ ms})$ 

SortingStation01 [IM155-6 PN H	F] 🖳 Properties 🚺 Info 🚺 🗓 Diagnostics 🚽 🗉 🗖						
General IO tags Syste	em constants Texts						
Project information	s s io cycle						
Catalog information	Shared Device						
Identification & Maintenance							
<ul> <li>PROFINET interface [X1]</li> </ul>	IO controller outside project						
<ul> <li>General</li> </ul>	with access to this IO device 0						
Ethernet addresses	Common condicionis 1 000						
<ul> <li>Advanced options</li> </ul>	Common serio ciock						
Interface options							
Media redundancy	Update time						
Isochronous mode							
<ul> <li>Real time settings</li> </ul>	Mutomatic ms						
IO cycle	Can be set 1.000 ms						
Synchronization	Adapt update time when send clock changes						
Port [X1 P1]							
Port [X1 P2]	Watchdog time						
Hardware identifier	······································						
<ul> <li>Module parameters</li> </ul>	Accepted update cycles						
Hardware identifier	without IO data: 3						
	Watchdog time: 3.000 ms						
	< III >						

### 7.9 Insert the 2 digital input modules DI 8x24VDC HF

 $\rightarrow$  Double-click the PROFINET device to change to the device view of the ET 200SP.

012_201_CPU1516F_ET200SP_PN   Devices & net	tworks	_∎≣×
	🛃 Topology view 📠 Network view 📗	Device view
Network Connections HMI connection	🕎 📰 🖽 🔍 z	
	IO system: CPU_1516F.PROFINET IO-System	em (100) 🛆
CPU 1516F CPU 1516F CPU_1516F.PROF	SortingStat IM 155-6 PN CPU_1516F IN ► ET 200SP station_1	Network data
<	▶ 100% ▼ -	

→ **Note:** You can also open the device view of the different devices in the drop-down menu at the top left of the device view.

2PU 1516F-3 PN/DP] > Distributed I/O > PROFINE	T IO-System (100): PN/IE_1  ▶ SortingStation01	_ # #×
	📲 Topology view 📠 Network view 🔢 De	evice view
SortingStation01 V V V Contraction01 V V V Contraction01 V V V Contraction01 V V V Contraction01 V V V V V V V V V V V V V V V V V V V	±	

→ Find the correct digital input module with the matching order number and version in the hardware catalog. Insert the digital input module into slot 1. (→Hardware Catalog → DI → DI 8x24VDC HF → 6ES7 131-6BF00-0CA0 → Version: V1.2)



#### Notes:

When you double-click a module in the hardware catalog, you insert it automatically at the next available compatible slot .Insert a digital input module of the same type into slot 2

If you do not use a slot, you must close the gap before you compile. Otherwise, an error message occurs.

#### 7.10 Insert the 2 digital output modules DQ 8x24VDC/0.5A HF

→ Find the correct digital output module with the matching order number and version in the hardware catalog. Insert two digital output modules into slots 3 and 4. (→ Hardware catalog  $\rightarrow$  DQ  $\rightarrow$  DQ 8x24VDC/0.5A HF  $\rightarrow$  (6ES7 132-6BF00-0CA0)  $\rightarrow$  Version: V1.2)



#### 7.11 Replace components in the hardware configuration

→ If it becomes necessary to replace a component in the hardware configuration with a newer version or a different type, this can be done by right-clicking the component and selecting "Change device". The new replacement component can be selected in the displayed dialog and the selection can be applied with "OK". (→ Change device → OK)



**Note:** If the new component is not displayed for selection, it is not compatible with the previous component. In this case, the old component must be deleted and the new component must then be inserted from the hardware catalog.

