SIEMENS Preparation Wiring SIMATIC Configuration 4 S7 300 Automation Systems CPU 317T-3PN/DP: Controlling a SINAMICS S120 Introduction Wiring 5 Configuration Frogramming 5

Special case - controlling a

virtual axis

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

DANGER

indicates that death or severe personal injury will result if proper precautions are not taken.

AWARNING

indicates that death or severe personal injury may result if proper precautions are not taken.

ACAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

AWARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

This Getting Started is a valuable help in getting started with the basic functions of a CPU 317T-3PN/DP, based on a practical example that takes you through thirteen steps in commissioning a fully functional application in which you execute a traverse motion.

It can take you between two and three hours to work through the example, depending on your degree of experience.

Requirement

Note

This Getting Started presumes that you have connected a SINAMICS S120 drive to the DP(DRIVE) interface of the CPU 317T-3PN/DP. You can also connect a different drive, the theoretical procedure remains the same.

If you use a different drive type, an additional software program can be required for the configuration and commissioning of the drive: For example, for SIMODRIVE 611U you additionally require the software SimoComU. Always take the associated technical information of the drive into account.

If a drive is not available, we recommend that you work with a virtual axis as described in chapter "Special case - controlling a virtual axis (Page 71)".

Validity

The manual is valid for the following components:

- CPU 317T-3PN/DP as of V3.2.9/4.1.5
- SINAMICS S120 as of V4.4
- S7 Technology as of V4.2 SP3

Note

You can also use the CPU 317T-3PN/DP instead of the CPU 315T-3PN/DP. To do this, select CPU 315T-3PN/DP in HW Config. Otherwise, the configuring steps are the same.

Preparation

2.1 Requirements

Requirements

The following requirements must be fulfilled:

- You have an S7-300 station, consisting of:
 - Power supply (PS), e.g., 6ES7307-1KA02-0AA0
 - CPU 317T-3PN/DP with MMC (8 MB or more),
 e.g., 6ES7317-7TK10-0AB0 V3.2/V4.1.5
 - Optional digital input module (DI) with bus connector, for example, 6ES7321-1BH02-0AA0
 - Optional digital output module (DO) with bus connector, for example, 6ES7322-1BH01-0AA0
 - Two optional front connectors for the digital modules
- The following software packages and commissioning tools are correctly installed on your programming device with Ethernet interface:
 - STEP 7 as of V5.5 SP2
 - S7 Technology as of V4.2 SP3
- The programming device is connected via Ethernet interface to the CPU:
 - Ethernet cable IE TP Cord RJ45/RJ45 TP cable 4 x 2 with 2 RJ45 plug-in connectors

0.5 m 6XV1 870-3QE50 1 m 6XV1 870-3QH10

2 m 6XV1 870-3QH20

6 m 6XV1 870-3QH60

10 m 6XV1 870-3QN10

- A SINAMICS S120 is connected to the CPU 317T-3PN/DP via the DP(DRIVE) interface.
 - PROFIBUS cable, e.g., 6ES7901-4BD00-0XA0

2.1 Requirements

- The SINAMICS S120 comprises the following modules:
 - CU320-2DP Control Unit (6SL3040-1MA00-0AA0) with TB30 Terminal Board (6SL3055-0AA00-2TA0)
 - Smart Line Module 5 kW (6SL3130-6AE15-0AB1)
 - Single/Double Motor Module 3 A (6SL3120-2TE13-0AA4)
 - 1 synchronous motor 1FK7022-5AK71-1AG3 with incremental encoder sin/cos 1 Vpp via SMC20 Sensor Module Cabinet (6SL3055-0AA00-5BA1)
 - 1 synchronous motor 1FK7022-5AK71-1LG3 with DRIVE-CLiQ interface: Absolute encoder EnDat 512 pulses/revolution
 - Reference loops for position monitoring
 - Control box for setpoint/actual-value linkage via terminals
- SINAMICS S120 has the factory settings.
- You know the firmware version of your SINAMICS S120.

If you do not know the firmware version, then you can find the version on the supplied certificate. Alternatively, you can open the "content.txt" file on the CF card. The firmware version is in the "Internal Version" entry. You can find more detailed information on reading the firmware version in the SINAMICS S120 product information.

Note

We have used a SINAMICS S120 training case as an example of a drive for this Getting Started. The training case is available under the following order number:

2-axis version with 1FK7 motors

6ZB2480-0CM00



- The configuration is completely installed and wired. For information, refer to *Getting Started CPU 31x: Commissioning*.
- You provided hardware limit switches and EMERGENCY-OFF switches for safe and reliable operation of the system.



Risk of accident

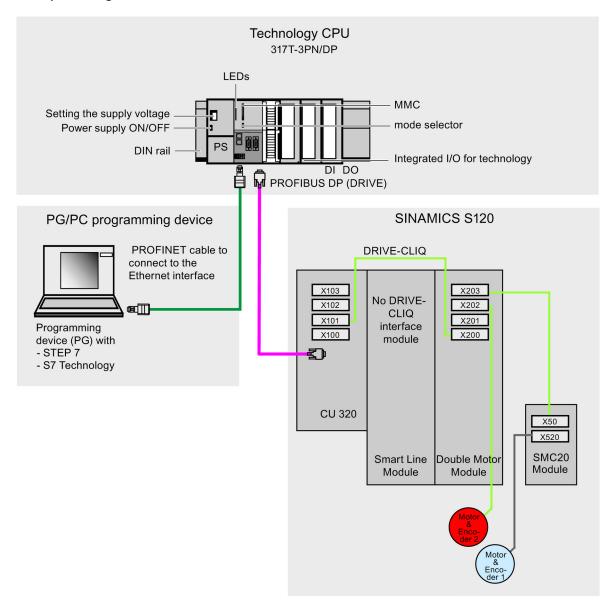
Operation of an S7-300 as part of plants or systems is subject to special rules and regulations, based on its field of application.

You risk severe injury, or damage to machines and equipment if you ignore these directives.

Please note the current safety regulations for the prevention of accidents, e.g. IEC 204 (EMERGENCY-OFF equipment).

2.2 Task

Example configuration



Task

Configuration of an axis using HW Config and S7T Config. You then operate this axis with the help of a STEP 7 user program.

The task is divided into the following learning units:

Step	Learning unit	Chapte r	Engineering tool
1	Wiring	3	
2	Creating a T station	4.1	SIMATIC Manager
			Station assistant
	Configuring CPU 317T-3PN/DP in HW Config		HW Config
	Configuring the DP(DRIVE)		HW Config
	Activating generation of the technology system data		HW Config
	Configuring a drive in HW Config		HW Config
	Configuring the PG/PC interface for access to		NetPro
	the drive		HW Config
3	Downloading the hardware configuration to the target hardware	4.2	HW Config
4	Configuring a SINAMICS drive in S7T Config	4.3	S7T Config
5	Configuring axes in S7T Config	4.4	S7T Config
6	Creating technology data blocks	5.1	Technology Objects Management
7	Controlling the axis with the STEP 7 user program	5.2	STEP 7
8	Trial run	6	

2.2 Task

Wiring

A WARNING

Live wires

You may come into contact with live wires when modules are connected to the power supply.

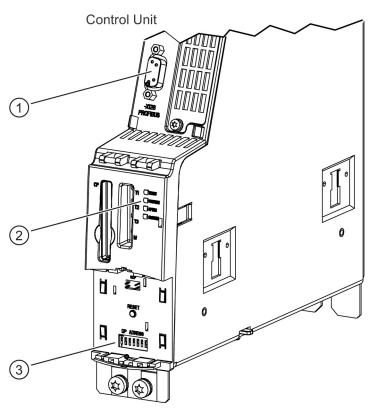
Always switch off power before you start wiring the S7-300. Connect only ferrules with insulating collar to the ends of the cable. When you have wired the modules, you must first close all front doors. Only then may you switch the devices back on.

Procedure

A description of the installation and wiring of your CPU 317T-3PN/DP is found in the *Getting Started Collection S7-300 PLC: CPU 31x: Commissioning.*

Setting the PROFIBUS address on the CU320-2DP

Set the PROFIBUS address of the SINAMICS to PROFIBUS address 4. You set the PROFIBUS address on the CU320-2DP directly on the lower rotary coding switch (L).



- 1 PROFIBUS interface
- ② PROFIBUS diagnostics LED "DP1"
- ③ PROFIBUS address switch

Configuration

4.1 Creating a T station

In the following chapters you will configure a CPU 317T-3PN/DP. To do this, you create a T station. You can create the T station with or without station wizard.

The station wizard helps you to carry out several steps when configuring a CPU 317T-3PN/DP in one work cycle.

The configuration "with station wizard" comprises the following steps:

- Creating a T station with station wizard
- Configuring digital input and digital output module
- Configuring a drive in HW Config

The configuration "without station wizard" comprises the following steps:

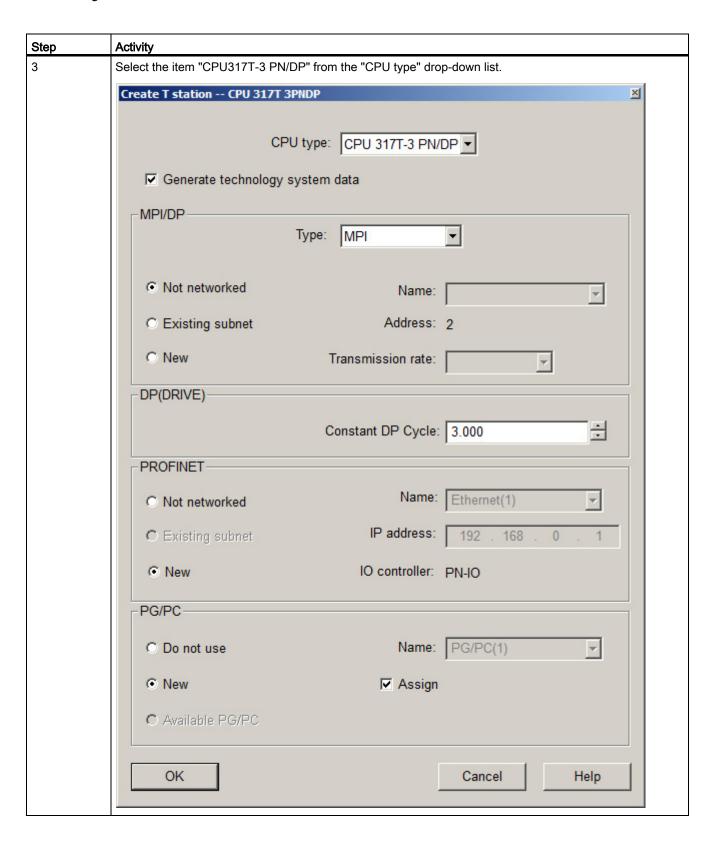
- Configuring CPU 317T-3PN/DP in HW Config
- · Activating generation of the technology system data
- · Configuring a drive in HW Config
- · Configuring the PG/PC interface for access to the drive
- Downloading the hardware configuration to the target hardware

