SIEMENS

SINUMERIK Commissioning S210 (6SL5...) with SINUMERIK ONE

Commissioning Manual

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Valid for
SINUMERIK ONE
SINUMERIK CNC software version 6.25
SINUMERIK STEP 7 Toolbox V20

03/2025
A5E54426935B AA

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

All names identified by ® are registered trademarks of Siemens Aktiengesellschaft. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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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1 Introduction

1.1 About SINUMERIK

From simple, standardized CNC machines to premium modular machine designs – the SINUMERIK CNCs offer the right solution for all machine concepts. Whether for individual parts or mass production, simple or complex workpieces – SINUMERIK is the highly dynamic automation solution, integrated for all areas of production. From prototype construction and tool design to mold making, all the way to large-scale series production.

Visit our website for more information SINUMERIK (https://www.siemens.com/sinumerik).

1.2 About this documentation

Target group

This document addresses experts involved in engineering and commissioning an S210 drive system (6SL5...) with a SINUMERIK ONE.

Purpose

This Commissioning Manual guides you through the most important steps when commissioning an S210 drive system (6SL5...) with a SINUMERIK ONE CNC control and the SINAMICS Startdrive commissioning tool.

Benefits

This Commissioning Manual enables the target group to develop the product, system or plant quickly and efficiently, and then commission it properly and safely.

Standard scope

This documentation only describes the functionality of the standard version. This may differ from the scope of the functionality of the system that is actually supplied. Please refer to the ordering documentation only for the functionality of the supplied drive system.

It may be possible to execute other functions in the system which are not described in this documentation. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

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

The machine manufacturer must document any additions or modifications they make to the product themselves.

Websites of third-party companies

This document may contain hyperlinks to third-party websites. Siemens is not responsible for and shall not be liable for these websites and their content. Siemens has no control over the information which appears on these websites and is not responsible for the content and information provided there. The user bears the risk for their use.

1.3 Documentation on the internet

1.3.1 Documentation overview SINUMERIK ONE

Comprehensive documentation about the functions provided in SINUMERIK ONE Version 6.13 and higher is provided in the Documentation overview SINUMERIK ONE (https://support.industry.siemens.com/cs/document/109768483).



You can display documents or download them in PDF and HTML5 format.

The documentation is divided into the following categories:

- User: Operating
- User: Programming
- Manufacturer/Service: Functions
- Manufacturer/Service: Hardware
- Manufacturer/Service: Configuring/Commissioning
- Manufacturer/Service: Safety Integrated
- Information and training
- Manufacturer/Service: SINAMICS

1.3.2 Documentation overview SINUMERIK operator components

Comprehensive documentation about the SINUMERIK operator components is provided in the Documentation overview SINUMERIK operator components (ttps://support.industry.siemens.com/cs/document/109783841).

You can display documents or download them in PDF and HTML5 format.

The documentation is divided into the following categories:

- Operator panels
- Handheld unit/Mini handheld devices
- Machine control panels
- Further operator components

An overview of the most important documents, entries and links on the topic of "SINUMERIK" is provided at SINUMERIK Overview - Topic Page (https://support.industry.siemens.com/cs/document/109766201).

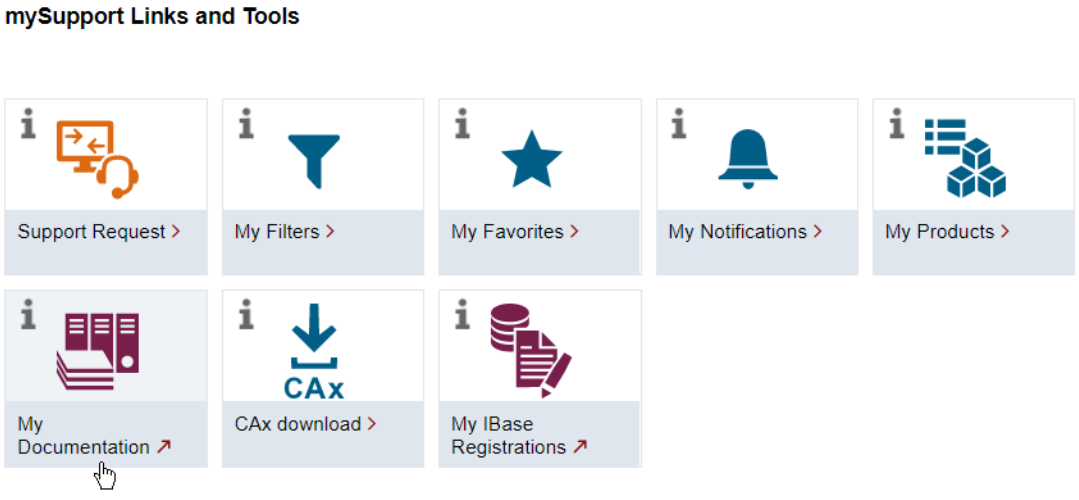
1.4 Feedback on the technical documentation

If you have any questions, suggestions, or corrections regarding the technical documentation published in the Siemens Industry Online Support, use the "Provide feedback" link which appears at the end of the entry.

1.5 mySupport documentation

With the "mySupport documentation" web-based system you can compile your own individual documentation based on Siemens content, and adapt it for your own machine documentation.

To start the application, click on the "My Documentation" tile on the "mySupport links and tools" (https://support.industry.siemens.com/cs/ww/en/my) portal page:



The configured manual can be exported in RTF, PDF or XML format.

Note

Siemens content that supports the mySupport documentation application can be identified by the presence of the "Configure" link.

1.6 Service and Support

Product support

You can find more information about products on the internet:

Product support (https://support.industry.siemens.com/cs/ww/en/)

The following is provided at this address:

- Up-to-date product information (product announcements)
- FAQs (frequently asked questions)
- Manuals
- Downloads
- Newsletters with the latest information about your products
- Global forum for information and best practice sharing between users and specialists
- Local contact persons via our Contacts at Siemens database (→ "Contact")
- Information about field services, repairs, spare parts, and much more (→ "Field Service")

Technical support

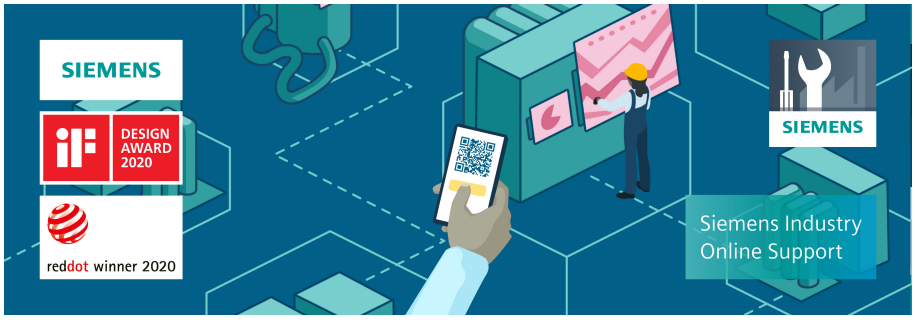
Country-specific telephone numbers for technical support are provided on the internet at address (https://support.industry.siemens.com/cs/ww/en/sc/4868) in the "Contact" area.

If you have any technical questions, please use the online form in the "Support Request" area.

Training

You can find information on SITRAIN at the following address (https://www.siemens.com/sitrain).
SITRAIN offers training courses for automation and drives products, systems and solutions from Siemens.

Siemens support on the go



With the award-winning "Industry Online Support" app, you can access more than 300,000 documents for Siemens Industry products – any time and from anywhere. The app can support you in areas including:

- Resolving problems when implementing a project
- Troubleshooting when faults develop
- Expanding a system or planning a new system

Furthermore, you have access to the Technical Forum and other articles from our experts:

- FAQs
- Application examples
- Manuals
- Certificates
- Product announcements and much more

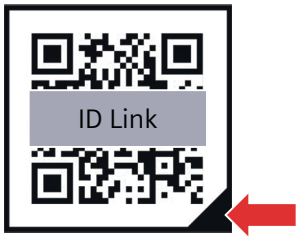
The "Industry Online Support" app is available for Apple iOS and Android.

Digital product information as QR code

The ID link according to IEC 61406 provides you with digital information about your product.

The ID link is a globally unique identifier and appears as a QR code on the product.

You can recognize the ID link by the frame with a black corner at the bottom right.



In addition to the digital nameplate you will find the following product information:

- Technical specifications
- FAQs

- Manuals
- Certificates
- Product announcements
- Application examples

1.7 Using OpenSSL

This product can contain the following software:

- Software developed by the OpenSSL project for use in the OpenSSL toolkit
- Cryptographic software created by Eric Young.
- Software developed by Eric Young

You can find more information on the internet:

- OpenSSL (https://www.openssl.org)
- Cryptsoft (https://www.cryptsoft.com)

1.8 Compliance with the General Data Protection Regulation

Siemens observes standard data protection principles, in particular the data minimization rules (privacy by design).

For this product, this means:

The product does not process or store any personal data, only technical function data (e.g. time stamps). If the user links this data with other data (e.g. shift plans) or if he/she stores person-related data on the same data medium (e.g. hard disk), thus personalizing this data, he/she must ensure compliance with the applicable data protection stipulations.

Safety instructions

2

2.1 Fundamental safety instructions

2.1.1 General safety instructions

⚠ WARNING

Danger to life if the safety instructions and residual risks are not observed

If the safety instructions and residual risks in the associated hardware documentation are not observed, accidents involving severe injuries or death can occur.

- Observe the safety instructions given in the hardware documentation.
- Consider the residual risks for the risk evaluation.

