

SIEMENS

Function Manual

SINAMICS

EXLOOP

External Loop Controller

Edition

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SIEMENS

SINAMICS

EXLOOP External Loop Controller

Function Manual

Valid for
Technology Extension Firmware version
EXLOOP 1.1
for
SINAMICS S120 from V4.7
SINAMICS Integrated

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Warning notice system

This Manual contains information that you must observe to ensure your own personal safety as well as to avoid material damage. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to equipment damage have no safety alert symbol. Depending on the hazard level, warnings are indicated in a descending order as follows:

| |
|--|
|  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 level of danger is simultaneously applicable, the warning notice for the highest level is used. A warning notice with a safety alert symbol warning of injury to persons may also include a warning relating to property damage.

Qualified personnel

The product/system described in this documentation may only be operated by **personnel qualified** for the specific task in accordance with the relevant documentation for the specific task, 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 are only permitted to be used for the applications listed in the catalog and in the associated technical documentation. If third-party products and components are used, then they must be recommended or approved by Siemens. These products can only function correctly and safely if they are transported, stored, set up, mounted, installed, commissioned, operated and maintained correctly. The permissible ambient conditions must be adhered to. Notes in the associated documentation must be observed. |

Trademarks

All names identified by the trademark symbol ® are registered trademarks of Siemens AG. Other designations used in this document may be trademarks whose use by third parties for their own purposes could violate the rights of the trademark owners.

Disclaimer of liability

We have checked the contents of this publication for consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. The information given in this document is reviewed at regular intervals and any corrections that might be necessary are made in the subsequent editions.

Preface

SINAMICS documentation

The SINAMICS documentation is structured according to the following categories:

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

Additional information

Information on the following topics is available at <https://support.industry.siemens.com/cs/document/108993276>:

- Ordering documentation/overview of documentation
- Additional links to download documents
- Using documentation online (find and search in manuals/information)

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

<mailto:docu.motioncontrol@siemens.com>

Siemens MySupport/Documentation

You can find information on how to create your own individual documentation based on Siemens' content and adapt it for your own machine documentation at:

<https://support.industry.siemens.com/My/ww/en/documentation>

Training

You can find information about SITRAIN (Siemens training for products, systems and solutions for automation and drives) at the following address.

<http://www.siemens.com/sitrain>

FAQs

You can find Frequently Asked Questions in the Service&Support pages under Product Support:

<https://support.industry.siemens.com/cs/de/en/ps/faq>

SINAMICS

You can find information about SINAMICS at the following address:

<http://www.siemens.com/sinamics>

Target group

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

Benefits

This manual contains information about all parameters, function diagrams, faults and alarms required to commission and service the system.

This manual should be used in addition to the other manuals and tools provided for the product.

Standard scope

This documentation is part of the Technical Customer Documentation for SINAMICS.

In the interests of clarity, this documentation does not contain all the detailed information for all product types and cannot take into account every possible aspect of installation, operation or maintenance.

The contents of this documentation are not part of an earlier or existing agreement, a promise, or a legal agreement, nor do they change this. All obligations on the part of Siemens can be found in the respective sales contract, which also contains the complete and sole warranty provisions. These contractual warranty provisions are neither extended nor curbed as a result of the statements made in this documentation.

Technical Support

Country-specific telephone numbers for technical support are provided in the Internet at:

<http://support.industry.siemens.com/sc/ww/en/sc/2090> in the "Contact" area.

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Fundamental safety instructions

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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. |
| <ul style="list-style-type: none">• 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. |
| <ul style="list-style-type: none">• Protect the parameterization against unauthorized access.• Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off. |

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 specific customer solutions, but are only intended to provide support for 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.

1.3 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:

Industrial security (<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 customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed at:

Industrial security
(<https://new.siemens.com/global/en/products/services/cert.html#Subscriptions>).

Further information is provided on the Internet:

Industrial Security Configuration Manual
(<https://support.industry.siemens.com/cs/ww/en/view/108862708>)



WARNING

Unsafe operating states resulting from software manipulation

Software manipulations (e.g. viruses, trojans, malware 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 holistic, state-of-the-art industrial security concept for the installation or machine.
- Make sure that you include all installed products into the holistic industrial security concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- On completion of commissioning, check all security-related settings.

Field of application, features

The "External control loop" Technology Extension (EXLOOP, External Loop Controller) is an expansion for the SINAMICS SERVO drive object.

A Technology Extension (TEC) is also known as "OA application".

Features

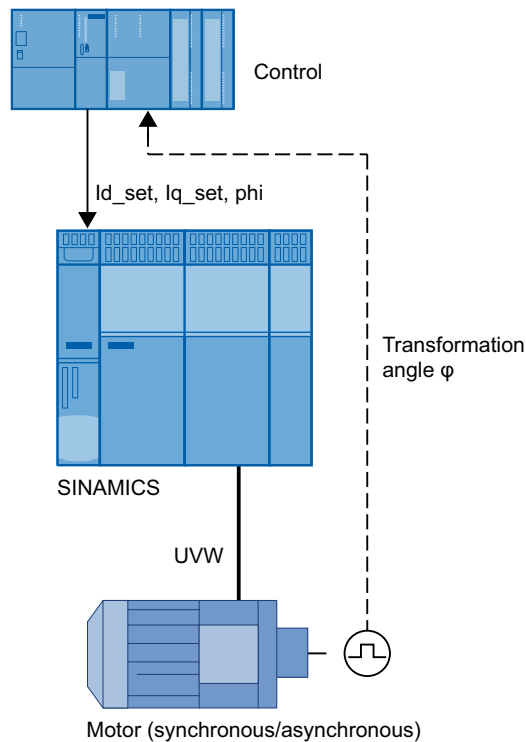
With the EXLOOP Technology Extension, external setpoints for the drive can be specified from a higher-level control via BICO interconnection:

