SIEMENS

SINAMICS

SINAMICS S120

Getting Started

Edition 04/2014

Answers for industry.

SIEMENS

SINAMICS

S120
Getting Started

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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.

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

⚠CAUTION
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:

⚠WARNING
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.

Trademarks

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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Preface

SINAMICS documentation

The SINAMICS documentation is organized in the following categories:

- General documentation/catalogs
- User documentation
- Manufacturer/service documentation

Additional information

The following link provides information on the topics:

- Ordering documentation/overview of documentation
- Additional links to download documents
- Using documentation online (find and search in manuals/information)
  http://www.siemens.com/motioncontrol/docu

Please send any questions about the technical documentation (e.g. suggestions for improvement, corrections) to the following e-mail address:
docu.motioncontrol@siemens.com

My Documentation Manager

Under the following link there is information on how to create your own individual documentation based on Siemens' content, and adapt it for your own machine documentation:
http://www.siemens.com/mdm

Training

Information about SITRAIN (Siemens training on products, systems and solutions for automation and drives) is available under the following link:
http://www.siemens.com/sitrain

FAQs

You can find Frequently Asked Questions on the Service&Support pages under **Product Support**.
http://support.automation.siemens.com

SINAMICS

You can find information on SINAMICS at: http://www.siemens.com/sinamics.

Usage phases and their documents/tools (as an example)

Table 1 Usage phases and the available documents/tools

Usage phase	Document/tool
Orientation	SINAMICS S Sales Documentation
Planning/configuration	• SIZER Engineering Tool • Configuration Manuals, Motors
Deciding/ordering	SINAMICS S120 catalogs • SIMOTION, SINAMICS S120 and Motors for Production Machines (Catalog PM 21) • SINAMICS and Motors for Single-axis Drives (Catalog D 31) • SINUMERIK & SINAMICS Equipment for Machine Tools (Catalog NC 61) • SINUMERIK 840D sl Type 1B Equipment for Machine Tools (Catalog NC 62)
Installation/assembly	• SINAMICS S120 Equipment Manual for Control Units and Additional System Components • SINAMICS S120 Equipment Manual for Booksize Power Units • SINAMICS S120 Equipment Manual for Chassis Power Units • SINAMICS S120 Equipment Manual for AC Drives • SINAMICS S120M Equipment Manual Distributed Drive Technology • SINAMICS HLA System Manual Hydraulic Drive
Commissioning	• STARTER Commissioning Tool • SINAMICS S120 Getting Started • SINAMICS S120 Commissioning Manual • SINAMICS S120 CANopen Commissioning Manual • SINAMICS S120 Function Manual • SINAMICS S120 Safety Integrated Function Manual • SINAMICS S120/S150 List Manual • SINAMICS HLA System Manual Hydraulic Drive
Usage/operation	• SINAMICS S120 Commissioning Manual • SINAMICS S120/S150 List Manual • SINAMICS HLA System Manual Hydraulic Drive
Maintenance/servicing	• SINAMICS S120 Commissioning Manual • SINAMICS S120/S150 List Manual
References	• SINAMICS S120/S150 List Manual

Target group

This documentation is intended for machine manufacturers, commissioning engineers, and service personnel who use the SINAMICS drive system.

Benefits

This manual describes all the information, procedures and operational instructions required for commissioning and servicing SINAMICS S120.

Standard scope

The scope of the functionality described in this document can differ from that of the drive system that is actually supplied.

- It may be possible for other functions not described in this documentation to be executed in the drive system. However, no claim can be made regarding the availability of these functions when the equipment is first supplied or in the event of servicing.
- Functions that are not available in a particular product version of the drive system may be described in the documentation. The functionality of the supplied drive system should only be taken from the ordering documentation.
- Extensions or changes made by the machine manufacturer must be documented by the machine manufacturer.

For reasons of clarity, this documentation does not contain all of the detailed information on all of the product types, and cannot take into consideration every conceivable type of installation, operation and service/maintenance.

Technical Support

Country-specific telephone numbers for technical support are provided on the Internet at **Contact**:
http://www.siemens.com/automation/service&support

EC Declaration of Conformity

The EC Declarations of Conformity for the machinery directive can be found on the Internet at:
http://support.automation.siemens.com/WW/view/de/21901735/67385845

Alternatively, you can contact the Siemens office in your region in order to obtain the EC Declaration of Conformity.

Purpose of this document

This documentation is aimed at beginners who want to find out more about the SINAMICS S120 drive system. The document offers a brief guide to commissioning a sample project with a simple SINAMICS S120 drive train. By following the instructions in this document, a beginner will need only a few minutes to engineer and configure the sample project and start up the motor.

The sample project will be processed using a SINAMICS S120 training case.

Table of contents

Fundamental safety instructions

1

1.1 General safety instructions

⚠DANGER

Danger to life due to live parts and other energy sources

Death or serious injury can result when live parts are touched.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, six steps apply when establishing safety:

1. Prepare for shutdown and notify all those who will be affected by the procedure.
2. Disconnect the machine from the supply.
   - Switch off the machine.
   - Wait until the discharge time specified on the warning labels has elapsed.
   - Check that it really is in a no-voltage condition, from phase conductor to phase conductor and phase conductor to protective conductor.
   - Check whether the existing auxiliary supply circuits are de-energized.
   - Ensure that the motors cannot move.
3. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water.
4. Isolate or neutralize all hazardous energy sources by closing switches, grounding or short-circuiting or closing valves, for example.
5. Secure the energy sources against switching on again.
6. Ensure that the correct machine is completely interlocked.

After you have completed the work, restore the operational readiness in the inverse sequence.

⚠WARNING

Danger to life through a hazardous voltage when connecting an unsuitable power supply

Touching live components can result in death or severe injury.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV-(Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

⚠WARNING

Danger to life when live parts are touched on damaged devices

Improper handling of devices can cause damage.

For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged devices.

⚠WARNING

Danger to life through electric shock due to unconnected cable shields

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the conductors of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.

⚠WARNING

Danger to life due to electric shock when not grounded

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.

⚠WARNING

Danger to life due to electric shock when opening plug connections in operation

When opening plug connections in operation, arcs can result in severe injury or death.

- Only open plug connections when the equipment is in a no-voltage state, unless it has been explicitly stated that they can be opened in operation.

WARNING

Danger to life due to fire spreading if housing is inadequate

Fire and smoke development can cause severe personal injury or material damage.

- Install devices without a protective housing in a metal control cabinet (or protect the device by another equivalent measure) in such a way that contact with fire is prevented.
- Ensure that smoke can only escape via controlled and monitored paths.

WARNING

Danger to life through unexpected movement of machines when using mobile wireless devices or mobile phones

Using mobile wireless devices or mobile phones with a transmit power > 1 W closer than approx. 2 m to the components may cause the devices to malfunction, influence the functional safety of machines therefore putting people at risk or causing material damage.

- Switch the wireless devices or mobile phones off in the immediate vicinity of the components.

WARNING

Danger to life due to the motor catching fire in the event of insulation overload

There is higher stress on the motor insulation through a ground fault in an IT system. If the insulation fails, it is possible that death or severe injury can occur as a result of smoke and fire.

- Use a monitoring device that signals an insulation fault.
- Correct the fault as quickly as possible so the motor insulation is not overloaded.

WARNING

Danger to life due to fire if overheating occurs because of insufficient ventilation clearances

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

⚠WARNING

Danger of an accident occurring due to missing or illegible warning labels

Missing or illegible warning labels can result in accidents involving death or serious injury.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, in the national language if necessary.
- Replace illegible warning labels.

NOTICE

Device damage caused by incorrect voltage/insulation tests

Incorrect voltage/insulation tests can damage the device.

- Before carrying out a voltage/insulation check of the system/machine, disconnect the devices as all converters and motors have been subject to a high voltage test by the manufacturer, and therefore it is not necessary to perform an additional test within the system/machine.

⚠WARNING

Danger to life when safety functions are inactive

Safety functions that are inactive or that have not been adjusted accordingly can cause operational faults on machines that could lead to serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

Note

Important safety notices for Safety Integrated functions

If you want to use Safety Integrated functions, you must observe the safety notices in the Safety Integrated manuals.

⚠WARNING

Danger to life or malfunctions of the machine as a result of incorrect or changed parameterization

As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect the parameterization (parameter assignments) against unauthorized access.
- Respond to possible malfunctions by applying suitable measures (e.g. EMERGENCY STOP or EMERGENCY OFF).

1.2 Safety instructions for electromagnetic fields (EMF)

⚠WARNING

Danger to life from electromagnetic fields

Electromagnetic fields (EMF) are generated by the operation of electrical power equipment such as transformers, converters or motors.

People with pacemakers or implants are at a special risk in the immediate vicinity of these devices/systems.

- Ensure that the persons involved are the necessary distance away (minimum 2 m).

1.3 Handling electrostatic sensitive devices (ESD)

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.

NOTICE

Damage through electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber of aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

1.4 Industrial security

Note

Industrial security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit adress (http://www.siemens.com/industrialsecurity).

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit address (http://support.automation.siemens.com).

WARNING

Danger as a result of unsafe operating states resulting from software manipulation

Software manipulation (e.g. by viruses, Trojan horses, malware, worms) can cause unsafe operating states to develop in your installation which can result in death, severe injuries and/or material damage.

- Keep the software up to date.

  You will find relevant information and newsletters at this address (http://support.automation.siemens.com).
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.

  You will find further information at this address (http://www.siemens.com/industrialsecurity).
- Make sure that you include all installed products into the holistic industrial security concept.

1.5 Residual risks of power drive systems

The control and drive components of a drive system are approved for industrial and commercial use in industrial line supplies. Their use in public line supplies requires a different configuration and/or additional measures.

These components may only be operated in closed housings or in higher-level control cabinets with protective covers that are closed, and when all of the protective devices are used.

These components may only be handled by qualified and trained technical personnel who are knowledgeable and observe all of the safety instructions on the components and in the associated technical user documentation.