⚠ WARNING

Malfunctions of the machine as a result of incorrect or changed parameter settings

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

- Protect the parameterization against unauthorized access.
- Handle possible malfunctions by taking suitable measures, e.g. EMERGENCY STOP or EMERGENCY OFF.

2.1.2 Warranty and liability for application examples

Application examples are not binding and do not claim to be complete regarding configuration, equipment, or any eventuality which may arise. Application examples do not represent customer-specific solutions, but merely serve to provide assistance with typical tasks.

As the user you yourself are responsible for ensuring that the products described are operated correctly. Application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

2.1.3 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://new.siemens.com/cert.

Further information is provided on the Internet:

Configuration Manual Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109975311)

⚠ WARNING

Unsafe operating states resulting from software manipulation

Software manipulations, e.g. viruses, Trojans, or worms, can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a state-of-the-art, integrated industrial cybersecurity concept for the installation or machine.
- Make sure that you include all installed products in the integrated industrial cybersecurity concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- Carefully check all cybersecurity-related settings once commissioning has been completed.

Overview

3

3.1 Restrictions

When operating a SINAMICS S210 (6SL5...) drive device with SINUMERIK ONE, the following special issues and restrictions must be taken into consideration:

- SINAMICS S210 (6SL5...) is operated with SINUMERIK ONE as external PLC drive via PROFINET at X150 P1/P2, X160. A SIMOTICS 1FT2/1FK2 with a 1-cable connection must be provided on the motor side.
- Commissioning and diagnostics are carried out using Startdrive Advanced or the web server (not supported by SINUMERIK Operate).
- Mixing SINAMICS S210 (6SL5...) and SINAMICS S120/S220 in an interpolation group is not possible.
- The properties stated in the operating instructions apply to the operation of the S210 (6SL5...).
  When operating SINAMICS S210 (6SL5...) with SINUMERIK ONE, CNC options D30, D50, K00, M01, M03, M12, M13, M41, M60, M61, P55, S11, S23 and S61 cannot be used.
- SINAMICS S210 (6SL5...) is not supported in SINUMERIK Operate: Restricted diagnostics, restricted transfer and display of alarm texts (only safety alarms can be transferred and displayed), no expert list and drive archive.
- Restriction when using S210 as NC axis: As soon as the S210 (6SL5...) is operated as an NC axis, acyclic communications to the drive from the PLC is not permissible, i.e. drive parameters cannot be read/written to, not even for alarm evaluation or drive diagnostics. Otherwise, alarm 300406 may be output.
- Safety Integrated functions available (Extended Safety), with the exception of component replacement.
  The Extended Safety license 6SL3074-0AA10-0AA0 must be ordered separately for S210 (6SL5...) (option K00, S61 cannot be used).
  The safety acceptance test is carried out using Startdrive (not SINUMERIK Operate).
- **No** Auto Servo Tuning (AST), SINUMERIK Tuning Center (STC) and optimization of gantry axes
- **No** time synchronization between CNC and S210 (time synchronization with PLC as SNTP server (https://support.industry.siemens.com/cs/ww/en/view/82203451) possible)
- **No** star-delta switchover
- Drive, motor, encoder data sets, maximum number = 1
- **No** torque precontrol (MD 32620 $MA_FFW_MODE = 4)
- **No** $AA_TORQUE from the drive
- **No** SINAMICS Technology Extension
- **No** Support of IdentSnapshot

3.2 Requirements

The following requirements must be fulfilled for commissioning and configuring the S210 (6SL5...) drive system using SINUMERIK ONE:

- CNC-SW 6.25 or higher
- TIA Portal V20 or higher
- SINUMERIK STEP 7 Toolbox V20 or higher
- SINAMICS Startdrive V20 or higher
- Startdrive Advanced license to use additional engineering functions
- SINUMERIK ONE NCU 17x0 or SINUMERIK ONE PPU 1740
- SINAMICS S210 (6SL5...) with firmware version 6.4 or higher

The innovated SINAMICS S210 (6SL5...) has the following Article Nos.:

- 6SL5310-1BB10-1xFx
- 6SL5310-1BB10-2xFx
- 6SL5310-1BB10-4xFx
- 6SL5310-1BB10-8xFx
- 6SL5310-1BE10-4xFx
- 6SL5310-1BE10-8xFx
- 6SL5310-1BE11-0xFx
- 6SL5310-1BE11-5xFx
- 6SL5310-1BE12-0xFx
- 6SL5310-1BE13-5xFx
- 6SL5310-1BE15-0xFx
- 6SL5310-1BE17-0xFx

3.3 Commissioning procedure

The web server and SINAMICS Startdrive commissioning tools are available for commissioning and configuring the S210 (6SL5...) drive system.

Commissioning using SINAMICS Startdrive in the TIA Portal is described in the following document.

You commission the SINAMICS S210 (6SL5...) drive system using SINAMICS Startdrive in the following steps:

- Create or open the TIA Portal project using Startdrive and the SINUMERIK STEP 7 toolbox
- Create the device configuration offline in Startdrive
  - Insert the SINAMICS drive into the project and specify it
  - Make detailed settings for the drive and components
  - Insert SINUMERIK ONE into the project and network with the drive
- Load project data into the target device
- Establish an online connection between Startdrive and the target device
- Make basic settings online using the guided quick startup in the editing mode.
- Make the settings in SINUMERIK Operate to facilitate communications between the drive and the NC

More information is provided in the information system of the TIA Portals in Chapter "Configuring SINAMICS S210 drives" as well as in the operating instructions "SINAMICS S210 servo drive system with SIMOTICS S-1FK2 and S-1FT2".

More information on security settings and user management is provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109983025) in Chapter "Security settings in Startdrive" or in the information system of the TIA Portal.

3.4 Protection and security settings

The following protection & security settings are available for the SINAMICS S210 (6SL5...):

- Wizard for security settings
- User Management & Access Control
- Ports and protocols
- Drive data encryption
- Syslog server
  - Syslog server
  - Trusted servers
- Certificate management

More information on these protection & security settings is provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109983025) in Chapter "Security settings in Startdrive" or in the information system of the TIA Portal.

Create the device configuration offline in Startdrive

4

4.1 Insert the drive unit offline

Introduction

You configure your SINAMICS drive device offline in the "Device view". You insert the individual components of the SINAMICS drive device and connect them.

Requirements

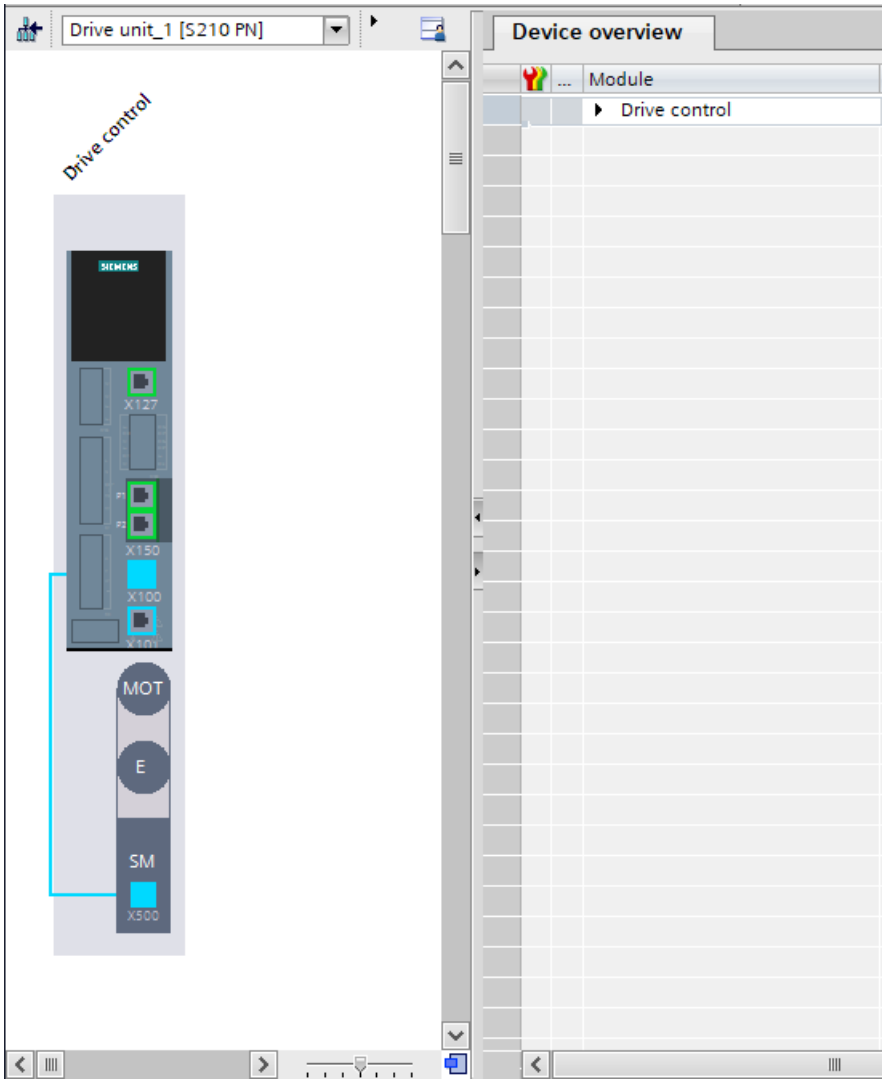
- A project is open in the TIA Portal.
- The device view is active.

