

SINAMICS V90 PN in the TIA Portal on SIMATIC S7-1500

Configuration Manual

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.
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 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.

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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.

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 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.
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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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Getting started with SINAMICS V90 PN on S7-1500 Motion Control

1

1.1 Fundamental safety instructions

1.1.1 General safety instructions

 WARNING
Danger to life if the safety instructions and residual risks are not observed
The non-observance of the safety instructions and residual risks stated in the associated hardware documentation can result in accidents with severe injuries or death.
<ul style="list-style-type: none">• Observe the safety instructions given in the hardware documentation.• Consider the residual risks for the risk evaluation.

 WARNING
Danger to life caused by machine malfunctions caused by incorrect or changed parameterization
Incorrect or changed parameterization can cause malfunctions on machines that can result in injuries or death.
<ul style="list-style-type: none">• Protect the parameterization (parameter assignments) against unauthorized access.• Respond to possible malfunctions by applying suitable measures (e.g. EMERGENCY STOP or EMERGENCY OFF).

1.1.2 Security information

Siemens provides products and solutions with industrial security 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 security 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 security measures that can be implemented, please visit (<https://www.siemens.com/industrialsecurity>).

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 customers' exposure to cyber threats.

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1.1.3 Note regarding the general data protection regulation

Siemens observes the principles of data protection, in particular the principle of data minimization (privacy by design). For this product this means:

The product does not process / store any personal data, only technical functional data (e.g. time stamp). If the user links this data with other data (e.g. shift plans) or stores personal data on the same medium (e.g. hard disk) and thus establishes a personal reference, the user must ensure compliance with data protection regulations.

1.1.4 Danger to life due to software manipulation when using removable storage media

 WARNING
Danger to life due to software manipulation when using removable storage media
The storage of files on removable storage media involves a high risk of infection, e.g. via viruses or malware. Incorrect parameter assignment can cause machines to malfunction, which can lead to injuries or death.
<ul style="list-style-type: none">• Protect the files on removable storage media against harmful software through appropriate protective measures, e.g. virus scanners.

1.2 Introduction

1.2.1 Drive system - Overview

This document describes the engineering of a SINAMICS V90 PN integrated in the TIA Portal. This engineering can be installed later with the HSP 0185 hardware support package. SINAMICS V90 PN with this engineering can be operated only on a technology object (TO) for the Axis type of a SIMATIC S7-1500 and must be interconnected with this via PROFINET.

Configuration and parameter assignment

The TIA Portal is available for the configuration and parameter assignment of the SINAMICS V90 PN drive system.

With the TIA Portal and SINAMICS V90 PN, you can perform the following tasks, for example:

- Create a project.
- Add the drive system to the project and interconnect it with a higher-level controller.
- Configure the drives (selection of the variants).
- Create a technology object.
- Go online on the drive and test the parameter assignment via the axis control panel.
- Perform diagnostics when an error occurs.

User interface

The graphic user interface provides support during the configuration and parameter assignment:

- Select the drive in the hardware catalog.
- In the "Network view", interconnect the drive with a higher-level controller and assign parameters for the communication via PROFINET.
- In online mode, test the drive with the drive control panel and load the parameter assignment to the drive.

Further information at a glance

Getting Started

- SINAMICS V90 PROFINET, SIMOTICS S-1FL6 Getting Started (<https://support.industry.siemens.com/cs/de/en/view/109737879>)

Device documentation

- SINAMICS V90 PN / SIMOTICS S-1FL6 operating instructions (<https://support.industry.siemens.com/cs/de/en/view/109737880>)

1.2.2 "Getting started" objectives

"Getting Started" provides an introduction to configuring SINAMICS V90 PN in conjunction with a technology object Axis of a SIMATIC S7-1500 in the TIA Portal Engineering System. You create a simple sample project by performing the typical optimization and configuration steps for the device, drive and axis configuring. You become acquainted with the most important tools that the TIA Portal provides for the configuring, commissioning and diagnostics of the SINAMICS V90 PN.

1.2.3 Sample project

Create a simple sample project based on "Getting Started".

Configuration steps

Preparing the configuration

- If necessary, restore the factory settings (Page 9) for the devices.
- You configure the interface for the network communications (Page 21) of the PG/PC with SINAMICS V90 PN and SIMATIC S7-1500.

Creating a project, configuring the devices and the network communications with the PG/PC

- Create a project (Page 10).
- Create SINAMICS V90 PN and SIMATIC S7-1500 (Page 12) and define the communications between the PG/PC and devices (Page 13).

Configuring SIMATIC S7-1500 and the technology object Positioning axis

- Configure a SIMATIC S7-1500 controller (Page 15).
- Define an axis (Page 20).
- Interconnect the axis with the drive (Page 21).

Commissioning and optimizing a drive

- Commission the drive and perform the optimization (Page 17).
- Test the axis with the axis control panel (Page 26).

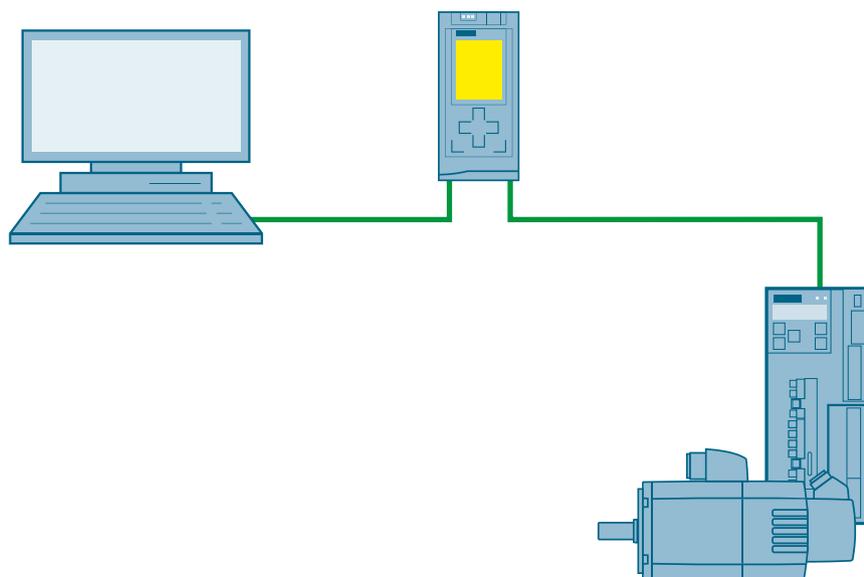


Figure 1-1 SINAMICS V90 PN on S7-1500 Motion Control

1.3 Prepare the configuration

1.3.1 Requirements

Device requirements

You require the following components to create the sample project:

- SINAMICS V90 PN with a 1FL6 motor
- SIMATIC S7-1500
- PG/PC with free Ethernet interface
- TIA Portal Engineering System as of V14 with the associated HSP 0185 (SINAMICS V90 PN)

Preparing the system

Your system is prepared for configuring with the TIA Portal:

- The hardware is preassembled and wired.
- The latest firmware of the V90 PN is available.
- PG/PC is connected directly with the PROFINET interface of the controller (S7-1500) via the Ethernet line.
- TIA Portal (at least V14) is installed on the PG/PC.
- HSP 0185 (SINAMICS V90 PN) is installed on the PG/PC.
- The TIA Portal is open. The portal view is open on the PG/PC screen.

1.3.2 Restoring factory settings

The reset to the factory settings is not normally necessary. If the current settings of the drive are not known or the settings cause errors that can no longer be reproduced, you can restore the factory settings of the drive. You so restore the default parameters.

If required you can restore the factory settings of the drive with "Online & diagnostics" > "Save/reset".

The following parameters are not affected by the factory settings:

- p8920[0...239] PN: Name of station
- p8921[0...3] PN: IP address of station
- p8922[0...3] PN: Default gateway of station
- p8923[0...3] PN: Subnet mask of station

If necessary, also reset these interface parameters to the factory settings via "Online & Diagnostics" > "Functions" > "Reset interface parameters".

See also

Save/reset (Page 46)

1.3.3 Result of the preparations

- The devices are prepared and the requirements have been checked.
- If necessary, the devices are reset to the factory settings.
- The requirements for online communication are satisfied.

1.4 Create a project

1.4.1 Overview

In this "Getting started" section, you create the "Sample_1" sample project in the TIA Portal. All of the subsequent configuring steps refer to this sample project.

1.4.2 Create new project

After opening the TIA Portal, you find yourself in the portal view. The portal view offers a task-oriented view of the tools, and provides the basic functions for the individual task areas.

To create a new project

You begin a new configuring by creating a new project in the TIA Portal.

1. Select "Start" > "Create new project" in the portal view navigation. The "Create new project" dialog opens.

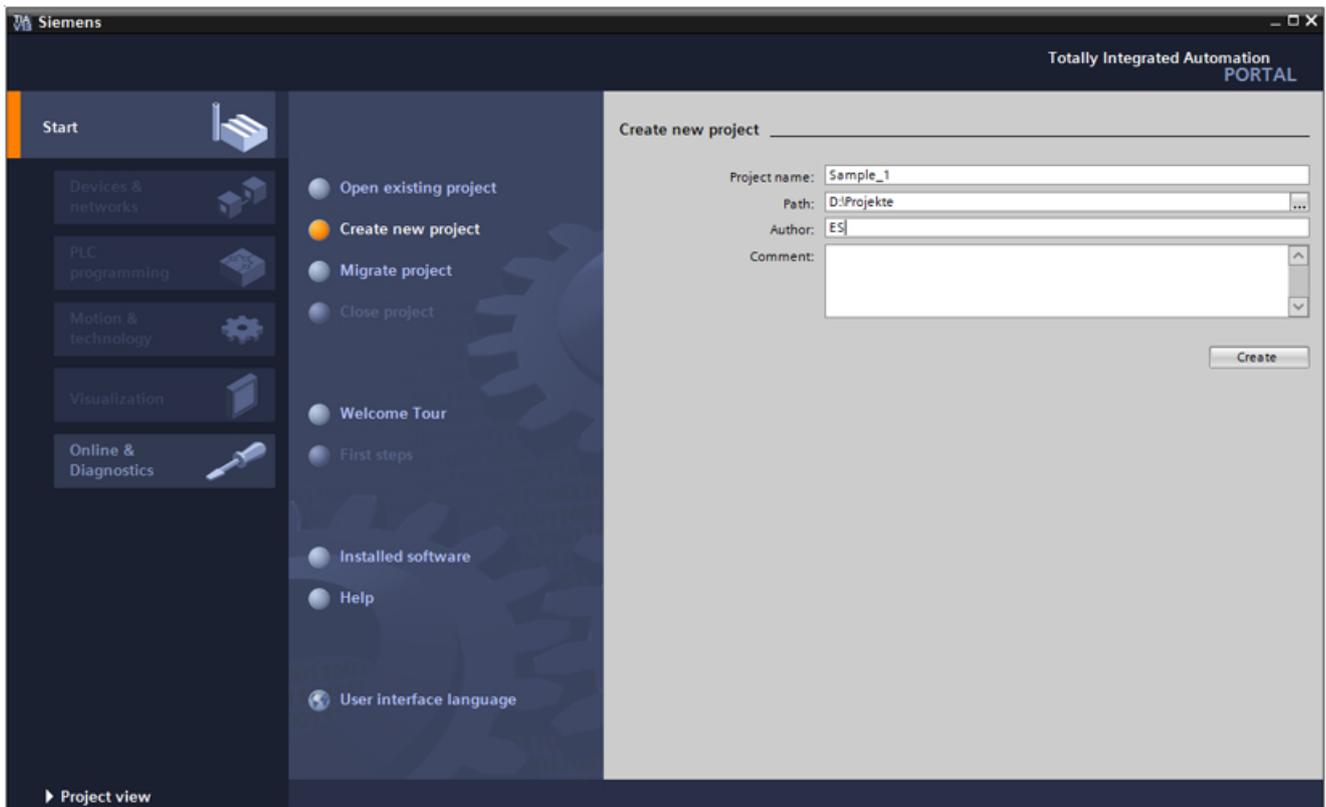


Figure 1-2 Create project

2. Enter the project name at "Project name", e.g. "Sample_1".
3. Enter the project location at "Path". The default path is already set.
4. Confirm with "Create". Your project is now created.

1.4.3 Result in the sample project

The sample project is created in the TIA Portal. You are in the portal view of the TIA Portal.

1.5 Creating devices

1.5.1 Adding devices from the hardware catalog

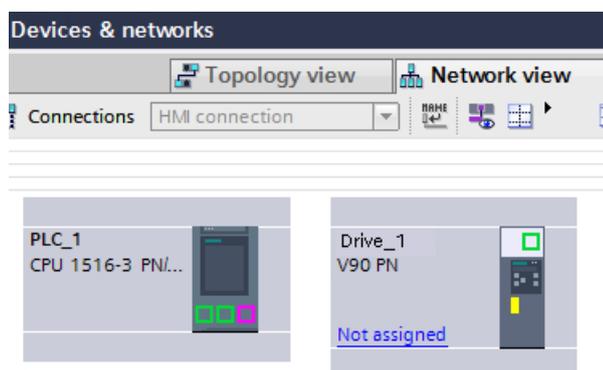
To add devices directly from the hardware catalog:

1. Open the project view of the TIA Portal by clicking the "Open project view" button and double-click "Devices and networks" in the Project Navigator.