- Field-generating current (I_{d_set})
- Torque-generating current (I_{q_set})
- Transformation angle (φ), (optional)
- Velocity actual value (v_{act}), (optional)

The internal setpoints of the servo control are overwritten here.

When the setpoints are specified via an IRT master with a sampling time that is greater than the current controller sampling time ($p0115[0]$), Technology Extension EXLOOP can interpolate the setpoints linearly.

Current setpoint specification with encoder evaluation by PLC



Current setpoint specification with encoder evaluation by drive

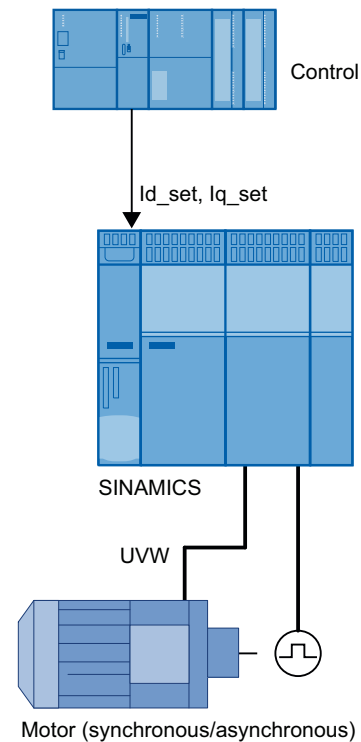


Fig. 2-1 Example topology:

System integration

The EXLOOP Technology Extension can be used in servo controls in conjunction with SINAMICS S120 (CU320-2).

License Key

A License Key is required for the EXLOOP Technology Extension, see "Licensing (Page 45)".

More information

The EXLOOP Technology Extension EXLOOP is described in detail in Chapter "Function description and commissioning (Page 37)".

Installation and activation

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3.1 Overview of installation and activation

Some of the subsequent installation descriptions in this chapter refer to the fictitious Technology Extension "ABC_OA". The procedures described can be applied similarly to any real Technology Extension.

Requirement

The basic commissioning of the control system and the drive or drive object has been completed.

Commissioning tools

A Technology Extension (TEC) EXLOOP can be installed in the following ways:

- STARTER Commissioning Tool, see "STARTER or SIMOTION SCOUT (Page 17)"
- SIMOTION SCOUT engineering software with integrated STARTER, see "STARTER or SIMOTION SCOUT (Page 17)"
- SINUMERIK Operate, see "SINUMERIK Operate (Page 29)"

Terms

Technology Extension (TEC)

Software component that is installed as an additional technology function and that expands the functionality of the SINAMICS drive system. A Technology Extension is also known as an OA-application (OA, Open Architecture).

Installation package

The Technology Extension is supplied in a software package, which in turn comprises several installation packages for different target systems and commissioning tools.

The following installation packages can be included:

- oasp_abc_oa_v1_1_oaif04402300.zip for installation with STARTER or SIMOTION SCOUT
- rmed_abc_oa_v1_1_oaif04402300.tgz for installation with SINUMERIK Operate

The file name of the installation package for the fictitious Technology Extension ABC_OA comprises the following elements:

- oasp = OA Support Package (only for STARTER / SIMOTION SCOUT)
- rmed = RunMyEngineeredDrive (only for SINUMERIK)
- abc_oa = name of the Technology Extension
- v1_1 = version of the Technology Extension
- oaif04402300 = OA-interface version (OA interfaces version, only for STARTER and SIMOTION SCOUT)

Version of the SINAMICS firmware from which this Technology Extension can be used (04402300 = V4.4)

3.2 STARTER or SIMOTION SCOUT

3.2.1 Requirements for installation using STARTER or SIMOTION SCOUT

This description for installing and commissioning a Technology Extension is applicable for the STARTER commissioning tool and for engineering software with integrated STARTER (e.g. SIMOTION SCOUT).

Generally, the term STARTER is used hereafter.

Devices

This general description applies to:

- SINAMICS S120, S150, G130, G150, MV (CU320-2)
- SINAMICS S120 (CU310-2)
- SIMOTION D4x5-2 with SINAMICS Integrated
- SIMOTION D410-2 with SINAMICS Integrated
- SINAMICS DCM, DCP

Preconditions

1. The current STARTER version is recommended for the installation. If scripting is to be used in STARTER, at least STARTER version V5.1 SP1 HF2 should be used.
2. The installation package for Technology Extension ABC_OA (oasp_abc_oa_v1_1_oaif04402300.zip) must be in a known directory.

3.2.2 Installing and activating a Technology Extension

3.2.2.1 Installing the OA support package in STARTER

In the following, the Technology Extension is installed in STARTER as a technology package.