Procedure

Proceed as follows to insert a SINAMICS drive device:

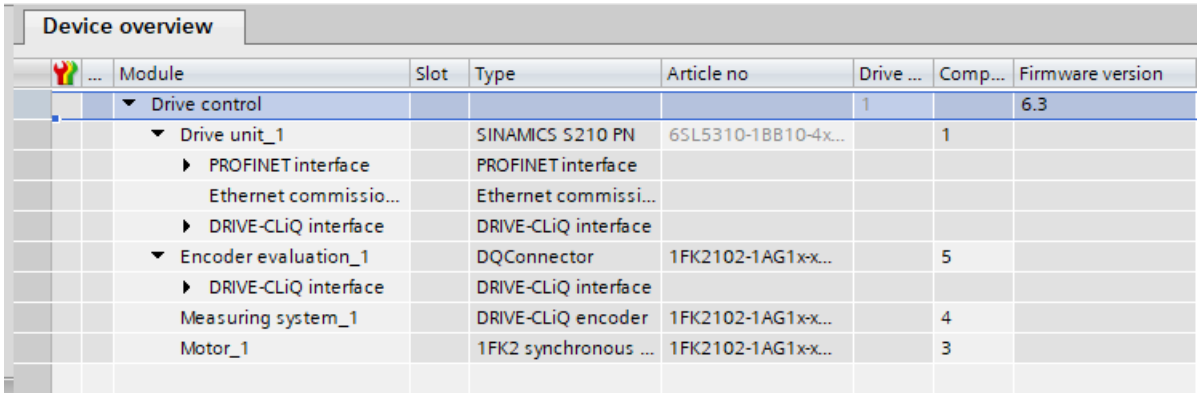
1. Double-click "Add new device" in the project navigation.
   The "Add new device" dialog box opens.
2. Click the "Drives" button to limit the list of devices to just drive devices.
   All of the available SINAMICS control modules are now displayed in the drop-down list.
3. Select the required SINAMICS drive device from the list.
4. When required, assign a different device name for the drive device - or change the suggested firmware version (from 6.3.).

5. Click "OK" to confirm your settings.
   As soon as the "Open device view" option is activated, the SINAMICS drive device is automatically created and displayed in the device view.



6. Supplement the DRIVE-CLiQ topology with the other components required:
   - Click on button "MOT" in the graphic of the device view and select the motor from the list in the inspector window in properties, tab "General".
     When required, you can filter the list according to various criteria in order to be able to select the required motor faster.
   - To select motors from other motor series, drag the corresponding entry from the hardware catalog onto button "MOT" in the graphic.
   - Then select the required motor again from the list in the inspector window in properties, tab "General".
     More information on the topic of specifying the motor is provided in the Operating Instructions SINAMICS S210/SIMOTICS S-1FK2 and S-1FT2 (https://support.industry.siemens.com/cs/document/109982746).

The components used by the SINAMICS drive device are listed in the "Device overview".



Device overview

	...	Module	Slot	Type	Article no	Drive ...	Comp...	Firmware version
		Drive control				1		6.3
		Drive unit_1		SINAMICS S210 PN	6SL5310-1BB10-4x...		1	
		PROFINET interface		PROFINET interface				
		Ethernet commissio...		Ethernet commissi...				
		DRIVE-CLiQ interface		DRIVE-CLiQ interface				
		Encoder evaluation_1		DQConnector	1FK2102-1AG1x-x...		5	
		DRIVE-CLiQ interface		DRIVE-CLiQ interface				
		Measuring system_1		DRIVE-CLiQ encoder	1FK2102-1AG1x-x...		4	
		Motor_1		1FK2 synchronous ...	1FK2102-1AG1x-x...		3	

Result

As soon as the drive device has been created, it appears in the project navigator under "Drive_unit_1" together with the following entries:

- Device configuration
- Online & diagnostics
- Parameter:
  - Function view: Parameter assignment on the graphical interface. The individual screen forms are based on the function diagrams and include the parameters required.
  - Parameter view: Clearly organized representation of the parameters available for the device.
- Commissioning
- Acceptance test
- Traces

4.2 Networking the drive device with the control system

Introduction

You can configure the telegrams and drive-integrated safety functions in the TIA Portal for SINAMICS drive devices (S210 (6SL5...)). You can configure the NCU/PPU and the networked drives entirely in the TIA Portal and do not need to import configuration data from other previously parameterized engineering tools into the TIA Portal. The requirement for this is that the drive device has also been created in the project and is networked with the NCU/PPU.

Requirements

- A project is open in the TIA Portal.
- A SINUMERIK NCU/PPU has been created.
- The device view is active.

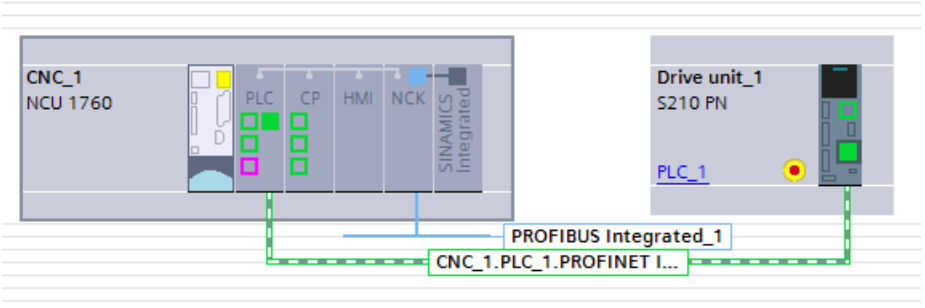
Procedure

Proceed as follows to establish the connection between the SINUMERIK NCU/PPU and the SINAMICS drive device:

1. Switch to the network view.
2. In the drive device view, click on "Not assigned" and under "Select IO controller", select "CNC_1.PLC_1.PROFINET interface_150".
   Alternatively, drag a connection between a PROFINET interface of the SINUMERIK NCU/PPU (e.g. the PLC) and the PROFINET interface of the SINAMICS drive device.
   The PROFINET IO system is created and the drive device is networked with the control system.

Note

A PROFINET IO system and a sync domain with the two nodes are created automatically. If you assign another IO device to the IO system of the IO controller, the IO device is assigned automatically to the sync domain of the IO controller.



Note

You need a telegram for communications between a control system and a drive device. Telegram 105 is automatically preset.

After inserting the IO device, you can configure the sync domain and the isochronous mode of the IO device. Isochronous mode is required for typical motion control applications.

4.3 Making detailed settings of the drive device

Overview

You can configure the following details for the SINAMICS S210 (6SL5...):

Group	Settings
General	• Product information Name data • Catalog information Brief description, description of the components included, firmware version used • Identification & Maintenance Information and data to identify and localize a drive within a plant or system.
PROFINET interface [X150]	• General • Ethernet addresses Subnet, IP address, subnet mask, PROFINET names • Telegram configuration – Telegrams of the closed-loop drive control: Send, receive, Safety Integrated Details are contained in Chapter "Configuring telegrams (Page 23)". • Advanced options – Interface options – Media redundancy – Clock cycle synchronization for local modules (isochronous mode) – Real time settings – Port [X150 P1] and port [X150 P2] • Shared device – Higher-level PROFINET IO controller of the PN interface
Module parameters	• Activation of channel diagnostics
Protection & Security	• Wizard for security settings • User Management & Access Control • Ports and protocols • Drive data encryption • Syslog server – Syslog server – Trusted servers • Certificate management **Note**: Information on these security settings is provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109983025) in Chapter "Security settings in Startdrive" or in the information system of the TIA Portal.

Group	Settings
OPC UA server (for drive devices with firmware 6.4)	• General – Application name and URI (Uniform Resource Identifier) • Server – Activating the port – Security policy When activating the connection, fixed security token policies in the "Security" setting range are automatically activated.
Hardware identifier (for drive devices with firmware 6.4)	• HW identifier Every hardware object has a hardware identifier that is automatically assigned when configuring a hardware component
Ethernet commissioning interface [X127]	• General • Ethernet addresses: – Subnet, IP address, subnet mask
Time synchronization/Time	• Option "Synchronize with NTP server" If the drive is connected to a SINUMERIK ONE control system in the device configuration, option "Use PLC as NTP server" is activated automatically. If the drive is connected to a PLC, the IP address of the PLC is displayed. In this case, the IP address and the time zone of the NTP server can be changed. • Option "No synchronization" In this case, NTP synchronization is not managed in the project. You can configure this synchronization separately for the drive in online mode with the Online & Diagnostics function "Set time".
Hardware settings	• Supply voltage The pre-assigned supply voltage is 230/400 V depending on the selected drive device (1AC / 3AC) • Braking resistor A braking resistor must be configured if an externally connected braking resistor is to be controlled. The following options are possible. – Third-party braking resistor (with software monitoring) Then enter the data of the external braking resistor. – No monitoring (external braking resistor) The internal braking resistor is used if an external braking resistor is incorrectly connected.
Web server	• Enabling access to the PROFINET interface [X150] and/or the service interface [X127] via HTTP or HTTPS.

Procedure

1. Select the desired drive device in the device view and open the inspector window.
2. In the secondary navigation of the inspector window, select the desired detail menu (see list in the summary).
3. Make the required detail settings in the white fields. Default settings are usually available in most detail menus.
   The gray fields are corrected automatically in accordance with their setting. Fields with a gray background cannot be edited directly.

4.4 Configuring telegrams

4.4.1 Overview of telegram configuration

Description

If communication is established between the drive device and a higher-level control system via PROFINET IO, the data (setpoints and actual values) are cyclically transferred using PROFIdrive telegrams.

For an external drive device such as the S210 (6SL5...), the telegram must be configured via the connected SINAMICS drive device.