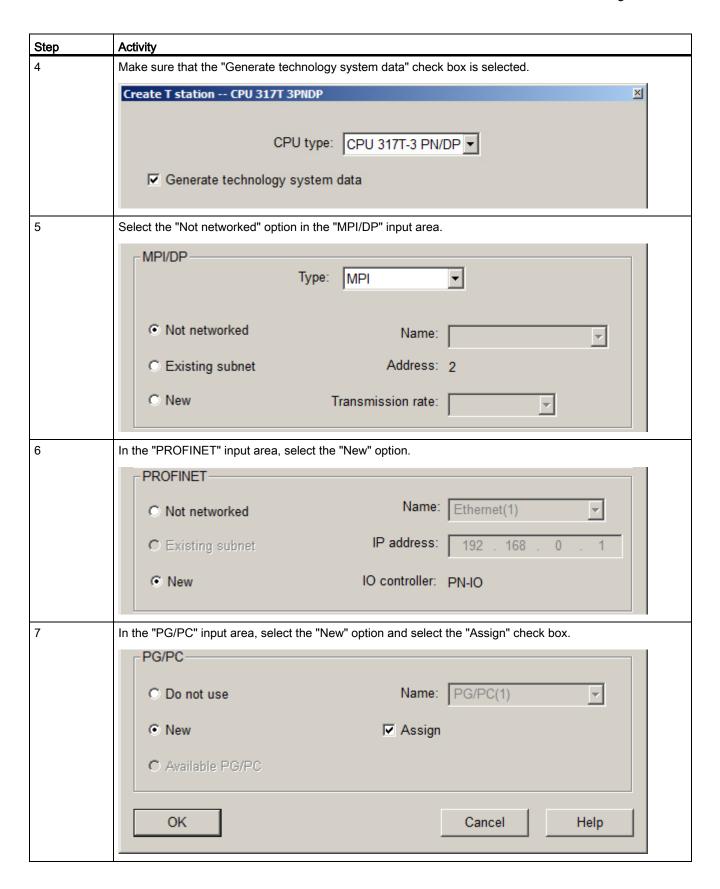
4.1.1 Creating a T station with station wizard

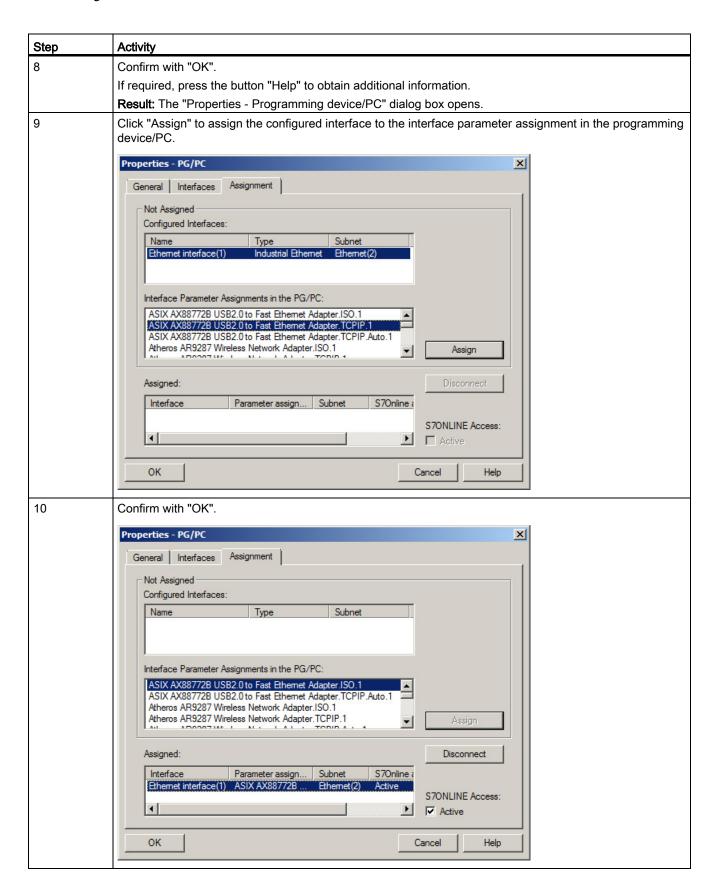
4.1.1.1 Creating a T station with station wizard

The station wizard helps you to carry out several steps when configuring a CPU 317T-3PN/DP in one work cycle.

Step	Activity	
1	Set up a new project in the SIMATIC Manager (for example, "GS_317T_3PN-DP_with_S120").	
2	Select the Insert > Station > SIMATIC T station menu command.	
	The "Set up T station" dialog box opens.	



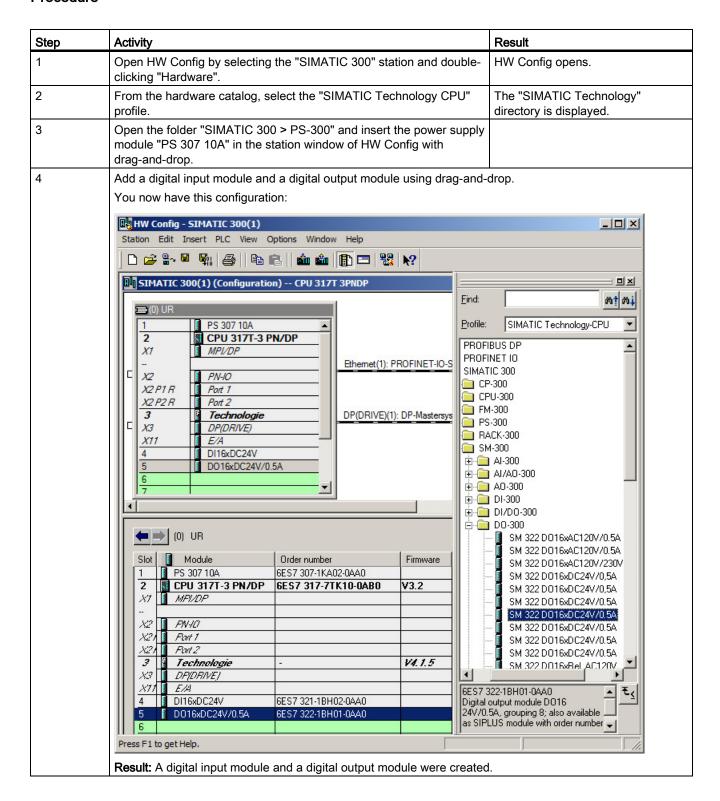




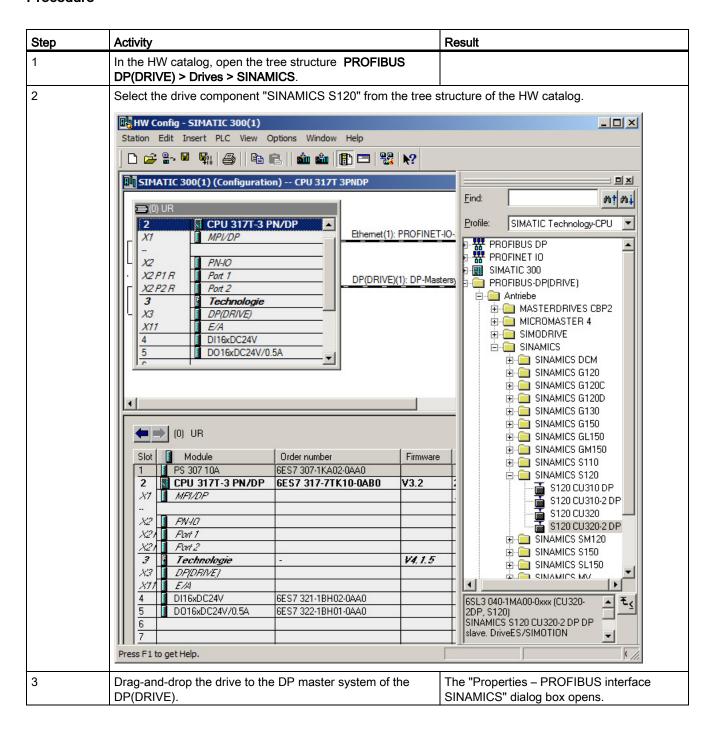
See also

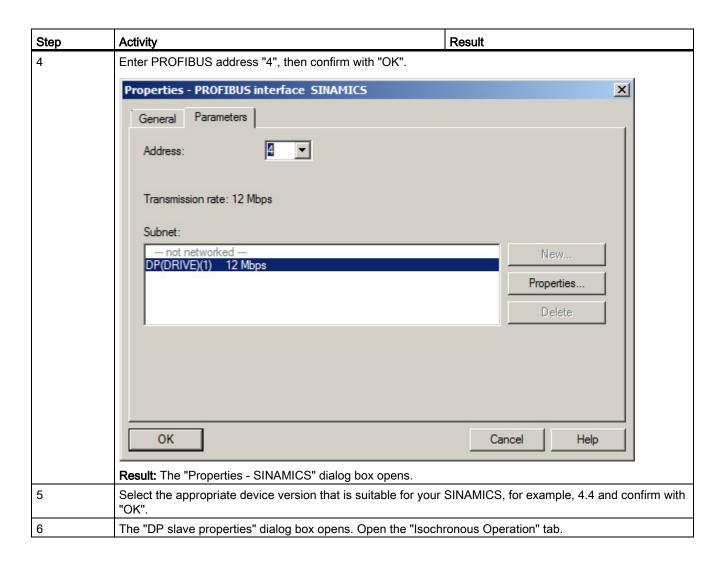
Configuring a drive in HW Config (Page 30)

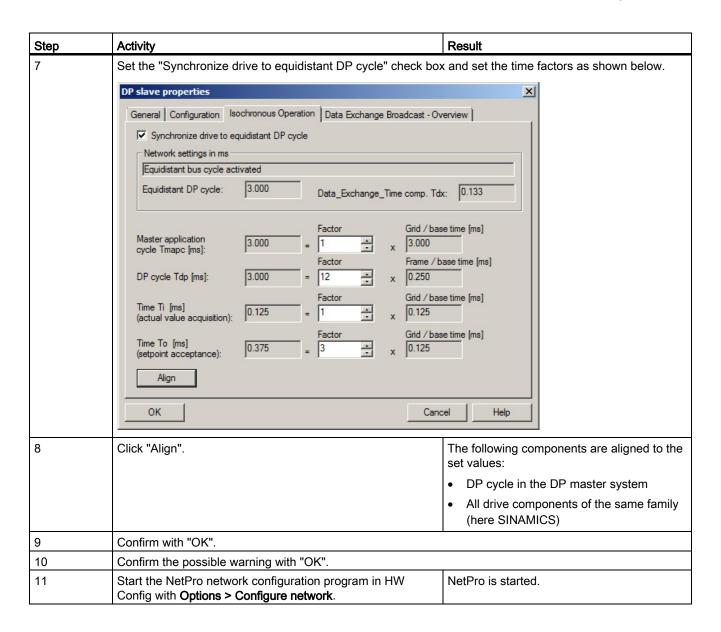
4.1.1.2 Configuring CPU 317T-3PN/DP in HW Config