Preconditions

The following preconditions must be met before installation:

1. The STARTER commissioning tool has been opened.
2. No project is open.

Procedure

Proceed as follows for installation:

1. From the "Tools" menu, choose the "Installation of libraries and technology packages" function.

The "Installation of libraries and technology packages" window opens.

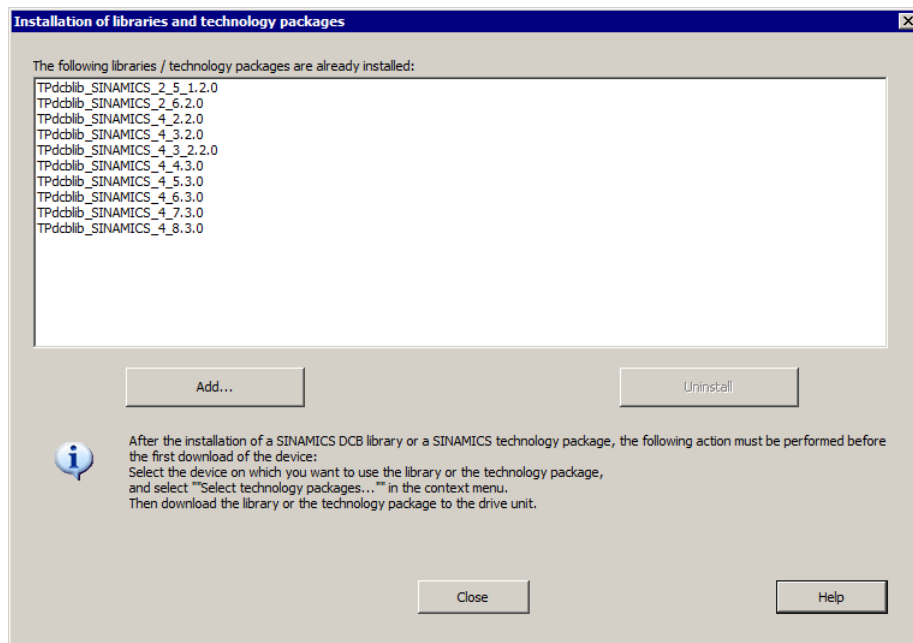


Fig. 3-1 Figure 4-8 Selecting and installing the technology package

2. Click "Add".
3. Open the file "oasp_abc_oa_v1_1_oaif04402300.zip".
The technology package belonging to the Technology Extension ABC_OA is added.
4. Click "Close"

3.2.2.2 Download the technology package

In the following, the Technology Extension ABC_OA version V1.1 is loaded into the device via STARTER.

Preconditions

The following requirements must be met for the download:

1. A project matching the device is open.
2. The STARTER commissioning tool is in ONLINE mode.

Procedure

To download, proceed as follows:

1. Right-click the drive unit in the project navigator.
2. Click "Select technology packages" in the shortcut menu.

The "Select technology packages" window opens.

3. For the technology package "ABC_OA", set the action "Load to target device".

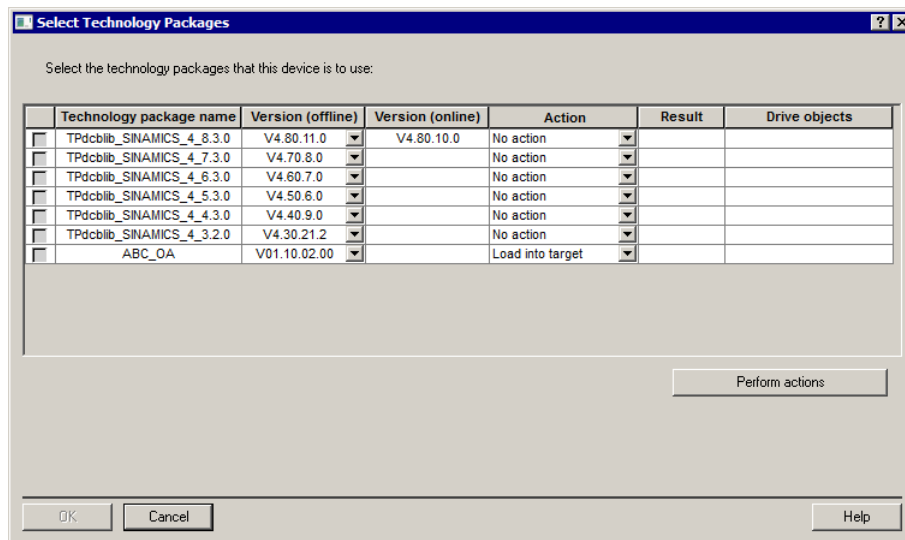


Fig. 3-2 Select the technology packages

4. Click the "Perform actions" button.

After successfully performing the action, the information "OK" is displayed for the corresponding "Result" field.

5. If necessary, switch the target device off and on again (POWER ON).

Additional information on the "Select technology packages" dialog

For a technology package, the "Version (online)" column is only populated after executing "Load to target device".

The version data between the "Version (offline)" and "Version (online)" columns may differ. When you download the technology package, the version in the target device is always overwritten.

3.2.2.3 Activating the Technology Extension in the drive object

In the following, the Technology Extension is assigned to a drive object.

Preconditions

1. The project matching the device is open.
2. The corresponding drive axes have been created in the project.
3. The STARTER commissioning tool is in OFFLINE mode.