#### 7.12 Insert the server module

- $\rightarrow\,$  Find the correct server module with matching order number and version in the hardware catalog. Insert the server module into slot 5.
  - $(\rightarrow$  Hardware Catalog  $\rightarrow$  Server module  $\rightarrow$  6ES7 193-6PA00-0AA0  $\rightarrow$  Version: V1.0)



**Note:** If you forget the server module, it is automatically created when the device configuration is compiled.

## 7.13 Configure the address areas DI/DQ: 0...1

→ The next step is to check the address areas of the inputs and output cards and adapt them if necessary. Inputs and outputs (DI/DQ) should have an address area of 0...1.



 $(\rightarrow \text{Device overview} \rightarrow \text{DI} \rightarrow \text{I} \text{ addresses: } 0/1 \rightarrow \text{DQ} \rightarrow \text{O} \text{ addresses: } 0/1)$ 

**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.



### 7.14 Configuration of the potential groups of the Base Units

→ To change the potential group of a Base Unit, select the associated module and open the Potential group section in the general properties.

(Slot 2  $\rightarrow$  Properties  $\rightarrow$  General  $\rightarrow$  Potential group)



→ Select the "Enable new potential group (light BaseUnit)" option.

Potential group	
	O Use potential group of the left module (dark BaseUnit)
	<ul> <li>Enable new potential group (light BaseUnit)</li> </ul>



 $\rightarrow$  The Base Unit now becomes light in the configuration.

→ Repeat these steps for slots 3 to 4 and compare the device configuration with the following figure.



#### 7.15 Save and compile the hardware configuration

 $\rightarrow$  Before you compile the configuration, you should save your project by clicking the

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

the  $\rightarrow$  "CPU\_1516F [CPU1516F-3 PN/DP]" folder and click the "Compile" icon  $\rightarrow$  🛅 .



**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.

	Ropertie	s 🗓 Info	i 🛛 🕻	Diagnostic	s 🗆 🗆 🗸 🗸
General 1 Cross-references	Compile				
Show all messages	•				
Compiling completed (errors: 0; warnings:	1)				
! Path	Description	Go to ?	Errors	Warnings	Time
▲ CPU_1516F		7	0	1	11:57:43 PM
🔥 🔻 Hardware configuration		7	0	1	11:57:43 PM
<ul> <li>\$71500/ET200MP station_1</li> </ul>		×	0	1	11:57:44 PM
🔥 🔻 Rail_O		×	0	1	11:57:44 PM
▲ CPU_1516F		×	0	1	11:57:44 PM
CPU_1516F		×	0	1	11:57:44 PM
L CPU_1516F	CPU_1516F does not contain a configured protection level	×			11:57:44 PM
Program blocks		7	0	0	11:57:47 PM
Solution (OB1)	Block was successfully compiled.	×			11:57:47 PM
<u>A</u>	Compiling completed (errors: 0; warnings: 1)				11:57:49 PM
<	III				>

**Note:** A warning appears here because no protection level has been configured. This warning can be ignored.

### 7.16 Assign device name to interface module IM 155-6PN HF

 $\rightarrow$  To obtain an overview of the assigned addresses within a project, you can click

the " 🚟 " icon in the "Network view".

 $(\rightarrow \text{Network view} \rightarrow \overset{\texttt{W}}{=} \text{Show addresses})$ 

Topology view      Network view     Device view	012_201_CPU1516F_ET2005F	PN → Devices & networks	_ # =×
Connections HAU connection W T D O		🖉 Topology view 🛛 🛔 Network view 📗	Device view
	Network Connections	II connection 🔽 🖽 🖽 🔍 🛨	
► Show address labels J_1516F.PROFINET IO-System (100)		► Show address labels	em (100) 🛕
CPU 1516F CPU 1516F       SortingStat         IM 155-6 PN       CPU_1516F         IP2.168.1.1       CPU_1516F.PROFIN         PN/IE_1: 192.168.0.1       2	CPU 1516F CPU 1516F	SortingStat IM 155-6 PN CPU_1516F PN/IE_1: 192.168.0.2	

→ In order for the controller, CPU1516F-3 PN/DP in this case, to find the assigned PROFINET devices in the network, the device name must be assigned to them. This is done by selecting the network connecting the devices in the "Network view" and clicking the "<sup>W</sup> icon.