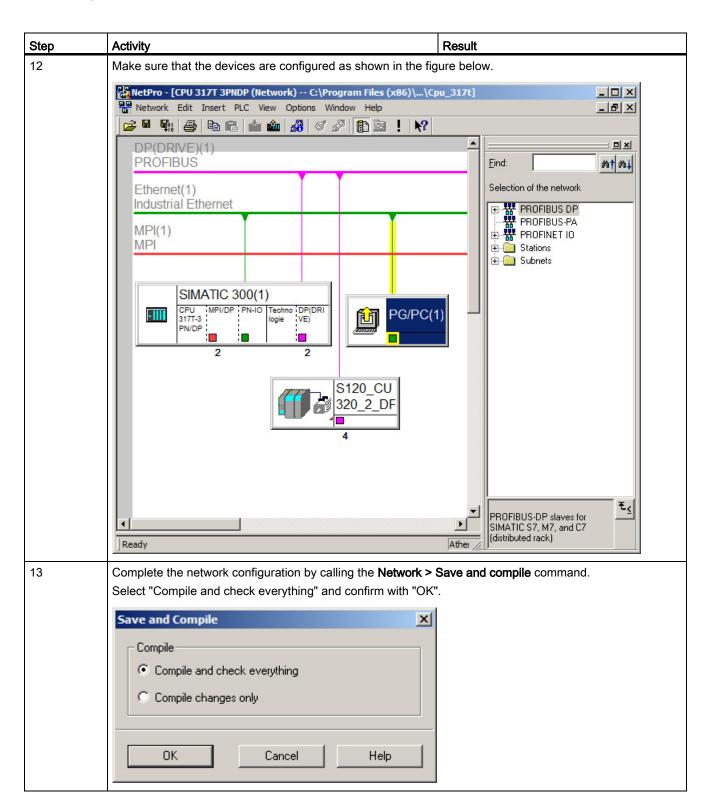


4.1.1.3 Configuring a drive in HW Config







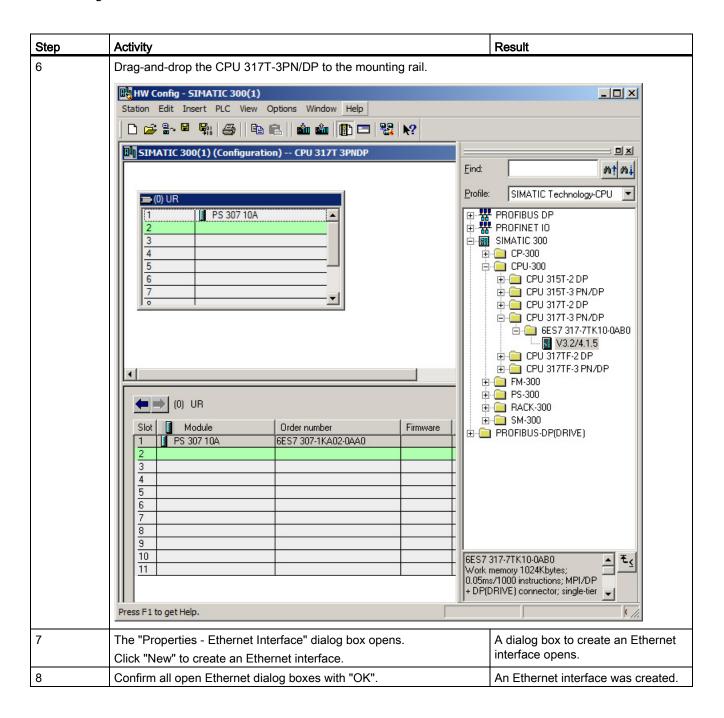


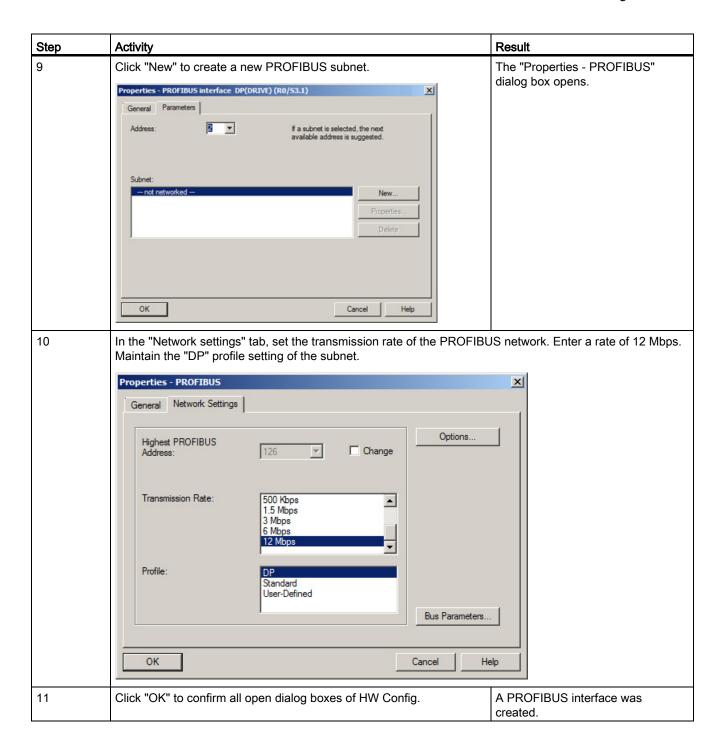
Step	Activity	Result
14	Close the output window with File > Close.	
15	Close the NetPro configuration program by calling the Network > Exit command.	
16	Finalize your HW configuration by calling the Station > Save and compile command.	The system compiles your project, and adds the "Technology Objects" object to the project window in SIMATIC Manager.

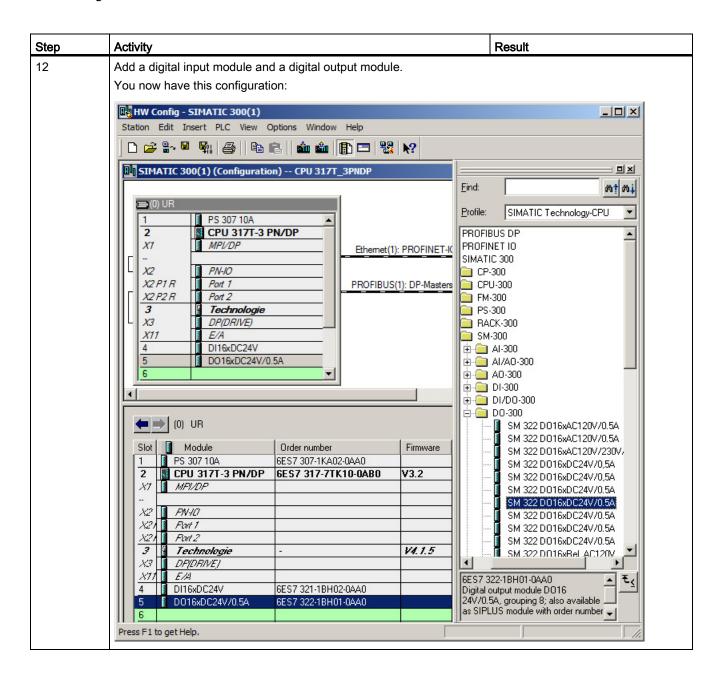
4.1.2 Creating a T station without station wizard

4.1.2.1 Configuring CPU 317T-3PN/DP in HW Config

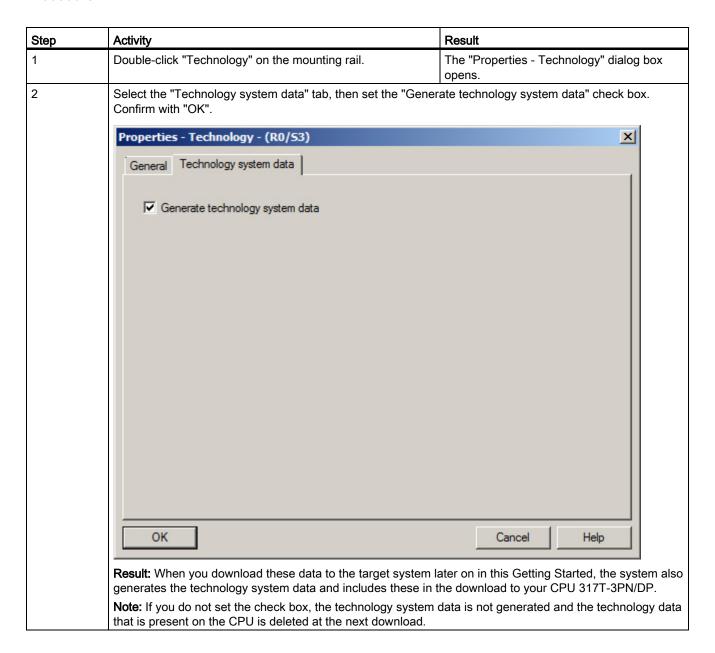
Step	Activity	Result
1	Create a new project in the SIMATIC Manager (for example, "GS_317T_3PN-DP_with_S120") and add a SIMATIC 300 station.	The SIMATIC 300 station is displayed in SIMATIC Manager.
2	Open HW Config by selecting the "SIMATIC 300" station and double-clicking "Hardware".	HW Config opens.
3	From the hardware catalog, select the "SIMATIC Technology CPU" profile.	The "SIMATIC Technology" directory is displayed.
4	Open the folder "SIMATIC 300 > RACK-300" and insert a mounting rail in the station window of HW Config with drag-and-drop.	This creates a mounting rail.
5	Drag-and-drop the "PS 307 10A" power supply module onto the mounting rail.	The power supply module appears on the mounting rail.