Open the project view

The network view opens. The hardware catalog appears on the right-hand side.

2. Select an appropriate controller (S7-1500) from "Controller" > "CPU" in the hardware catalog and drag it with drag-and-drop to the network view.
3. Select an appropriate SINAMICS V90 PN from "SINAMICS drives" in the hardware catalog and drag it with drag-and-drop to the network view.



Result

Both devices are now in the network view.

Cyclic data exchange

Telegram 105 will be added automatically when the drive is created. If necessary, you can select a different telegram from "Properties" > "General" > "Cyclic data exchange".

Configuring the hardware interface (Page 21) describes how you use the telegram. The cyclic data exchange has not yet been parameterized at this time. This is set automatically after creating a positioning axis / synchronous axis and assigning the drive for the axis. The sequence with which you add devices does not matter.

Motor selection

The creation of the drive specifies the motor selection as the default setting. Further information is available at Setting parameters (Page 31).

1.5.2 Connecting devices

After adding the drive, it must first be assigned to an IO Controller or to a PLC. This automatically makes the assignment to an appropriate subnet.

Provided no subnet has been assigned the drive, it will be displayed as "not assigned device" in the Project Navigator (PNV). The nodes of a subnet form a PROFINET IO system. To synchronize the PROFINET IO devices, a sync domain is also required. The sync domain assures that all nodes are synchronized. The creation of the subnet creates a new sync domain.

- Assign the drive to the controller. Click the "Not assigned" link in the network view and select an interface (PLC_1.PROFINET-interface_1) to which you assign the drive.

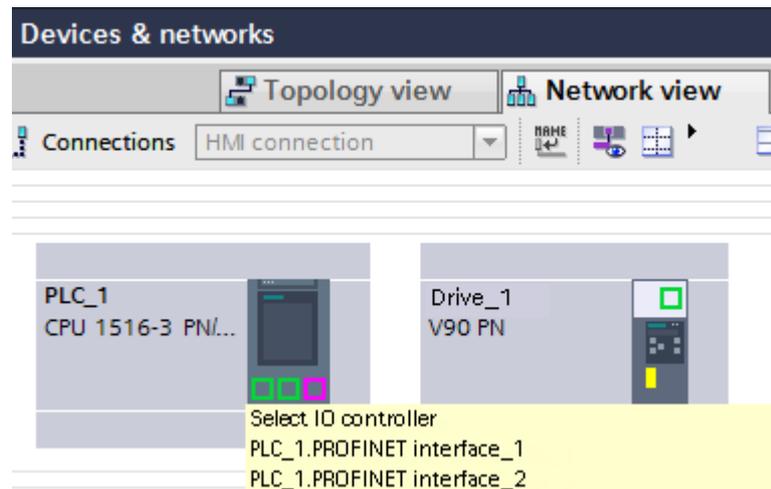


Figure 1-3 Assigning a drive

Result

After assigning the drive, a sync domain and a PROFINET IO system are created automatically.

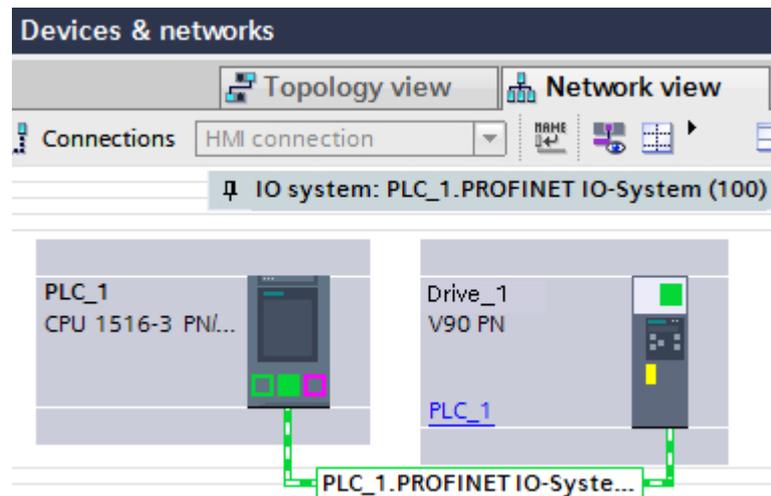


Figure 1-4 The drive is assigned

Automatic generation of the IP addresses

The default IP address device setting is 0.0.0.0. When creating a device in the TIA Portal, a new IP address is generated by the TIA Portal and the appropriate subnet mask set. You can see this in the "General" > "Ethernet addresses" tab.

Both the controller and the drive receive the same IP addresses (e.g. 192.168.0.1) and subnet mask (255.255.255.0). This means no communication is possible.



Figure 1-5 Not connected devices

Because the IP addresses are adapted automatically when connecting the devices in the network view or assigning the drive to the controller, a valid combination is set automatically. The drive receives a new IP address, e.g. 192.168.0.2.

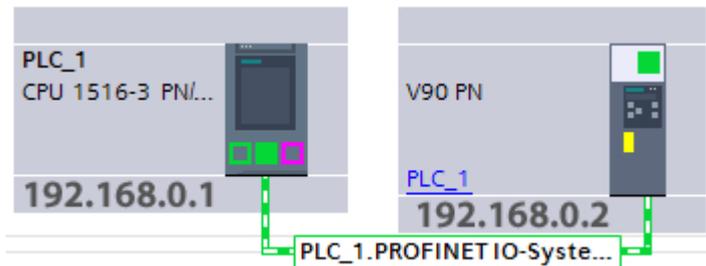
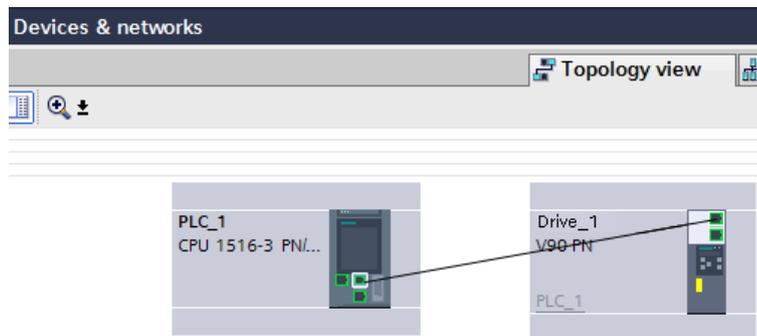


Figure 1-6 Connected devices

1.5.3 Operate devices in isochronous mode

Use the isochronous PROFINET interface X150 on the V90 PN and the PROFINET interface X1 on the controller. Switch to the topology view and connect the appropriate interface ports on the drive with the interface on the controller per drag-and-drop.



1.5.4 Result in the sample project

The devices have been created. The Ethernet addresses have been defined and the topology configured. The drive is stored in the "Not grouped devices" folder in the Project Navigator.

1.6 Configuring and optimizing a SINAMICS V90 PN

1.6.1 Overview

The following step of the example concerns both the optimization of the drive in conjunction with an S7-1500 controller and also with a drive not assigned to any controller.

1.6.2 Connect online

The drive is connected with the controller

If the drive is connected with the controller via isochronous interfaces, it goes into cyclic operation automatically in accordance with the wiring and configuration.

Establish an online connection:

1. Select the drive in the Project Navigator.
2. To do this, click the  **Go online** button.
3. Enter the PG/PC interface type and the PG/PC interface in the "Connect online" window.
4. Select "PN/IE_1" from "Connection with interface/subnet".
5. Click "Start search".

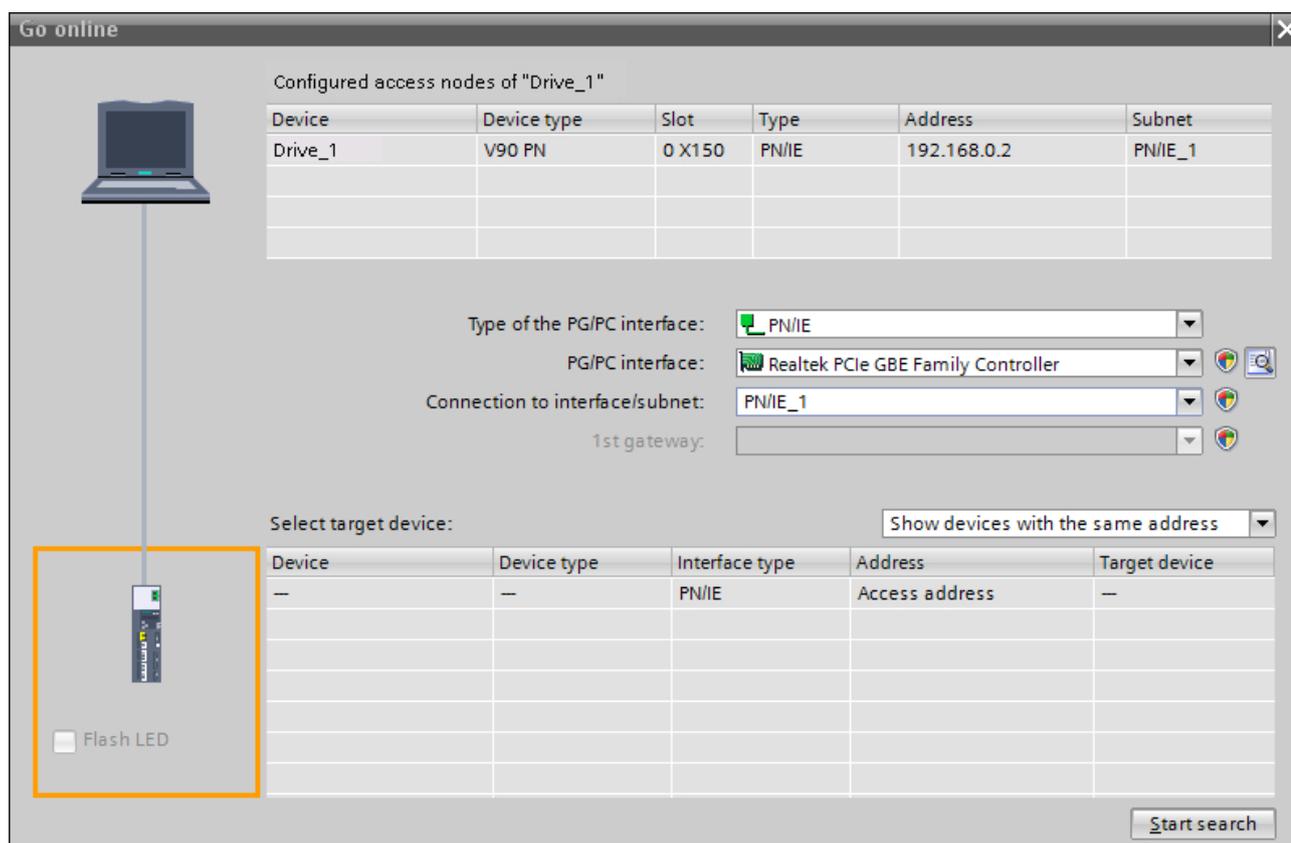


Figure 1-7 "Going online" window

The compatible nodes in the target subnet appear after a successful search. Select the found device and click "Connect".

1.6.3 Checking drive configuration

In online mode, check the drive settings, especially the settings for motor and encoder type.

1. In the drive settings, open the dialog "Parameter" > "Motor and encoder".
2. Make the settings for your deployed motor under "Motor".
3. If necessary, modify additional parameters, e.g. Basic settings or Brake control.
4. Load the configuration to the device.

Note

The drive configuration has to be checked before starting or optimizing the drive.

1.6.4 Performing an optimization

Optimize the drive by performing a turning measurement with coupled load. The appropriate procedure is described in the following section.

The "Optimization" window is opened from "Drive" > "Commissioning" > "Control panel / optimization" in the Project Navigator; select the second tab at the top right.

1. First fetch master control.
2. Configure the settings and, if necessary, the extended settings.
Set the maximum motion angle for each direction manually (phase 2 of the measurement). We recommend that you enter 360 degrees manually.

Note

When setting the maximum motion angle, consider how the axis should move with coupled load.

3. Click the "Start optimization" button.
The turning measurement is performed.
4. Return the master control after the successful optimization.
5. Load the data to the drive to save the settings permanently.



WARNING

Danger for persons and machinery caused by a turning motor.

The motor must be able to turn freely by +/-720 degrees for incremental encoders.



Figure 1-8 Optimization

Result of the optimization

After performing the optimization, the new and old values are displayed as follows. The new values are transferred automatically unless you reset them to their original values by clicking the button at the bottom in the screen. After checking the values, the data still needs to be loaded from the device (Page 19).