( $ ightarrow$ evice name	e)
---------------------------	----

012_201_CPU1516F_ET20	OSP_PN ► Devices & networks _ 🗖	■×
	🛃 Topology view 📓 Network view 🛐 Device vi	ew
Network Connections	HMI connection 🔽 🖫 🗄 🔍 ±	
	Assign device name	
CPU 1516F CPU 1516F 192.168.1.1 PN/IE_1: 192.168.0.1 2	SortingStat IM 155-6 PN CPU_1516F PN/IE_1: 192.168.0.2	Network data
< III	▶ 100% ▼	2

**Note:** The IP addresses set in the project are assigned by the controller to the devices later when the communication connection is established.

→ Online access must be correctly set in the dialog for assignment of the PROFINET device names. Any device can then be selected individually and filtered by devices of the same type. If a new device is being connected for the first time, the list has to be updated again.
 ( → PROFINET device name: sortingstation01 → Type of PG/PC interface: PN/IE → PG/PC interface: here: Intel(R) Ethernet Connection I217-LM → Only show devices of the same type → Update list )

Assign PRO	FINET device	e name.					×			
			Configured	PROFIN	ET dev					
	_		PROFINET devic	e name:	sortingstation	01	•			
			Dev	ice type:	IM 155-6 PN HF					
			Online acces Type of the PG/PC in	SS nterface:	PN//E					
			PG/PC i	nterface:	Intel(R) Ethe	rnet Connection I217-LM	▼ 🖲 🖸			
Device filter										
			🛃 Only show	devices of t	he same type					
			Only show	devices wit	h bad paramete	r settings				
			Only show	devices with	hout names					
		Accessible devi	ces in the network:							
		IP address	MAC address	Device	PROFINET devi	ce name Status				
		192.168.0.2	28-63-36-42-82-1	ET2005P		🦺 No device r	name assigned			
_	<b></b>									
📄 Flash										
		٢					>			
						Update list	Assign name			
Online stat	us information: rch.completed	0 of 1 dovices we	vice forward							
G Sea	rch completed.	. 0 of 1 devices we	ere found.							
🕤 Sea	rch completed.	1 of 1 devices we	re found.				*			
<				1111			>			
							Close			

→ The correct device must be always be clearly determined by the MAC address printed on the device before the name is assigned. To check this, you can also have the LEDs on the device flash.

$(\rightarrow \square Flash LED \rightarrow$	Assign name
--	-------------

Accessible devic	Accessible devices in the network:									
IP address	MAC address	Device	PROFINET device	name		Status				
192.168.0.2	28-63-36-42-82-1	ET200SP			Δ	No device n	ame	e assig	ned	
<			1111							>
			[	Up	oda	te list		Ass	ign name	

→ Successful assignment of the PROFINET device name should be checked before closing the dialog. (→ Close))

Assign PROFINET device	e name.						×
		Configured	PROFIN	ET dev			
		PROFINET device name:		sortingstation01		•	
			Device type:		IM 155-6 PN HE		
		Online acce Type of the PG/PC i	SS nterface:	PN/IE			
		PG/PC i	nterface:	Intel(R) Ethernet Con	nection I217-LM		
		Device filter					
		🗹 Only show	he same type				
		Only show	devices with	h bad parameter setting	s		
		Only show	devices with	hout names			
	Accessible devi	ces in the network:					
	IP address	MAC address	Device	PROFINET device name	Status		
	192.168.0.2	28-63-36-42-82-1	1 ET200SP	sortingstation01	🥑 ОК		
Flash LED							
	<						>
					Update list	Assign name	
Online status information	:						
<ol> <li>Search completed.</li> </ol>	. 0 of 1 devices we	ere found.					^
<ol> <li>Search completed.</li> </ol>	. 0 of 1 devices we	ere found.					≡
Search completed.	. 1 of 1 devices we	ere found.					~
<						>	
						Close	

# 7.17 Download the hardware configuration to the device

 $\rightarrow$  To download your entire CPU, select the  $\rightarrow$  "CPU\_1516F [CPU1516F-3 PN/DP]" folder

and click the  $\blacksquare \rightarrow$  "Download to device" icon.