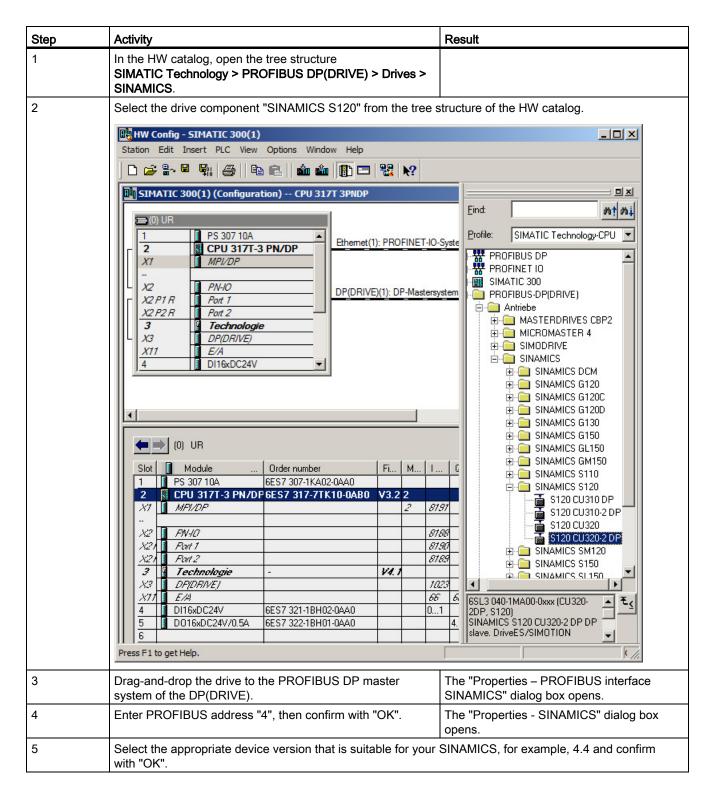


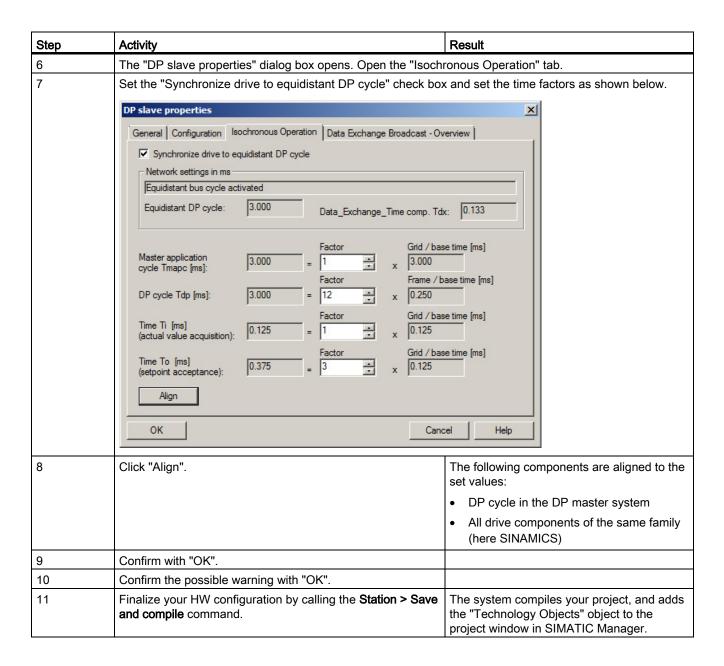


4.1.2.2 Activating generation of the technology system data

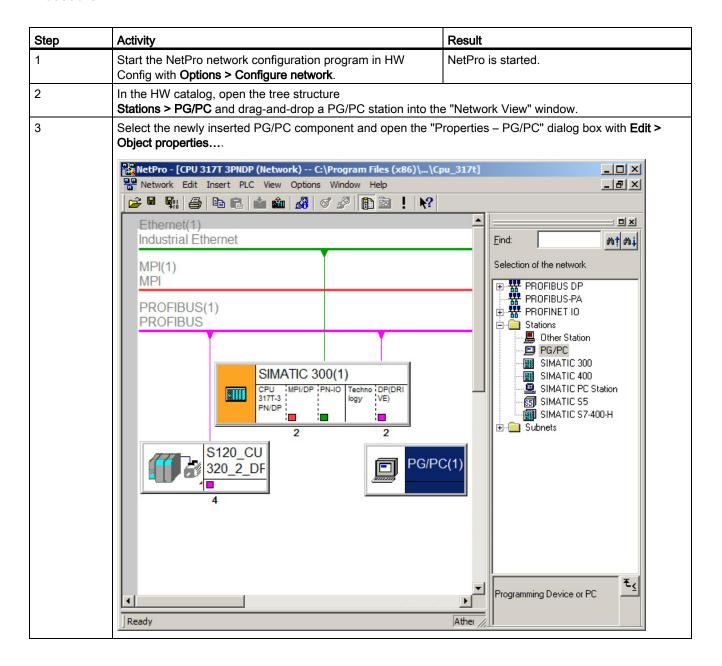


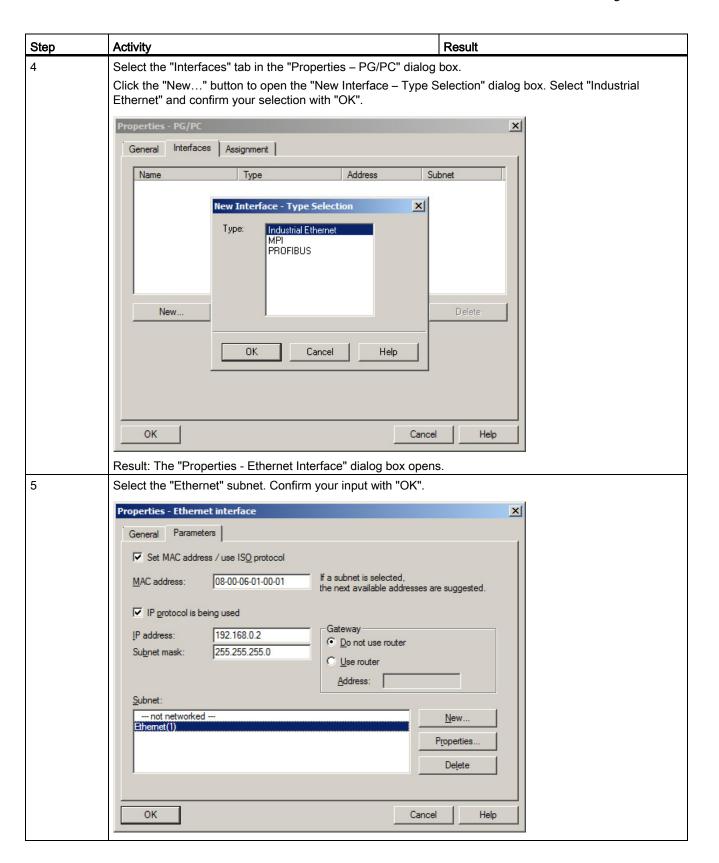
4.1.2.3 Configuring a drive in HW Config

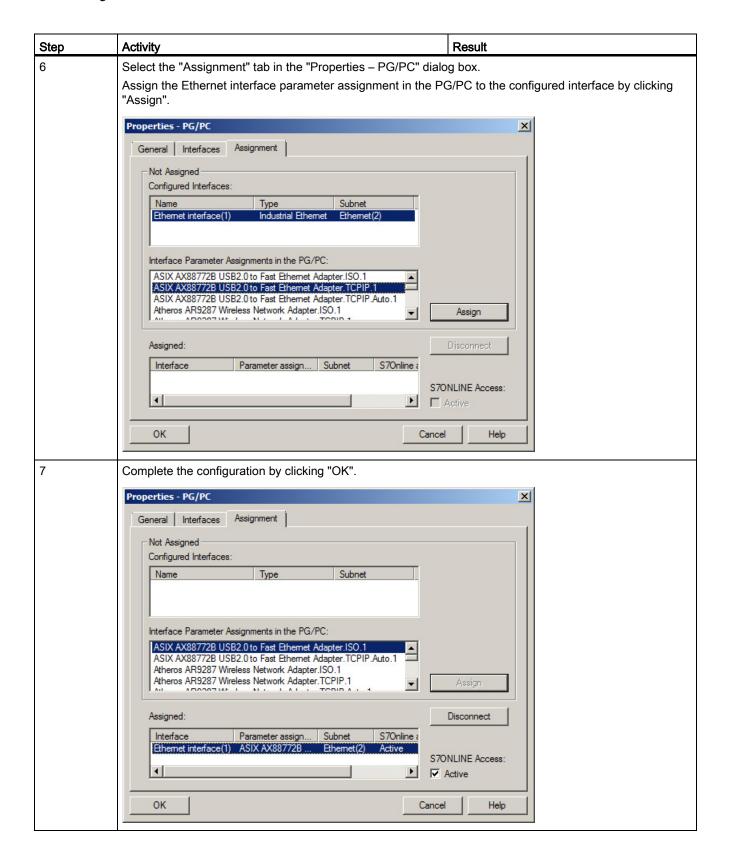


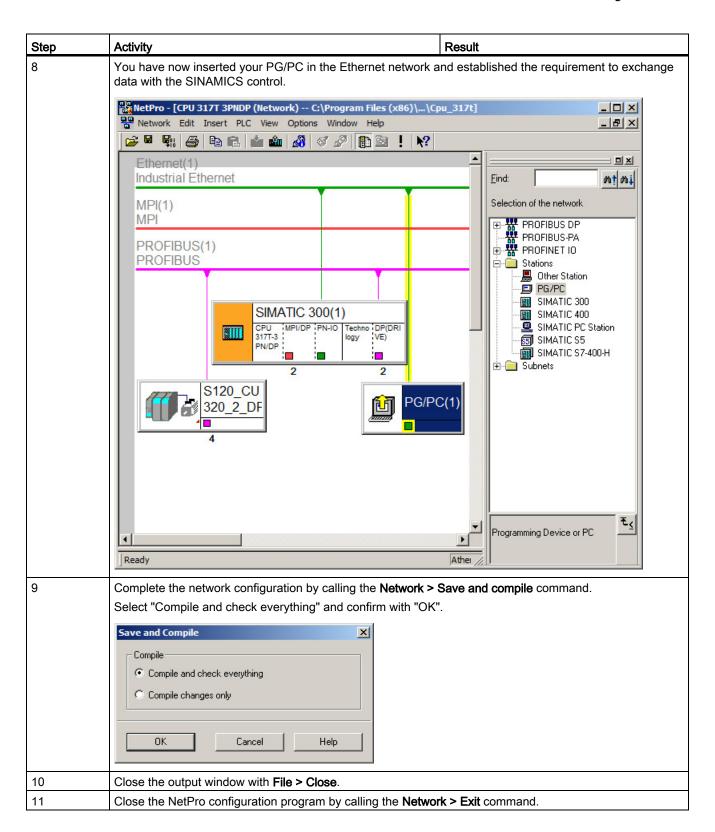


4.1.2.4 Configuring the PG/PC interface for access to the drive









4.2 Downloading the hardware configuration to the target hardware

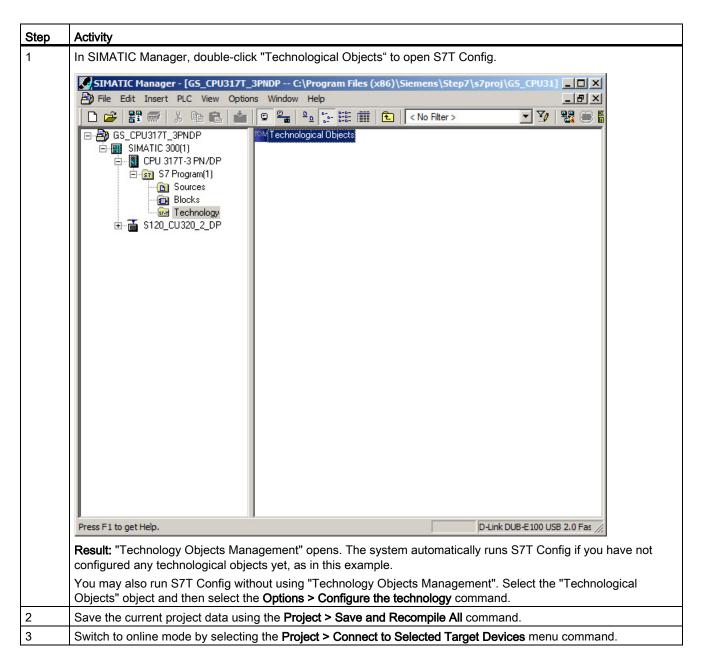
4.2 Downloading the hardware configuration to the target hardware

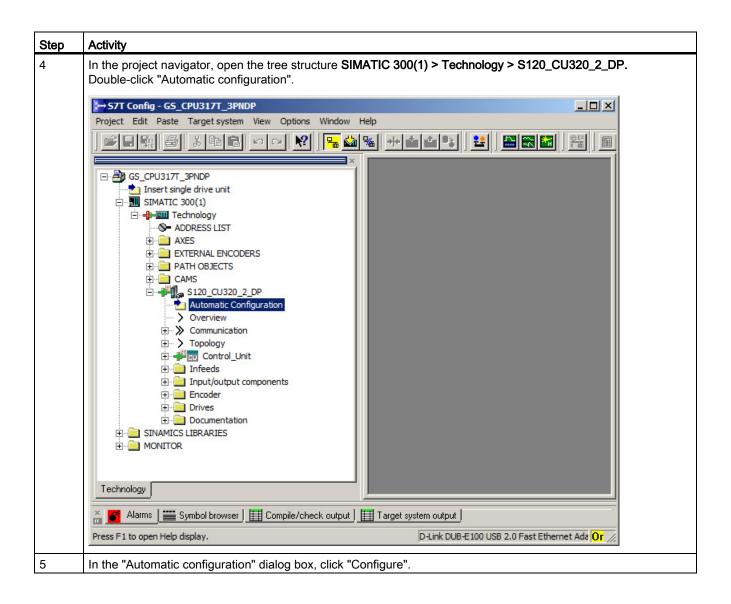
Step	Activity	
1	Switch back to HW Config.	
	Download the hardware configuration to the CPU using the menu command PLC > Download to Module.	
2	Exit HW Config with Station > Exit .	