To configure a cyclic data transfer, proceed as follows:

- Insert and network the drive device and control system in the TIA Portal
- Insert the PROFINET subnet in the SINAMICS drive device
- Check the PROFINET settings
- Parameterize the drive
  You must create telegrams for the closed-loop drive control and for the relevant drive objects, such as drive axes, closed-loop drive control or infeed.
- Check and edit the telegram settings
  For all telegrams that are processed by the NCK (e.g. closed-loop control telegrams), you must choose process image partition "PIP NCK".
- If you control a drive device with safety functions via PROFIsafe, then you must insert the corresponding PROFIsafe telegram.

Telegram overview

The following table shows the telegrams for PROFIdrive communications:

Drive system	Designation	Purpose
S210	SIEMENS telegram 105	Manufacturer-specific telegram for PROFIdrive communication.

The telegram configuration (e.g. telegram address, telegram type) in the SINUMERIK Operate must match that of the configuration in the TIA Portal.

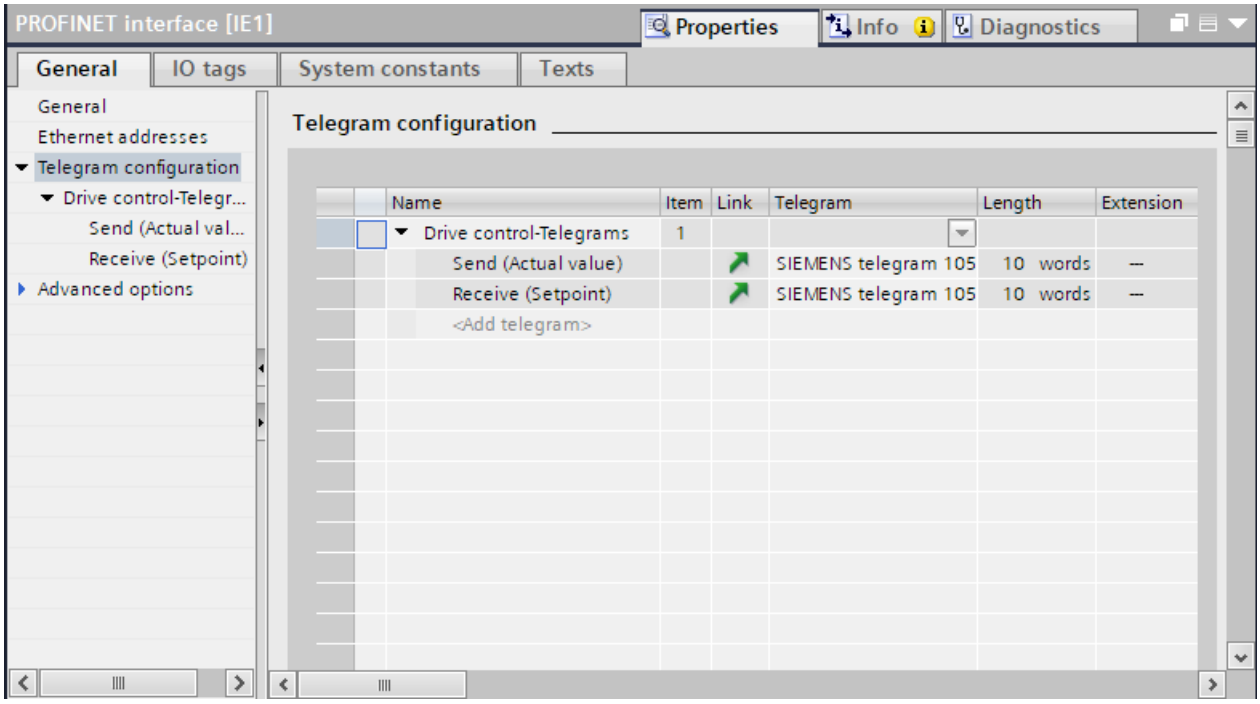
4.4.2 Displaying telegram configuration

The "Telegram configuration" screen form is part of the device configuration and is displayed in the Inspector window. Here, you can create telegrams and view their properties.

You can call this screen form, either via the project navigation or also via direct links from the communication screen forms.

Procedure

1. In the network view, select the IO device (S210 (6SL5...)) and then click on the PROFINET interface.
2. In the Inspector window, select "Properties > Telegram configuration".
   The telegram configuration settings are displayed.
   Telegram 105 is automatically preset.



4.4.3 Creating telegrams

You can create the following telegrams once, as long as they are still not available in the telegram list of the drive object:

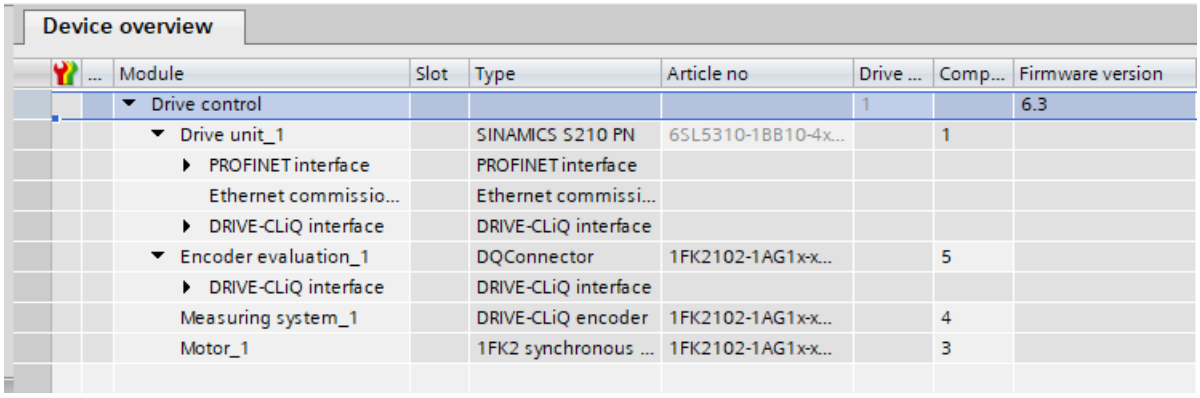
- Safety Integrated telegram (901)
- Supplementary telegram Safety Integrated (701)

Procedure

To add a telegram, proceed as follows:

1. In the Inspector window, select "Properties > PROFINET interface > Telegram configuration".
2. Click on the "Add telegram" entry.
   A drop-down list opens. All telegram types that have not been assigned yet can be used.

3. Select the required telegram type.
   The entries for the telegram are created.
4. If required, now change the telegram, e.g. from telegram 30 to telegram 901 for safety telegram type.



4.4.4 Parameterizing sending (actual value/safety actual value)

Description

Edit the following parameters for the setpoints of the communications between the drive device and the control system. The communications direction is from the drive device to the partner (e.g. a control system). The settings relevant to PROFIsafe are marked yellow and only displayed when you add a PROFIsafe telegram.

Note

Check of the PROFIsafe telegrams

By default, the setting of the PROFIsafe telegrams under "Telegram configuration" is not password-protected.

- Apply the TIA Portal project protection to the whole project to protect the telegram settings from being accidentally or deliberately overwritten.
- When working with PROFIsafe telegrams, check the setting of the PROFIsafe telegrams again during the safety acceptance process in order to ensure that the selected PROFIsafe telegram corresponds to the requirements of your application.

Parameter	Drive device	Controller
Name	Name of the drive device in the project	Name of the assigned controller in the network view. The assignment can only be changed there.
Role	Device	Controller
IP address	IP address of the drive device (this cannot be changed)	IP address of the IO controller (control) (this cannot be changed)

Parameter	Drive device	Controller
Telegram	Drop-down list to select the telegram (the default setting is telegram 105 for the main telegram or telegram 700 for the Safety Integrated supplementary telegram).	
Telegram (only for PROFIsafe)	Drop-down list to select the PROFIsafe telegram (default setting is telegram 30).	
F address (only for PROFIsafe)	PROFIsafe address of the destination (F_Dest_Add). The address uniquely identifies the destination.	PROFIsafe address of the source (F_Source_Add, cannot be changed). The address uniquely identifies the source.
Slot	Position of the telegram in the drive device	-
Start address	Drop-down list to select the process data word (PZD) (cannot be set for standard telegrams)	Next free start address for the configured module. You can accept or change the address.
Length	Length of the selected telegram Can only be changed on "free telegrams".	
Extension	Cannot be changed	
Organization block	Select the organization block from the drop-down list. If you have assigned the drive device to a control system, then you require an organization block for communications between the drive device and the control system. For an S7-1500 for example, if you create a technology object, type "Positioning axis" and assign it to a drive axis, then you require an organization block, type "MC-Servo [OB91]". The communications must then be isochronous. Additional OBs are for example, Main [OB1]. PROFIsafe telegrams are assigned to OB "---". It cannot be changed.	
Process image	Select the process image partition that you want to use in the drop-down list in order to transfer the data consistently: • "---" • None • Automatic update • PIP 1... PIP 31 • PIP OB servo • PIP NCK The process image partitions that are listed for selection depend on the telegram type (safety, main telegram, supplementary data). For information on process images, enter the term in the online help search.	
F-watchdog time (only for PROFIsafe)	Monitoring time in the fail-safe DP standard slave / IO standard device / PA field device. A valid, current safety telegram must arrive from the F-CPU within the monitoring time. This ensures that failures and errors are detected and the appropriate reactions triggered to keep the F system in a safe state or to transfer it to a safe state. Activate option "Manual assignment of the F-I/O DB number" if you wish to manually enter the monitoring time. If "Manual assignment of the F-I/O DB number" is not activated, then the F-system assigns the monitoring time.	

Parameter	Drive device	Controller
F-I/O DB number (only for PROFIsafe)	The number of the block that controls the F-I/O. Activate option "Manual assignment of the F-I/O DB number" if you wish to manually enter the F-I/O DB number.	
F-I/O DB name (only for PROFIsafe)	The name of the block that controls the F-I/O.	
Hardware identifier	Used to address and identify the module.	