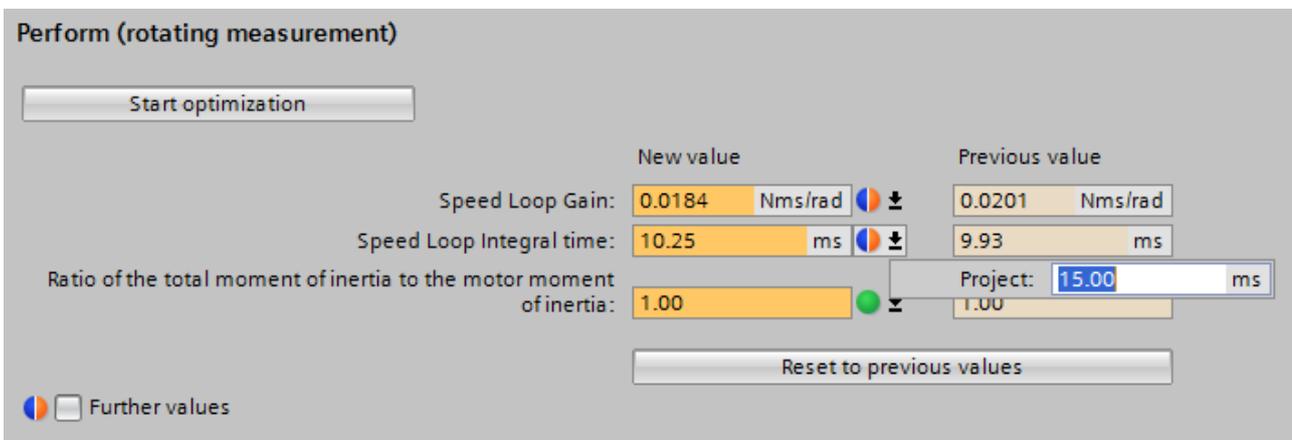


Figure 1-9 Result of the optimization

See also

Optimization (Page 39)

1.6.5 Loading the optimized data from the device

After the optimization, the optimized values are located in the volatile memory on the device.

You can change the online value directly and then copy it to the drive. The actual value can also be changed for directly editable parameters. The change is transferred directly to the drive.

See also

Compare values (Page 30)

1.6.6 Saving data in the drive

The online values are located in the volatile work memory of the drive whose content is lost when switched off. To store the values permanently in the drive, copy the data from memory card to the drive.

Note

The "Save data in the drive" function saves not only the values changed by the optimization, but also all values in the drive.

To do this, navigate to:

- "Commissioning" > "Optimization"
- Save the data.
- Then save the project.



Figure 1-10 Copying RAM to ROM

The same function can be called from "Online & Diagnostics" > "Save/Reset" > "Save data in the drive".

1.6.7 Result in the sample project

You have created and optimized a drive. The data that results from the optimization is saved in the drive and in the project.

1.7 Configure the axis

1.7.1 Overview

This section describes how you create and configure a positioning axis in the project, and interconnect it with the SINAMICS V90 PN drive.

Requirement

You have created the drive as described in the Creating devices (Page 12) section.

1.7.2 Technology object axis

Technology objects (TOs) represent the associated real objects (e.g. a positioning axis) in the controller.

The technology object Positioning axis / Synchronous axis provides a technological view of the drive and the encoder (actuator and sensor), provides technological functions for them and contains the concrete hardware interconnection.

The technology object Positioning axis / Synchronous axis contains extensive functionality, e.g. communication with the drive, actual value processing, position control, and positioning functionality. It executes control and motion commands and indicates states and actual values.

Technological limitations and values for the mechanical system for the axis and encoder are set on the axis. You can then work exclusively with technological variables.

1.7.3 Creating an axis

Create the "PositioningAxis_1" axis for the sample project. Assign a drive to the axis.

How to create an axis in the project

1. Open the Controller folder in the Project Navigator and select "Technology objects".
2. Double-click "Add new object". The "Add new object" dialog opens.
3. Select from "Motion Control" a "TO_PositioningAxis" positioning axis.
4. Enter a name for the axis. Use the designation "PositioningAxis_1" for the axis of the sample project.
5. Leave the other preset values to their default values.
6. Click "OK".
The "Basic parameters" window opens in the function view.

See also

Configuring and optimizing a SINAMICS V90 PN (Page 15)

1.7.4 Configuring the hardware interface

To complete the configuration of the axis, you must assign a drive to it. The red icon in the configuration of the axis indicates that no assignment to the drive has been made (see figure).



Figure 1-11 The hardware interface is incomplete.

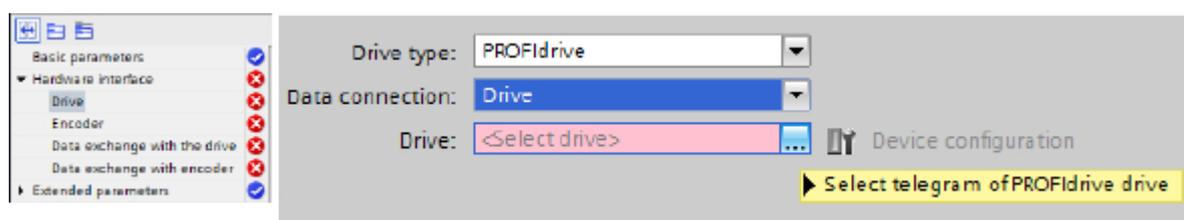
Icons in the area navigation

Icons in the area navigation of the configuration show additional details about the status of the configuration:

✓	The configuration contains preset values and is complete. The configuration contains only preset values. With these preset values you can use the technology object without additional changes.
✔	The configuration contains user-defined or automatically adapted values and is complete. All input fields of the configuration contain valid values and at least one preset value has been changed.
✗	The configuration is incorrect. At least one input field or drop-down list contains an invalid value. The corresponding field or the drop-down list is displayed on a red background. Clicking the field shows the roll-out error message that indicates the cause of error.

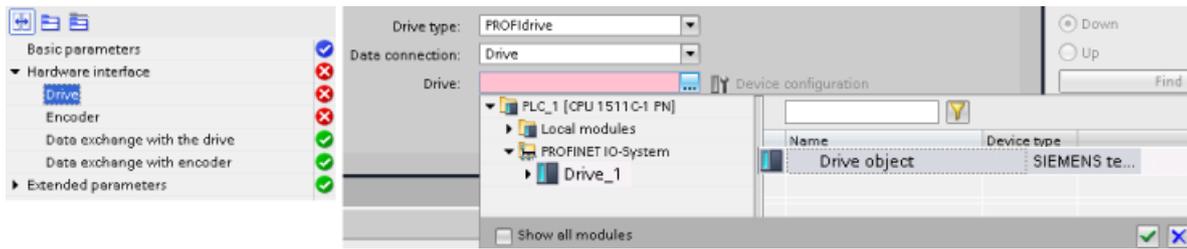
Assigning a drive

- Open the "Hardware interface". The "Drive" window opens:



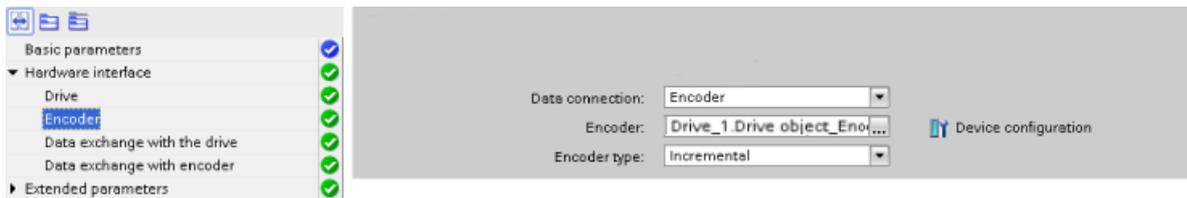
- Assign the drive as follows:
Select the drive.

1.7 Configure the axis



Setting the encoder type

The encoder type is not compared with the data adaptation. Configure the encoder type (incremental, absolute or cyclic absolute) in the "Encoder" configuration window.



Data exchange between the drive and controller

Data is exchanged between the drive and controller for the data adaptation. The data adaptation on the axis is selected with HSP by default when a V90 PN is used. During the data adaptation, the reference values and motor/encoder data are compared with the drive/encoder parameterization required for the data exchange. The "Automatic transfer of the drive parameters" and "Automatic transfer of the encoder parameters" settings to the TO Axis are set only when they are connected with the drive in the offline project. The setting for the drive (actuator) or encoder can be activated or deactivated independently of each other.

The screenshot shows the 'Data exchange with the drive' configuration window. On the left, a navigation tree lists various parameters, with 'Data exchange with the drive' selected. The main area contains a diagram of the PLC, Drive, Encoder, and Motor. A green arrow labeled 'Data exchange' connects the PLC and Drive. A black arrow labeled 'Encoder data' points from the Encoder to the Drive. A black arrow labeled 'Power' points from the Drive to the Motor. Below the diagram, the 'Drive telegram' is set to 'Telegram 105'. The 'Automatic data exchange of drive values' checkbox is checked. The 'Reference speed' and 'Maximum speed' are both set to 3000.0 1/min. A warning icon indicates that the parameters must match specifications in the device configuration.

The screenshot shows the 'Data exchange with encoder' configuration window. On the left, the navigation tree is the same as in the previous screenshot, but 'Data exchange with encoder' is selected. The main area contains the same diagram of the PLC, Drive, Encoder, and Motor. A green arrow labeled 'Data exchange' connects the PLC and Drive. A black arrow labeled 'Encoder data' points from the Encoder to the Drive. A black arrow labeled 'Power' points from the Drive to the Motor. Below the diagram, the 'Encoder telegram' is set to 'Telegram 105'. The 'Automatic data exchange of encoder values' checkbox is checked.

1.7 Configure the axis

Which data is adapted?

All actuator and encoder data that must be set identical in the technology object Axis to the associated data in the drive is adapted:

- Actuator data on the TO Axis: "Reference speed", "Reference torque", "Maximum speed"
- Encoder data on the TO Axis: "Increments per revolution", "Number of revolutions", "Fine resolution Xact1", "Fine resolution Xact2"

The following is always performed for activated adaptation:

- For each TO Power up (after controller power up or loading the TO to the controller).
- For each restoration after drive failure, namely always after a station restoration of the drive that belongs to the associated technology object.
- For each restart of a technology object.

After a successful adaptation

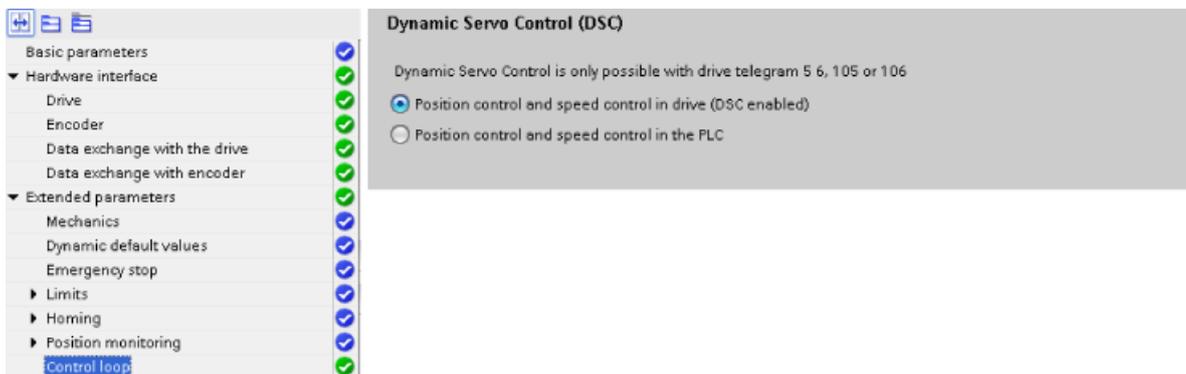
After a successful adaptation, the actual values of the adapted data are overwritten in the associated TO-DB. The adapted data, however, is not stored automatically on the memory card of the drive and also not transferred as initial values in an offline project.

If the adapted data should not be stored permanently, the following two possibilities are available:

- **Save the adapted data in the offline project and the subsequent download:** If the adapted data should be saved in the offline project, TIA Portal functions can be used: Call the "Snapshot of the actual values" function to store the actual values of the associated TO-DB as snapshot in the offline project, then call the "Copy the momentary values to the initial values" function to transfer them to the initial values of the associated TO-DB in the offline project and finally load the TO-DB stored in the offline project to the CPU.
- **Save the adapted data on the memory card:** Call the SFC "WRIT_DBL" in the user program to save the actual values of the adapted data on the memory card.

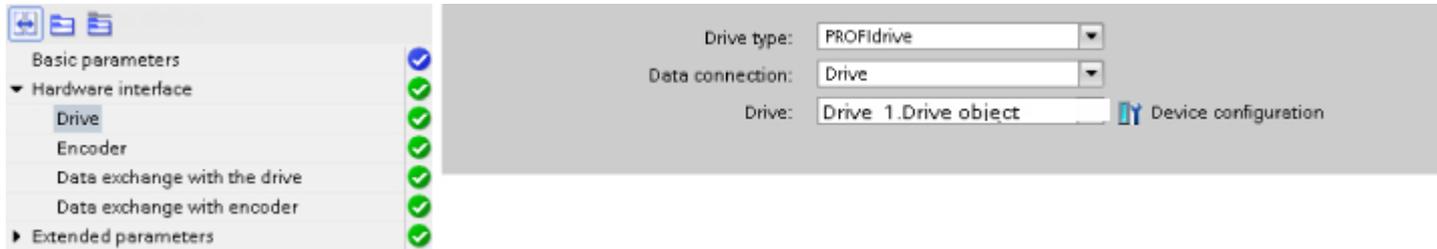
Setting the position control

Ensure that position control in the drive (DSC enabled) is set. Dynamic Servo Control (DSC) depends on the deployed drive telegram. The setting acts only after the telegram selection (5, 6, 105 or 106). Use "Position control on the PLC" for all other telegrams.