VA	Siemens - D:\00_TIA_Portal\012_201_CPU1516F_	200SP_PNI012_201_CPU1516F_ET200SP_PN	_ <b>_ ×</b>
P	roject Edit View Insert Online Options To	s Window Help	Totally Integrated Automation
	🆥 📑 🔚 Save project 昌 🐰 🛅 🗊 🗙 🍤 ± 🤆	Ł 🖥 🔃 🗗 🖳 🧖 Go online 🖉 Go offline 🍦 🖪 📭 🛠 🖃 🛄	PORTAL
	Project tree	● 012_2 <mark>Download to device</mark> 200SP_PN → Devices & networks ■ ■ i	🗙 Hardware catalog 🗊 🖩 🕨
	Devices	🖉 Topology view 👗 Network view 🛐 Device vie	W Options
	1×00	Network 11 Connection	
rks			X Catalog
	▼ 1 012 201 CPU1516E ET2005P PN		
E	Add new device		(Search> mt mt g
	Devices & networks	CPU 1516F SortingStat	Filter 💆
	▼ Im CPU 1516F [CPU 1516F-3 PN/DP]	CPU 1516F IM 155-6 PN	🖌 🕞 Controllers
evi	Device configuration	CPU_1516F	z 🕨 🛅 HMI
	Online & diagnostics		📲 🕨 🛅 PC systems 🔣
	Program blocks	PN/IE_1: 192.168.0.2	📑 📜 🕨 🚂 Drives & starters 🔤
	Technology objects	192.168.1.1 CPU_1516F.PROFIN	Network components
	<ul> <li>External source files</li> </ul>	PN/IE_1: 192.168.0.1	Detecting & Monitoring
	PLC tags		Distributed I/O
	<ul> <li>Description</li> <li>PLC data types</li> </ul>	-	Power Supplies
	<ul> <li>Watch and force tables</li> </ul>		Field devices
	🕨 📭 Online backups		Other field devices
	🕨 🌬 Traces	×	as as
	Program info	< m > 100% •	<u>ه</u>
	🕨 🕞 Device proxy data	Properties Diagnostics	▼
	PLC alarms		
	Text lists	General Cross-reterences Complie	[ij
	<ul> <li>Local modules</li> </ul>	Show all messages	At Information
	Distributed I/O		• Information
	Common data	! Message Go to ? Date	Device:
	Documentation settings	Scanning for devices completed for interface Intel(R) Ethernet Connection I217-LM. Found     2/21/20	16 ^
	Languages & resources	Scanning for devices on interface Intel(R) Ethernet Connection I217-LM was started. 2/21/20	16 =
	Imig Online access	Scanning for devices completed for interface Intel(R) Ethernet Connection I217-LM. Found 2/21/20	16
	Card Keader/USB memory	The parameters were transferred successfully. 2/21/20	16 🗸 🗸
	> Details view	K	> <
	🖣 Portal view 🔠 Overview 🧰 D	ices & ne 👽 The PRC	FINET device name "sortingstat