4.4.5 Parameterizing receiving (setpoint/safety setpoint)

Description

Edit the following parameters for the setpoints of the communications between the drive device and the control system. The communications direction is from the partner (e.g. a control system to the drive). The settings relevant to PROFIsafe are marked yellow and only displayed when you add a PROFIsafe telegram.

Note

Check of the PROFIsafe telegrams

By default, the setting of the PROFIsafe telegrams under "Telegram configuration" is not password-protected.

- Apply the TIA Portal project protection to the whole project to protect the telegram settings from being accidentally or deliberately overwritten.
- When working with PROFIsafe telegrams, check the setting of the PROFIsafe telegrams again during the safety acceptance process in order to ensure that the selected PROFIsafe telegram corresponds to the requirements of your application.

Parameter	Drive device	Controller
Name	Name of the drive device in the project	Name of the assigned controller in the network view. The assignment can only be changed there.
Role	Device	Controller
IP address	IP address of the drive device (this cannot be changed)	IP address of the IO controller (control) (this cannot be changed)
Telegram	Drop-down list to select the telegram (the default setting is telegram 105 for the main telegram).	
Telegram (PROFIsafe)	Drop-down list for selecting the PROFIsafe telegram (the default setting is telegram 30).	
F address (only for PROFIsafe)	PROFIsafe address of the destination (F_Dest_Add)	PROFIsafe address of the source (F_Source_Add, cannot be changed). The address uniquely identifies the source.
Slot	Position of the telegram in the drive device	-

Parameter	Drive device	Controller
Start address	Drop-down list to select the process data word (PZD) (cannot be set for standard telegrams)	Next free start address for the configured module that you can accept or change.
Length	Length of the telegram Can only be changed on "free telegrams".	
Extension	Cannot be changed	
Organization block	Select the organization block from the drop-down list. If you have assigned the drive device to a control system, then you require an organization block for communications between the drive device and the control system. For an S7-1500 for example, if you create a technology object, type "Positioning axis" and assign it to a drive axis, then you require an organization block, type "MC-Servo [OB91]". The communications must then be isochronous. Additional OBs are for example, Main [OB1]. PROFIsafe telegrams are assigned to OB "---". It cannot be changed.	
Process image	Select the process image partition that you want to use in the drop-down list in order to transfer the data consistently: • "---" • None • Automatic update • PIP 1... PIP 31 • PIP OB servo • PIP NCK The process image partitions that are listed for selection depend on the telegram type (safety, main telegram, supplementary data). For information on process images, enter the term in the online help search.	
F-watchdog time (only for PROFIsafe)	Monitoring time in the fail-safe DP standard slave / IO standard device / PA field device. A valid, current safety telegram must arrive from the F-CPU within the monitoring time. This ensures that failures and errors are detected and the appropriate reactions triggered to keep the F system in a safe state or to transfer it to a safe state. Activate option "Manual assignment of the F-monitoring time" if you wish to manually enter the monitoring time. If "Manual assignment of the F-monitoring time" is not activated, then the F-system assigns the monitoring time.	
F-I/O DB number (only for PROFIsafe)	The number of the block that controls the F-I/O. Activate option "Manual assignment of the F-I/O DB number" if you wish to manually enter the F-I/O DB number.	
F-I/O DB name (only for PROFIsafe)	The name of the block that controls the F-I/O.	
Hardware identifier	Used to address and identify the module.	

4.4.6 Structure of the telegrams, control and status words

Structure of the telegrams

The selection of a telegram determines the process data of the drive unit (Control Unit) that is transferred.
From the drive unit view, the received process data represents the receive words and the process data to be sent represents the send words.

The receive and send words consist of the following elements:

- Receive words: Control words or setpoints
- Send words: Status words or actual values

To maintain the PROFIdrive profile, the following must apply:

- Interconnect PZD receive word 1 as control word 1 (STW1).
- Interconnect PZD send word 1 as status word 1 (ZSW1). (The WORD format must be used for PZD1)

One PZD (process data item) corresponds to one word.

The signals of the control and status words are interconnected with the corresponding signals of the drive device via BICO.

4.5 Preparing communications via PROFINET IO

4.5.1 Configuring topology and ports

Interconnecting ports

Prerequisite for IRT is the topology configuration with the specification of which device is connected via which port to which other devices.

There are two options for defining the properties of the cables between the ports of the switches:

- Via the topology view
- Via the object properties

Using the topology view

With the topology view you have an overview of all ports in the project and can interconnect them centrally.

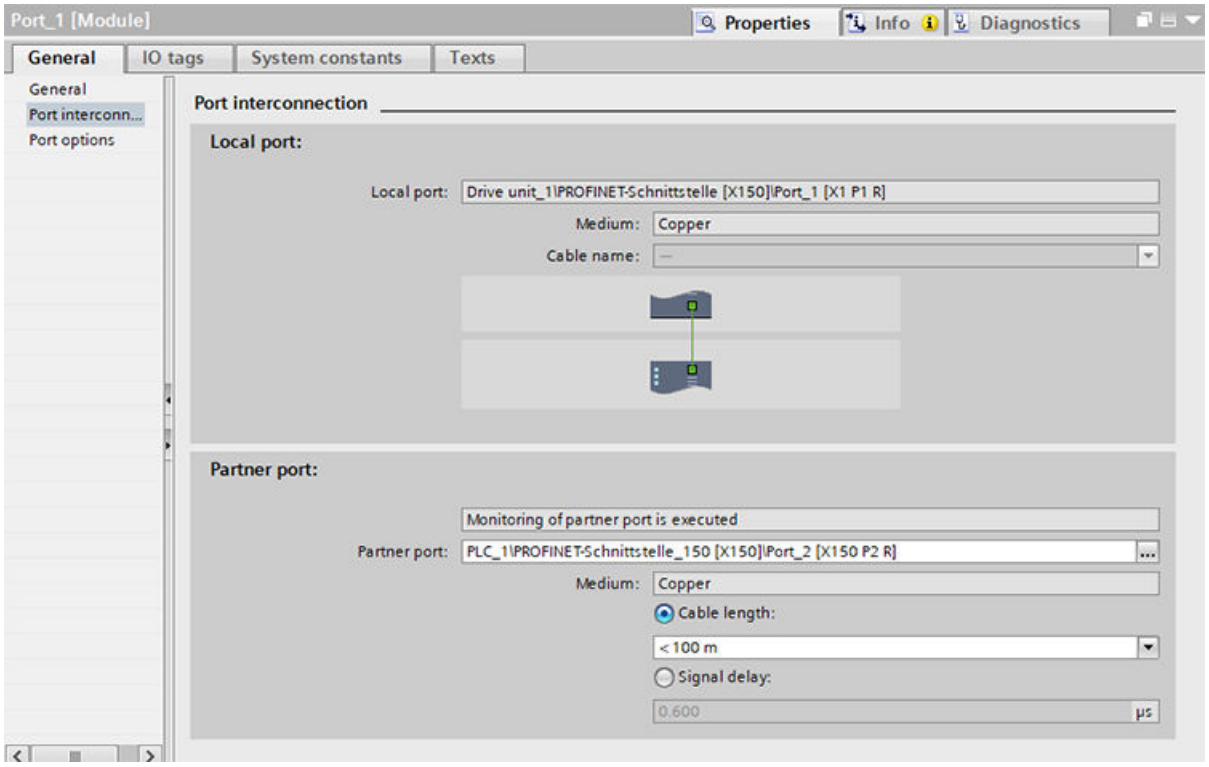
To configure the topology, proceed as follows:

1. Click the "Topology view" tab.
   You can perform the following in the topology view:
   - Interconnect ports
   - Modify the properties of the interconnection
   - Insert passive components
   - Arrange for an offline/online comparison to be displayed in online mode
2. If you hover the mouse over the ports, port names are displayed in the tooltip. In the Inspector window, the properties for each selected port/device are displayed.
3. Click the source port and drag the connection onto the target port.
   The topology view then shows the connection between the two ports.

Port interconnection via the properties

After the selection of a device or an interface, the entries for the ports are displayed in the Inspector window in the "General" tab at "PROFINET PN / IO interface > Advanced options" or "Advanced options".

1. Select the interface, whose ports you want to edit, from the Inspector window.
2. Select the interface you wish to interconnect.
3. Select the "Port interconnection" entry.
   The "Local port" and "Partner port" dialogs open.



4. Open the "Partner port" drop-down menu.
   All devices with their PROFINET interfaces are shown.
5. Below the respective interface, select the port you want to connect to the selected port.
   Ports that you cannot connect are marked in red. Ports that are already occupied are not displayed.
   The connection between the ports is displayed in the topology view.
6. If necessary, edit the other parameters of the port.