When assessing the machine's risk in accordance with the respective local regulations (e.g., EC Machinery Directive), the machine manufacturer must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine components during commissioning, operation, maintenance, and repairs caused by, for example,
   - Hardware and/or software errors in the sensors, control system, actuators, and cables and connections
   - Response times of the control system and of the drive
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of wireless devices/mobile phones in the immediate vicinity of the control system
   - External influences/damage
2. In the event of a fault, exceptionally high temperatures, including an open fire, as well as emissions of light, noise, particles, gases, etc. can occur inside and outside the inverter, e.g.:
   - Component failure
   - Software errors
   - Operation and/or environmental conditions outside the specification
   - External influences/damage

   Inverters of the Open Type/IP20 degree of protection must be installed in a metal control cabinet (or protected by another equivalent measure) such that contact with fire inside and outside the inverter is not possible.

3. Hazardous shock voltages caused by, for example,
   - Component failure
   - Influence during electrostatic charging
   - Induction of voltages in moving motors
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly

Note

The components must be protected against conductive contamination (e.g. by installing them in a control cabinet with degree of protection IP54 according to IEC 60529 or NEMA 12).

Assuming that conductive contamination at the installation site can definitely be excluded, a lower degree of cabinet protection may be permitted.

For more information about residual risks of the components in a drive system, see the relevant sections in the technical user documentation.

SINAMICS S120 drive system

2

Modular system for sophisticated drive tasks

SINAMICS S120 solves complex drive tasks for a wide range of industrial applications and is, therefore, designed as a modular system. Users can choose from many different harmonized components and functions to create a solution that best meets their requirements. SIZER, a high-performance engineering tool, makes it easier to choose and determine the optimum drive configuration.

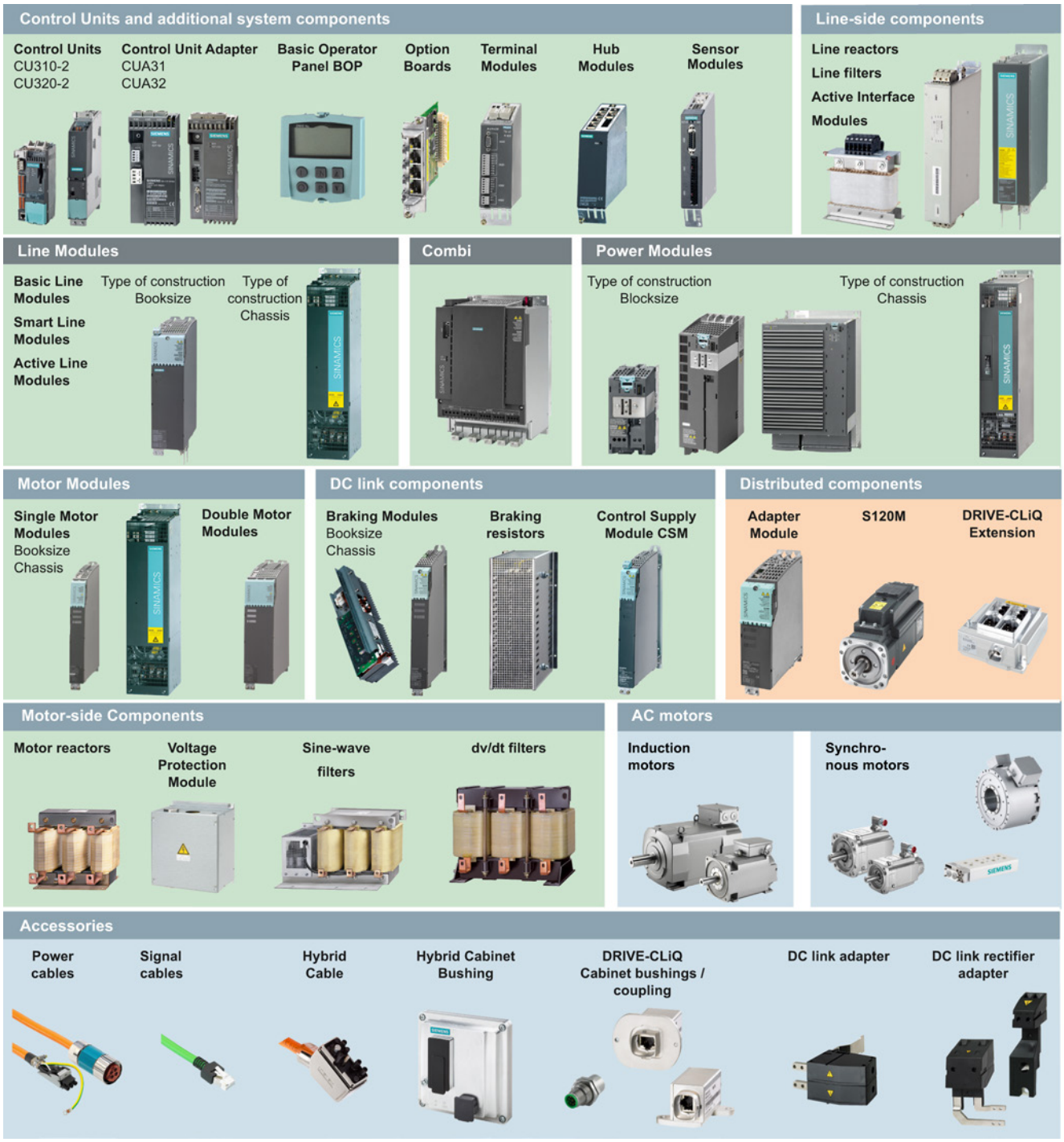
SINAMICS S120 is supplemented by a wide range of motors. Whether torque, synchronous or induction motors, whether rotating or linear motors, all of these motors are optimally supported by SINAMICS S120.

System architecture with a central Control Unit

On the SINAMICS S120, the drive intelligence is combined with closed-loop control functions into Control Units. These units are capable of controlling drives in the vector, servo, and V/f modes. They also perform the speed and torque control functions plus other intelligent drive functions for all axes on the drive. Inter-axis connections can be established within a component and easily configured in the STARTER commissioning tool using a mouse.

System overview

The SINAMICS S120 drive system consists of a variety of different modules. It is constructed of infeeds, filters, motor power units, modules for additional functions, Control Units plus standard and special versions of rotating and linear motors.



Overview

3

This manual provides instructions on how to commission a simple SINAMICS S120 drive based on a sample project.

To create a sample project the following points are explained:

1. Which hardware components do you need for the sample project?
2. How do you create a simple project in the STARTER?
3. How do you configure a drive?
4. How do you put the drive into operation?

Hardware components

4

4.1 Components of the example configuration

The following components are contained within the example configuration:

- CU320-2 DP from firmware version 4.5 with integrated Ethernet interface
- Smart Line Module (supply module)
- Line filter
- Double Motor Module
- Line reactor (for ALM and SLM)
- Synchronous servo motor with absolute encoder and DRIVE-CLiQ interface
- Standard PC with Windows operating system as a programming device (PG/PC), with pre-installed STARTER commissioning tool from version 4.3.
  The following procedure uses the Windows 7 operating system. Operation can differ slightly for other operating systems (e.g. Windows XP).
- Installed motor, power, and control cables
- DRIVE-CLiQ cables
- Ethernet interface in the PG/PC
- Ethernet connection between the PG/PC and the Control Unit

4.2 System data of the SINAMICS S120 training case

The example configuration is performed on a SINAMICS S120 training case.

Figure 4-1 Training case

The following technical data applies to the training case used:

Structure

Drive system comprising:

- CU320-2 Control Unit with TB30 Terminal Board
- Smart Line Module 5 kW, Double Motor Module 3 A
- One 1FK7022-5AK71-1AG3 synchronous servo motor with incremental encoder sin/cos 1 Vpp via SMC 20
- One 1FK7022-5AK71-1LG3 synchronous servo motor with absolute encoder 2048 and DRIVE-CLiQ interface.
- Reference discs for position monitoring

The training case is supplied ready-to-use with a demo project on the memory card and documentation.

Technical data	
Degree of protection in accordance with DIN VDE 0470 Part 1/ EN 60529/IEC 529	IP20
Supply voltage[1)]	• 1 AC 230 V/50 Hz • Via power supply adapter 1 AC 115 V (USA) (not supplied in the package)
Dimensions (W x H x D) in mm	320 × 650 × 330
Weight	Approx. 30 kg

1) The connection conditions of the respective network operator are to be observed.

Selection and ordering data	**Order no.**
Training case SINAMICS S120 TK-SIN-CU320-2 2-axis design with1FK7 motors • With CU320-2 DP and demo project • With CU320-2 PN and demo project	 6ZB2480-0CM00 6ZB2480-0CN00
Power supply adapter 1 AC 115 V / 1 AC 230 V	6AG1 064-1AA02-0AA0
Operator box SINAMICS (if ordered separately)	6AG1 064-1AA01-0AA0

4.3 Wiring the components

The components of this example are assembled and wired into the SINAMICS training case. No changes to this wiring are permitted. For the purpose of commissioning this project example, it is not permissible to connect other components or drive loads to the motor.