Procedure

To activate the Technology Extension in the drive object, proceed as follows:

1. In the project navigator, select the drive object for which the functionality is required (e. g. SERVO_03).
2. Select "Properties" in the shortcut menu.
3. To activate the Technology Extension, select checkbox "ABC_OA" on the "Technology packages" tab.

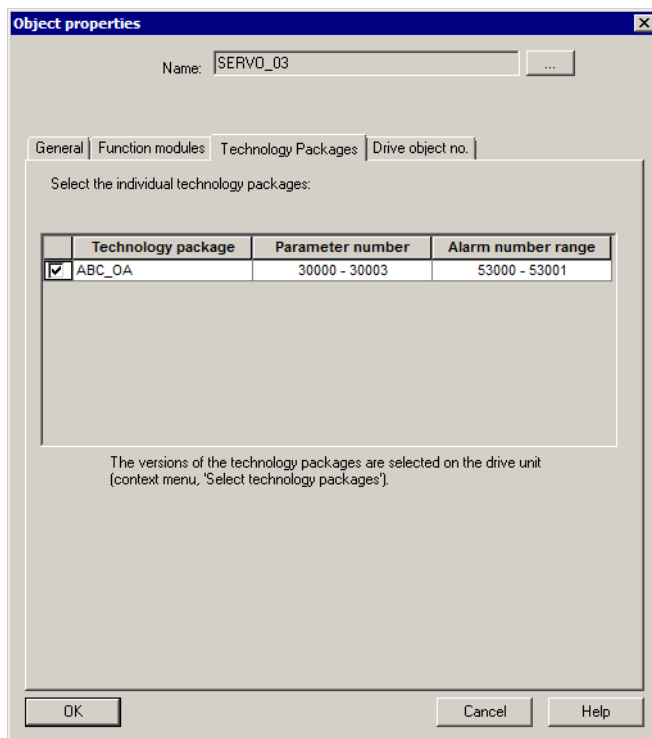


Fig. 3-3 Object properties

- Click the "OK" button.

Note

If multiple versions of a Technology Extension are installed in STARTER, select the required version, see "Download the technology package (Page 19)":

- Check the expert list of the drive object.

The additional parameters of the installed Technology Extension must now be visible in the expert list of the corresponding drive object.

| | Parameter | Data set | Parameter text | Offline value | SERVO_03 | Unit | Modifiable to | Access level | Minimum | Maximum |
|------|-----------|----------|---|---------------|----------------------|------|----------------|--------------|---------|---------|
| 1215 | p10203 | All | SI Motion SBT control selection | [0] | SBT via SCC (p10235) | All | All | All | All | All |
| 1216 | p10204 | All | SI Motion SBT motor type | [0] | Rotating | All | All | All | All | All |
| 1217 | p10208[0] | All | SI Motion SBT test torque ramp time, Brake 1 | 1000 | | ms | Commissioni... | 3 | 20 | 10000 |
| 1218 | p10209[0] | All | SI Motion SBT brake holding torque, Brake 1 | 10.00 | | Nm | Commissioni... | 3 | 1 | 60000 |
| 1219 | p10210[0] | All | SI Motion SBT test torque factor sequence 1, Brake 1 | 1.00 | | | Commissioni... | 3 | 0.3 | 1 |
| 1220 | p10211[0] | All | SI Motion SBT test duration sequence 1, Brake 1 | 1000 | | ms | Commissioni... | 3 | 20 | 10000 |
| 1221 | p10212[0] | All | SI Motion SBT position tolerance sequence 1, Brake 1 | 1.000 | | mm | Commissioni... | 3 | 0.001 | 360 |
| 1222 | p10218 | All | SI Motion SBT test torque sign | [0] | Positive | | Commissioni... | 3 | | |
| 1223 | p10220[0] | All | SI Motion SBT test torque factor sequence 2, Brake 1 | 1.00 | | | Commissioni... | 3 | 0.3 | 1 |
| 1224 | p10221[0] | All | SI Motion SBT test duration sequence 2, Brake 1 | 1000 | | ms | Commissioni... | 3 | 20 | 10000 |
| 1225 | p10222[0] | All | SI Motion SBT position tolerance sequence 2, Brake 1 | 1.000 | | mm | Commissioni... | 3 | 0.001 | 360 |
| 1226 | p10230[0] | All | SI Motion SBT control word, Select brake test | 0 | | | Commissioni... | 3 | | |
| 1227 | r10231 | All | SI Motion SBT control word diagnostics | 0H | | | | 3 | | |
| 1228 | r10234 | All | CO/BO: SI Safety Info Channel status word S_ZSW3B | 0H | | | | 3 | | |
| 1229 | p10235 | All | CI: SI Safety Control Channel control word S_STW3B | 0 | | | Ready to run | 3 | | |
| 1230 | r10240 | All | SI Motion SBT test torque diagnostics | 0.00 | | Nm | | 3 | | |
| 1231 | r10241 | All | SI Motion SBT load torque diagnostics | 0.00 | | Nm | | 3 | | |
| 1232 | p10250 | All | CI: SI Safety Control Channel control word S_STW1B | 0 | | | Ready to run | 3 | | |
| 1233 | r10251 | All | CO/BO: SI Safety Control Channel control word S_STW1B diagnostics | 0H | | | | 3 | | |
| 1234 | p30000 | All | ABC_OA switch-on mode | [0] | Reset messages | | Operation | 1 | | |
| 1235 | p30001 | All | CI: ABC_OA P controller input signal source | 0 | | | Operation | 1 | | |
| 1236 | r30002 | All | CO: ABC_OA P controller output signal | 0.00 | | | | 1 | | |
| 1237 | p30003 | All | ABC_OA P controller gain factor | 1.00 | | | Operation | 1 | 0 | 1000 |

Fig. 3-4 Expert list

- To activate the Technology Extension for the drive object, download the project.
Set the mode to ONLINE and select "Download project to target system".