4.5.2 Configuring sync domains, synchronization roles and send clock

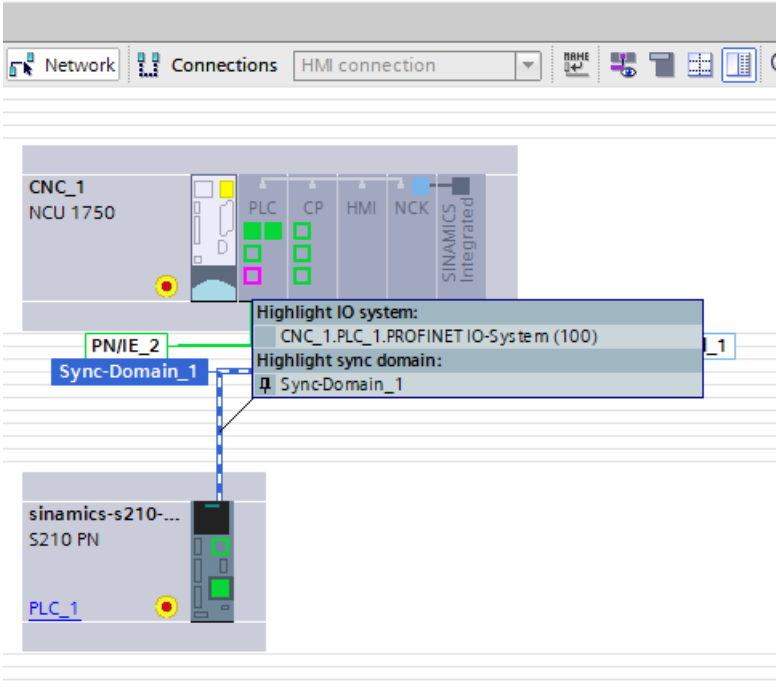
Configuring sync domains

A sync domain is needed for synchronizing PROFINET IO devices. The sync domain ensures that all nodes that belong to the domain are synchronized. After being inserted, the nodes of the sync domain are not synchronized. The drive device and control system together form a sync domain.

After you have inserted a control and a SINAMICS drive unit, you must first assign them to a subnet. Unassigned devices are displayed as "Not assigned".

To configure the sync domain, proceed as follows:

1. In the network view, select the subnet and activate "Sync-Domain_1" under "Highlight sync domain".

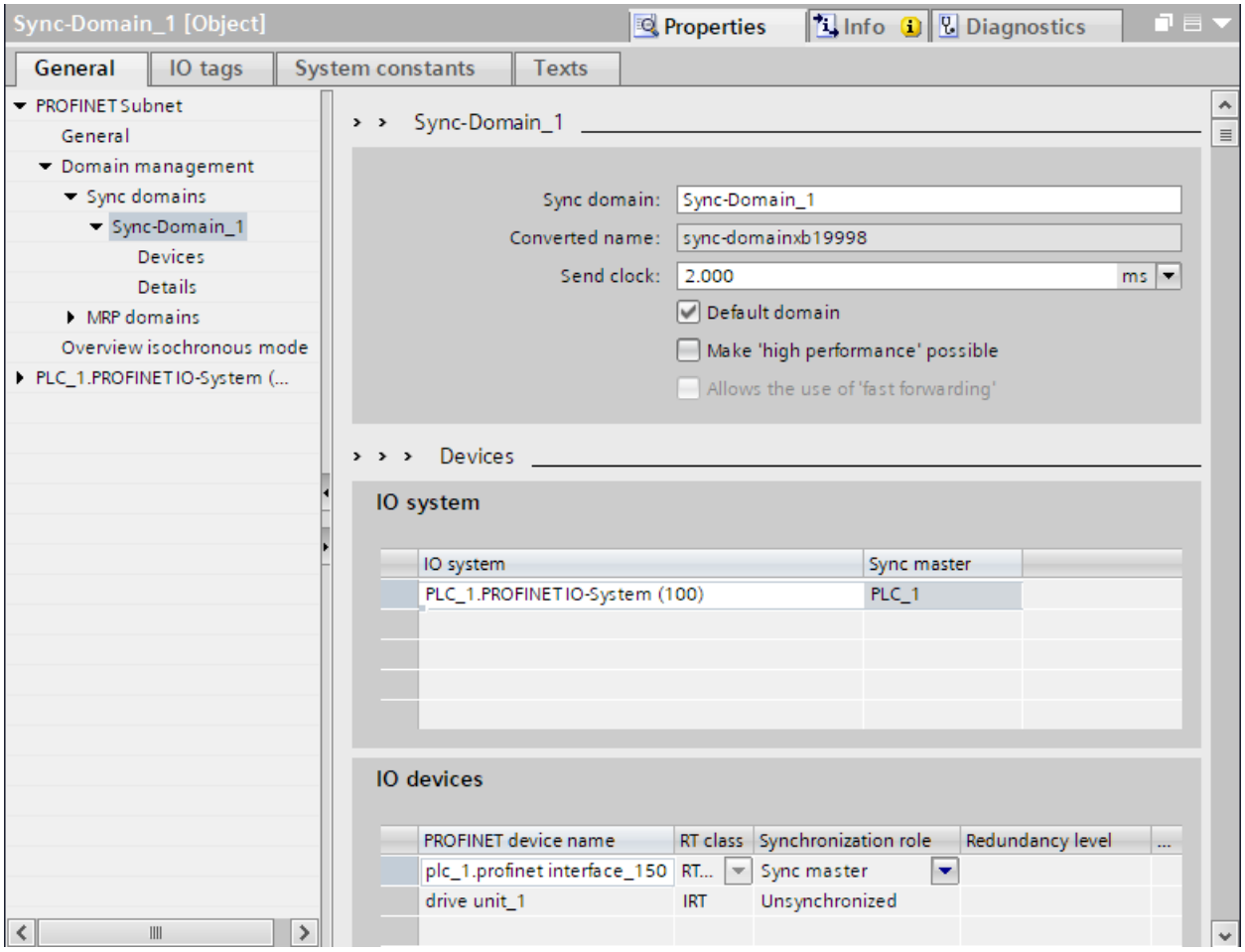


2. In the inspector window, under tab "General" under "PROFINET Subnet > Domain management > Sync domains > Sync-Domain_1" set the required parameters.
   You can enter a new name under "Sync-Domain_1". It is converted automatically to a conformant name that is displayed at "Converted name".

3. Under "IO-Devices" assign synchronization roles to the devices: role "Sync master" to the PLC of the NCU/PPU and the role "Sync slave" to the drive device.
4. Select the "send clock" for the sync domain.

Note

You can set the send clock only when you have configured the synchronization role and the RT class under "IO devices".



Note

Aligning the values at the PROFINET IO and at the DP Integrated interface of the NCK

The send clock at the PROFINET IO and DP Integrated must match one another.

The default setting for the send clock at the DP Integrated interface is 2 ms.

Explanation of the parameters

Parameter	Description
Sync domain	Name of the sync domain. This name is converted automatically if it does not conform with the DNS conventions.
IO devices	Here, you can see a list of the IO devices of the sync domain. You can select the following parameters for the nodes: • RT class: Select either RT (Real Time) or IRT (Isochronous Real Time). • Synchronization role: Select sync master or sync slave. The synchronization role is displayed as "unsynchronized" by default, e.g. for devices in RT networks.
Send clock	Select the send clock for the sync domain here. The send clock is valid for all PROFINET devices on the IO system. The value of the send clock must be identical throughout the complete system (all devices, modules, submodules and bus systems): You can find these settings in the TIA Portal at the following locations: • Properties of the PROFINET IO system under "Domain management > Sync domains > Sync-Domain_x > Send clock". • Properties of the PROFIBUS Integrated bus system under "Equidistance > DP cycle".
Nodes	The nodes of the PROFINET IO system are listed here.
RT class	• RT (realtime Ethernet): Transfer the data in prioritized Ethernet telegrams, not in the isochronous mode. • IRT (Isochronous Realtime Ethernet): Isochronous transfer of data with a high degree of stability for time-critical applications. PROFINET devices are synchronized with a very high degree of accuracy. When you select RT class "IRT", then the synchronization role of the IO device is set automatically to sync slave.

More information on the topic of the sync domain can be found in the information system of the TIA Portal in the following chapters.

- Send times and DP cycle times
- Dependency of the interface (drives)
- Rules for the sync domain

4.5.3 Check the sync master and sync slave and if required set up

Requirements

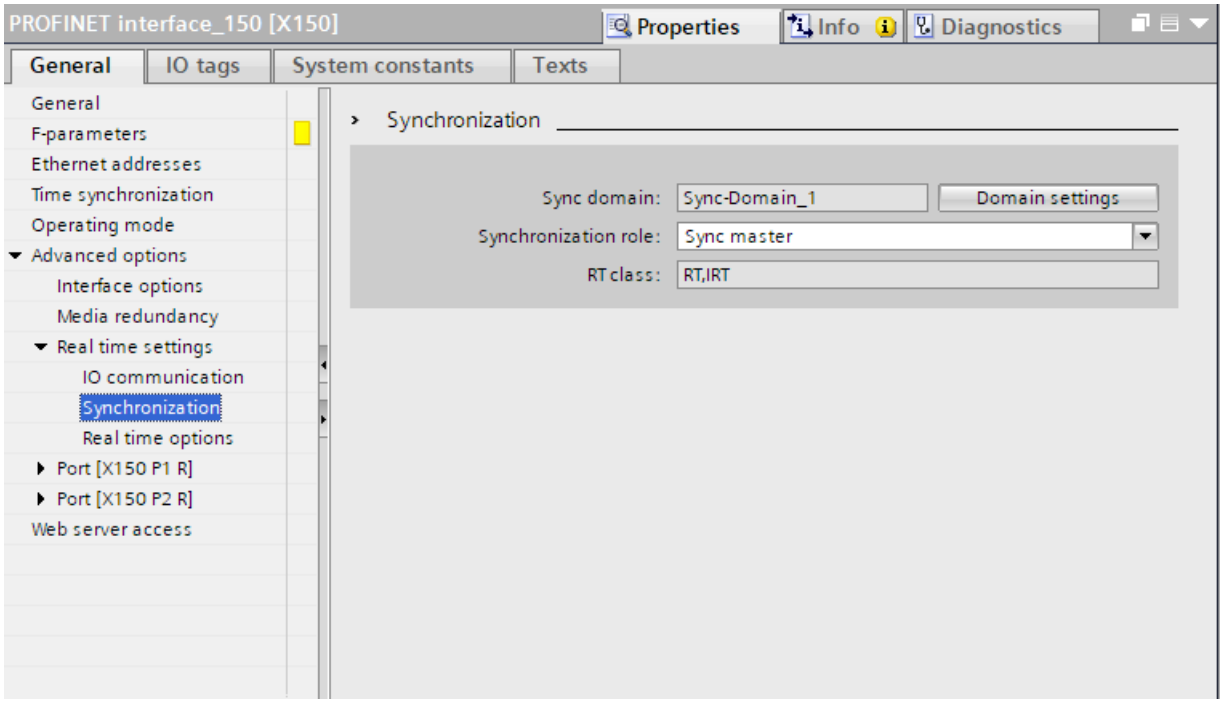
You have performed the following configuration steps:

- IO controller and IO device configured with RT
- Port interconnections are configured

Configuring the sync master

To configure a sync master, proceed as follows:

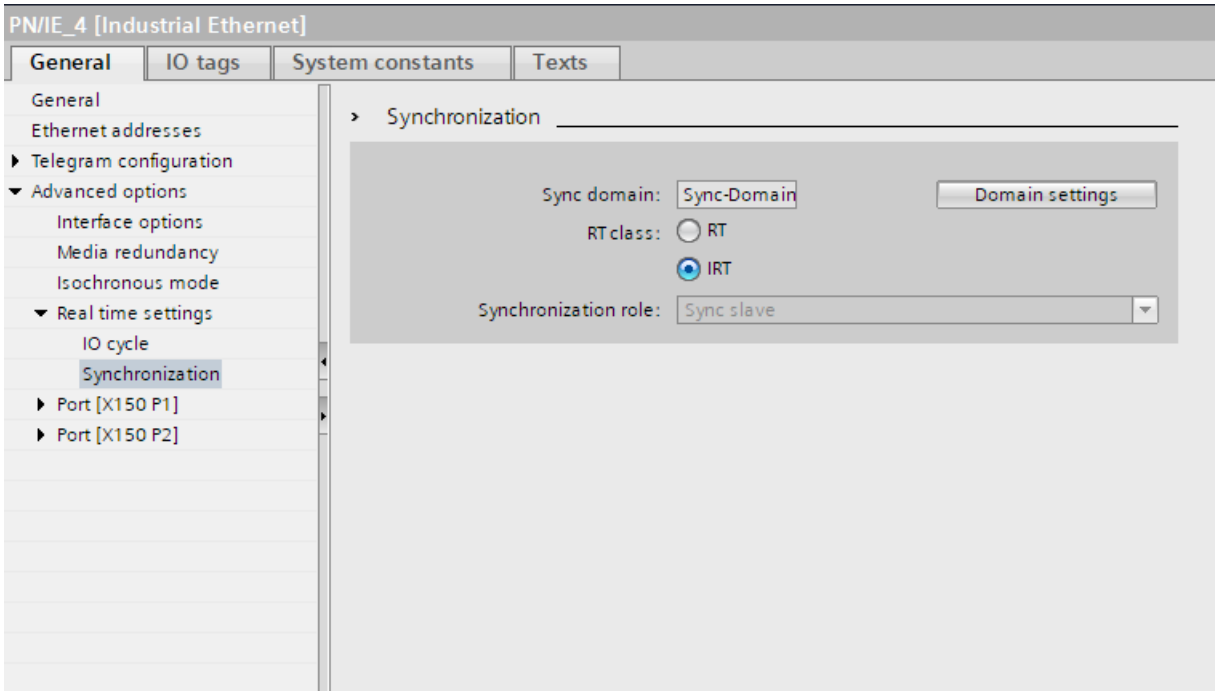
1. Select the PROFINET interface of the sync master in the network view, e.g. the PLC interface of the SINUMERIK NCU/PPU.
   The interface settings are displayed in the Inspector window.
2. Under "General", click "Extended options > Real-time settings > Synchronization".
3. Select the "Sync master" entry at "Synchronization role".



Configuring the IO device as a sync slave

To configure a device within a PROFINET IO system as a sync slave, proceed as follows:

1. Select the PROFINET interface for the sync slave in the network view, e.g. the interface of the drive system.
   The interface settings are displayed in the Inspector window.
2. Under "General", click "Extended options > Real-time settings > Synchronization".
3. Select RT class "IRT".
   The entry "Sync slave" is automatically selected under "Synchronization role".



4.5.4 Configure isochronous IO device

Configuring isochronous mode for IO devices

The drive device and control system together form a sync domain. For motion control applications of the PROFINET IO system, you must parameterize the IRT operating mode (for isochronous drive devices) and the PROFINET settings. Isochronous mode for the application on the bus is only possible for PROFINET IO with IRT. In the case of PROFINET IO with IRT, a sync master generates a synchronization telegram to which all sync slaves synchronize themselves. To use isochronous mode, you must configure it for the IO device.

Note

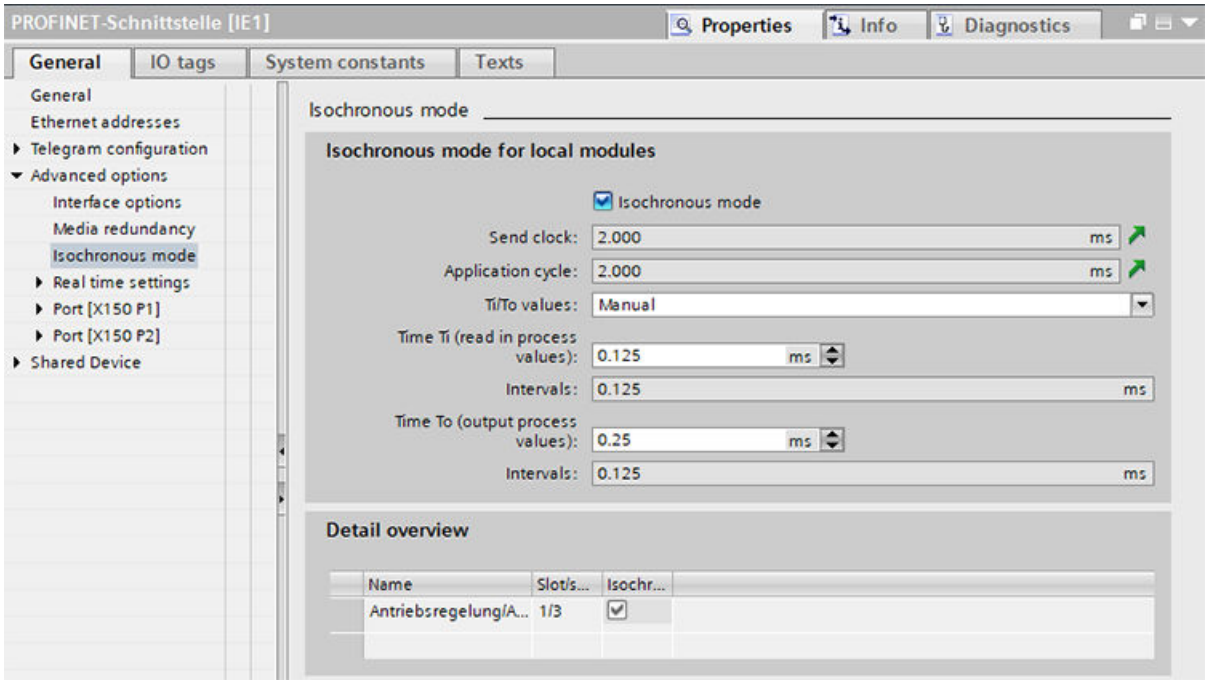
Isochronous mode only applies if isochronous submodules are configured in the IO device so that the IO controller has isochronous IO submodules. Otherwise, the Save and compile in the TIA Portal will be terminated with an error message.

To configure the isochronous mode in the TIA Portal, you should therefore have already configured the drive device and an axis for the control system and assigned it to a drive object in Startdrive.

To configure isochronous mode, proceed as follows:

1. Select the IO device in the network view and click the PN interface.
   The interface properties are displayed in the Inspector window.
2. In the Inspector window, under "General", click "Extended options > Isochronous mode".

3. Activate the "isochronous mode" option.
   In the "detailed overview", the drive objects are displayed with the appropriate telegrams. You must already have configured the objects and telegrams in Startdrive.
4. If necessary, activate the option "Isochronous mode" for the drive object in question. This setting cannot be changed for telegrams for which isochronous mode is essential (e.g. telegram 105).



Parameterizing isochronous mode

Isochronous mode can be activated and deactivated for each IO device or module in the IO device. You will find a more detailed description of the possible settings for isochronous mode in the following table.

Parameter	Description
Isochronous mode	Activate this option if you want to operate the drive device (IO device) in isochronous mode with the PROFINET IO.
Send clock	Shows the send clock of the PROFINET IO system. Click the link to edit the setting.
Application cycle	Shows the application cycle (multiple of the data cycle).
Ti/To values	Three settings are possible for the Ti/To values: • Automatic: Ti/To is automatically calculated. • Manual: Ti/To can be edited. • Task: Ti/To values are transferred to the OB. Ti, To: can only be edited if "manual" is set. Ti_{Min}/Ti_{Max}: minimum or maximum time for Ti. To_{Min}/To_{Max}: minimum or maximum time for To. Interval: defined interval for Ti/To values.

Parameter	Description
Time Ti (actual value)	Specifies at what time Ti, the actual value will be read in before the cycle starts.
Intervals	Indicates in which interval the value will be read in. The value should not be changed.
Time To (setpoint)	Specifies at what time To, the setpoint will be read out after the end of the cycle.
Interval	Indicates in which interval the value will be read in. The value should not be changed.