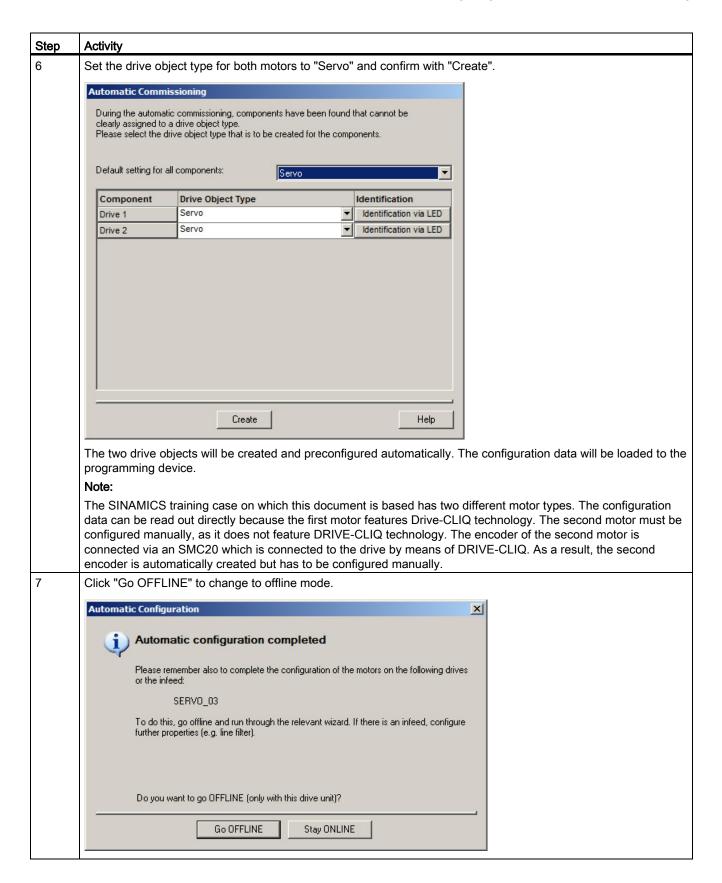
Basic procedure

- 1. Automatic online configuration of the drives
- 2. Offline configuration of the Servo 03 drive without complete DRIVE-CLIQ technology
- 3. Offline configuration of the Servo 02 drive with complete DRIVE-CLIQ technology

Automatic online configuration of the drives

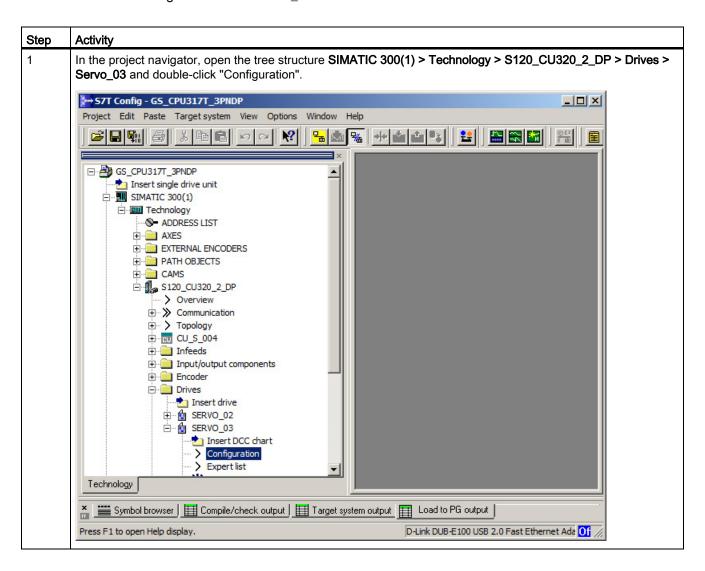


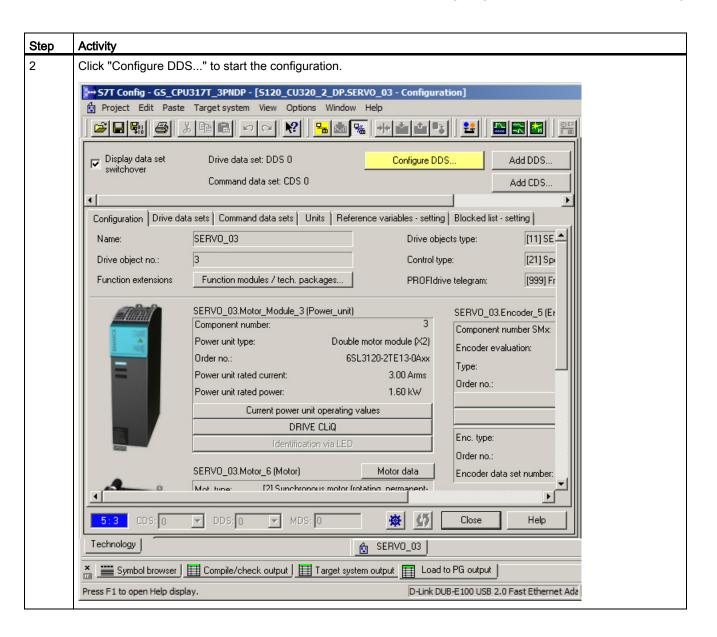


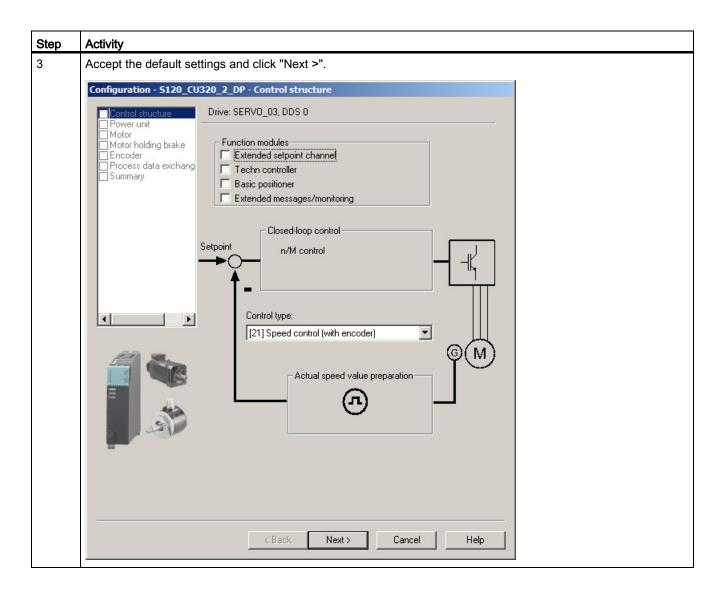


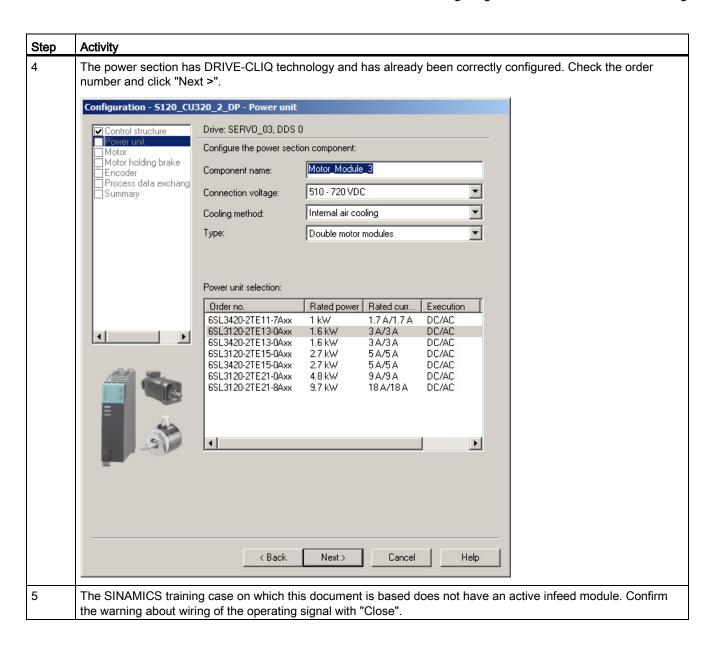
Offline configuration of the Servo 03 drive without complete DRIVE-CLIQ technology

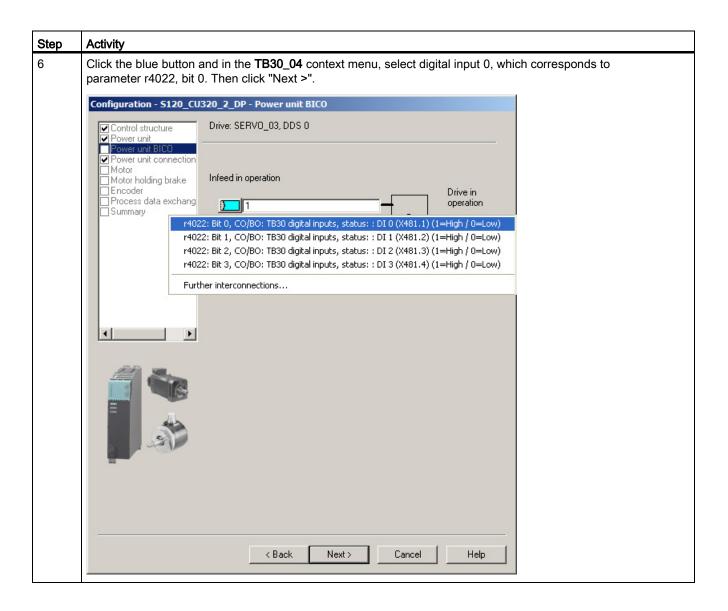
Configure the drive "Servo_03".