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

	Configured acces	s nodes of "CPU_1516F"					
	Device	Device type	Slot	Туре	Address	Subnet	
	CPU_1516F	CPU 1516F-3 PN/	1 X3	PROFIBUS	2		
		CPU 1516F-3 PN/	1 X1	PN/IE	192.168.0.1	PN/IE_1	
		CPU 1516F-3 PN/	1 X2	PN/IE	192.168.1.1		
		Type of the PG/PC inter	faco.	Plazes coloct			
		Type of the PG/PC inter	face:	Flease select			1
		PG/PC Inter	nace:			· · ·	
		Connection to interface/su	ibnet:			<b>T</b>	
		1st gate	eway:			-	
	Compatible devic	es in target subnet:			Show all compatin	ble devices	
	Compatible devic	es in target subnet: Device type	Type	A	ddress	Target devices	e
	Compatible devic	es in target subnet: Device type	Туре	A	ddress	Target devices	e
	Compatible devic	es in target subnet: Device type	Туре	A	ddress	Target devices	e
	Compatible devic	es in target subnet: Device type	Туре	A	ddress	Target devic	e
	Compatible devic	es in target subnet: Device type	Туре	A	ddress	Target devic	e
Flash LED	Compatible devic	es in target subnet: Device type	Туре	A	ddress	Target devic	e
Flash LED	Compatible devic	es in target subnet: Device type	Туре	A	show all compatie	Target devic	e
Flash LED	Compatible devic	es in target subnet: Device type	Туре	A	show all compatie	Target devic	e
Flash LED	Compatible devic Device	es in target subnet: Device type	Туре	A	show all compatie	Target devic	e
Flash LED	Compatible devic Device	es in target subnet: Device type	Туре	A	show all compatin	Target devices	e
Flash LED	Compatible devic Device on:	es in target subnet: Device type	Туре	A	show all compatin	Target devices	e
Flash LED	Compatible devic Device	es in target subnet: Device type	Туре	A	ddress	Target devices	e
$\rightarrow$  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	o device						×
	Configured access no	des of "CPU_1516F"					
	Device	Device type	Slot	Туре	Address	Subnet	
	CPU_1516F	CPU 1516F-3 PN/	1 X3	PROFIBUS	2		
		CPU 1516F-3 PN/	1 X1	PN/IE	192.168.0.1	PN/IE_1	
		CPU 1516F-3 PN/	1 X2	PN/IE	192.168.1.1		
	т	ype of the PG/PC inte	rface:	PN/IE		•	
		PG/PC inte	rface:	Please select		1 🐑	
	Conn	action to interface/su	boot.	-L PN/IE		i i i i i i i i i i i i i i i i i i i	
	Conn	ection to internace/st	ibriet:	PROFIBUS			
		1st gat	eway:	Automatic p	rotocol detection		
				TeleService			



	evice	Device type	Slot	Туре	Address	Subnet
C	PU_1516F	CPU 1516F-3 PN/	1 X3	PROFIBUS	2	
		CPU 1516F-3 PN/	1 X1	PN/IE	192.168.0.1	PN/IE_1
		CPU 1516F-3 PN/	1 X2	PN/IE	192.168.1.1	
	Ту	pe of the PG/PC inte	face:	PN/IE		-
		PG/PC inte	face:	💹 Intel(R) Ether	net Connection I217-LM	•
	Conne	ction to interface/su	bnet:	Please select		
		1st date	wav:	🔛 Intel(R) Ethe	met Connection I217-LM	
		121 901		Dell Wireless	1550 802.11ac	
	ompotible devices in t	arget subnet:		PLCSIM S7-1	200/57-1500	
C	Simpatible devices in i					
C i	evice	Device type	Туре	Ac	Idress	Target device
	evice	Device type	Туре	Ac	ldress	Target device
C C	evice	Device type	Туре	Ac	Idress	Target device

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

Extended d	ownload to device					>
	Configured acce	ess nodes of "CPU_1516F"				
	Device	Device type	Slot	Туре	Address	Subnet
	CPU_1516F	CPU 1516F-3 PN/	1 X3	PROFIBUS	2	
		CPU 1516F-3 PN/	1 X1	PN/IE	192.168.0.1	PN/IE_1
	_	CPU 1516F-3 PN/	1 X2	PN/IE	192.168.1.1	
		Type of the PG/PC inte	rface:	PN/IE		•
		PG/PC inte	rface:	💹 Intel(R) Ethe	rnet Connection I217-LI	M 💌 🖲
		Connection to interface/su	bnet:	PN/IE_1		- 🖲
		1st gate	eway:	Please select Direct at slot ' Direct at slot '	1 X1' 1 X2'	۲
	Compatible dev	ices in target subnet:		Try all interfac	es	