3.2.2.4 Commissioning the Technology Extension

By setting the corresponding additional parameters, the Technology Extension ABC_OA can be commissioned using the STARTER commissioning tool via the expert list.

Parameters p30000 ... p30003 are available for ABC_OA.

Commissioning the Technology Extension EXLOOP

The parameters from p32500 onwards are available for the Technology Extension EXLOOP, see "List of parameters (Page 49)".

Commissioning is described in Chapter "Function description and commissioning (Page 37)".

3.2.3 Upgrading the Technology Extension

3.2.3.1 Installing the OA support package in STARTER

Technology Extension "ABC_OA" is upgraded from version V1.1 to version V1.2 in the following.

The new Technology Extension is installed in STARTER as an additional technology package.

Procedure

To install the OA Support Package "oasp_abc_oa_v1_2_oaif04402300.zip", proceed as described in Chapter "Installing the OA support package in STARTER (Page 17)".

After this installation, both versions of ABC_OA are visible in the window "Installation of libraries and technology packages".

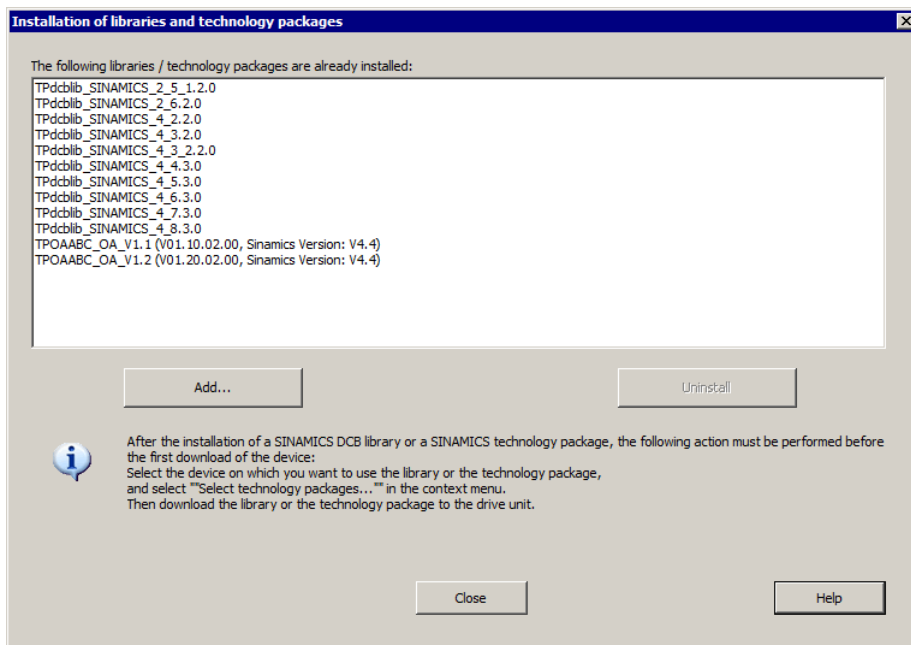


Fig. 3-5 Installing the OA support package (technology package)

3.2.3.2 Download the technology package for the new version

In the following, the Technology Extension ABC_OA with version V1.2 is loaded into the device via STARTER.

Preconditions

The following requirements must be met for the download:

1. A project matching the device is open.
2. The STARTER commissioning tool is in ONLINE mode.

Procedure

To download, proceed as follows:

1. Right-click the drive unit in the project navigator.
2. Click "Select technology packages" in the shortcut menu.

The "Select technology packages" window opens.