Guided quick startup

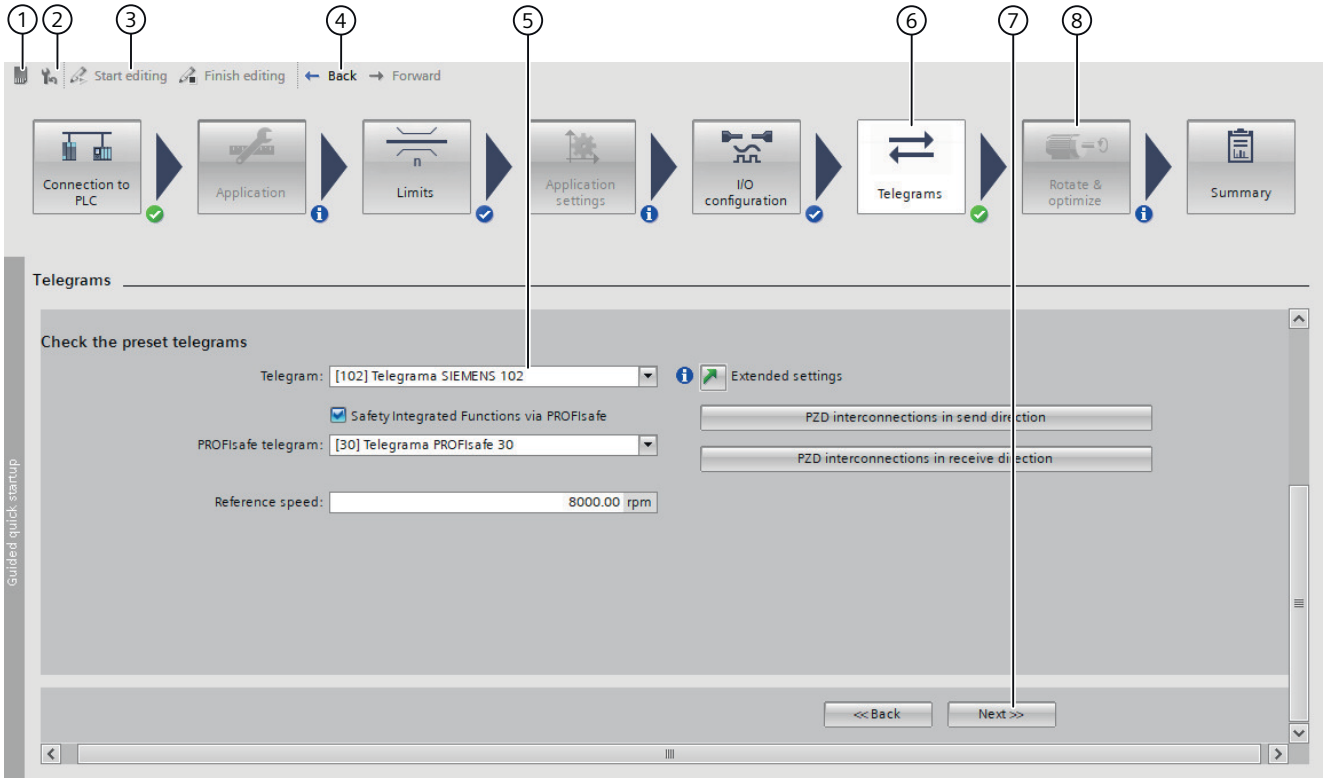
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Overview

Guided quick startup is a commissioning Wizard Using the guided quick startup, you make the basic settings for the drive device in Startdrive that are used to avoid subsequent detailed settings as far as possible. All drive device settings are pre-assigned according to the required application using these basic settings.

To open the guided quick startup, select the drive device in the project navigator and select "Guided quick startup" in the context menu.

Structure



① Icon: Saves data protected against power failure (in online mode)
② Icon: Restores the factory settings (in the online mode)
③ Buttons: Start or exit editing mode (in online mode)
④ Buttons: Jump to the next or previous step.
⑤ Detailed setting of active quick startup step.
⑥ Active quick startup step: Button is brightened
⑦ Quick startup buttons:
- Back/Next: are always displayed.
- Cancel/finish: only displayed in online mode.

⑧ Inactive quick startup step: One of several possible steps

Figure 5-1 Example: Guided quick startup in offline mode

More information is provided in the information system of the TIA Portals in Chapter "Configuring SINAMICS S210 drives" as well as in the operating instructions "SINAMICS S210 servo drive system with SIMOTICS S-1FK2 and S-1FT2".

Make the basic settings in SINUMERIK Operate

6

6.1 Overview of NC and drive device communications

After basic commissioning in "SINAMICS Startdrive" in the TIA Portal, you must make the following settings in SINUMERIK Operate to allow communications between the drive device and the NC:

- Assign the general machine data (relevant for communication via PROFINET with the drive device)
- Assign the axis machine data (relevant for transferring setpoint and actual values)
- Assign the axes
- Assign the components to the drive objects (e.g. assignment of the Motor Modules, motors and encoders and their assignment to the NC machine axes)

For an S210 drive system, you must manually assign the parameters in SINUMERIK Operate.

Note

The configuration in SINUMERIK Operate must match that of the configuration in the TIA Portal.

6.2 Assignment of the machine data

Assignment in the general machine data for S210 drive devices

The following table lists the general machine data that you must appropriately configure in SINUMERIK Operate for S210 drive devices:

Number	Designation	Value	Meaning
MD13050[n][1)]	$MN_DRIVE_LOGIC_ADDRESS	= 4340[2)]	Telegram address[3)] Cyclic communications The start address of the input and output must be identical.
MD13060[n][1)]	$MN_DRIVE_TELEGRAM_TYPE	= 105	Telegram type[2)]
MD13070[n][1)]	$MN_DRIVE_FUNCTION_MASK	= FH	Access to drive parameters
MD13080[n][1)]	$MN_DRIVE_TYPE_DP	• = 1 (synchronous) • = 0 (not defined)	Drive type

Number	Designation	Value	Meaning
MD13374[n][1)]	SAFE_IN-FO_DRIVE_LOG-IC_ADDR	= 5896	Telegram address (supplementary safety telegram 701)[2)]
MD13376[n][1)]	SAFE_INFO_TELE-GRAM_TYPE	= 701	Telegram type (supplementary safety telegram 701)[2)]

[1)] [n] stands for the axis index (for MD13050, MD13060, MD13070, MD13080, MD13374, MD13376) or for the index of the Control Unit (for MD13120). Index 0 stands for the first NC axis or the first Control Unit.

[2)] Example, dependent on the configured hardware configuration of the drive device.

[3)] If you set the machine data for telegram number or I/O address in SINUMERIK Operate, and then subsequently change in the TIA Portal project and load in the PLC and the drive device S210 (6SL5...), then you must again appropriately change the modified data in the machine data.

As example, the I/O addresses and telegram numbers are shown for the case that telegrams 105 and 701 are used with default I/O addresses (4340, 5896) for the first drive object on the NX at X105.

Assignment in the axis machine data for S210 drive devices

The following table lists axis machine data and parameters for spindle/axis interpolation for the S210 drive system, which you must configure in SINUMERIK Operate depending on the axis type:

Number	Designation	Value	Meaning
MD30130[0]	$MA_CTRLOUT_TYPE	= 1	Output type setpoint
MD30240[0..1]	$MA_ENC_TYPE	• = 4 (absolute) • = 1 (incremental)	Acquisition of actual value
MD30300	$MA_IS_ROT_AX	Dependent on task type • = 0 (linear) • = 1 (rotary)	Rotary axis/spindle (axis: rotary/linear)
MD30310	$MA_ROT_IS_MODULO	= 1	Modulo conversion for rotary axis / spindle
MD30320	$MA_DIS-PLAY_IS_MODU-LO	= 1	360-degree modulo display for rotary axis or spindle
MD32000	$MA_MAX_AX_VELO	= 8000	Maximum axis velocity
MD31020	$MA_ENC_RE-SOL	Dependent on the encoder	Encoder pulses / rev.
MD31025	$MA_ENC_PULSE_MULT[n]	Dependent on the encoder type	Encoder multiplication/ Multiturn resolution
MD32250	$MA_RAT-ED_OUTVAL	100 %[1)]	Rated output voltage; The rated output voltage must be adapted to the rated speed of the analog drive:

Number	Designation	Value	Meaning
MD32260	$MA_RATED_VELO	According to the real rated motor speed[2)]	Rated motor speed
MD30220[0..1]	$MA_ENC_MODULE_NR	According to the index (n) of MD13050: x = n + 1[3)]	Actual value assignment: Drive number/ measuring circuit number
MD34200[0]	$MA_ENC_REFP_MODE	• 0 (reference point approach not possible) • 1 (referencing of incremental, rotary, or linear measuring systems: zero pulse on the encoder track)	Referencing methods

[1)] 100 % setpoint output corresponds to the rated speed of the motor

[2)] In the drive device, for p2000 the maximum motor speed is entered as reference speed. In SINUMERIK Operate for linear axes equipped with a synchronous motor, it is recommended that rated speed p0311 is entered as reference speed p2000. Alternatively, you can view the values set for the S210 device (6SL5...) in Startdrive. To do this, in the project navigator open the folder of the particular drive device and double click on "Parameterization". In the upper right-hand corner select tab "Parameter view": Under "All parameters", you can filter according to the particular numbers or parameter texts or use entries "Global settings" and "Motor data" to filter parameters.

[3)] The logical I/O address of the drive device is assigned from MD13050 $MN_DRIVE_LOGIC_ADDRESS[n] using the drive number.

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