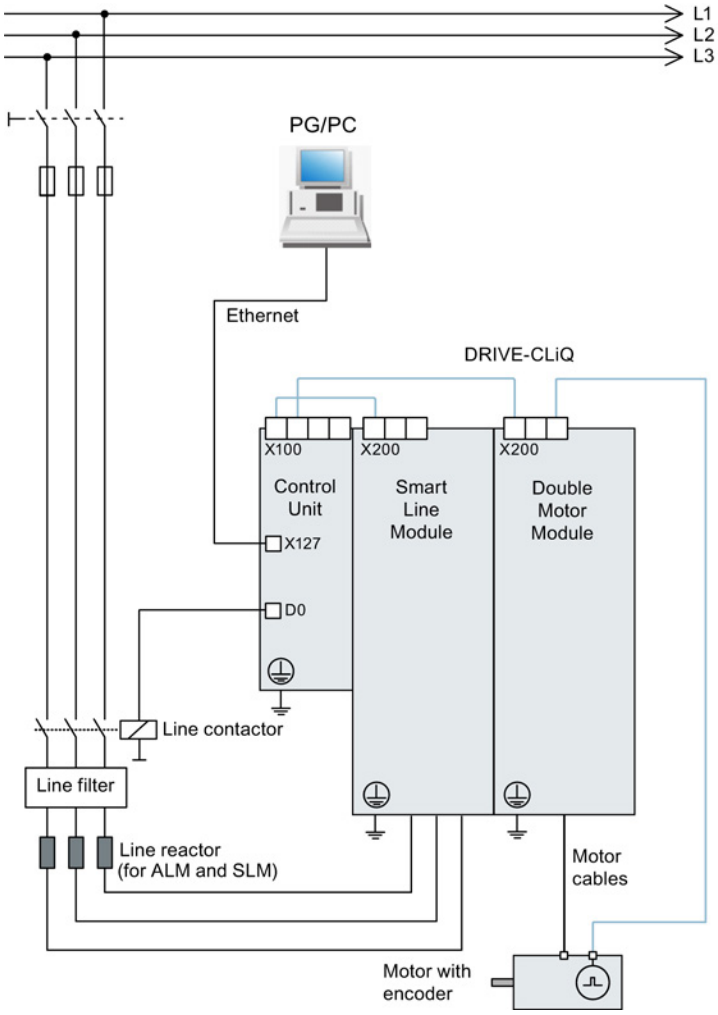


Figure 4-2 Wiring principle

Note

The following description only refers to one of the two motors.

Creating a drive object

5

5.1 Overview

This example shows how you can generate a new drive project using the STARTER commissioning tool. You then transfer the drive project via a communication interface to the Control Unit of the drive.

For data exchange between the programming device (PG/PC) and the Control Unit (CU), an Ethernet interface is used in the example, which is integrated into each SINAMICS S120 device. With PROFIBUS or PROFINET interfaces, commissioning happens in a similar way.

The programming device and the drive (in the training case example) are switched on and connected to each other via a data line.

5.2 Setting the communication interfaces

5.2.1 Setting up the Ethernet interface

For the commissioning, the programming device (PG/PC) can be connected to the Control Unit via an Ethernet interface. However, the communications interface of the programming device must first be set up.

Note

The following procedure refers to the Windows 7 operating system. Operation can differ slightly for other operating systems (e.g. Windows XP).

Communication interface of the programming device

1. In the programming device (PG/PC) call up the control panel via the menu items "Start > Control Panel".
2. In the control panel of your programming device, under "Network and Internet", select the "Network and Sharing Center" function.
3. For your network card that is displayed, click on the connection link.
4. Click in the status dialog of the connection on "Properties" and acknowledge the subsequent confirmation prompt with "Yes".
5. In the properties dialog of the connection, select the element "Internet protocol 4 (TCP/IPv4)" and then click on "Properties".
6. In the properties dialog, activate the "Use the following IP address" option.

7. Set the IP address of the access interface of the PG/PC to the Control Unit to 169.254.11.1 and the subnet mask to 255.255.0.0.

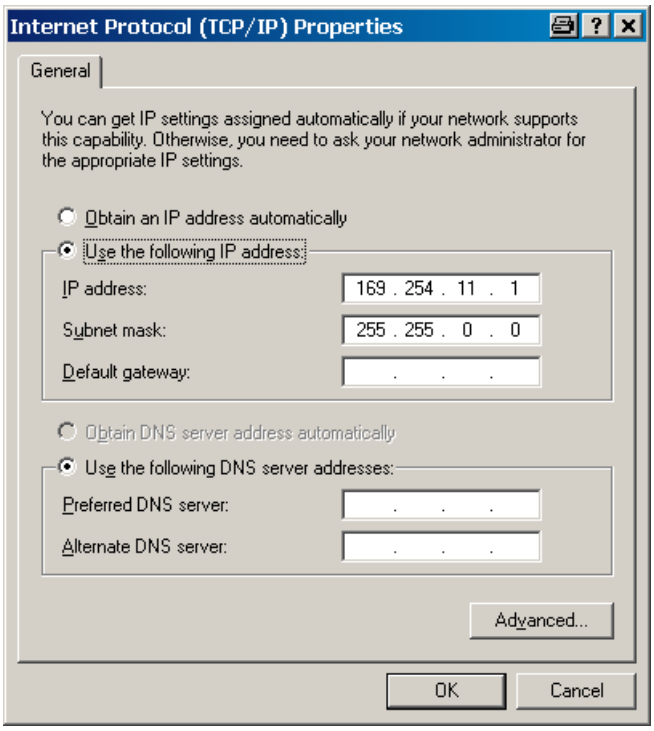


Figure 5-1 Example: IPv4 address of the PG/PC

8. Click "OK" and close the Windows-specific window of the network connections.

5.2.2 Calling STARTER

Note

The following procedure refers to the Windows 7 operating system. Operation can differ slightly for other operating systems (e.g. Windows XP).

1. Click on the STARTER symbol of your user interface.

   Or

2. In the Windows starting menu, call the menu command "Start > STARTER > STARTER".

5.2.3 Assigning the Ethernet interface in STARTER

Assigning the communication interface

1. In STARTER, go through the menu items "Tools > Set PG/PC interface...".

   The "Set PG/PC interface" window opens:

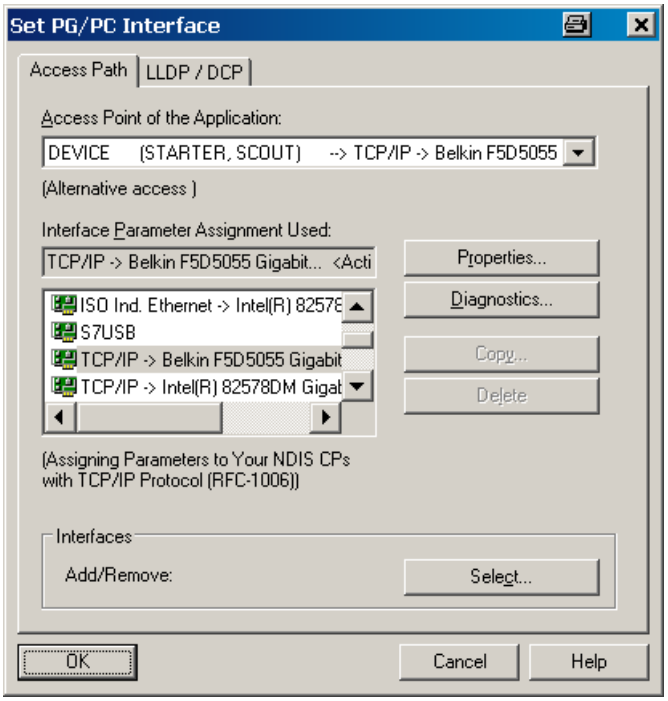


   Figure 5-2 Creating an access point

2. Check the access point of the application. Here, the access point "DEVICE (STARTER, SCOUT) ..." must be set.
   If necessary, correct the access point using the "Access Point of the Application" drop-down list.

Note

The interface in our example has the designation **TCP/IP -> Belkin F5D 5055 Gigabit USB 2.0 Network Adapter**.
However, any Ethernet interface of the PG/PC can essentially be used.

3. If the desired adapter is in the list, continue as described in point 6.
   If the required adapter is not included in the list, you must add the appropriate entry. To do so, click on the "Selection..." button.

   The already installed interfaces are located in the window "Install/uninstall interfaces". If the required interface is not present, you must install it yourself.

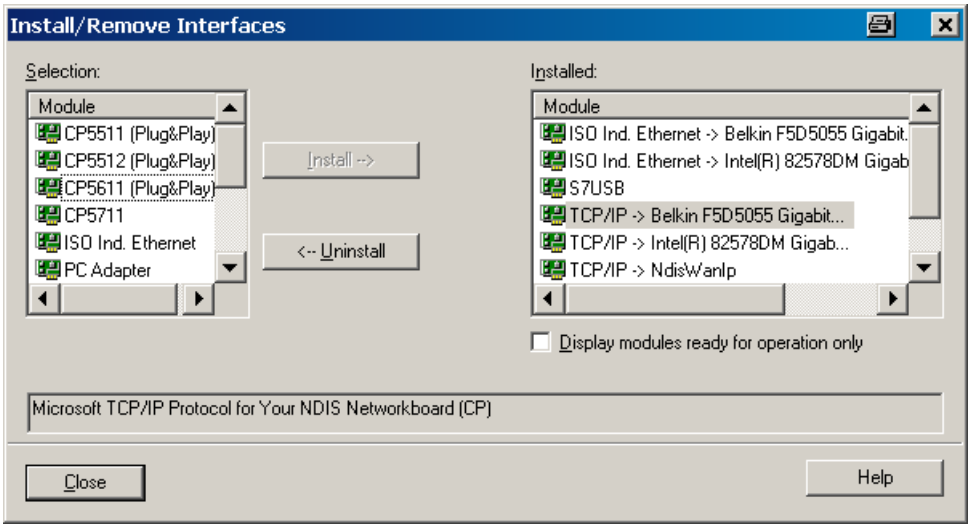


Figure 5-3 Selecting the interface

4. Select the desired interface on the left-hand side, and then click on "Install-- > ".

   The interface then changes to the right-hand side.

5. Select the required interface and close the window.
6. Click in the list box "Interface parameter assignment used:" on the interface parameter assignment "TCP/IP -> Belkin F5D 5055 Gigabit USB 2.0 Network Adapter."
7. Close the "Set PG/PC interface" window by clicking "OK."

5.3 Creating a drive project

In STARTER, the project wizard will guide you through all the steps necessary to create and set up a new drive project.

Procedure

1. In STARTER, click on the menu items "Project > New with Wizard."

   The start window of the project wizard is opened.