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

Extended dov	wnload to	o device						×
		Configured access node	s of "CPU_1516F"					
		Device	Device type	Slot	Туре	Address	Subnet	
		CPU_1516F	CPU 1516F-3 PN/	1 X3	PROFIBUS	2		
			CPU 1516F-3 PN/	1 X1	PN/IE	192.168.0.1	PN/IE_1	
			CPU 1516F-3 PN/	1 X2	PN/IE	192.168.1.1		
		Type of the PG/PC interface:						
			PG/PC inter	face:	Intel(R) Et	hernet Connection I217-LI	M	و ج
		Connee	ction to interface/sul	bnet:	PN/IE_1			•
			1st gate	way:				۲
		Connectible devices in t				Show all compatib	le devices	
		Compatible devices in a	arget subnet:	<b>T</b>		Address	Terret de lier	
				PN/IE		Access address		
*E								
	_							
📄 Flash LED								
							<u>S</u> tart se	arch
Online status in	nformation:						Start	search
Display on	ly error me	ssages						
						Load	<u>C</u> an	cel

→ If your CPU is shown in the "Compatible devices in target subnet" list, it must be selected and the download started.

	Configured acces	s nodes of "CPU_1516F"						
	Device	Device type S	Slot	Туре	Address	Sub	net	
	CPU_1516F	CPU 1516F-3 PN/ 1	1 X3	PROFIBUS	2			
		CPU 1516F-3 PN/ 1	1 X1	PN/IE	192.168.0.1	PN	/IE_1	
		CPU 1516F-3 PN/ 1	1 X2	PN/IE	192.168.1.1			
		Type of the PG/PC interf	ace:	PN/IE			-	ļ
		PG/PC interf	ace:	Intel(R) Ether	net Connection I217-	-LM	-	) 🦲
	(	Connection to interface/sub	onet:	PN/IE_1			-	۲
	Compatible device	1st gatev es in target subnet:	way:		Show all compat	tible device:	5	)
	Compatible device	1st gatev es in target subnet:	way:		Show all compations	tible device:	5	) 💽
	Compatible device Device PLC 1500	1st gatev es in target subnet: Device type CPU 1516F-3 PN/	Type	Ac	Show all compations	tible device: Target	s devic	)
	Compatible device Device PLC_1500	es in target subnet: Device type CPU 1516F-3 PN/ 	Type PN/IE PN/IE	Ac	Show all compar Idress 22.168.0.1 :cess address	tible devices Target PLC_1	s devic	) ()
	Compatible device Device PLC_1500	1st gatev es in target subnet: Device type CPU 1516F-3 PN/ 	Type PN/IE PN/IE	Ac	Show all compar Idress 22.168.0.1 ccess address	tible device: Target PLC_1: 	devic	) 💽
	Compatible devic Device PLC_1500 	es in target subnet: Device type CPU 1516F-3 PN/ 	Type PN/IE PN/IE	Ac 15 Ac	Show all compar Idress 22.168.0.1 :cess address	tible device: Target PLC_1: 	s devic	) 🤅
	Compatible devic Device PLC_1500 	1st gatev es in target subnet: Device type CPU 1516F-3 PN/ 	Type PN/IE PN/IE	Ac	Show all compar Idress 22.168.0.1 ccess address	tible device: Target PLC_1: 	s devic	( ( ( ( ( ( ( ( ( ( ( ( ( ( ( ( ( ( (
Flash LED	Compatible device Device PLC_1500 	1st gatev es in target subnet: Device type CPU 1516F-3 PN/ 	Type PN/IE PN/IE	Ac 15 Ac	Show all compared by the second secon	tible device: Target PLC_1: 	devic	
Flash LED	Compatible devic Device PLC_1500 	1st gatev es in target subnet: Device type CPU 1516F-3 PN/ 	Type PN/IE PN/IE	Ac	Show all compations Idress 22.168.0.1 ccess address	tible device: Target PLC_1:	v 5 devic 500	
Flash LED	Compatible device Device PLC_1500 	es in target subnet: Device type CPU 1516F-3 PN/ 	Type PN/IE PN/IE	Ac	Show all compatient of the second sec	tible device: Target PLC_1: 	devic 500	e sear
Flash LED	Compatible devic Device PLC_1500 	1st gatev es in target subnet: Device type CPU 1516F-3 PN/ 	Type PN/IE PN/IE	Ac	Show all compations Show all compations 22.168.0.1 ccess address	tible device: Target PLC_1: 	devic 500	e sea
Flash LED	Compatible devic Device PLC_1500 	es in target subnet: Device type CPU 1516F-3 PN/ 	Type PN/IE PN/IE	Ac	Show all compations Show all compations 22.168.0.1 ccess address	tible device: Target PLC_1: 	devic 500	e sear
Flash LED	Compatible devic Device PLC_1500 	es in target subnet: Device type CPU 1516F-3 PN/ 	Type PN/IE PN/IE	Ac	Show all compations Show all compations 22.168.0.1 ccess address	tible device: Target PLC_1: 	s devic 500	e sear
Flash LED ine status informatic Retrieving device i Scan and informati	Compatible device PLC_1500 PLC	es in target subnet: Device type CPU 1516F-3 PN/ 	Type PN/IE PN/IE	Ac	Show all compation of the second seco	tible device: Target PLC_1: 	devic	e sea