Result

The drive is assigned and the configuration is complete.



1.7.5 Result in the sample project

The technology object Axis is fully configured.

1.8 Going online with devices

Load the sample project with the axis configuration to the controller so that the function of the axis can be tested with the axis control panel in the next step.

Load the project

1. Save the project 
2. Compile the project 
3. Select the controller in the Project Navigation.
4. Load the project to the device. 
The "Going online" dialog opens:

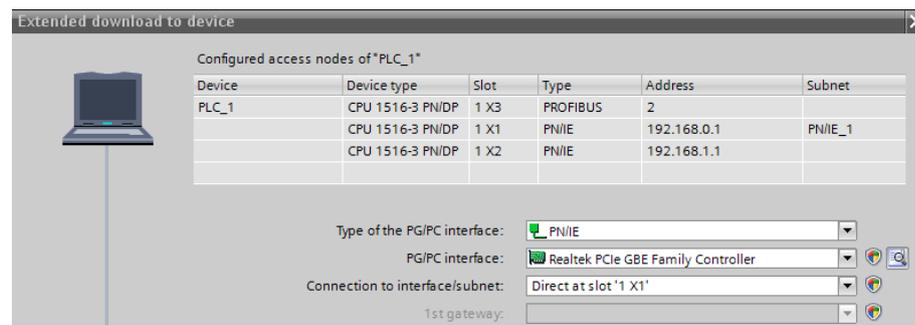


Figure 1-12 Connect online

1.9 Test the axis with the axis control panel

Going online

To permit an online connection, your PG/PC and the controller must be in the same subnet. The TIA Portal supports you if your PG/PC does not have any appropriate settings by setting them automatically.

1. Select the appropriate PG/PC interface type and the PG/PC interface.
In the example, PN/IE and Intel(R) Gigabit Network Connection (the name of the network card).
2. Select the appropriate interface on the controller.
3. Search for accessible network nodes.
4. Connect with the appropriate node (appropriate S7-1500 controller).

1.9 Test the axis with the axis control panel

1.9.1 Overview

In this "Getting Started" section, you test the configured axis. TIA Portal provides the axis control panel for this purpose.

Requirements

- The devices have been created and configured, see Section Creating devices (Page 12).
- You have configured the motor in the drive, see Configuring and optimizing a SINAMICS V90 PN (Page 15).
- The drive configuration is loaded to the device, see Configuring and optimizing a SINAMICS V90 PN (Page 15).
- Motor, encoder and motor holding brake are connected to the drive.
- The drive is supplied with power, 24 V and 230/400 V.
- The ports of the PROFINET interfaces are wired in accordance with the port interconnection.
- The STO must be connected correctly.
- An axis in the sample project has been created and configured, see Section Configure the axis (Page 20).
- The project with the axis configuring is loaded to the target system.
- The axis is not switched on via a motion command (*MC_Power*).

Note**Further information concerning the requirements**

Further information for the V90 PN is available in the *SINAMICS V90, SIMOTICS S-1FL6 operating instructions*.

Further information concerning technology objects and motion topics is available in the online help for the TIA Portal at "Deploying technology functions" > "Motion control".

1.9.2 Working with the axis control panel

You traverse individual axes with the axis control panel.

A user program is not necessary for the operation of the axis control panel. With the axis control panel, you take over master control for a technology object and control the axis motions.

 WARNING
Uncontrolled axis motions
During operation with the axis control panel, the axis can execute uncontrolled motions (e.g. due to erroneous configuration of the drive, or of the technology object). Furthermore, any synchronized following axis is moved as well when moving a leading axis with the axis control panel.
Therefore, perform the following protective measures before operation with the axis control panel:
<ul style="list-style-type: none">• Ensure that the EMERGENCY OFF switch is within the reach of the operator.• Enable the hardware limit switches.• Enable the software limit switches.• Ensure that following error monitoring is enabled.• Make sure that no following axis is coupled to the axis to be moved.

Traversing the drive with the axis control panel

1. Open the axis control panel of the technology object Positioning axis from "Technology object > Commissioning" in the Project Navigator.
The "Axis control panel" window opens.
2. Fetch master control.
3. Set the drive enable.
4. Select "Jogging" operating mode.
5. Click the "Forward" or "Backward" button to start a motion.

1.9 Test the axis with the axis control panel

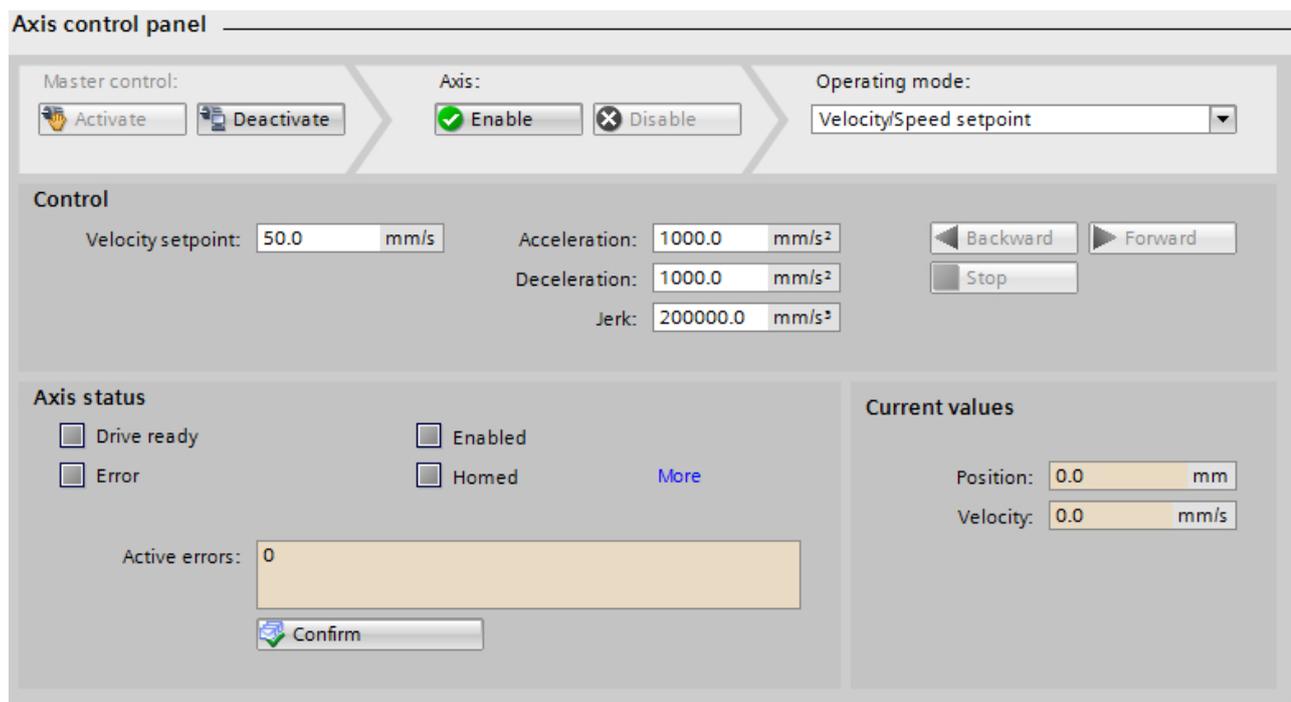


Figure 1-13 Axis control panel

Note

Changes made to the axis configuration performed online have no effect on operation with the axis control panel.

Note

No transfer of the parameters

The configured parameter values are discarded when master control is returned. Transfer the values as needed into your configuration.

If you have changed configuration values with the axis control panel during operation, they have no effect on the operation of the axis control panel.

1.9.3 Result in the sample project

You have traversed the axis of the sample project with the axis control panel and thus ensured its correct functioning. Configuring the axis is thus completed.

Configuring drives

2.1 Drives in the hardware catalog

Selecting devices via the hardware catalog

Devices are administered in the TIA Portal using the hardware catalog. This is anchored as a tab in the right-hand margin of the TIA Portal.

For example, you can add drive units using drag-and-drop in the device view and network view from the hardware catalog.

All device variants are listed in the catalog view that can be restricted via filters:

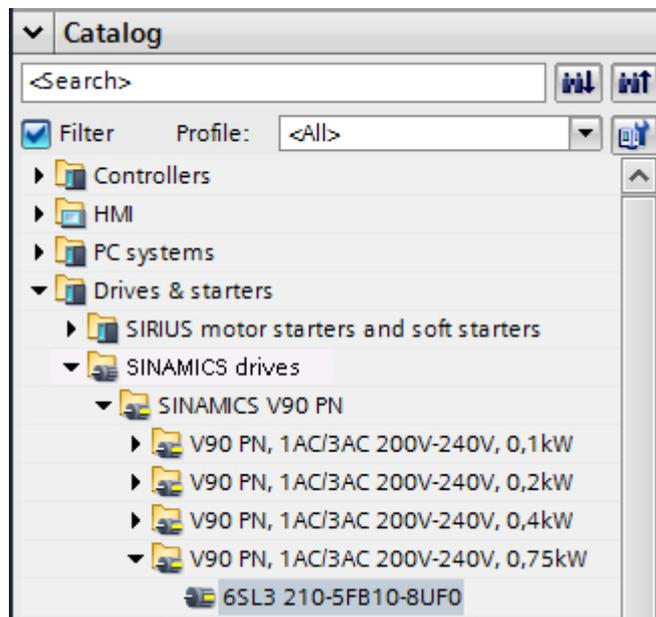


Figure 2-1 SINAMICS V90 PN in the hardware catalog

2.2 Parameters

2.2.1 Overview

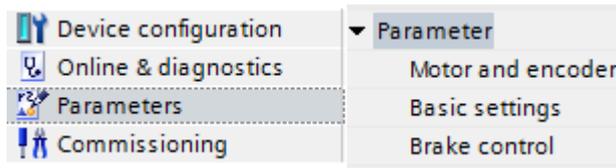
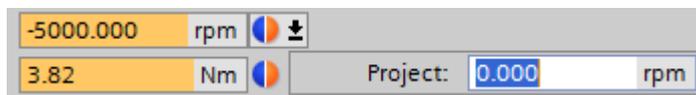


Figure 2-2 Parameter

2.2.2 Compare values

The online data can be transferred individually to the project. Use the "Compare values" function to perform a comparison between the values in the drive and the values in the project:

- Comparison of the offline values in the project with the online values in the drive
- Direct editing of the actual values and the initial values of the project
- Immediate detection and display of input errors with suggested corrections
- Backup of the online values in the project



Icons and operator controls

If an online connection to the drive exists, the actual values are displayed for the parameters.

In addition to the actual values of the parameters, the following icons appear:

Icon	Description
	The online value in the drive matches the configured offline value in the project
	The online value in the drive does not match the configured offline value in the project
	The comparison between the online value in the drive with the configured offline value in the project cannot be performed
	Click this button to show the offline value of the drive and the offline value of the project for the associated parameter.

2.2.3 Setting parameters

You change the parameters in online and offline mode.

Setting parameters online

All changes that you perform online take effect immediately. Then load them to the project.

Setting parameters offline

1. Set the desired parameters.
2. Load the set parameters from "Load to the device".

2.2.4 Motors and encoders

Motors and encoders

Depending on the encoder type used, dependencies result in the settings for motors and encoders:

- Motors with incremental encoders
- Motors with absolute encoders

The setting of the motor can be changed only when no online connection exists to the drive.

Fetching motor and encoder settings

Note

Motor and encoder settings can be fetched via an upload to the project.

Motors with incremental encoders

1FL6 motors with incremental encoders do not have any electronic name plate. The V90 PN device detects that a motor with incremental encoder is connected and makes the settings for an appropriate default motor for the associated device. Adding a V90 PN to a project selects a default motor with incremental encoder. Make the settings for your deployed motor with incremental encoder in the project. Load the settings to the device.

Motors with absolute encoders

1FL6 motors with absolute encoders have an electronic name plate. The motor is detected by the SINAMICS V90 PN converter. The parameter assignment in the drive is set appropriately for the detected motor. Select in the project the appropriate motor and encoder so that a download can be performed.

Basic settings

The settings in the Parameters window depend on the motor selection. The parameters appropriate for the motor are preassigned in the TIA Portal for S7-1500 motion control applications. The parameters appropriate for this motor are set when you reselect the motor. If necessary, the settings can be changed.

See also

Brake control (Page 34)

Encoder types (Page 32)

2.2.5 Encoder types

The following encoder types are used in conjunction with V90 PN:

- Incremental encoder with TTL (Transistor Transistor Logic) interface and 2500 pulses/revolution
- Single-turn absolute encoder with 21-bit resolution and BiSS interface
- Multi-turn absolute encoder with 20-bit resolution, 12-bit rotational resolution and BiSS interface

Incremental encoders

Incremental encoders supply a defined number of pulses/revolution and a so-called zero pulse pro revolution. Two digital output signals (A and B track) displaced by a quarter pulse (90 degrees electrical) are output. The position value is determined by counting the pulses. The digital output signals displaced by 90 degrees determine the direction of rotation that specifies whether the position value should be counted in the positive or negative direction. The edge evaluation of the pulses quadruplicates the encoder resolution. Consequently, the incremental encoder deployed in the V90 PN can resolve a revolution with $2500 \times 4 (= 10000)$ increments. The reference between the position of an axis and its mechanical position must be established for an incremental encoder by homing.