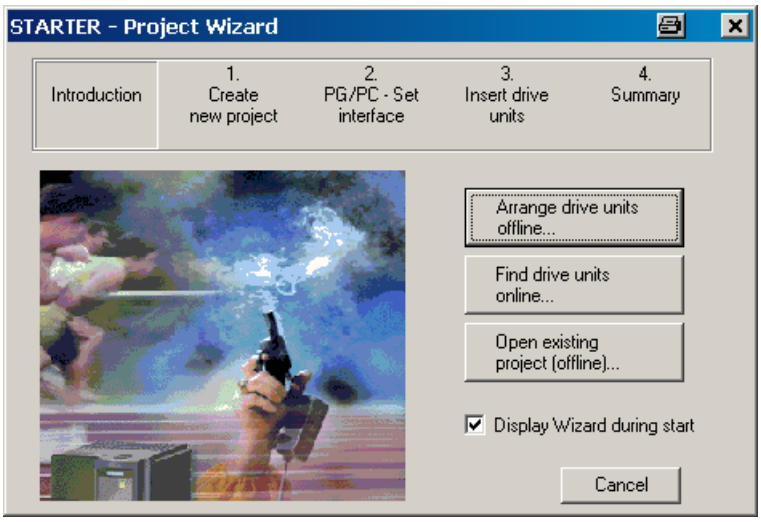


Figure 5-4 Find drive units online

2. Click on the "Find drive units online..." button.

   In step 1, the project wizard opens the "Create new project" window.

3. Enter a name for your project, e.g. "Sample Project", in the input field.

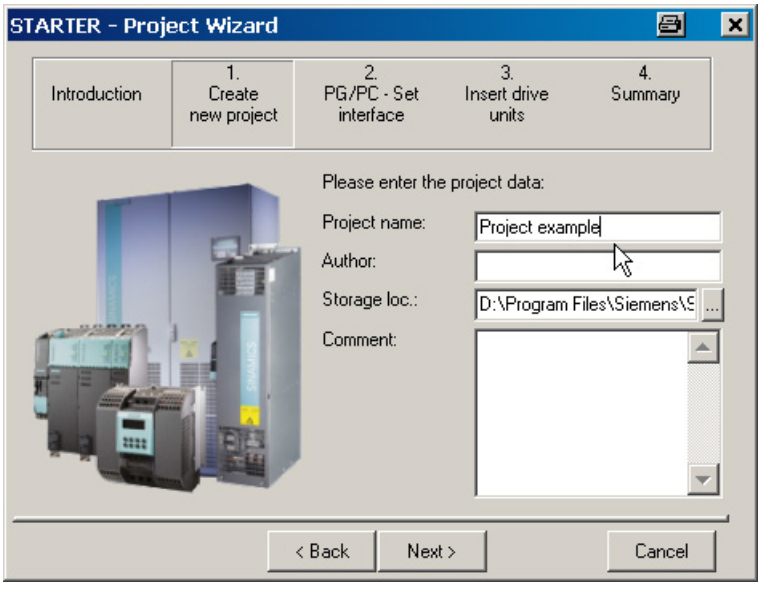


Figure 5-5 Creating a new project

4. Click on "Continue >".

   In step 2, the project wizard opens the "Set PG/PC interface" window.

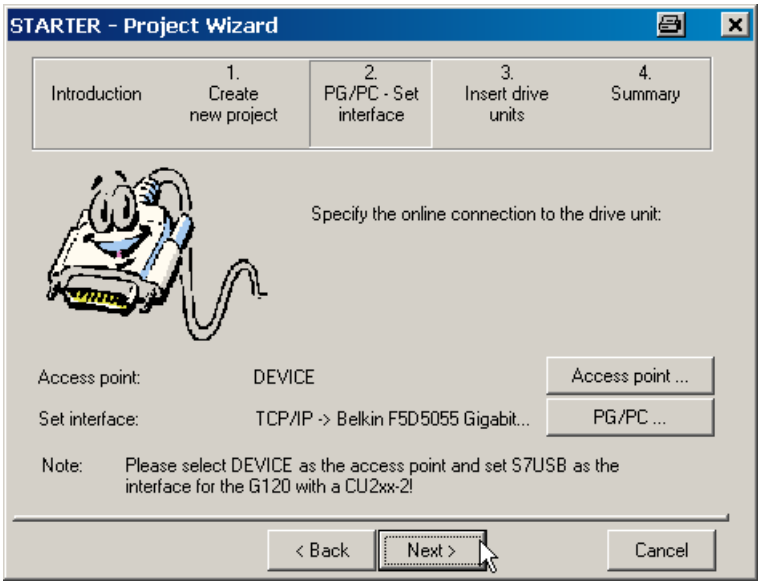


Figure 5-6 Setting the PG/PC Interface

5. In this window, you can check the settings of the communication interface made in the previous chapter, i.e. you do not have to change anything in this window. Click on "Continue >".

   The project wizard searches for drive units in step 3. The drive units found are displayed in "Preview".

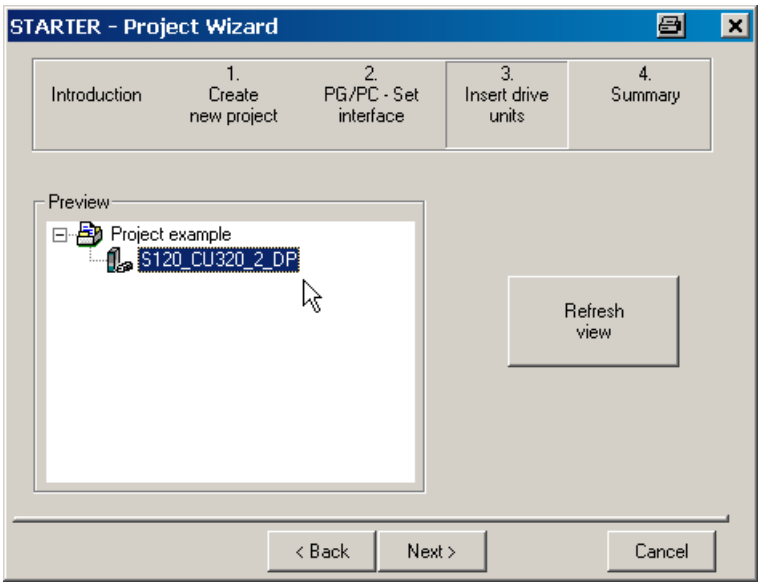


Figure 5-7 Insert drive units

6. Click on "Continue >".

   The project wizard continues to step 4 to display a summary of your project settings.

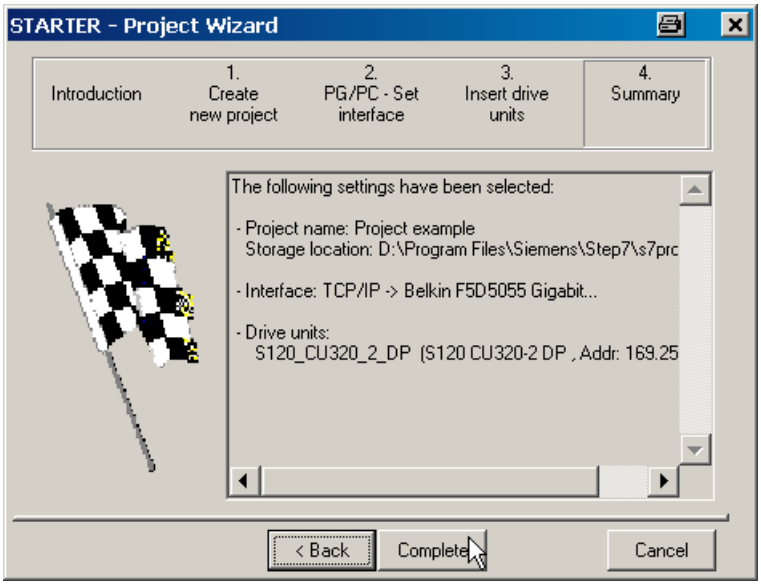


Figure 5-8 Summary

7. Click on button "Complete".

   The project wizard closes the window.

   In the project navigator, the found drive unit "S120_CU320_2_DP" is then displayed under the sample project.

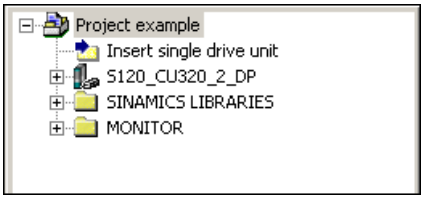


Figure 5-9 Drive object created

Configuring the drive object

6

6.1 Configuring the drive unit

In the example configuration, the "S120_CU320_2_DP" drive unit is configured for operation in the online mode. Through automatic configuration, the drive is initially switched to the "Factory settings" state and then provided with a standard configuration.

Procedure

1. Go to the menu items "Project > Connect to selected target devices" to switch to online mode.

   When connecting with a target device for the first time, the target device selection is opened. The "DEVICE" option is activated as the access point.

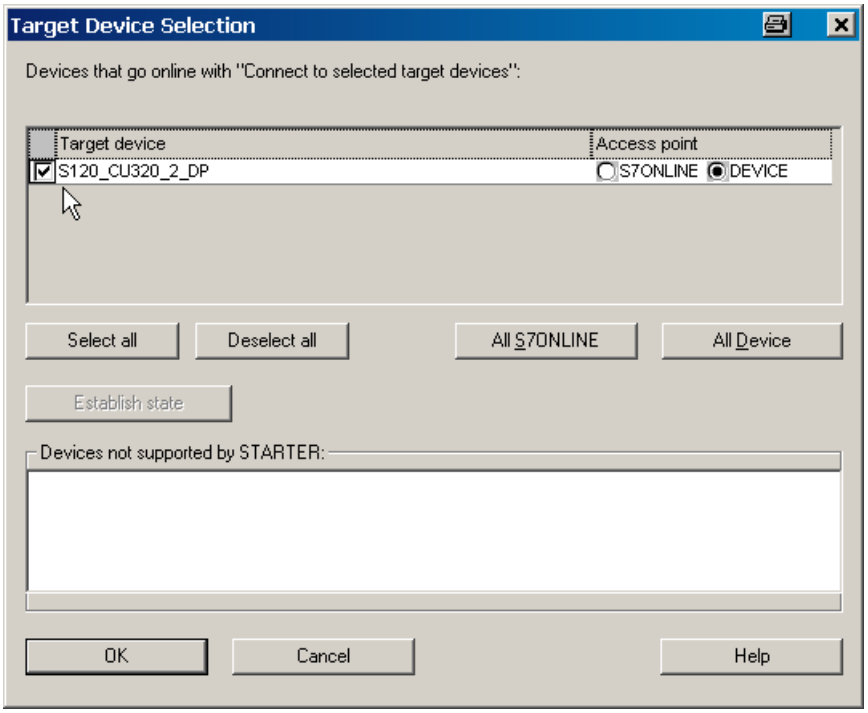


Figure 6-1 Target device selection

2. Activate the desired target device and click on "OK."

   The target device selection is closed and online mode is active.