 $\rightarrow~$  You first obtain a preview. Confirm the prompt  $\rightarrow$  "Overwrite all" and continue

Load pr	eviev Check	w before loading		×
Status	1	Target	Message	Action
ŧ	<b>%</b>	▼ CPU_1516F	Ready for loading.	
	▲	<ul> <li>Protection</li> </ul>	Protection against unauthorized access	
	4		Devices connected to an enterprise network or directly to the internet must be appropriately protected against unauthorized access, e.g. by use of firewalls and network segmentation. For more information about industrial security, please visit http://www.siemens.com/industrialsecurity	
	0	Software	Download software to device	Consistent download
	-			
	0	Text libraries	Download all alarm texts and text list texts	Consistent download
				Refresh
			Finish	Load Cancel

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

with  $\rightarrow$  Load.

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

atus	1	Target	Message	Action
ή.	<u> </u>	<ul> <li>CPU_1516F</li> </ul>	Downloading to device completed without error.	
	▲	<ul> <li>Start modules</li> </ul>	Start modules after downloading to device.	Start all
	1		The module "CPU_1516F" can be started.	🗹 Start

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

Project Edit View Insert Online Options Tools Window Help Totally Integra	
🔮 💁 🔂 Save project 🚇 🐰 🕲 🖆 🗶 🏷 🗄 🔃 🏠 🔛 🔛 🔛 🖉 Go online 🖉 Go offline	ted Automation
	PORTAL
Project tree	e catalog 📑 🗉 🕨
Devices Topology view 🔥 Network view 🕅 Device view Options	
	E 🗌
	ng d
• 1012 201 CPU1516F ET2005P PN	
Percent and the second and the secon	mt m 8
Devices & networks     CPU 1516F     SortingStat     Vision	
2 • GCPU_1516F [CPU 1516F-3 PN/DP]	trollers
Device configuration	
S Online & diagnostics	us & starters
PN/IE 1 PN/IE 1 PN/IE 1 PN/IE 1	work components
PN/F 1: 192 168 0 1	ecting & Monitoring
Implicit the second sec	tributed I/O
	er Supplies
Watch and spres	d devices
	er field devices 🛛 🗐
	Ta:
Program info	ks
Device proxy data	
PLC alarms     Show all messages	
Text lists	E
Local modules	a
Distributed I/O     CPU 1516E     CPU 1	mation
Val Common data	<u>^</u>
Hardware configuration was loaded successfully. 2/21/2016 1:20:25 AM	=
Connection configuration was downloaded successfully. 2/21/2016 1:20:25 AM	
Routing configuration was loaded successfully. 2/21/2016 1:20:25 AM	
CPU_1516F started. 2/21/2016 1:22:12 AM	
Vain' was loaded successfully.         2/21/2016         1:20:24 AM	
Details view     Coading completed (errors: 0; warnings: 0).     2/21/2016     1:22:12 AM	