Absolute encoders

Absolute encoders provide the position value as an absolute numerical value. Because this numerical value is unique over the resolution range of an absolute encoder, no initial homing as for incremental encoders is necessary. The absolute numerical value is transferred from the absolute encoder to the V90 PN via the BiSS (Bidirectional Serial Synchronous) interface. For rotatory absolute encoders, a differentiation is made between those that can resolve only one revolution and then restart at 0 again (single-turn), and those that can resolve several revolutions (multi-turn).

Absolute encoder adjustment

The absolute position value supplied by an absolute encoder must be assigned to the associated mechanical position using an absolute encoder adjustment. The absolute encoder adjustment only needs to be performed once. The absolute encoder adjustment results in an

absolute value offset saved permanently even when the controller is switched off and on. The absolute encoder adjustment is performed on the positioning axis / synchronous axis.

Single-turn absolute encoders

For a single-turn absolute encoder, absolute position values are assigned only to the angle positions within one revolution. This means that the angle position is known only within one revolution. However, in order to determine the position values also over multiple revolutions, the revolutions of the encoder for the positioning axis / synchronous axis are accumulated. When the CPU is switched off, the revolutions counted for a positioning axis / synchronous axis are stored permanently. When the CPU is switched on again, the permanently stored revolution counts are included in the calculation of the actual position. To ensure that a positioning axis / synchronous axis continues travel from the correct position after switch on, it must be guaranteed that the single-turn absolute encoder does not turn more than half a revolution when switched off. The single-turn absolute encoder used in the V90 PN has a 21-bit resolution and so provides 2^{21} (= 2097152) absolute position values for one revolution. Single-turn rotary transducers have a measuring range of 360 degrees.

Multi-turn rotary transducers

For a multi-turn rotary transducer, an absolute position value is formed from each angle position within a revolution together with the number of complete revolutions. Unlike its single-turn equivalent, the multi-turn rotary transducer may turn more than half a revolution when switched off. The multi-turn absolute encoder used in the V90 PN has a 20-bit resolution and a 12-bit rotational resolution; it so resolves a revolution with 2^{20} (1048576) angle positions and 2^{12} (4096) revolutions. Multi-turn rotary transducers have a measuring range of $n \times 360$ degrees. Where n represents the number of revolutions that the encoder can resolve.

Position control for positioning axes /synchronous axes

Positioning axes /synchronous axes require for their position control an actual position as a position value of an encoder. This actual position is transferred from the drive to the CPU as PROFIdrive telegram. The relationship between the position values of an encoder and a defined position of a positioning axis / synchronous axis is established by parameterizing the mechanical properties and encoder settings as well as with a homing operation / absolute encoder adjustment. Positioning axes / synchronous axes support the following types of actual position values in the "Encoder type" setting:

- Incremental actual position value with the **"Incremental"** setting
 - This setting must be selected when an incremental encoder is connected.
- Absolute actual position value with the **"Absolute"** setting
 - The maximum traversing range of the axis lies within the measuring range of the encoder.
 - The actual position value so results directly from the absolute encoder value.
 - Consequently, the zero crossings (measuring range overflow) of the encoder must not lie within the maximum traversing range of the axis, because they are not counted by the positioning axis / synchronous axis with this setting.
- Absolute actual position value with the **"Cyclic absolute"** setting
 - The maximum traversing range of the axis lies outside the measuring range of the encoder.
 - The actual position value so does not result directly from the absolute encoder value.
 - The encoder within its measuring range supplies an absolute encoder value. The axis accumulates the performed zero crossings (overflow of the measuring range) of the encoder and so determines the correct actual position value beyond the measuring range of the encoder.
 - When the CPU is switched off, the traversed zero crossings are saved in the retentive memory area.

The **"Cyclic absolute"** and **"Absolute"** settings do not have any reference to the absolute encoder type (single-turn or multi-turn), rather they affect the maximum traversing range of an axis in the measuring range of the absolute encoder. If the maximum traversing range of an axis lies within the measuring range of the single-turn absolute encoder, "absolute" must be set. If this is not the case, "cyclic absolute" must be set. If the maximum traversing range of an axis does not lie within the measuring range of the multi-turn absolute encoder, "cyclic absolute" must be set.

2.2.6 Brake control

The motor holding brake prevents drives from making unwanted motions when they are switched off.

You can configure the motor holding brake of the selected motor here.

Note

In online mode, the "motor holding brake configuration" cannot be changed if the "operation enabled" state is pending on the drive.

Holding brake configuration

- No holding brake available. For this setting and a motor with holding brake, the motor holding brake must remain closed.
- Motor holding brake, like sequential control: The motor holding brake acts as specified by the sequential control.
- Motor holding brake always open. The motor holding brake has no effect.

Opening and closing times.

For motors with integrated holding brake, the opening and closing times are preset automatically. The start of the brake closing time depends on the sequence of the shorter of the two intervals, the stationary state detection monitoring time and the trigger pulse suppression delay.

Note

The following parameters cannot be changed in the "operation enabled" state

P29001: Motor rotational direction reversal

P29006: Line voltage

P29023: Configuration OBT (One Button Tuning)

P29026: Duration of the test signal

P29027: Optimization: Limitation of the motor rotation

P1215: Motor holding brake configuration

P2000: Reference speed, reference frequency

P2003: Reference torque

2.3 Commissioning

2.3.1 Overview



Figure 2-3 Commissioning

2.3.2 Control panel

Drive control panel

The drive control panel is used for the control and monitoring of individual drives. You traverse drives with the control panel by specifying values. You choose one of the various operating modes; depending on the operating mode, this is, for example, the speed setpoint. For more information, see Drive control panel and axis control panel (Page 39)

Calling up the control panel

Call the control panel via "Commissioning" > "Control panel".

When an online connection has been established, the bar in the header area is shown in color. Except for the Master control: "Fetch" button, the control elements are grayed-out. The other control elements are active only when you fetch the master control and switch on the drive.

Operating the control panel

You can use the drive control panel to traverse the drive and test the settings that have been made.

WARNING

This control panel may be used only when the associated safety instructions are observed! Failure to comply with these instructions can result in injury or material damage!

The function is released exclusively for commissioning, diagnostic and service purposes. The function should generally only be used by authorized technicians. The safety shutdowns from the higher-level controller have no effect.

Note**Drive reacts immediately**

Although all enables are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.

Fetch master control

You can activate the control panel by fetching the master control of the drive. The control panel can only be activated for one drive.

To activate the control panel, proceed as follows:

1. Activate the control panel at "Commissioning > Control panel" with master control: "Fetch".
2. Read the alarm carefully and check the value for the monitoring time. The monitoring time specifies the time during which the connection from the PG/PC to the drive is monitored cyclically. The minimum value is 1000 ms.
3. Click "OK" to confirm. The control panel is then active.

Relinquish master control

You deactivate the drive control panel by relinquishing master control. Master control cannot be relinquished unless the drive is switched off.

To relinquish master control, proceed as follows:

1. Click "Relinquish" to return the master control.

Result

You can now traverse the drive with the control panel. Enables and faults are displayed at "Drive status". In addition to "Active fault", the currently pending fault is displayed.

2.3.3 Using the control panel**Operating the control panel**

You can use the drive control panel to traverse the drive and test the settings that have already been made.

 **WARNING**

This control panel may be used only when the associated safety instructions are observed! Failure to comply with these instructions can result in injury or material damage!

This function is for commissioning, diagnostic and service purposes, and may be used only by authorized personnel. The safety settings of the PLC will be switched off.

The "Stop with the space key" function cannot be guaranteed for all operating situations of the drive. Consequently, it is important to implement a hardware solution for an emergency stop. You must adopt the required measures.

The drive can be controlled manually only when a connection to the PC exists. The connection is monitored cyclically.

Note

Drive reacts immediately

Although all enables are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.

Activating the control panel

You can activate the control panel by fetching the master control of the drive. The control panel can always only be activated for one drive.

To activate the control panel, proceed as follows:

1. Activate the control panel at "Commissioning > Control panel" with master control: "Fetch".
2. Read the warning carefully and check the value for the monitoring time. The monitoring time specifies the time during which the connection from the PG/PC to the drive is monitored. The minimum value is 1000 ms.
3. Click "OK" to confirm. The operating panel is then active.

Deactivating the control panel

You deactivate the control panel by returning master control. The control panel cannot be deactivated until the drive is switched off ("0" button).

To deactivate the control panel, proceed as follows:

1. Click "Relinquish" to return the master control.
2. The user interface of the control panel is grayed-out.

Result

You can now traverse the drive with the control panel. If a fault is pending, it is displayed as "Active fault".

2.3.4 Drive control panel and axis control panel

Drive control panel

The drive control panel is used for the control and monitoring of individual drives. You traverse drives with the control panel by specifying values. You choose one of the various operating modes; depending on the operating mode, this is, for example, the speed setpoint.

Axis control panel

You traverse individual axes with the axis control panel. A user program is not necessary for the operation of the axis control panel. With the axis control panel, you take over master control for a technology object and control the movements of the axis.

Master control

You fetch the master control for the drive control panel or the axis control panel.

Operation

The control panel can be operated only when an online connection is established to the CPU or the drive.

2.3.5 Optimization

Motor optimization

The motor optimization assists with determining the closed-loop control settings. Perform the motor optimization under load to improve the closed-loop control properties of the motor.

The optimization can be used to determine the proportional gain (P-gain) of the speed controller provided "Set speed loop gain" (p29023.0) is set.

The P-gain determined by the optimization is multiplied by the "Optimization: dynamic response factor" (p29020) and the result of the multiplication written to the "Closed-loop speed control gain" (p29120) parameter.

The setting for the "Optimization: Dynamic response factor" (p29020) can be used to influence the P-gain of the speed controller.

- The lower the "Optimization: Dynamic response factor" (p29020), the lower the P-gain, the "softer" the speed controller is set.
- The higher the "Optimization: Dynamic response factor" (p29020), the greater higher P-gain, the "harder" the speed controller is set.

The optimization consists of two phases. These phases differ for motors with incremental encoders and motors with absolute encoders.

Duration of the test signal

The mechanical drive train is measured using test signals. This allows the closed-loop control parameters to be calculated so that the drive train is set with best-possible dynamic response.

2.3.7 Performing an optimization

Optimize the drive by performing a turning measurement with coupled load. The appropriate procedure is described in the following section.

The "Optimization" window is opened from "Drive" > "Commissioning" > "Control panel / optimization" in the Project Navigator; select the second tab at the top right.

1. First fetch master control.
2. Configure the settings and, if necessary, the extended settings.
Set the maximum motion angle for each direction manually (phase 2 of the measurement). We recommend that you enter 360 degrees manually.

Note

When setting the maximum motion angle, consider how the axis should move with coupled load.

3. Click the "Start optimization" button.
The turning measurement is performed.
4. Return the master control after the successful optimization.
5. Load the data to the drive to save the settings permanently.

 WARNING
--

Danger for persons and machinery caused by a turning motor.
--

The motor must be able to turn freely by +/-720 degrees for incremental encoders.



Figure 2-4 Optimization

Result of the optimization

After performing the optimization, the new and old values are displayed as follows. The new values are transferred automatically unless you reset them to their original values by clicking the button at the bottom in the screen. After checking the values, the data still needs to be loaded from the device.

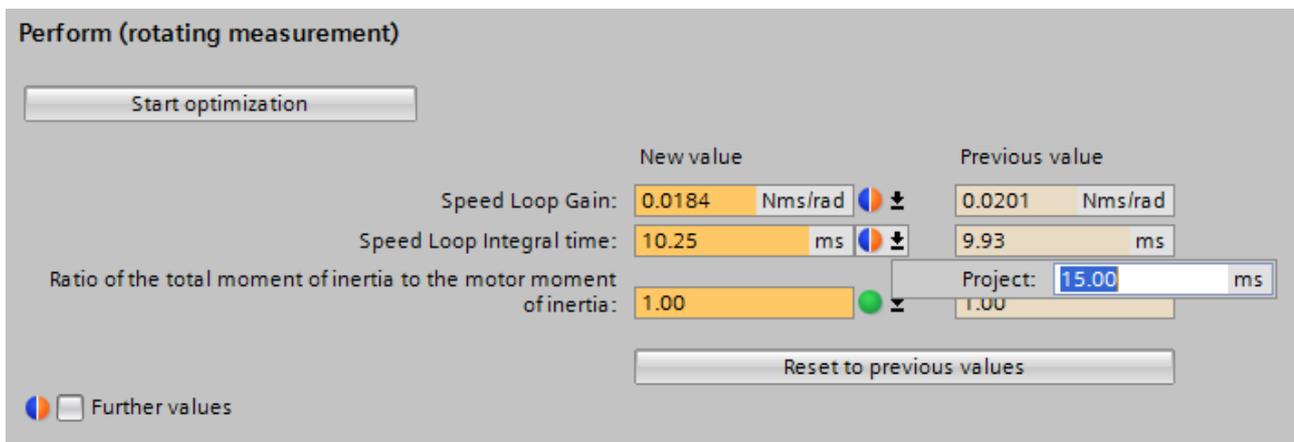


Figure 2-5 Result of the optimization

See also

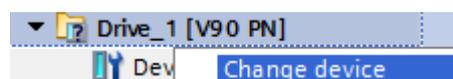
Optimization (Page 39)

2.3.8 Loading the optimized data from the device

After the optimization, the optimized values are located in the volatile memory on the device.