Note

Online/offline comparison

If you create additional projects in the same way in quick succession, the "Online/offline comparison" dialog appears after closing the target device selection. This dialog indicates that the data saved in your drive object (of the training case) does not correspond with the data of the new project. The reason for this is generally because you have configured settings in the expert list in the last project that are still saved in the target device (the training case), but which are missing in the newly created project in STARTER (see section Special issues with the SINAMICS S120 training case (Page 41) and section Commissioning a drive (Page 45)).

However, as the online and offline configuration has to be identical, the data records have to be aligned.

1. To do this, click on the "Load to PG ==>" button and confirm the subsequent "Load to PG" prompt with "OK."

   The "Online/offline comparison" dialog is emptied.

2. If no more differences remain, click on "Close."

   In general, the settings required for the training case are then already available in the expert list (see section Special issues with the SINAMICS S120 training case (Page 41) and section Commissioning a drive (Page 45)).

3. In the project navigator, click on the "+" symbol before the entry "S120_CU320_2_DP".

   The list of objects for this drive opens and looks like this:

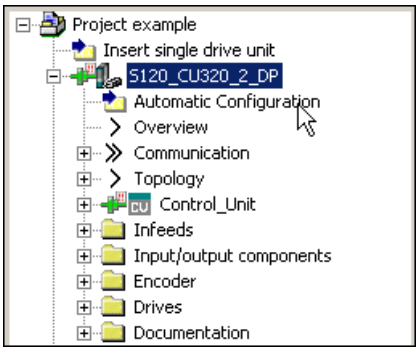


Figure 6-2 Launch automatic configuration

4. Double-click on option "Automatic configuration" in the project navigator.

   The following window opens:

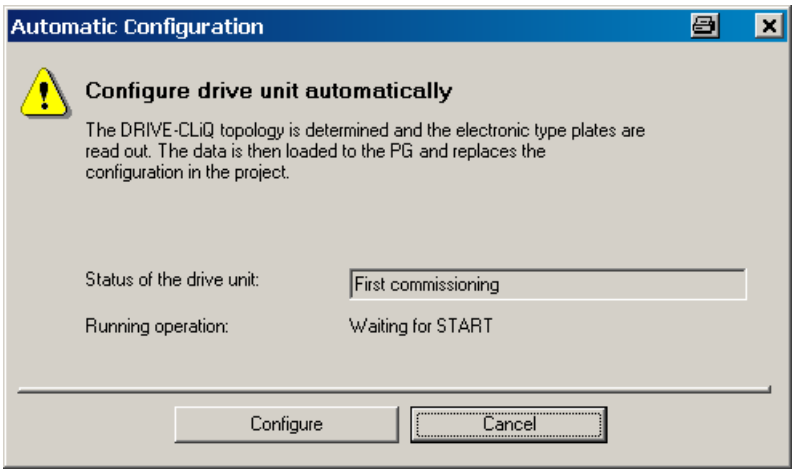


Figure 6-3 Automatic configuration is prepared

5. Start the automatic configuration of the drive unit by clicking on the "Configure" button.

   The programming device (PG/PC) searches the DRIVE-CLiQ bus for connected objects. In the sample project, the PG/PC finds two drives.

6. Select the entry "Servo" from the list "Default setting for all components".

   The drive in the project example is therefore used as servo control.

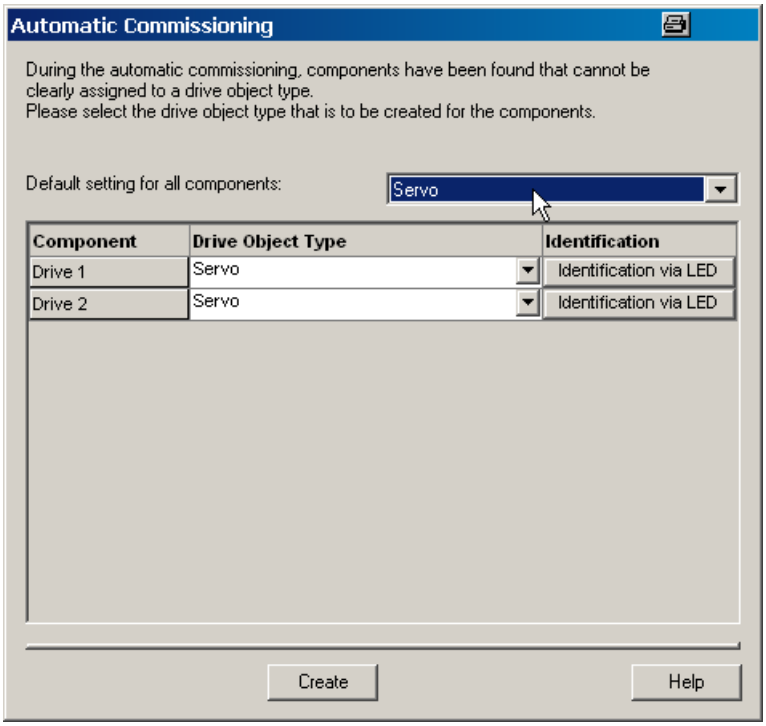


Figure 6-4 Automatic configuration drive selection

7. Click on button "Create".

   The automatic configuration process commences. When the process has been completed, a window with the message "Automatic configuration is complete" opens.

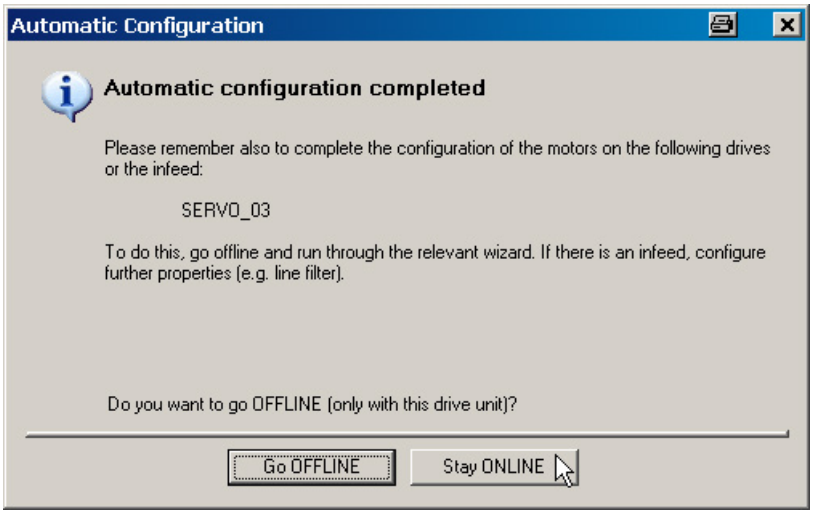


Figure 6-5 Automatic configuration, stay online

Note

The above message appears because two drives are integrated in the training case. For our example configuration, however, we only put one drive into operation.

8. Click on the button "Stay ONLINE."

6.2 Configuring the Motor Module

The Control Unit has detected the connected Motor Module and the SMI motor during the automatic configuration process. The device data have been transferred to the Control Unit. The Control Unit has automatically entered the correct device data into the parameters required to operate the components.

The sample project is now ready to commission.

6.3 Special issues with the SINAMICS S120 training case

If you use the SINAMICS S120 training case (which is customary with SITRAIN), as in the example case, pay attention to the following special issues:

Motor used in the example configuration

In this example, we only put the motor with the DRIVE-CLiQ interface into operation. The second motor (with incremental encoder) is ignored.

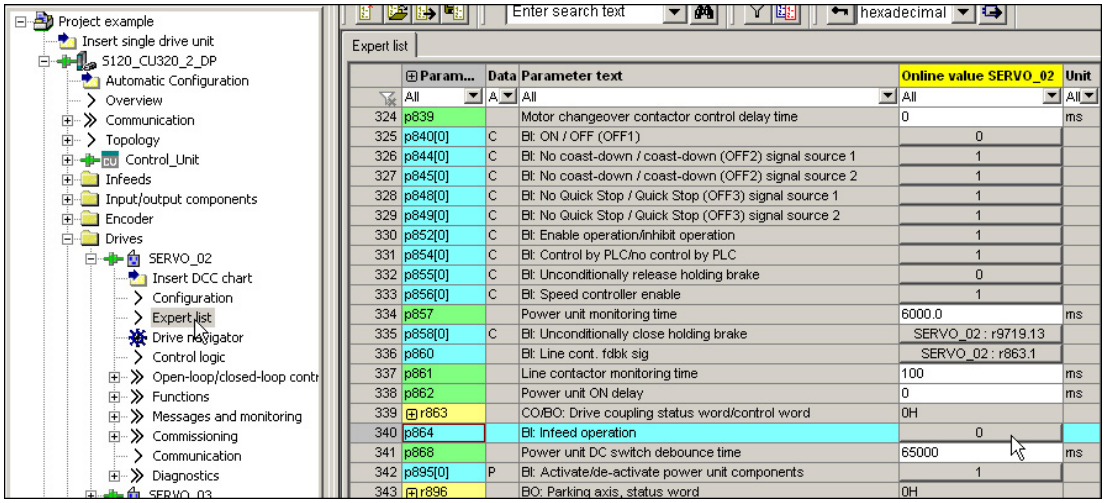
Define infeed operating message

Note

The settings explained below refer exclusively to the example case. If you have already taken data from an earlier project, only checking the parameter settings described below will suffice. In this regard, see also the note "Online/offline comparison" in section Configuring the drive unit (Page 37).

So that you can commission the drive, you will need to define the signal source for the "Operating message of the infeed". In this example, we permanently set this signal to "1."