#### 7.18 Archive the project

 $\rightarrow$  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 p	project (0104:000006)	×
	Save project? The last saved project will be archived. Do you want to save the project before archiving to back up the current changes?	
	Yes No	

→ Select a folder where you want to archive your project and save it as a "TIA Portal project archive" file type.

( $\rightarrow$  "TIA Portal project archive"  $\rightarrow$  "SCE\_EN\_012-201\_Decentral Hardware Configuration S7-1500 ET 200SP PN\_..."  $\rightarrow$  "Save")

## 7.19 Checklist

No.	Description	Completed
1	Project was created	
2	Slot 0: Power module with correct order number	
3	Slot 1: CPU with correct order number	
4	Slot 1: CPU with correct firmware version	
5	IM of the ET 200SP created as distributed IO	
6	CPU and IM connected to the same subnet	
7	IM is assigned to the CPU	
8	ET 200SP slot 12: Digital input module with correct order number	
9	ET 200SP slot 12: Digital input module with correct firmware version	
10	ET 200SP slot 12: Address area of the digital input module is correct	
11	ET 200SP slot 34: Digital output module with correct order number	
12	ET 200SP slot 34: Digital output module with correct firmware version	
13	ET 200SP slot 34: Address area of the digital output module is correct	
14	ET 200SP slot 5: Server module with correct order number	
15	ET 200SP slot 5: Server module with correct firmware version	
16	ET 200SP modules have all the correct potential groups set for the	
	Base Units	
17	Hardware configuration was compiled without error message	
18	Hardware configuration was downloaded without error message	
19	Project was successfully archived	

## 8 Exercise

#### 8.1 Task – Exercise

The hardware configuration is to be expanded to include the trainer package SIMATIC ET 200SP Analogy Modules Expansion. Insert the modules that are still missing. In so doing, select slots 5 and 6 for the analog input modules and slot 7 for the analog output module. The server module is moved to slot 8 Use the address area starting from 64 for the analog modules.

- 2X AI 2XU/I 2-/4-WIRE HS (order number: 6ES7134-6HB00-0DA1)
- 1X AQ 2XU/I HS (order number: 6ES7135-6HB00-0DA1)

Module	Order number	Slot	Address area
AI 2xU/I 2-/4-wire HS	6ES7134-6HB00-0DA1	5	6467
AI 2xU/I 2-/4-wire HS	6ES7134-6HB00-0DA1	6	6871
AQ 2xU/I HS	6ES7135-6HB00-0DA1	7	6467

Table 1: Analog modules of the ET 200SP

#### 8.2 Planning

Plan the implementation of the task on your own.

## 8.3 Checklist – Exercise

No.	Description	Completed
1	ET 200SP slot 56: Analog input modules with correct order number	
2	ET 200SP slot 56: Analog input modules with correct firmware version	
3	ET 200SP slot 56: Address areas of the analog input modules are	
4	ET 200SP slot 7: Analog output module with correct order number	
5	ET 200SP slot 7: Analog output module with correct firmware version	
6	ET 200SP slot 7: Address area of the analog output module is correct	
7	ET 200SP slot 8: Server module	
8	ET 200SP modules have all the correct potential groups set for the	
	Base Units	
9	Hardware configuration was compiled without error message	
10	Hardware configuration was downloaded without error message	
11	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/s7-1500