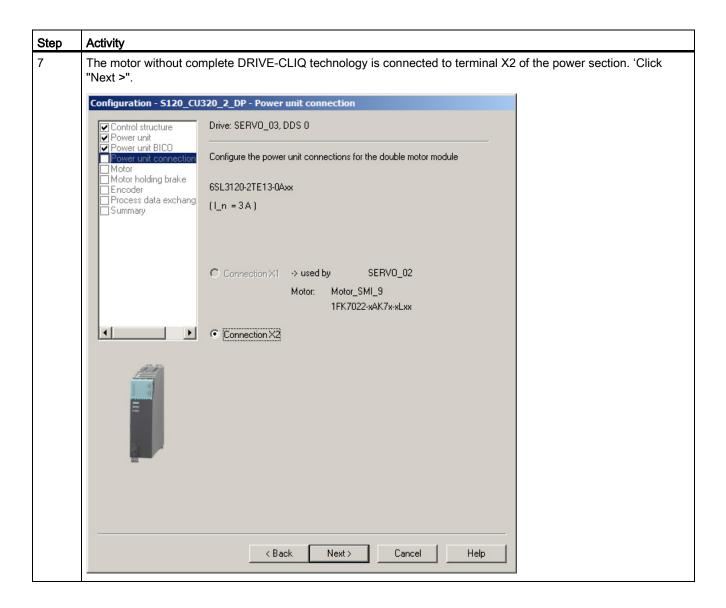


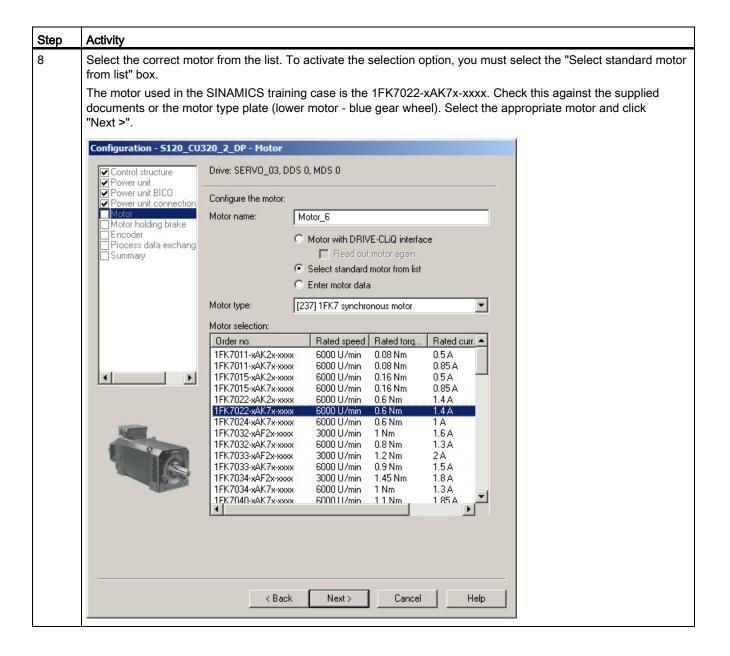


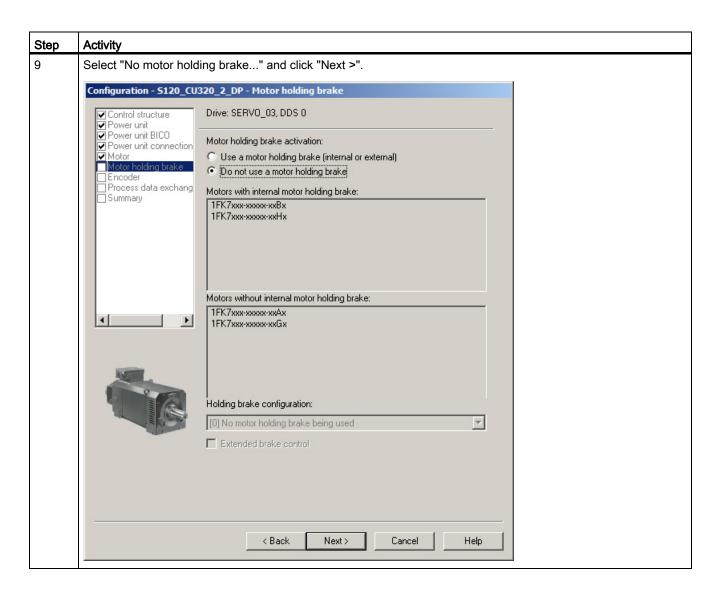


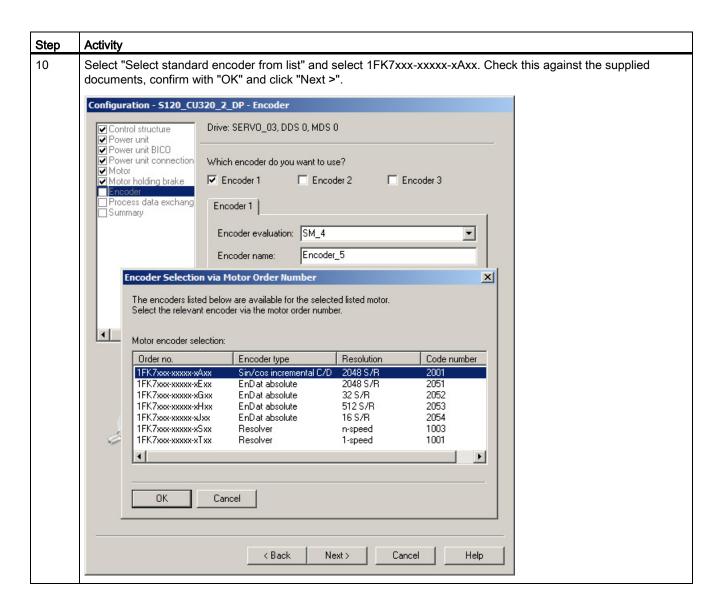


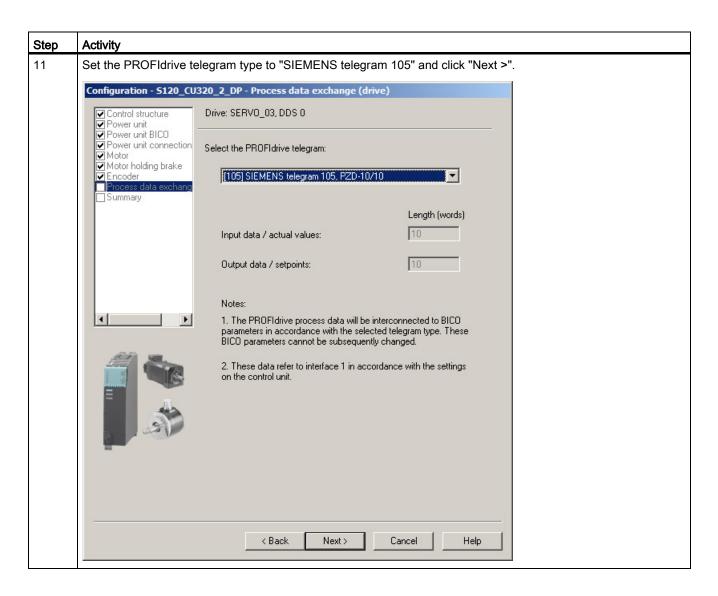


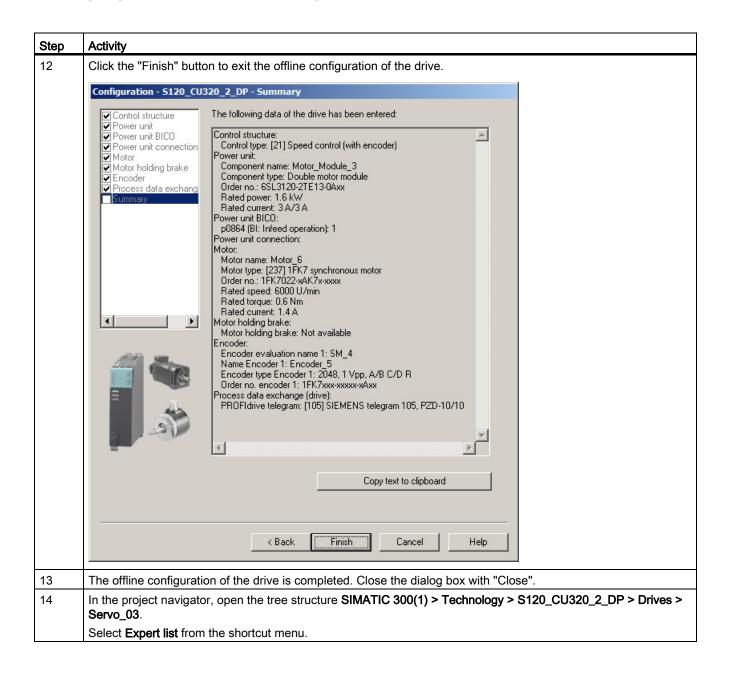


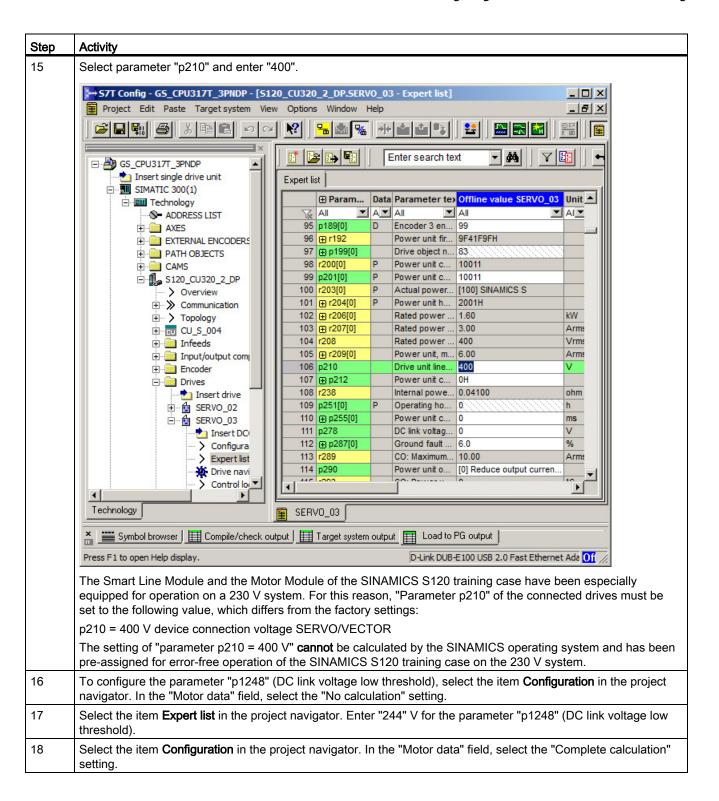






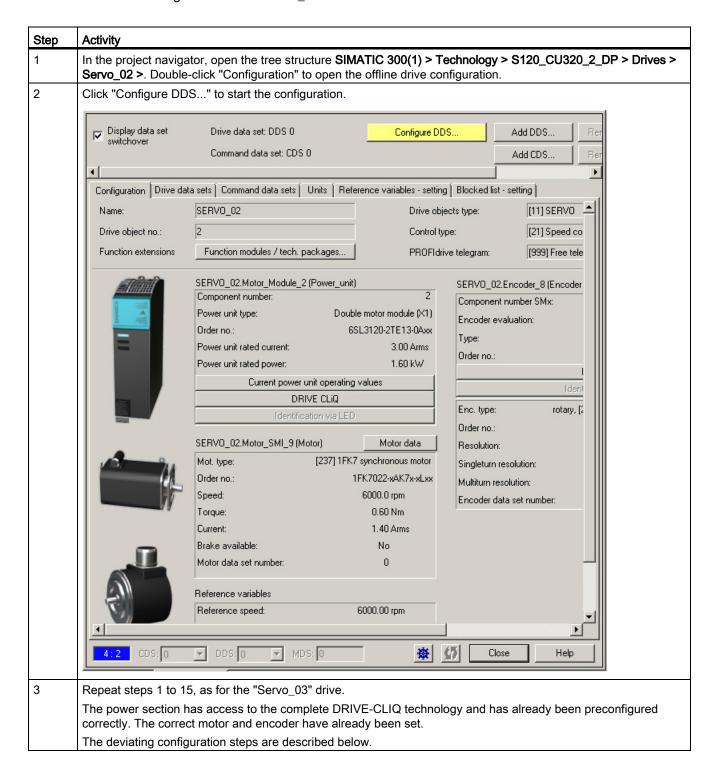


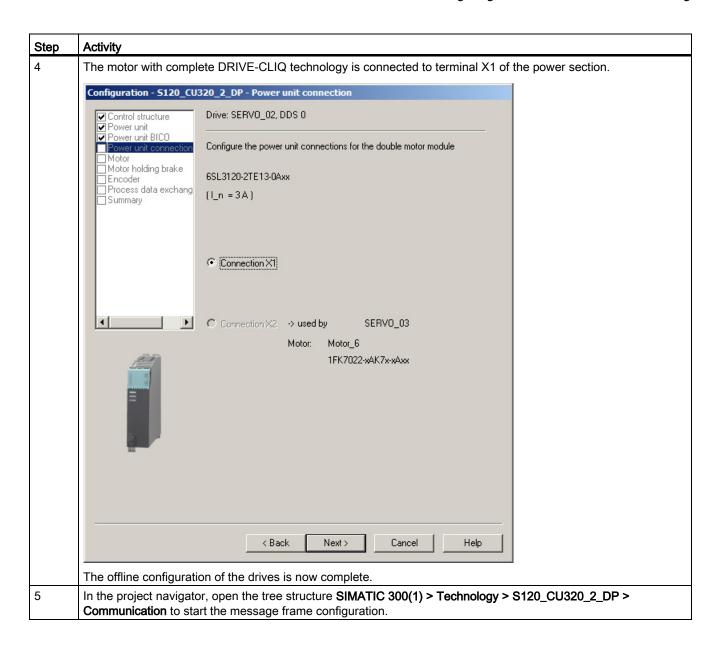


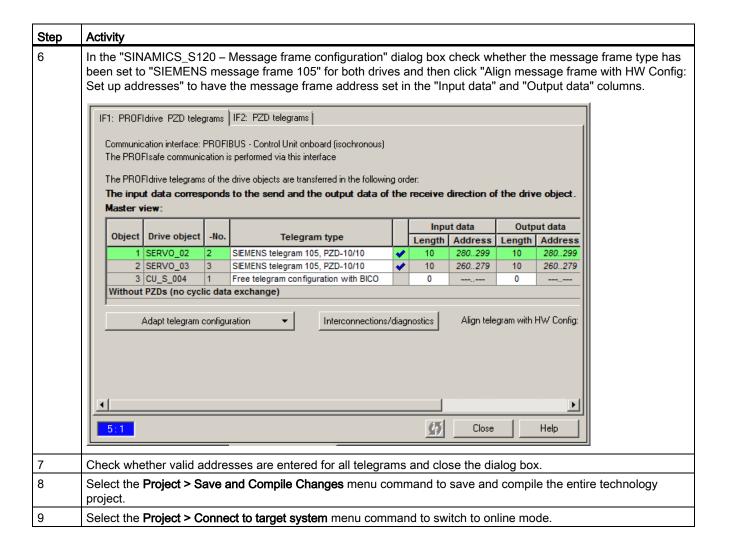


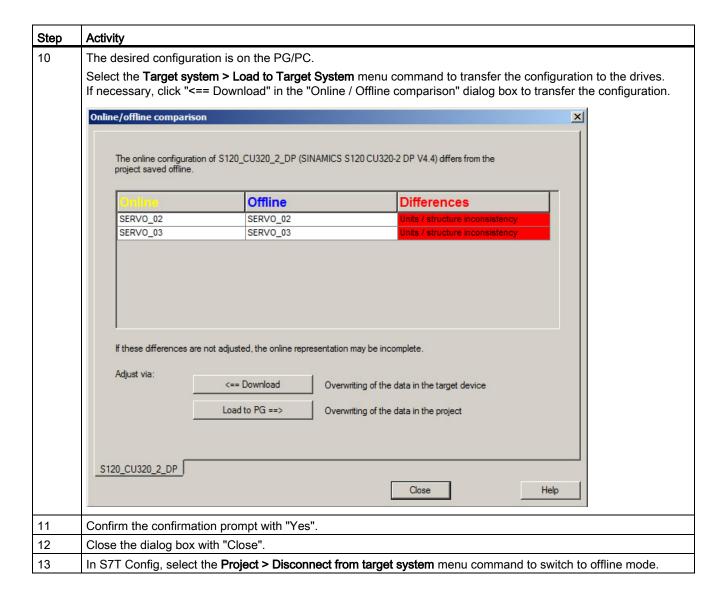
Offline configuration of the Servo 02 drive with complete DRIVE-CLIQ technology