3. For technology package "ABC_OA", select version V01.20.02.00 under the column "Version (offline)".

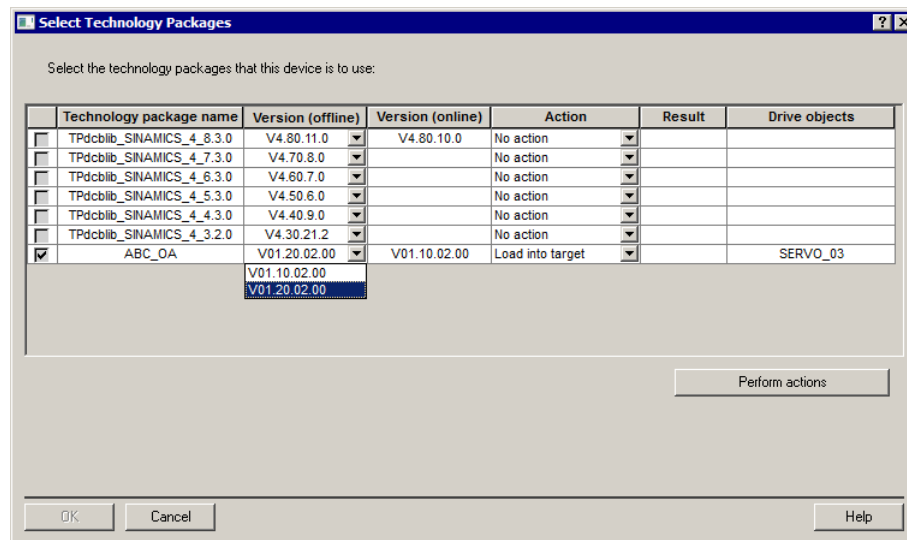


Fig. 3-6 Select the technology packages

4. For the technology package "ABC_OA", set the action "Load to target device".
5. Click the "Perform actions" button.
6. Confirm the message that the existing technology package should be overwritten.

After successfully performing the action, the information "OK" is displayed for the corresponding "Result" field.

Version V01.20.02.00 is now used on the drive device.

7. To activate the Technology Extension for the drive object, download the project. Set the mode to ONLINE and select "Download project to target system".

3.2.3.3 Additional information about upgrading

Pay particular attention to the following information about upgrading:

1. The drive objects activated in the previous version of the Technology Extension remain activated.

For the procedure for activating/deactivating the Technology Extension in additional drive objects, see "Activating the Technology Extension in the drive object (Page 20)".

2. The parameters set in a drive object in the previous version of the Technology Extension and their values are retained.

3. New parameters of the newly installed version of the Technology Extension are preassigned the factory settings and may have to be set.

4. The OA Support Package of the previous version of the Technology Extension can be deleted from STARTER if it can no longer be used for other projects or drive devices.

For the procedure for deleting/uninstalling, see "Installing the OA support package in STARTER (Page 17)".

3.2.4 Uninstalling a Technology Extension

Procedure

To uninstall a Technology Extension using STARTER or SIMOTION SCOUT, reverse the installation sequence.

1. Deactivate the Technology Extension in the drive object, see "Activating the Technology Extension in the drive object (Page 20)".
2. Delete the technology package belonging to the Technology Extension in the drive unit, see "Download the technology package (Page 19)".
 - Deactivate the technology package in OFFLINE mode.
 - Save and compile the project.
 - Download the project to the target device.
 - For the technology package in ONLINE mode, select the "Delete" action and click the "Perform actions" button.
3. Uninstall the Technology Extension in STARTER.

Uninstalling the Technology Extension in STARTER

To uninstall, proceed as follows:

1. From the "Tools" menu, choose the "Installation of libraries and technology packages" function.

The "Installation of libraries and technology packages" window opens.

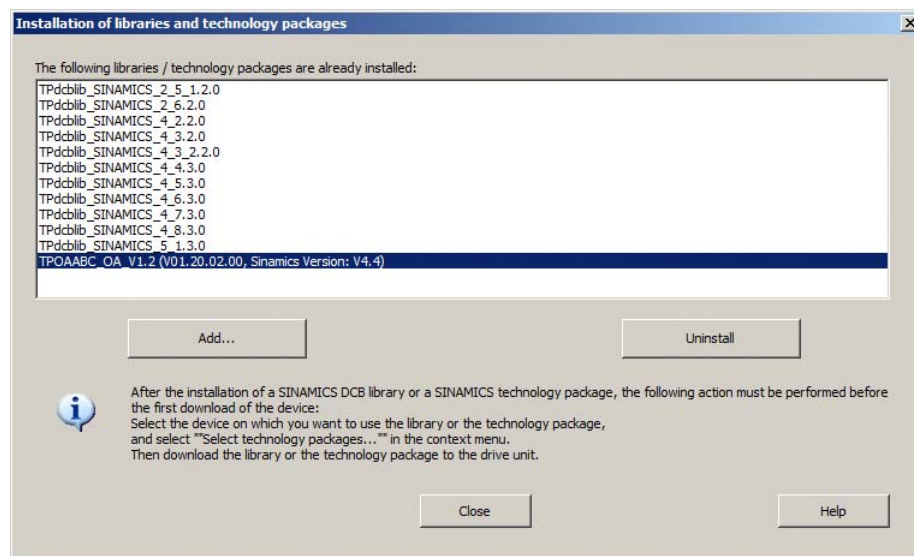


Fig. 3-7 Figure 4-14 Uninstalling technology packages

2. Select the technology package belonging to the Technology Extension ABC_OA.
3. Click the "Uninstall" button.

The technology package is deleted.
4. Click "Close".

3.2.5 Scripting with STARTER or SIMOTION SCOUT

3.2.5.1 Information about scripting

Preconditions

To use scripting functionality, you need to be familiar with script programming; therefore, a general introduction will not be provided here.

The implementation is based on VBScript from MICROSOFT, which has been expanded to include special objects and methods for STARTER. The current STARTER version is recommended when using SINAMICS TEC scripting functions with STARTER. As a minimum, STARTER version V5.1 SP1 HF2 is required when using SINAMICS TEC scripting functions.