You can change the online value directly and then copy it to the drive. The actual value can also be changed for directly editable parameters. The change is transferred directly to the drive.

2.3.9 Device replacement in the hardware configuration



All SINAMICS V90 PN device types can be replaced with each other.

Replace the device in the TIA Portal by right-clicking "Replace device" in the PNV or in the device, network or topology view.

- To do this, select a new device from the hardware catalog. The version to be replaced is displayed at "Version:".

Motor selection

Each device type has a default motor. Like adding a device, the associated default motor is preset when a device is replaced.

WARNING

Automatic setting to the default settings

All parameters are set to their default setting when a device is replaced.

- Check the parameter settings after a module replacement.

2.4 Diagnostics

2.4.1 General

You can use the "Online & Diagnostics" functions only when an online connection exists.

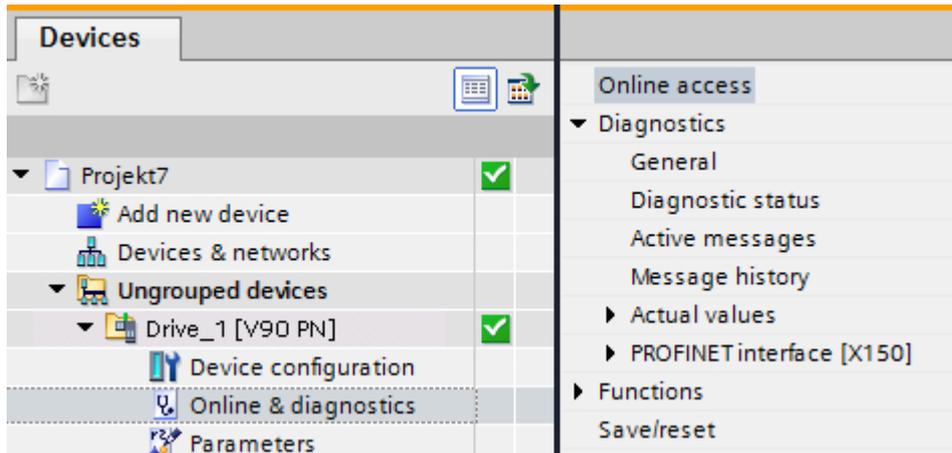


Figure 2-6 Online & Diagnostics in the Project Navigator

See also

Going online with devices (Page 25)

2.4.2 Active messages

Description

"Active messages" displays the currently pending alarms and faults in the drive. Faults must be acknowledged after the cause has been corrected.

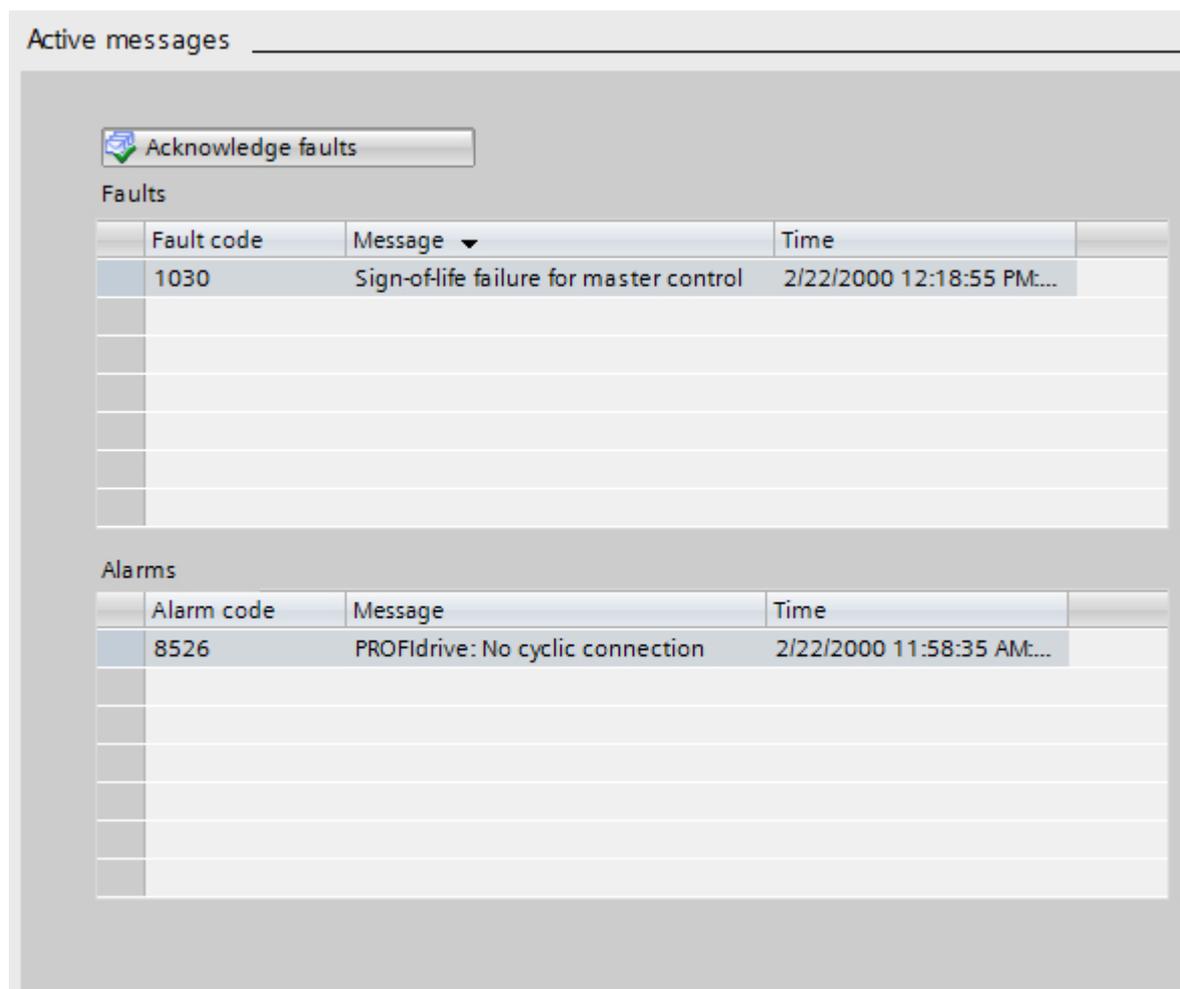


Figure 2-7 Active messages

Faults and alarms

Column	Description
Fault code / alarm code	Number of the fault/alarm
Alarm	Description of the fault/alarm
Time	Time stamp that shows when the fault/alarm occurred.

Acknowledging faults

- To acknowledge all active faults, click the "Acknowledge faults" button.

After acknowledgement, faults and alarms are moved to the message history, see also Message history (Page 46).

2.4.3 Message history

Message history

The drive has a message history in which all alarms and faults are recorded. You can read out this message history in online mode.

Delete fault buffer

1. Click the "Delete fault buffer" button to delete the fault buffer.
2. Click the "Export message history" button to export the fault and alarm buffer as a CSV file.

Messages

Column	Description
Fault buffer / alarm buffer	Designation of the fault/alarm
Fault code / alarm code	Number of the fault/alarm
Alarm	Description of the message
Fault time / alarm time "come"	The time stamp that shows the time when a fault/alarm occurred.
Fault time / alarm time "rectified"	The time stamp that shows the time when the cause of the fault/alarm was rectified. The error must also be acknowledged for faults.

2.4.4 Save/reset

Saving data in the drive

Online changes to parameter values are always made in volatile memory. To make permanent changes, they must be stored in the drive.

To save the data retentively, proceed as follows:

1. Establish an online connection to the drive.
2. Open "Online & Diagnostics > Save/Reset" at the drive.
3. Click the "Save" button in the "Save/Reset" dialog at "Save data in drive".



Figure 2-8 Saving data in the drive

After the successful execution of the function, the parameter values are saved in the drive. If a memory card is inserted, the data is also saved there automatically.

All parameter values in volatile memory are saved protected against power failure in the drive.

Restarting drives

The drive is restarted with the new values saved in the ROM (or with those on the optional inserted memory card). All data not saved previously in the drive is lost.

1. Establish an online connection to the drive.
2. Open "Online & Diagnostics > Save/Reset" at the drive.
3. In the "Save/Reset" dialog, click the "Restart" button at "Restart drive".



Figure 2-9 Restarting drives

The drive is restarted. The online connection to the drive is interrupted and re-established automatically.

Restoring factory settings

To restore the factory settings, proceed as follows:

1. Establish an online connection to the drive.
2. Open "Online & Diagnostics > Save/Reset" at the drive.
3. In the "Save/Reset" dialog, click the "Start" button at "Restore factory settings".



Figure 2-10 Restoring factory settings

The parameter values are reset to the delivery condition (in volatile memory).

You can select whether the factory settings in the drive should be saved; otherwise, they will be lost after a restart or being switched off.

Note

Some settings, such as the PROFINET interface parameters and the IP address, are retained after restoring the factory settings.

For more information, refer to Restoring factory settings (Page 9).

Loading data from the memory card to the drive

The function writes to the drive the parameter values saved on the memory card.

To transfer the settings to the drive, proceed as follows:

1. Insert the memory card into the drive.
2. Establish an online connection to the drive.
3. Open "Online & Diagnostics > Save/Reset" at the drive.
4. Go to "Load data from the memory card to the drive".
5. Click "Load" to load the data from the memory card to the drive.
6. Click "Safely remove card" to ensure that there is currently no access to the memory card and the card can be safely removed.

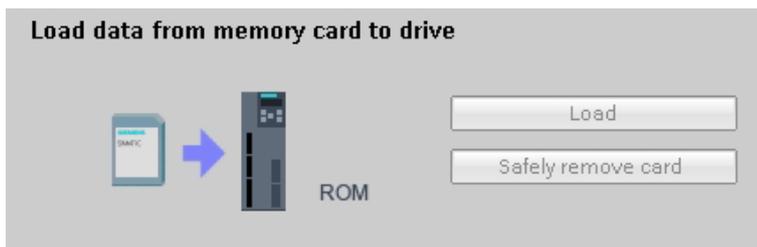


Figure 2-11 Loading data from the memory card to the drive

The data from the memory card is now saved in the drive.

Note

If the parameters on the memory card do not match the parameters present in the drive memory (RAM), you must restart the servo drive in order to transfer the changes.

Copying data from the drive to the memory card

The function saves the parameter values from the drive to the memory card. This allows, for example, the configurations to be transferred from one drive to another drive for a series commissioning.

To save the settings on a memory card, proceed as follows:

1. Insert the memory card into the drive.
2. Establish an online connection to the drive.
3. Open "Online & Diagnostics > Save/Reset" at the drive.
4. Go to "Copy data from the drive to the memory card".
5. Click "Copy" to save the data to the memory card.
6. Click "Safely remove card" to ensure that there is currently no access to the memory card and the card can be safely removed.

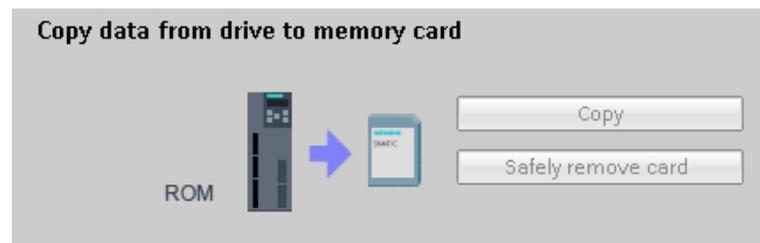


Figure 2-12 Copying data from the drive to the memory card

2.4.5 Setting the time of day

The drive has a preset time, whereby the time relative to the preset time and switch-on time of the drive is stored for faults and messages. You can overwrite this time-of-day setting. Normally, the drive receives the time-of-day from the PG/PC; this requires a manual synchronization. The default time is restored after each restart or power on/off of the drive. The currently set time is useful for evaluating messages, for example.

To synchronize the times-of-day between the PG/PC and the drive, proceed as follows:

1. Establish an online connection to the drive.
2. Open "Online & Diagnostics > Functions > Set time-of-day" at the drive.
3. Activate the "Take from PG/PC" option in the "Set time-of-day" dialog and click the "Apply" button.

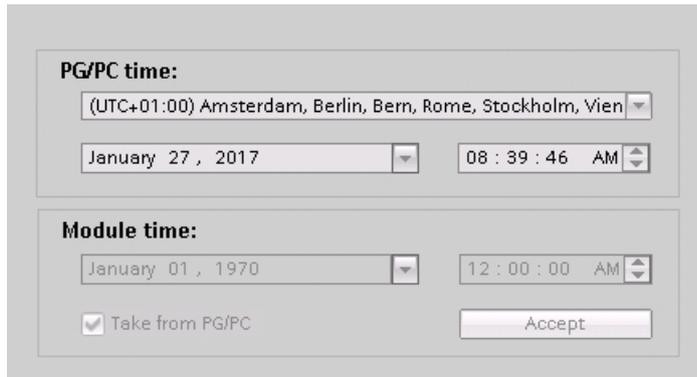


Figure 2-13 Setting the time-of-day

The drive now accepts the time-of-day from the PG/PC.