1. In the project navigator, click on the "+" symbol before the entry "S120_CU320_2_DP".
2. In the project navigator, click on the "+" symbol before drive "SERVO_02."
3. Double-click on the entry "Expert list."
4. Scroll to the right through the expert list to parameter p0864.



	Param...	Data	Parameter text	Online value SERVO_02	Unit
324	p839		Motor changeover contactor control delay time	0	ms
325	p840[0]	C	BI: ON / OFF (OFF1)	0	
326	p844[0]	C	BI: No coast-down / coast-down (OFF2) signal source 1	1	
327	p845[0]	C	BI: No coast-down / coast-down (OFF2) signal source 2	1	
328	p848[0]	C	BI: No Quick Stop / Quick Stop (OFF3) signal source 1	1	
329	p849[0]	C	BI: No Quick Stop / Quick Stop (OFF3) signal source 2	1	
330	p852[0]	C	BI: Enable operation/inhibit operation	1	
331	p854[0]	C	BI: Control by PLC/no control by PLC	1	
332	p855[0]	C	BI: Unconditionally release holding brake	0	
333	p856[0]	C	BI: Speed controller enable	1	
334	p857		Power unit monitoring time	6000.0	ms
335	p858[0]	C	BI: Unconditionally close holding brake	SERVO_02 : r9719.13	
336	p860		BI: Line cont. fdbk sig	SERVO_02 : r863.1	
337	p861		Line contactor monitoring time	100	ms
338	p862		Power unit ON delay	0	ms
339	r863		CO/BO: Drive coupling status word/control word	0H	
340	p864		BI: Infeed operation	0	
341	p868		Power unit DC switch debounce time	65000	ms
342	p895[0]	P	BI: Activate/de-activate power unit components	1	
343	r896		BO: Parking axis, status word	0H	

Figure 6-6 Expert list

5. There, click on the "0" button in the expert list.

   The following configuration dialog is opened:

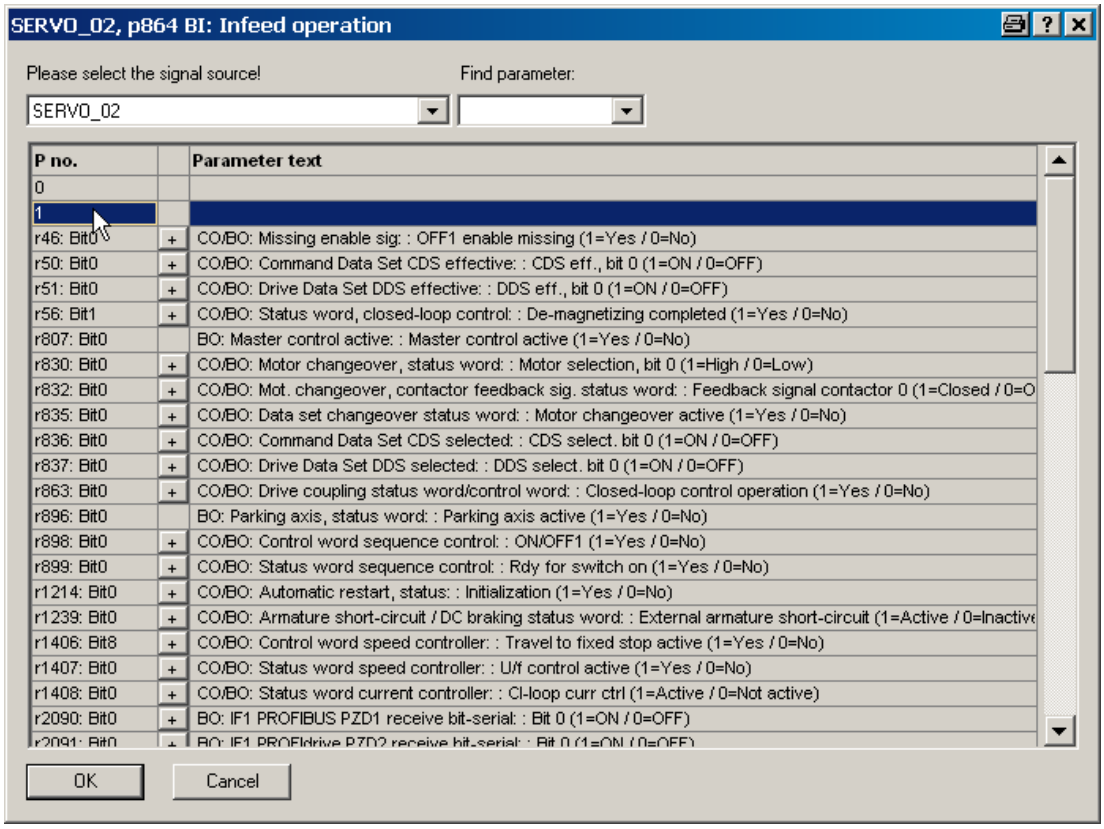


Figure 6-7 Infeed operation

6. Click on row "1" and then click on "OK".
7. Go to the menu items "Project > Save" to save the example project.

Device supply voltage

You must reduce the device supply voltage so that you can commission the drive.

1. Scroll through the expert list of the drive to parameter p0210 (device supply voltage)

Expert list

	Param...	Data	Parameter text	Online value SERVO_02	Unit	Mo
	All	A	All	All	All	All
104	r206[0]		Rated power unit power, Rated value	4.30	kW	
105	r207[0]		Rated power unit current, Rated value	9.00	Arms	
106	r208		Rated power unit line supply voltage	400	Vrms	
107	r209[0]		Power unit, maximum current, Catalog	18.00	Arms	
108	p210		Drive unit line supply voltage	600	V	Rea
109	p212		Power unit configuration	0H		Con
110	r238		Internal power unit resistance	0.04200	ohm	
111	p251[0]	P	Operating hours counter power unit fan	5	h	Rea
112	p255[0]		Power unit contactor monitoring time, Pre-charge contactor	0	ms	Rea
113	p278		DC link voltage undervoltage threshold reduction	0	V	Rea
114	p287[0]		Ground fault monitoring thresholds, Threshold at which pre-c...	6.0	%	Rea
115	r289		CO: Maximum power unit output current	10.80	Arms	
116	p290		Power unit overload response	[0] Reduce output curren...		Rea
117	r293		CO: Power unit alarm threshold model temperature	0	°C	
118	p294		Power unit alarm with I2t overload	95.0	%	Ope

Figure 6-8 Device supply voltage

2. In the "Online value SERVO_02", overwrite the value "600" with "**300**"
3. Go to the menu items "Project > Save" to save the example project.

Commissioning a drive

7

The control panel allows you to perform basic tasks for operating, monitoring, and testing the drive. For operation, the symbols (START), (STOP), and (TIP), and various diagnostic functions are available.

You can find more information about these functions in the SINAMICS S120 Drive Functions Function Manual.

ON/OFF enable

1. In the project navigator, click on the "+" symbol before the entry "S120_CU320_2_DP".
2. In the project navigator, click on the "+" symbol before drive "SERVO_02."
3. Double-click on the entry "Expert list."
4. Scroll to the right through the expert list to parameter p0840 for the ON/OFF signal.

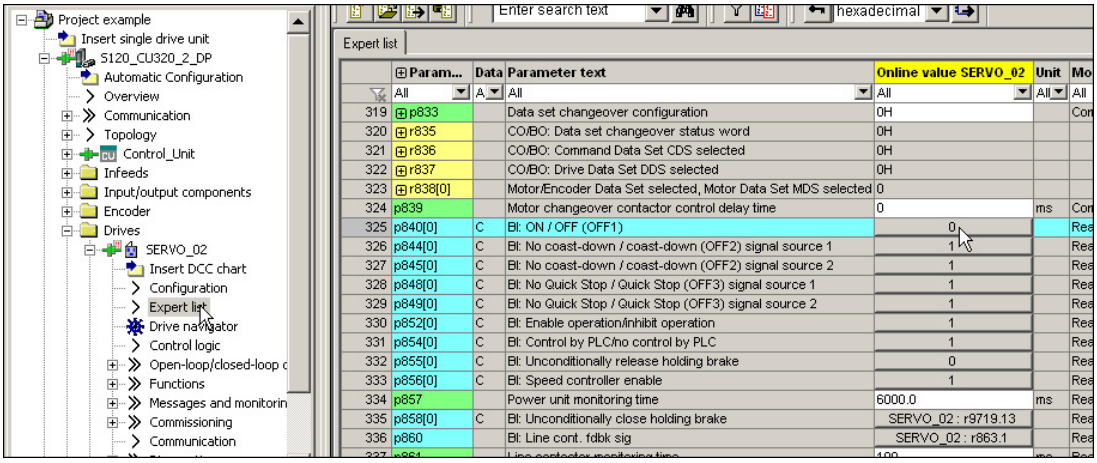


Figure 7-1 On/off signal

5. There, click on the "0" button.

   The configuration dialog for the ON/OFF signal is opened:

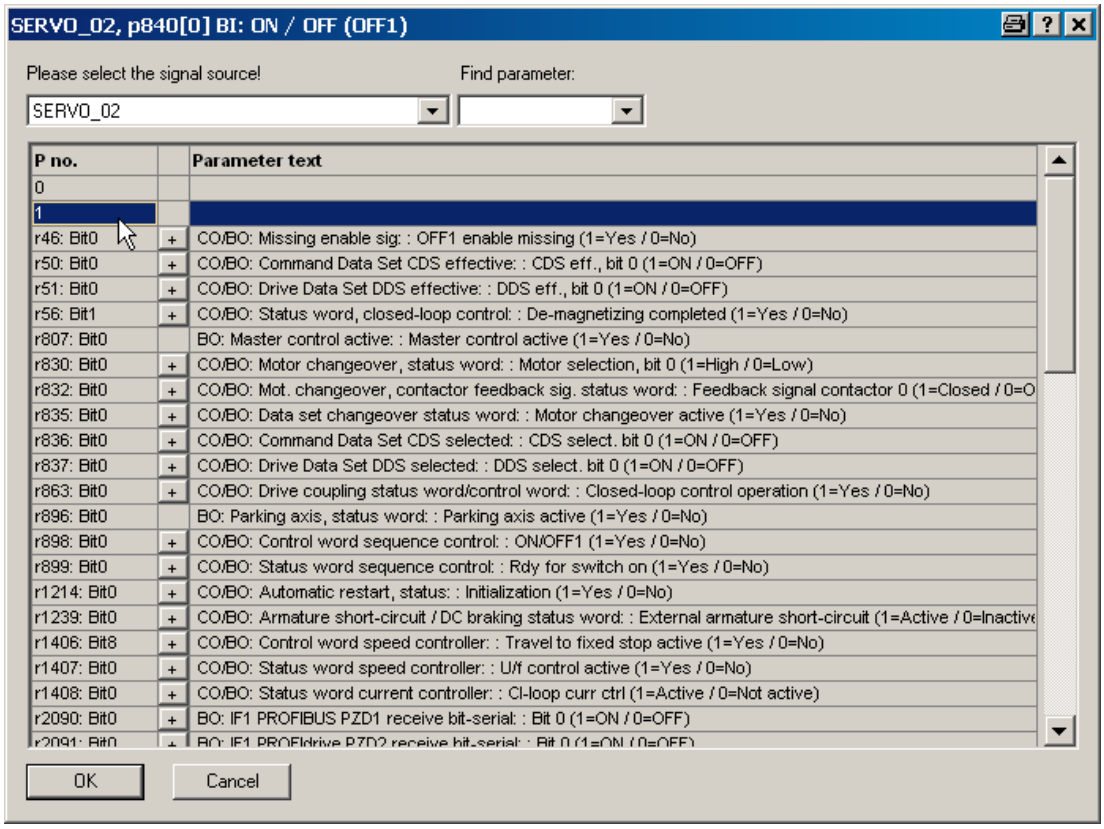


Figure 7-2 On/off configuration

6. Click on row "1" and then click on "OK".

Commission with the control panel

1. Double-click on the entries "S120_CU320_2_DP" > "Drives" > "SERVO_02" > "Commissioning" > "Control Panel" in the project navigator.

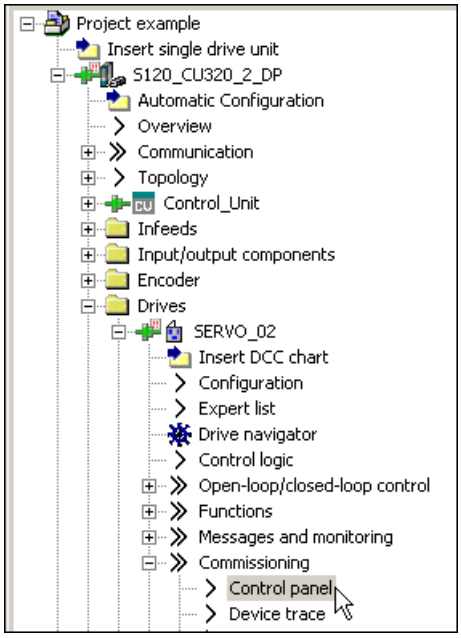


Figure 7-3 Calling up the control panel

The control panel is opened.

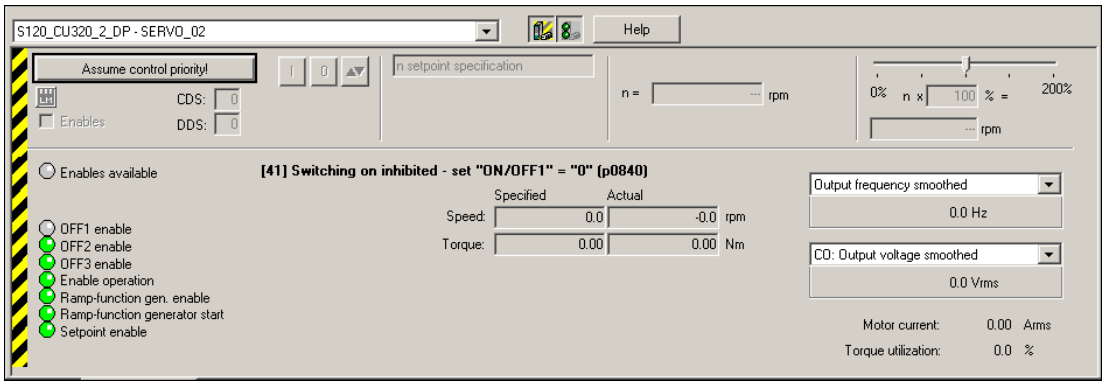


Figure 7-4 Control panel displayed

2. Click on button "Assume control priority!".

The "Assume control priority" window opens.

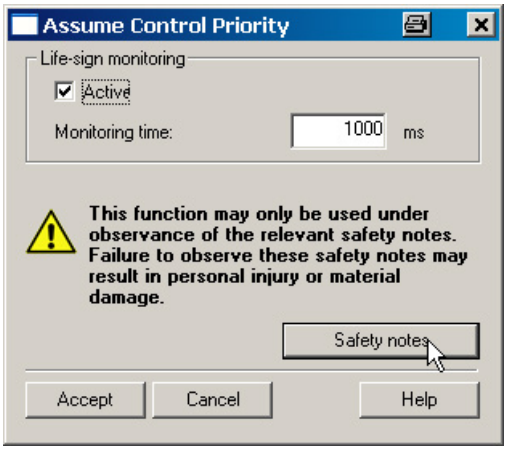


Figure 7-5 Assuming control priority

3. Click on button "Safety notes".

   The "Safety notes" window opens.

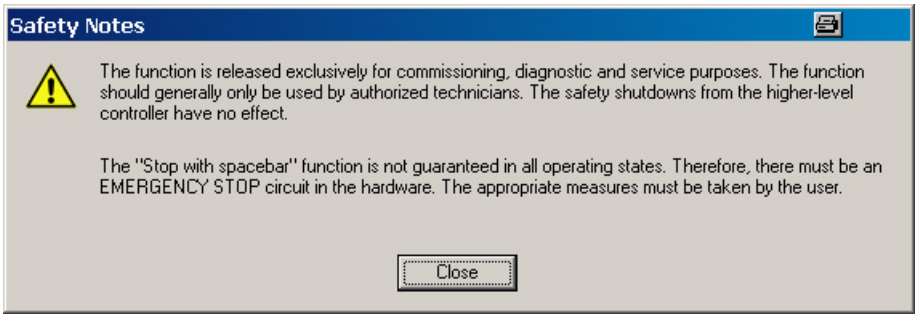


Figure 7-6 Safety instructions

4. Read and take note of the safety notes and then close the window.

5. In the "Assume control priority" window, click on button "Accept".
   The window is closed and the control panel is activated.

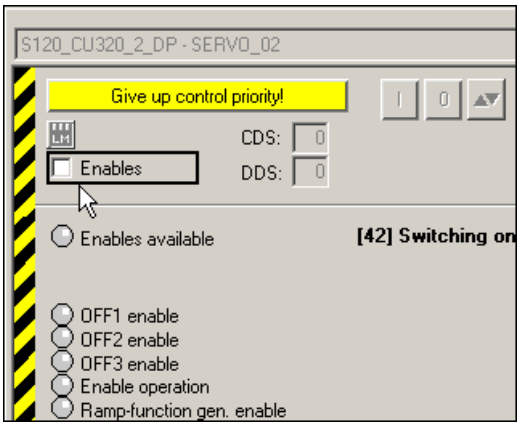


Figure 7-7 Control panel motor enable signal

6. Activate the check box "Enable signals".

   The symbols I and 0 are active.

7. Enter a suitable speed for the motor in input field "n = ", e.g. "1,000."

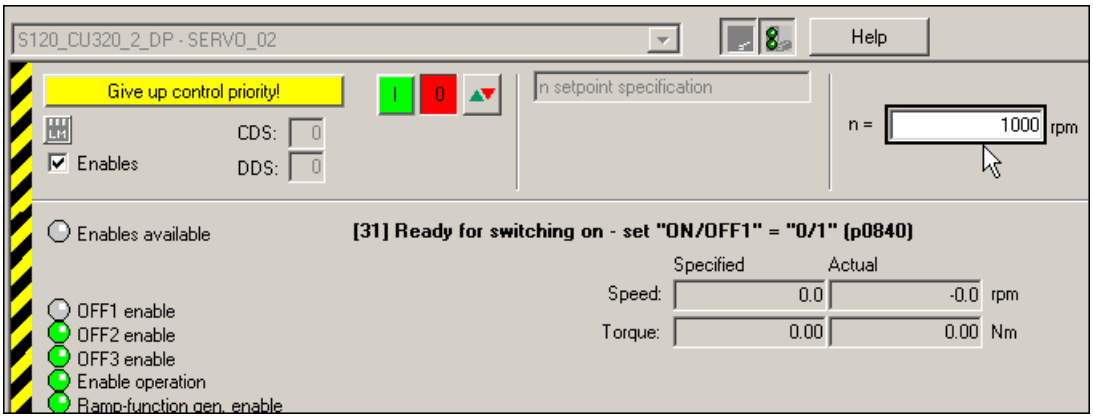


Figure 7-8 Control panel motor running

8. Click on the symbol I.

   The motor accelerates to the selected example speed of 1000 rpm. The "Enables available" LED lights up green.

Switching off the drive

1. To switch-off the motor, click on the  symbol.

   The drive coasts to a standstill.
2. Click on the "Give up control priority!" button to return the control priority.
3. Confirm the following "Return control priority" prompt with "Yes."
4. Go to the menu items "Project > Disconnect from target system" to end the communication between the PG/PC and the Control Unit.
5. Go to the menu items "Project > Save" to save the example project to the local hard disk of the PG/PC.