Devices


This description applies to:

- SINAMICS S120, S150, G130, G150, MV (CU320-2)
- SINAMICS S120 (CU310-2)
- SIMOTION D4x5-2 with SINAMICS Integrated
- SIMOTION D410-2 with SINAMICS Integrated
- SINAMICS DCM, DCP

Working with scripting functionality

Using the scripting functionality, you can automate the configuration using an easy-to-learn script language. Drive objects (DOs), e. g. SINAMICS drives and SIMOTION technology objects (TOs), e. g. axes, can be configured.

Standard scripts can be adapted to specific situations during runtime using interactive queries, which means that the scripts are executed dependent on query results. This simplifies and speeds up commissioning. Other possible applications include documenting settings that have been made and repeating complex settings without error, for example.

| |
|--|
|  WARNING |
| Malfunctions as a result of incorrect scripts |
| Scripting provides extensive automation options that are required to be able to automate manual operator actions in STARTER, therefore optimizing the time required for the recurring configuration of projects and tasks. Incorrect configurations that are not identified in tests can result in serious injury or death! The script programmer and the script user are responsible for the operator actions implemented in the scripting. |
| <ul style="list-style-type: none">• Run systematic tests on new and modified scripts to verify and validate them.• Before running a script, make sure it has the correct content. Verify and validate the results of running the script by performing tests on the machine. |

Note**Information about scripting, tools and application examples**

- Detailed documentation about VBScript is available at the following address (<https://www.microsoft.com>).
 - Detailed notes for SIMOTION scripts are contained in SIMOTION Utilities & Applications. This information is available on DVD or on the Internet at the following address (<https://support.industry.siemens.com/cs/document/26340545>). In addition to the SIMOTION Scripting Interface Manual and a script style guide, there is a collection of scripts that provide support when working with SIMOTION SCOUT.
-

Scripting variants

The following scripting variants are available in STARTER:

VBScript Internal

In the STARTER project navigator, script folders can be inserted under the project, each device and each TO/DO. You can then insert the scripts into this script folder.

Scripts are edited using an internal editor. Scripts can be imported or exported in text format (ASCII) and XML.

VBScript External

Scripts can also be executed from Windows Explorer. STARTER does not have to be started for this purpose. This allows operators without system knowledge to perform configuration tasks. In this case, the script is available as a VBScript in an ASCII file "TECupdaten.vbs" in the Windows file system, for example.

External scripting

For more complex scripting applications, you can implement your own application – which provides a task-oriented user interface – and internal SIMOTION scripting, which uses the STEP 7 command interface and other scripting interfaces (e. g. for databases or XML). This form of scripting is implemented using Visual Basic or Visual C#, for example.

3.2.5.2 Scripting for Technology Extensions

An application example where several TEC-specific scripting methods are applied is the automated update of Technology Extensions. The typical workflow when upgrading and the methods used are described below.

Detailed information about general and TEC-specific scripting methods is provided in the STARTER online help.

Upgrading a Technology Extension using scripting methods

To update a Technology Extension using scripting, the same steps as for a manual update generally need to be performed, see "Upgrading the Technology Extension (Page 22)". Additional steps and queries serve especially to guarantee safe and reliable functioning.

Table 3-1 Scripting methods and corresponding commissioning steps

| Scripting method | Commissioning step |
|-----------------------|--|
| GetActivatedTECs | Query as to which drive objects Technology Extensions are activated on and which version is used. |
| GetTECParameterRanges | Query as to which parameters belong to a specific, activated Technology Extension. |
| Parameter | Read out and save the settings of these parameters. |
| DeActivateTEC | Deactivate the old TEC version. |
| UninstallTEC | Uninstall the old TEC version. |
| InstallTEC | Install the new TEC version. |
| SelectTECVersion | Select the newly installed TEC version. |
| DownloadTEC | Download the new TEC version. |
| ActivateTEC | Activate the new TEC version on all drive objects on which the old version was active. To do this, the drive objects read out using "GetActivatedTECs" must now be used as target. |
| Parameter | Restore the parameter settings in the new TEC version. |

The methods listed can be removed from the complex context and separately applied. For instance, a text file can be created using "GetActivatedTECs" that can be used for documentation purposes or as configuration example.

The steps defined using scripting can also be extended to include additional actions. For example, the results from "GetActivatedTECs" can be compared with the OASP in an installation folder. If more recent versions are saved in the installation folder, an update can be performed fully automatically in STARTER.

Explanations and programming examples

An overview and help on scripting methods specific to Technology Extensions are provided in the STARTER help:

1. Open Help by pressing key "F1", for example.
2. Double-click on folder "Scripts for Automated Execution".
3. Double-click on folder "Methods".
4. Double-click on folder "Technology Extensions methods".

A detailed description with syntax, notes and programming examples is provided in this folder for all TEC-specific scripting methods.

3.3 SINUMERIK Operate

3.3.1 Requirements for installation using SINUMERIK Operate

This description on how to install and commission a Technology Extension is applicable when commissioning a SINUMERIK using an HMI.

Devices

This general description is valid for SINUMERIK control systems with SINAMICS Integrated:

- SINUMERIK 840D sl
- SINUMERIK ONE

Requirements

1. Access level "Manufacturer" must be set in SINUMERIK Operate.
2. A USB memory, which is installed on the portable service system for the NCU, is available.