See also

SIMATIC S7-1200/S7-1500 and SIMOTION: Acyclic communication (<https://support.industry.siemens.com/cs/ww/en/view/109479553>)

2.4.6 Current values

The actual values and the status bits are displayed at "Actual values".

Actual values

> Actual values

Speed setpoint after the filter:	0.00	rpm
Actual speed smoothed:	0.0	rpm
DC link voltage smoothed:	323.3	V
Absolute actual current smoothed:	0.00	Arms
Current actual value torque-generating smoothed:	0.00	Arms
Actual torque smoothed:	0.00	Nm
Converter temperature (current maximum value):	34	°C
Motor stator temperature (modeled):	40	°C
Motor utilization thermal:	0.00	%

> Status bits

<input type="checkbox"/> Rdy for switch on	<input checked="" type="checkbox"/> Actual speed value ≥ 0
<input type="checkbox"/> Ready	<input type="checkbox"/> Torque limit reached
<input type="checkbox"/> Operation enabled	<input type="checkbox"/> Alarm power unit thermal overload
<input checked="" type="checkbox"/> Fault present 	<input type="checkbox"/> Alarm motor overtemperature
<input checked="" type="checkbox"/> Coast down active	<input type="checkbox"/> "Open holding brake" active
<input checked="" type="checkbox"/> Quick stop active	<input type="checkbox"/> Safety enable missing
<input checked="" type="checkbox"/> Switching on inhibited active	
<input checked="" type="checkbox"/> Alarm present 	

Actual values

The actual values of various parameters are displayed at "Actual values".

Status bits

The status bits show the current status / alarm bit / fault bit; also refer to the following table:

Color of the status bit	Meaning
Green/gray (state)	Indicates that a state with one of the following designations is active: <ul style="list-style-type: none"> • Ready to start • Ready for operation • Operation enabled • Actual speed value ≥ 0 • "Open holding brake" active
Yellow/gray (alarm bit)	Indicates that one of the alarms with the following designations is pending: <ul style="list-style-type: none"> • Coasting active • Quick stop active • Switching on inhibited active • Alarm effective • Torque limit reached • Alarm motor overtemperature • Alarm power unit thermal overload • Safety release missing
Red/gray (fault bit)	Indicates that a fault is pending <ul style="list-style-type: none"> • Fault effective

The status bits are visible online and offline. All bits are inactive in offline mode. The current status is displayed in offline mode.

2.5 Extended functions

2.5.1 Torque control via PROFIdrive supplementary telegram

2.5.1.1 Overview

For some applications, the option of torque control is required. Examples:

- Collision detection through evaluation of the torque in the automation of robot applications
- Compensation of friction, inertia and acceleration torque through transmission of an additional torque in winder applications

PROFIdrive supplementary telegram 750 for torque control

An additional transmission channel for torque control is provided via the PROFIdrive supplementary telegram 750.

Supplementary telegram 750 supplements the actual drive telegram (e.g. "Siemens telegram 105, PZD-10/10"). With the supplementary telegram, the PLC can exchange data with the

Control Unit (CU) of the drive. The supplementary telegram becomes active once a connection has been established between the PLC and the drive CU.

2.5.1.2 Configuring the supplementary telegram for torque control

The supplementary telegram is dependent on the drive telegram. You therefore need to define the drive telegram first (e.g. "SIEMENS telegram 105, PZD-10/10"). In the default setting, no supplementary telegram is used.

Note

Dependencies in the drive when using supplementary telegram 750

For the drive, the parameterization of the supplementary telegram is stored in parameter p8864:

- **p8864 = 999** (default setting: no supplementary telegram)
The torque limits in parameters p29050 and p29051 are evaluated.
 - **p8864 = 750** (supplementary telegram 750)
The torque limits in parameters p29050 and p29051 are **not** evaluated.
-

Configuring the supplementary telegram

You can configure the supplementary telegram under "Cyclic data exchange" of the PROFINET interface:

1. Select the drive telegram under "Telegram".

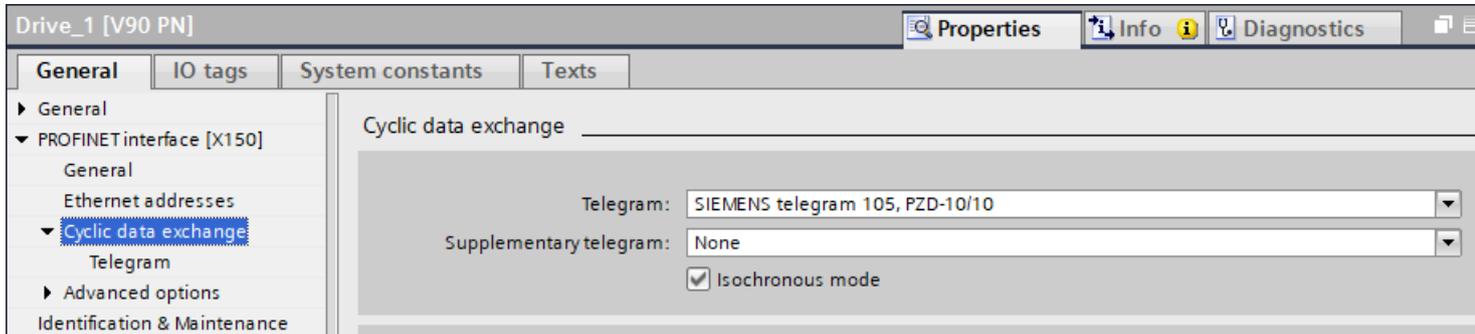


Figure 2-14 Cyclic data exchange – Default setting no supplementary telegram

Representation in the "Device view" under "Device overview" without supplementary telegram:

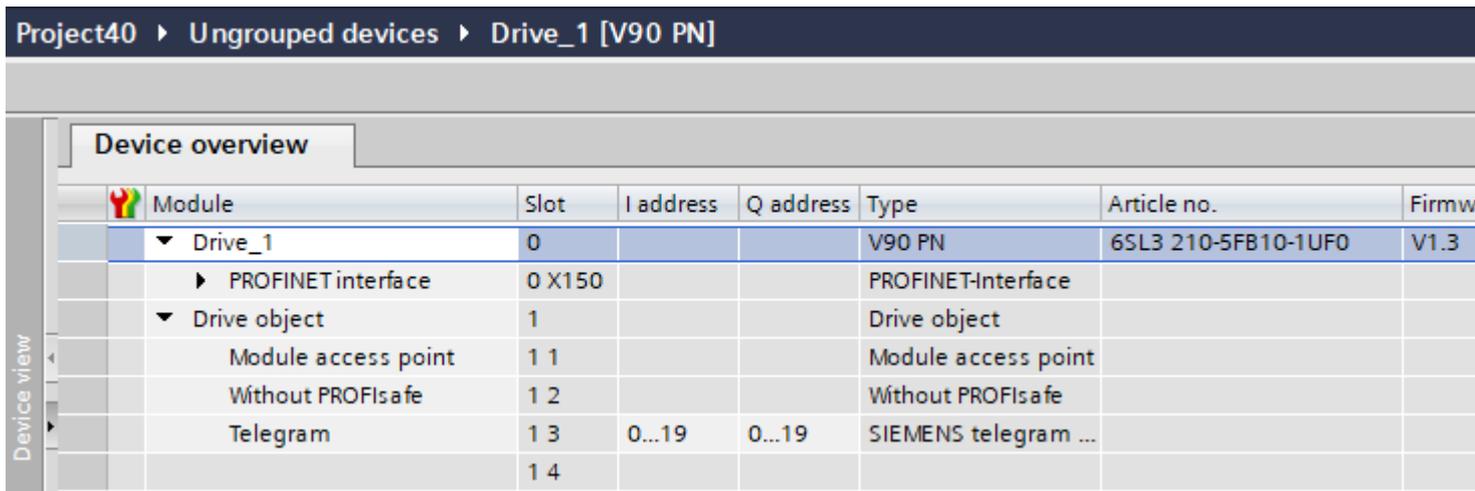


Figure 2-15 Device overview – default setting: no supplementary telegram

2. Under "Supplementary telegram", select "Supplementary telegram 750. PZD-3/1". The "supplementary telegram" is then displayed under "Cyclic data exchange".

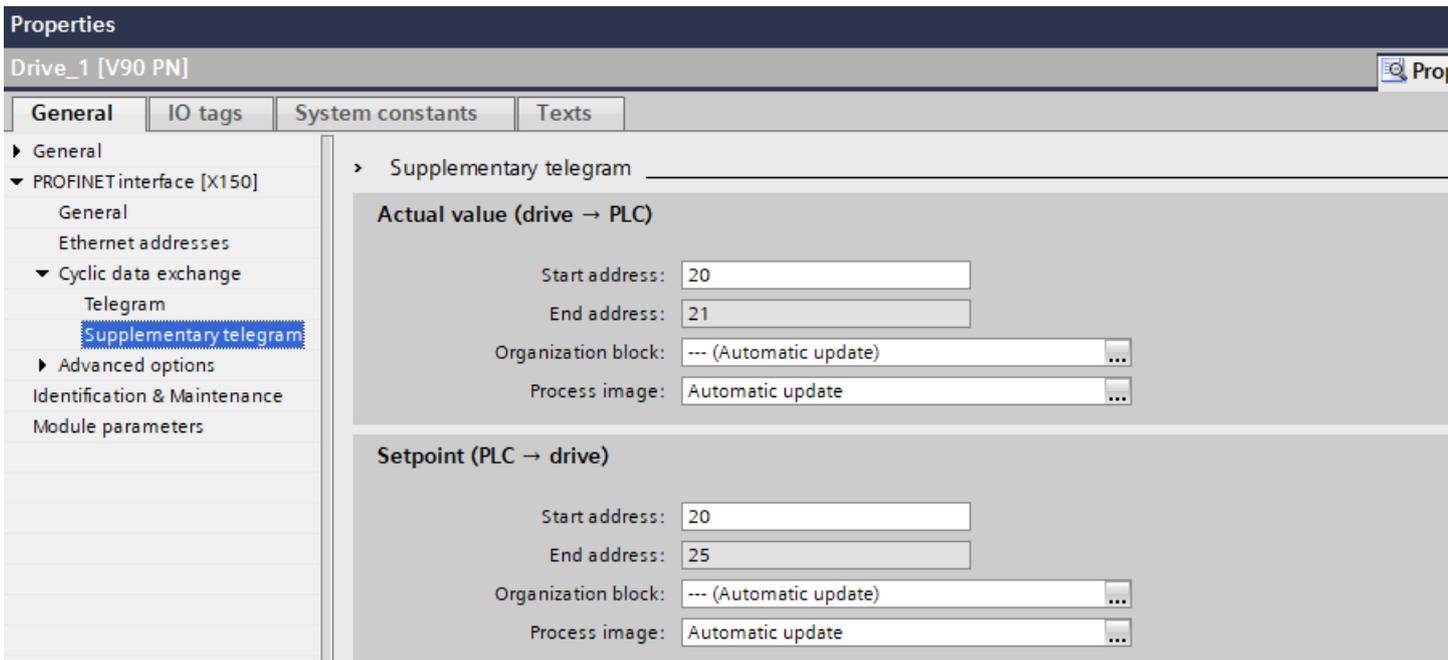


Figure 2-16 Cyclic data exchange – supplementary telegram

Representation in the "Device view" under "Device overview" with supplementary telegram:

Device overview							
Module	Slot	I address	Q address	Type	Article no.	Firmware	
Drive_1	0			V90 PN	6SL3 210-5FB10-1UF0	V1.3	
PROFINET interface	0 X150			PROFINET-Interface			
Drive object	1			Drive object			
Module access point	1 1			Module access point			
Without PROFIsafe	1 2			Without PROFIsafe			
Telegram	1 3	0...19	0...19	SIEMENS telegram ...			
Supplementary Telegram	1 4	20...21	20...25	Supplementary tele..			

Figure 2-17 Device overview – with supplementary telegram

- Parameterize the "Actual value (drive → PLC)" for the supplementary telegram. The direction of transfer is from the drive to the higher-level PLC. Parameterize the "Setpoint (PLC → drive)" for the supplementary telegram. The direction of transfer is from the higher-level PLC to the drive.

Parameter	Description
Start address	Next free start address for the configured module. You can change the address.
End address	Next free end address for the configured module. You can change the address.

Parameter	Description
Organization block	If you have connected the drive to a PLC, you need an organization block (OB) for communication. If you have created a technology object of the "positioning axis" type for a SIMATIC S7-1500, for example, and assigned it to a drive axis, you need an organization block of the type "MC-Servo [OB91]". In this case, you need to disable "Isochronous mode". Other OBs include the "Main [OB1]" block for the user program or the "FOB_RTG1 [OB123]" block for Safety functions.
Process image	Select the process image to which the data are to be continuously transferred (e.g. "OB1-PI"). You can find more information on the topic of process images in the TIA Portal information system by searching for "process image".