Configure the drive "Servo_02".







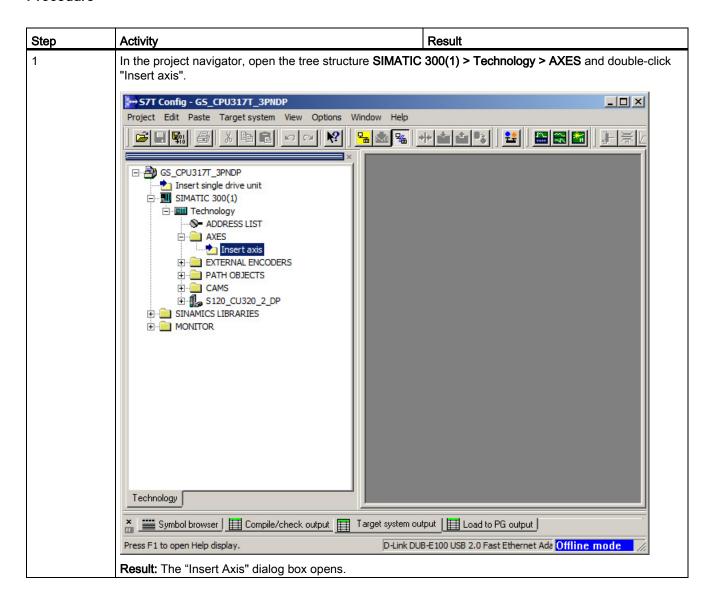


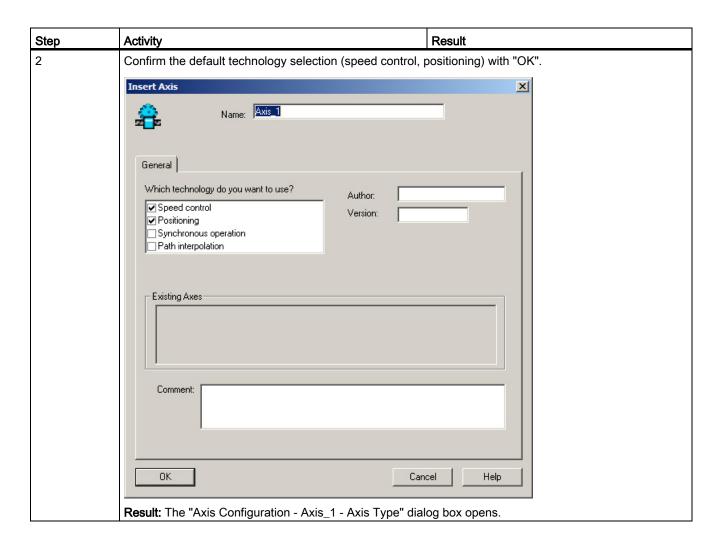
4.4 Configuring axes in S7T Config

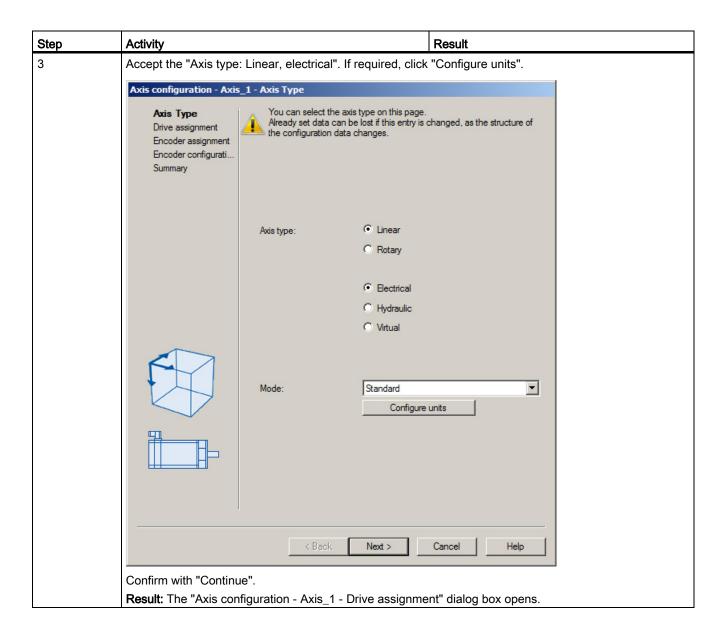
Important information

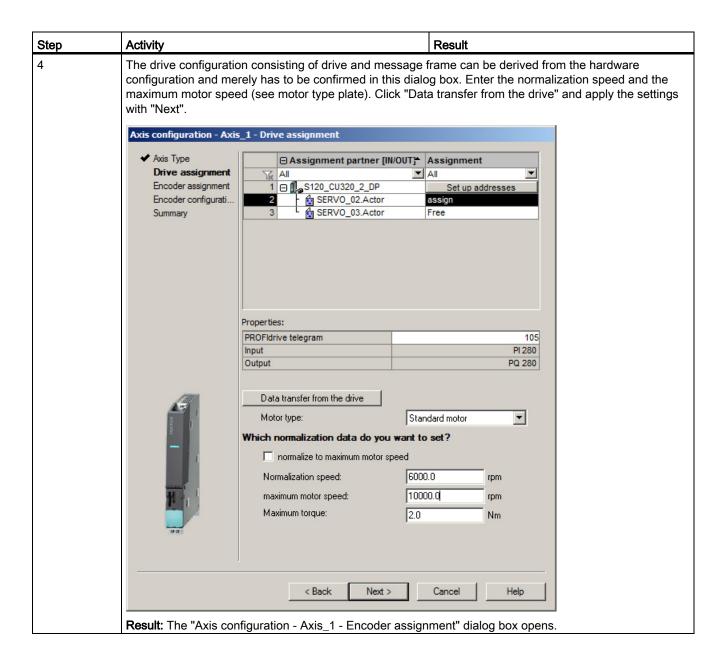
In this step, you create your technology objects (e.g., axes) with S7T Config. Use "Technology Objects Management" to generate a technology DB for each TO. Do not copy the technology DBs in order to ensure a defined assignment between the technology DB and its TO