Appendix

A

A.1 List of important alarms and faults

Axxxxx: Alarm

Fyyyyy: Fault

Table A- 1 The most important alarms and faults

Number	Cause	Remedy
F07085	Control parameters were compulsorily changed for the following reasons: • They exceeded dynamic limits due to different parameters. • They are not applicable because of properties of the detected hardware that are not present. – Fault value (r0949, interpret as decimal): Changed parameter number. – 340: The automatic calculation of the motor and control parameters was performed (p0340 = 1), because the vector control was later activated as a configuration (r0108.2).	Not necessary. No parameter change is necessary as the parameters have already been limited to a reasonable level.
F07802	Infeed or drive does not reply a 'ready' after an internal actuation command. • Monitoring time too short. • DC link voltage not available. • Associated infeed or drive of the reporting components defective. • Supply voltage incorrectly set.	• Extend monitoring time (p0857). • Ensure the DC link voltage. Check the DC link voltage. Enable the infeed. • Replace associated infeed or drive of the reporting components. • Check settings of the supply voltage (p0210).

Number	Cause	Remedy
F07840	The "Infeed operation" signal is not available, though the enables for the drive have already been pending for longer than the parameterized monitoring time (p0857). • Infeed not in operation. • Interconnection of the binector input for the 'ready' signal is incorrect or missing (p0864). • Infeed is currently identifying the network.	• Put infeed into operation. • Check the interconnection of the binector input for the "infeed operation" signal (p0864). • Extend monitoring time (p0857). • Wait for completion of the infeed network identification.
A08526	No cyclic connection to the control is available.	Establish a cyclic connection and activate the control with cyclic operation. On PROFINET, check the parameters "Name of station" and "IP of station" (r61000, r61001). If a CBE20 is inserted and PROFIBUS should communicate through process data interface 1, then this has to be parameterized with the STARTER commissioning tool or directly through p8839.

A.2 Restoring factory settings

In rare cases, it may be necessary to revert the target device (the training case) back to factory settings. The simulated drive in the training case thus obtains a defined state once again and you can then restart the configuration on a secure basis. Factory settings can only be reached in online mode.

Procedure

1. Go to the menu items "Project > Connect to selected target devices" to switch to online mode.

   The window "Target Device Selection" opens and lists the configured drive units.

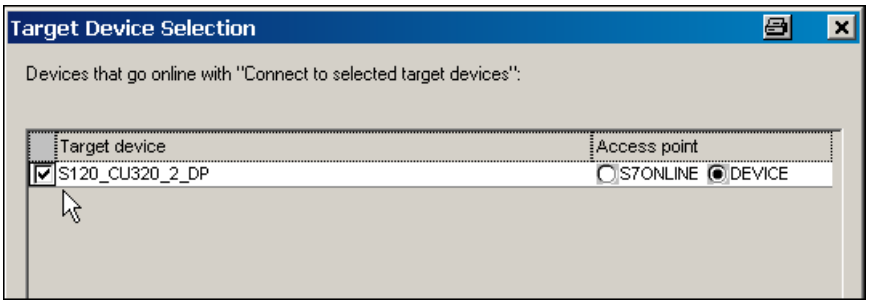


Figure A-1 Access point control

2. Activate the "DEVICE" option.

3. Activate the check box " S120_CU320_2_DP ", and click on "OK."

   The PG/PC establishes the link to the Control Unit. It then performs an "Online/offline comparison". The result is displayed in the following dialog "Online/offline comparison". Example:

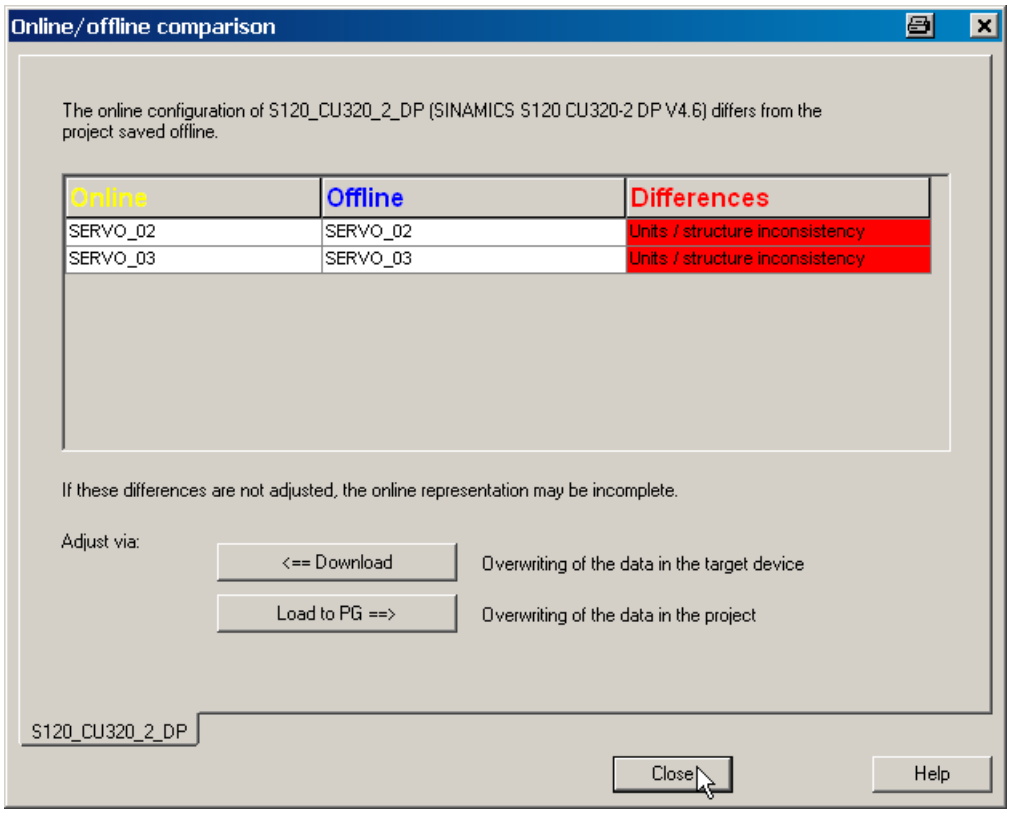


Figure A-2 Online/offline comparison

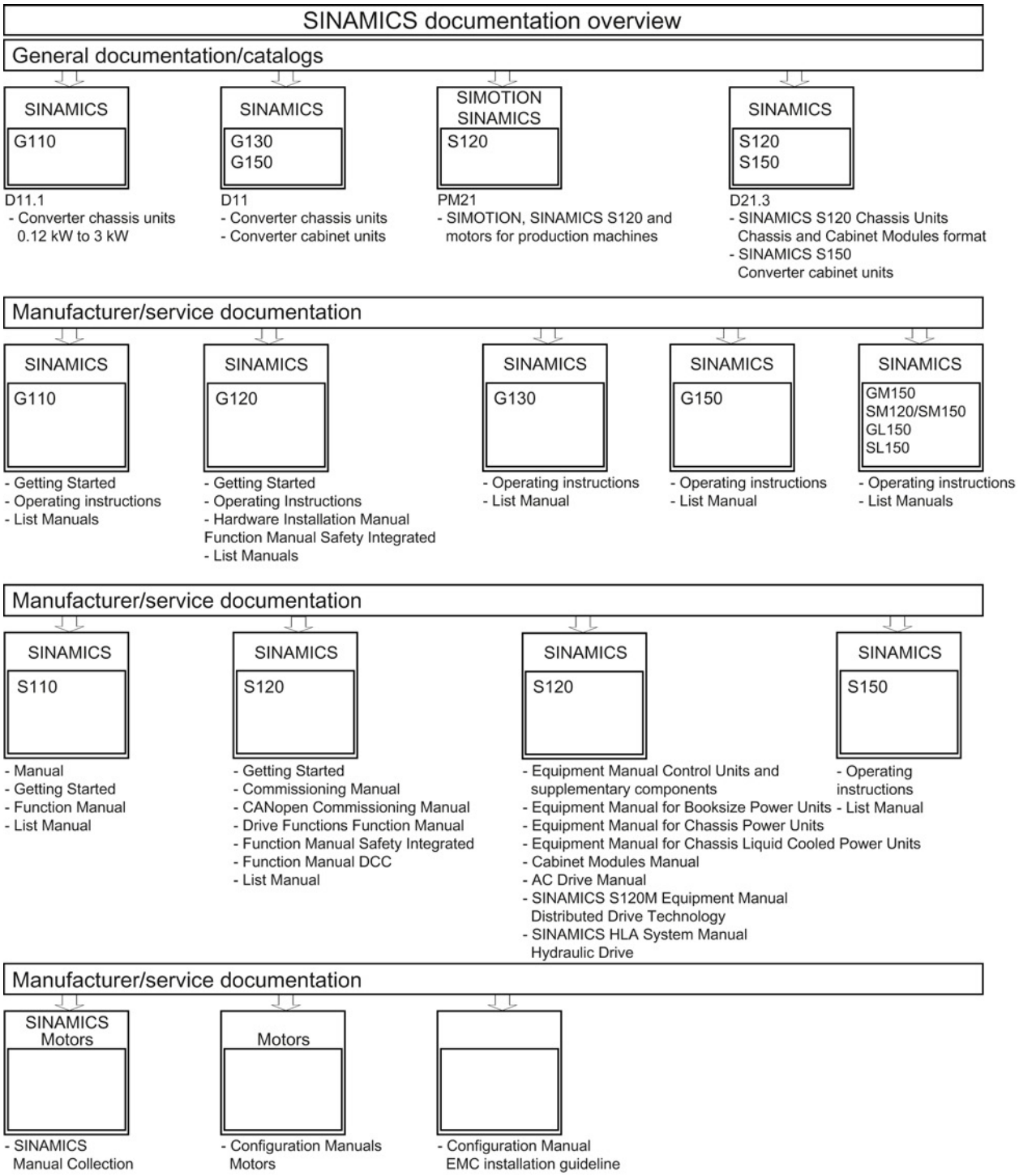
4. Click on the "Close" button.
5. Select the drive object "S120_CU320_2_DP" in the project navigator.
6. With the right mouse button, select the shortcut menu "Target device > Restore factory settings."
7. Confirm the query with "OK".

   The PG/PC sets the drive parameters to their factory settings.

   The new status is automatically transferred to the Control Unit memory card using the function "Copy RAM to ROM".
8. Select the drive unit in the project navigator and go to the shortcut menu "Target device > Copy RAM to ROM."

   The factory settings have now been restored: the drive is in a defined basic state.

A.3 Documentation overview



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