2.5.2 Automatically synchronizing the drive object with technology object offline

2.5.2.1 Overview

During the configuration, you can automatically synchronize the drive object (DO) with the technology object (TO) offline. When doing this, parameters from the drive and/or encoder are transferred into the technology object:

- When configuring, drive values are automatically accepted (offline)
- Encoder values are automatically exchanged (offline)

Drive values are automatically synchronized offline with TO parameters

The following drive values are automatically synchronized with the TO offline:

- **p0922** PROFIdrive PZD telegram selection
- **p2000** Reference speed reference frequency
- **p1082** Maximum speed
- **p2003** Reference torque

Encoder values are automatically synchronized offline with TO parameters

The following encoder values are automatically synchronized with the TO offline:

- **p0922** PROFIdrive PZD telegram selection
- **p0404.0** Encoder configuration effective, measuring system (rotary, linear)
- **p0404.1** Encoder configuration effective, encoder type (incremental, absolute)
- **p0407** Linear encoder grid division
- **p0408** Rotary encoder, pulse number
- **p0418** Fine resolution Gx_XIST1 (in bits)
- **p0419** Fine resolution absolute value Gx_XIST2 (in bits)

- p0421 Absolute encoder rotary multiturn resolution
- p0423 Absolute encoder rotary singleturn resolution

2.5.2.2 Automatically synchronizing the drive object with technology object offline

For the drive and encoder, you can independently activate or deactivate the automatic offline synchronization of the drive values or encoder values with the technology object (TO) during the configuration.

Activating automatic offline synchronization of the drive values during configuration

Proceed as follows to activate automatic offline synchronization of the drive values during the configuration:

1. Under "Hardware interface", open "Data exchange with the drive" and activate option "Automatically apply drive values during configuration (offline)".

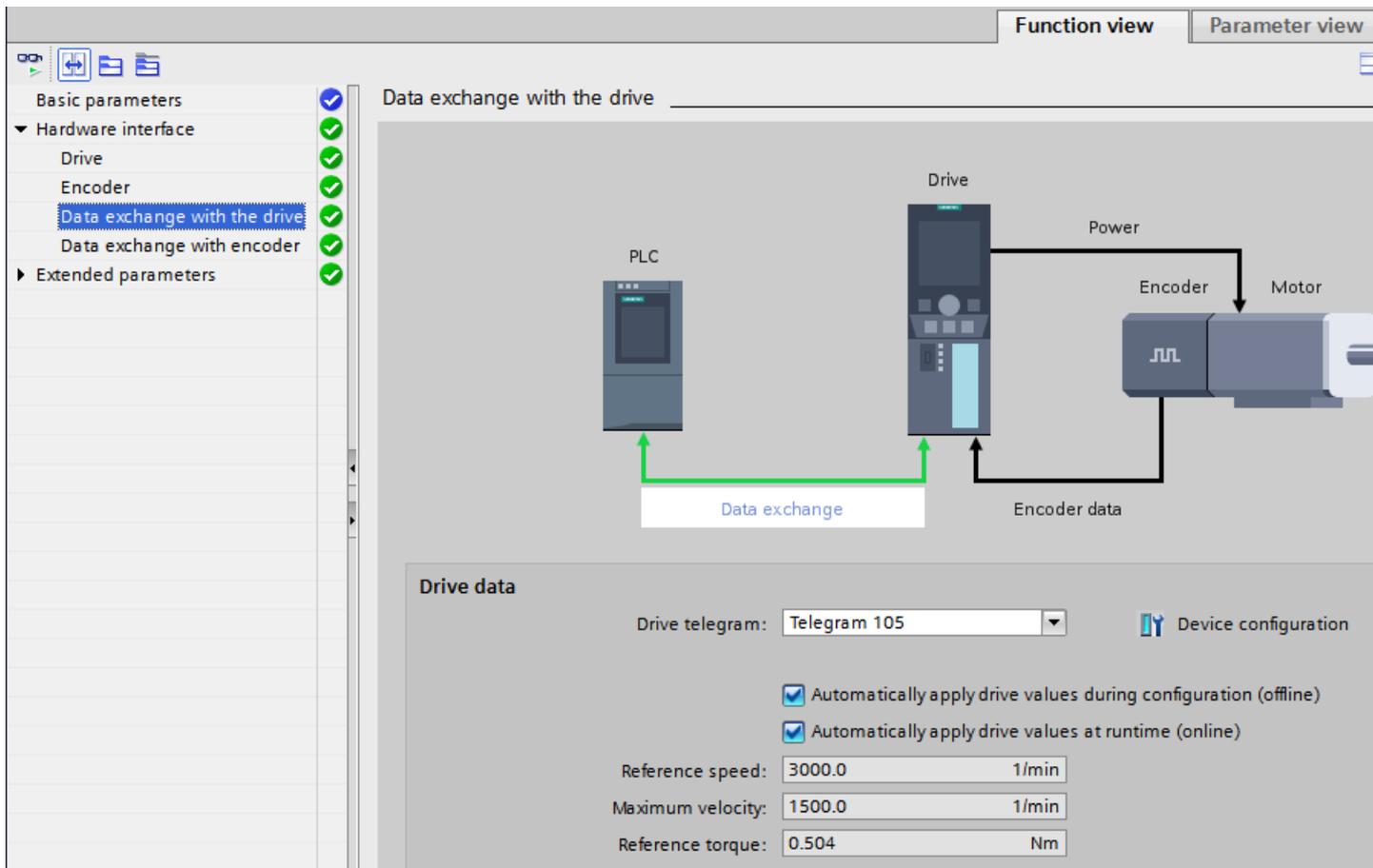


Figure 2-18 Activating automatic offline synchronization of the drive values during configuration

Activating automatic offline synchronization of the encoder values during configuration

Proceed as follows to activate automatic offline synchronization of the encoder values during the configuration:

1. Under "Hardware interface", open "Data exchange with encoder" - and activate option "Automatic data exchange for encoder values (offline)".

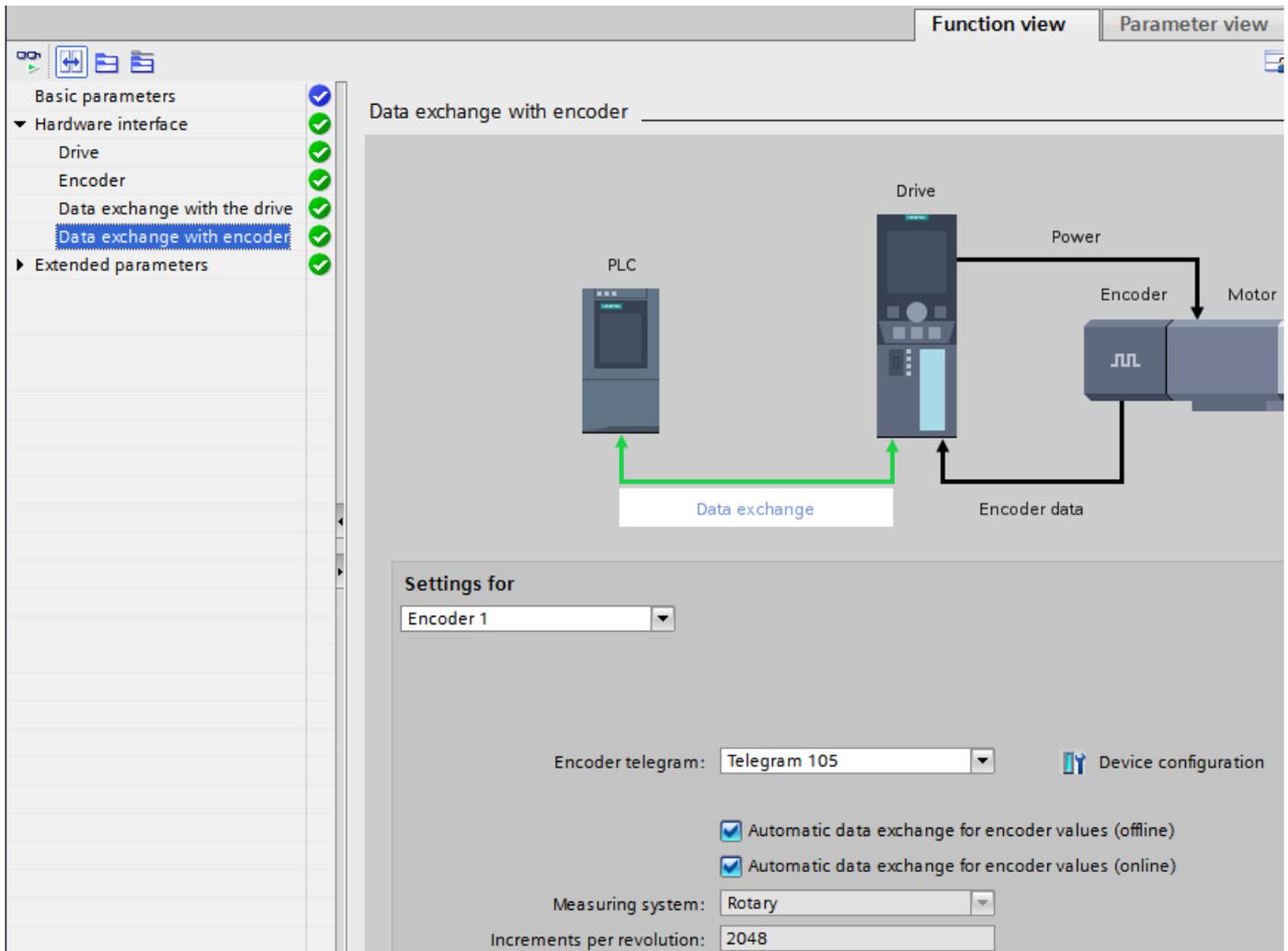


Figure 2-19 Activating automatic offline synchronization of the encoder values during configuration

Drive values or encoder values automatically synchronized offline during the configuration

After the drive values or encoder values have been automatically synchronized offline during the configuration, the background color in the selection list under "Drive telegram" or "Encoder telegram" changes to orange.

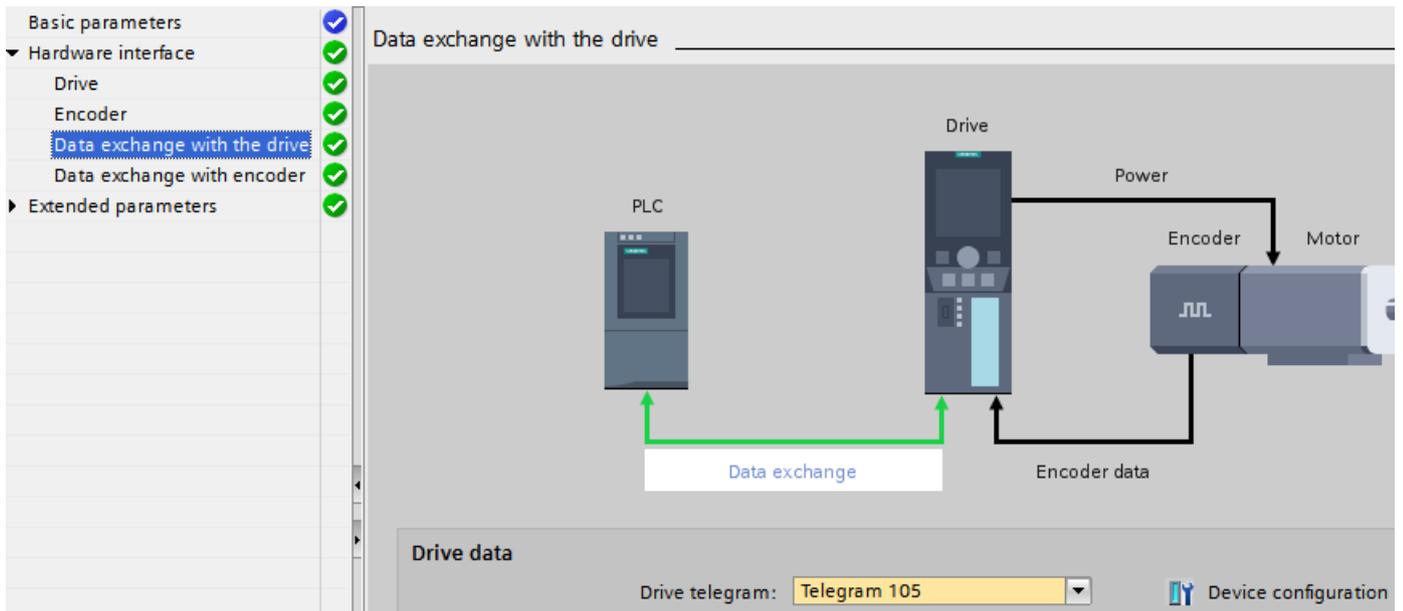


Figure 2-20 Drive values automatically synchronized offline during the configuration (orange background color below the drive telegram)

Note

Compile the PLC program to overwrite the values automatically synchronized offline in the associated TO-DB

You must compile the PLC program to overwrite the drive and/or encoder values automatically synchronized offline in the associated technology object data block (TO-DB).

Alarms and parameters

- 3.1 SINAMICS V90 PN CU alarms
- 3.2 SINAMICS V90 PN drive alarms
- 3.3 SINAMICS V90 PN CU parameters
- 3.4 SINAMICS V90 PN drive parameters

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