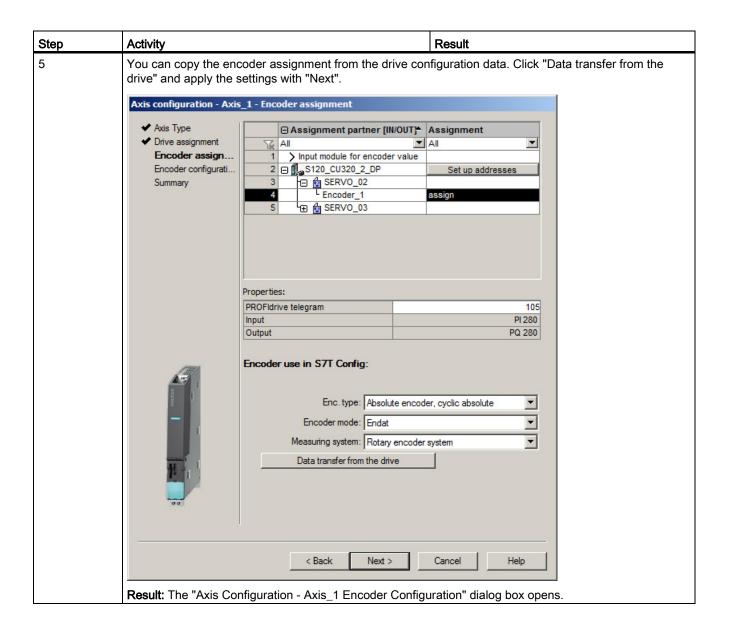
Procedure

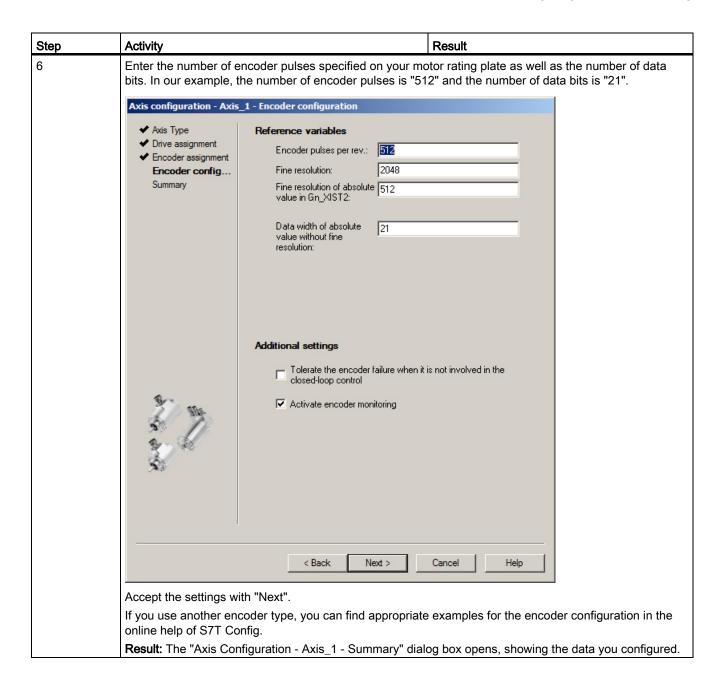


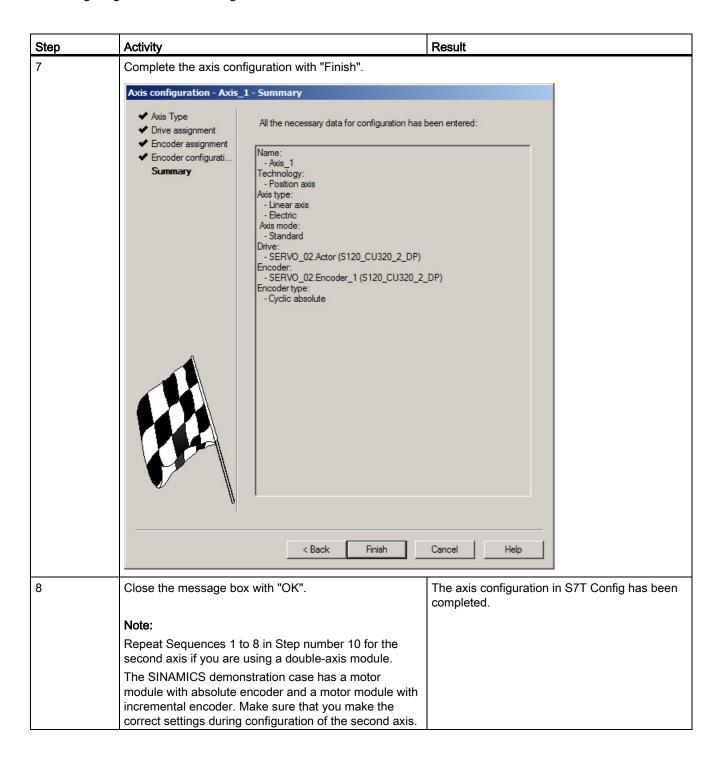


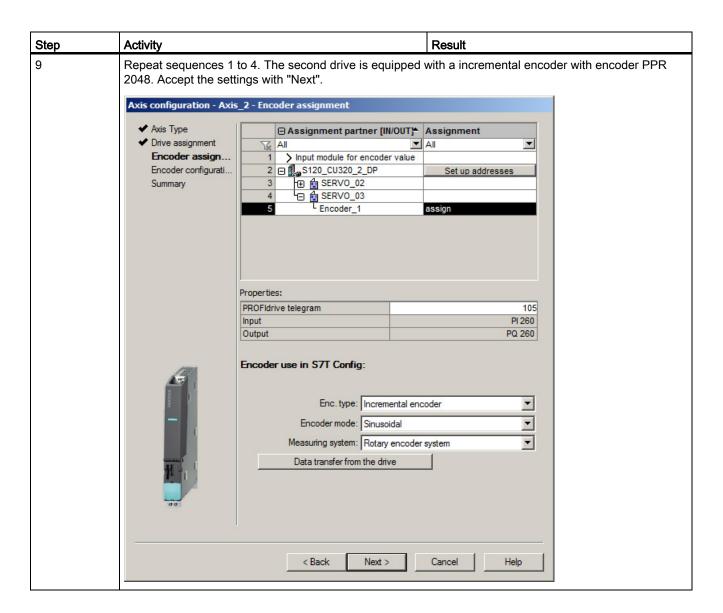


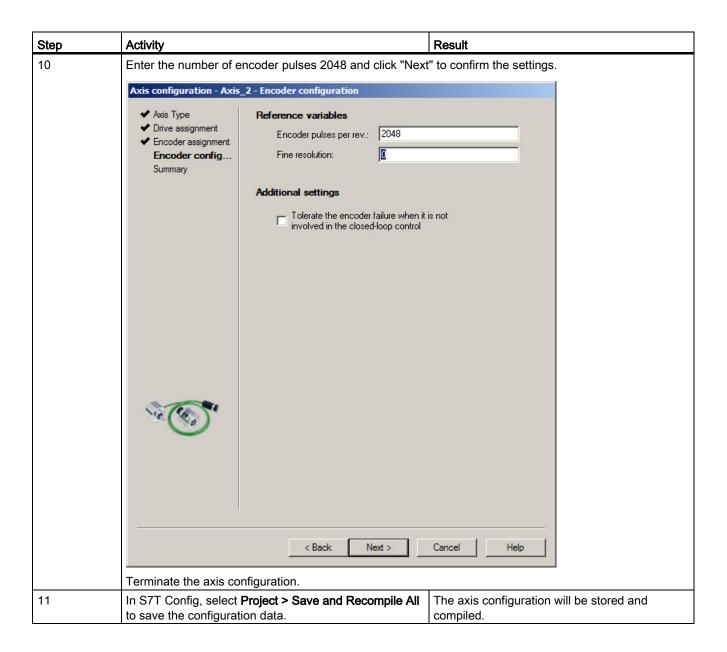










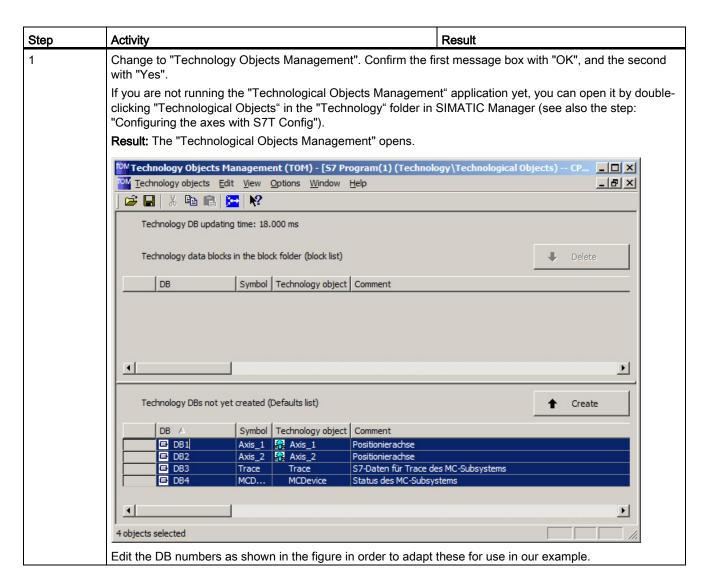


5

Programming

5.1 Creating technology data blocks

Procedure



5.2 Controlling the axis with the STEP 7 user program using a sample project

Step	Activity	Result
2	Create the technology DBs listed below by clicking "Create": • Axis_1 • Axis_2 (if this exists) • Trace • MCDevice	The system generates the technology data blocks DB 1 to DB 3, or DB 4.
3	Close the "Technology Objects Management" by selecting the Technological objects > Exit menu command.	

5.2 Controlling the axis with the STEP 7 user program using a sample project

The sample project "PROJECT-CPU317T" is used to describe the procedure. The sample project is included in the S7 Technology installation package.

Procedure

Step	Activity	Result
1	In SIMATIC Manager, open the sample project "PROJECT-CPU317T". Copy the blocks listed below to your project:	The sample program is copied to the project.
	• OB1	
	FB 100 (SimplePositioning)	
	• FB401 (MC_Power)	
	• FB402 (MC_Power)	
	FB405 (MC_Halt)	
	FB410 (MC_MoveAbsolute)	
	DB 100 (IDB_SimplePositioning)	
	AxisData (variable table for axis control)	
	Confirm the message "The object 'OB1' already exists. Do you want to overwrite it?" with "Yes".	
	Also copy the inputs (I), outputs (O) and flags (F) from the example symbol table to the project, so that the symbols are displayed completely in the variable table.	
	Important: The sample program does not contain DB 1 to DB 4! Create these technology DBs in STEP 7 (see the step "Creating the technology DBs"), in order to maintain consistency between the user program and the technology objects.	
2	Double-click the FB 100 if you want to edit the program example.	The LAD/STL/FBD editor opens.

5.2 Controlling the axis with the STEP 7 user program using a sample project

Step	Activity	Result
3	Select these settings: • View > LAD, • View > Overviews, and • View > Details.	You have now opened an extended and clear view for editing the STEP 7 user program.
4	Load the entire user program to the CPU selecting Target system > Download user program to memory card in the SIMATIC Manager.	
5	Confirm the message box with "Yes".	The STEP 7 user program is now stored in the CPU. This download of your SDBs may take longer (up to a few minutes), because of their larger data volume.

5.2 Controlling the axis with the STEP 7 user program using a sample project

Trial run

Procedure

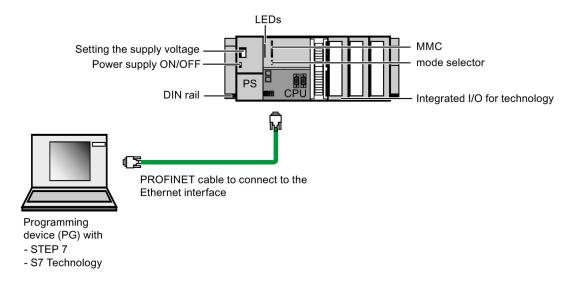
Step	Activity	Result
1	In the "Blocks" folder of your project, double-click the "AxisData" variable table.	The variable table is opened for monitoring.
2	Select the Target system > Connect to > Configured CPU menu command to go online.	The CPU "STOP" status is indicated on the bottom right.
3	Select the Variable > Monitor menu command to switch to monitoring.	The "Status value" column shows the actual values of the operands.
	Caution You start the drive in the next two steps.	Use the variable table to monitor the control and status bits of the application, and the status of the axis.
	To stop the drive again:	
	Set input I0.2 (Stop) to "1"	
	Switch the CPU to STOP.	
4	Switch the CPU to "RUN".	The CPU "RUN" status is indicated on the bottom right.
5	Perform the following trials: Monitor the relevant output value	es.
	Enable the axis by setting I0.0 = "1" (DriveEnable)	
	Move the axis into position 2 by setting I0.4 (StartPosition2)	
	Move the axis into position 1 by setting I0.3 (StartPosition1)	
	Stop the moving axis with a signal at I0.2 (Stop)	
	Acknowledge all queued errors of the axis with I0.1 (Reset)	
	Terminal strip:	
	Drive Enable Velocity:	
	Reset Axis 1: v = 100) mm/a
	Stop	711111/5
	Start_Position1	
	Start_Position2	
		osition2
	0 mm 50	00 mm
	•	-
	Axis 1	

Special case - controlling a virtual axis

7

This chapter describes the theoretical procedure and the special points for controlling a virtual axis.

Example configuration



Task

Configuration of an axis using HW Config and S7T Config. You then operate this axis with the help of a STEP 7 user program.

The following table shows the special points at the learning units to be carried out:

Step	Learning unit	Special features
1	Wiring	You do not have to connect a drive to the DP(DRIVE) interface.
2	Configuring CPU 317T-3PN/DP in HW Config	None - see Chapter Configuring CPU 317T-3PN/DP in HW Config (Page 25)
	Configuring the DP(DRIVE)	N/A
	Activating generation of the technology system data	None - see Chapter Activating generation of the technology system data (Page 29)
	Configuring a drive in HW Config	N/A
	Configuring the PG/PC interface for access to the drive	N/A
3	Downloading the hardware configuration to the target hardware	None - see Chapter Downloading the hardware configuration to the target hardware (Page 36)

Step	Learning unit	Special features
4	Configuring a drive in S7T Config	N/A
5	Configuring an axis / axes in S7T Config	In the "Axis configuration Axis type": "Linear" dialog box select "virtual" and then accept the default configuration data. See Chapter Configuring axes in S7T Config (Page 56).
6	Creating technology data blocks	None - see Chapter Creating technology data blocks (Page 65)
7	Controlling the axis with the STEP 7 user program	None - see Chapter Controlling the axis with the STEP 7 user program using a sample project (Page 66)
8	Trial run	Since no drive is connected, use the variable table in order to monitor the control and status bits of the application as well as the status of the axis.
		See Chapter Trial run (Page 69)

Diagnostics/troubleshooting

Incorrect operator input, faulty wiring or inconsistent configuration data may lead to errors.

For information on how to analyze such errors and messages, refer to the *S7-Technology* manual.

Service and support on the Internet

In addition to our documentation, we offer a comprehensive knowledge base on the Internet (http://www.siemens.com/automation/service&support). There you will find:

- The newsletter that provides you with latest information related to your products
- Your appropriate documentation, using our Service & Support search engine
- An international bulletin board where users and specialists can share their knowledge
- Your local Siemens partner for Automation & Drives in our Partner database
- Information about local service, repairs, and spare parts. Lots more is available under "Services".