Note

The SINUMERIK service system, as well as the procedure to generate it on a USB memory, is described in detail in the following references:

- SINUMERIK ONE New Installation and Upgrade, Installation Manual
 - SINUMERIK 840D sl operating system NCU, Commissioning Manual
-

3. The installation package of Technology Extension ABC_OA (abc_oa_v1_1_oaif04402300.tgz) is copied to the FAT partition of the USB memory using the SINUMERIK service system.

3.3.2 Installing and activating the Technology Extension

3.3.2.1 Installing Technology Extension on the drive object

The Technology Extension is installed on the drive unit in the following.

Procedure

1. Connect the USB memory with portable service system to USB interface X125 or X135 of the SINUMERIK NCU.
2. Restart the SINUMERIK NCU:
 - Switch off the device and then switch on again.or
 - press the "Reset" button.SINUMERIK NCU starts with the service system.
3. In the service system, execute the following actions one after the other:
 - In the main menu, select menu item "Update NCU Software and Data".
 - Then select menu item "Update system software from USB memory stick".
 - Select file "abc_oa_v1_2_oaif04402300.tgz" and acknowledge with "OK".File "abc_oa.cfs" is extracted from file "abc_oa_v1_2_oaif04402300.tgz", and is saved in the directory "/card/oem/sinamics/oa".
4. Restart SINUMERIK NCU as described under Step 2.

Technology Extension ABC_OA OA is installed in the "/card/oem/sinamics/oa" directory when the system boots. The appropriate data is made available in the "abc_oa" subdirectory.

Alternative installation via an SFTP client for Windows (e.g. WinSCP)

Alternatively installation can also be performed via an SFTP client for Windows based on SSH. The client permits a secure data and file transfer between different computers. The freely available software WinSCP (Windows Secure Copy) meets these requirements.

You should proceed as follows when installing:

1. Copy the file "abc_oa_v1_2_oaif04402300.tgz" into a target directory on the device (e.g. /tmp).
2. Mark the window with the target directory and open the input console from the "Commands > Open Terminal" menu.
3. Enter the following commands in the "Enter command" field and click the "Execute" button for each to confirm:
 - sc stop all.
 - sc restore -update -force abc_oa_v1_2_oaif04402300.tgzThe "abc_oa.cfs" file is extracted from the "abc_oa_v1_2_oaif04402300.tgz" file and stored in the following directory:
/card/oem/sinamics/oa
 - sc rebootTechnology Extension ABC_OA OA is installed in the "/card/oem/sinamics/oa" directory when the system boots. The appropriate data is made available in the "abc_oa" subdirectory.

Note

Any error messages that appear can normally be ignored.

"abc_oa_v1_2_oaif4402300.tgz" is a temporary file and will be deleted when the "sc reboot" command is executed or for POWER ON.

3.3.2.2 Activating Technology Extension for the drive object

In the following, the ABC_OA Technology Extension is assigned to the desired axes and the appropriate drive objects.

Configuration example

A 3-axis SINUMERIK system comprises the following drive objects, for instance:

- Control Unit (DO_1)
- Infeed (DO_2)
- X axis (DO_3, AX1)
- Y axis (DO_4, AX2)
- Z axis (DO_5, AX3)

Procedure

To activate the Technology Extension on the desired axes, proceed as follows:

1. Deactivate the pulse enable for SINAMICS (e.g. via the EP terminal)
2. Control Unit: Set the configuration for the Technology Extension
 - p0009 = 0 → 50
3. Perform the following tasks for the first axis or drive object on which this Technology Extension should be activated (e.g. DO_3, AX1):
 - p4956[0] = 0 → 1

For SINUMERIK, this is displayed as follows in the drive machine data:

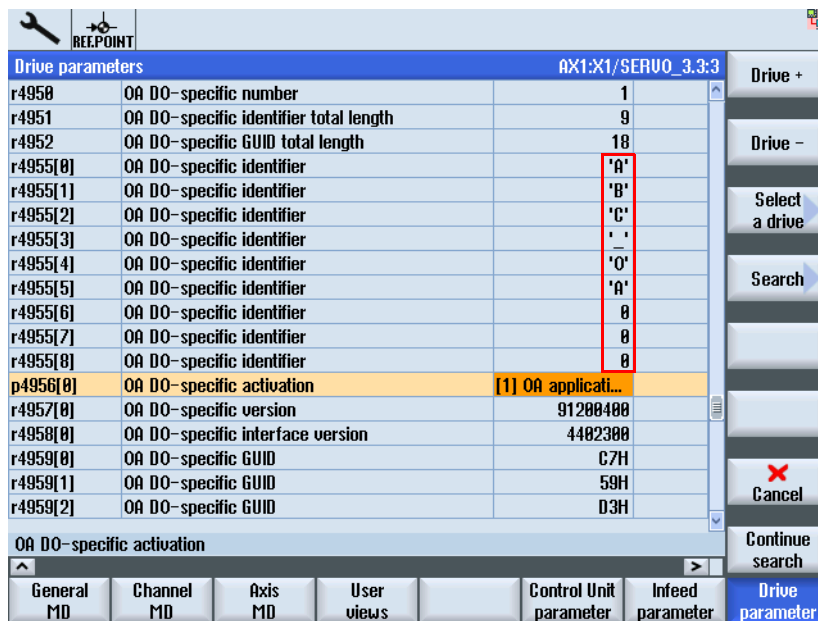


Fig. 3-8 Activated Technology Extension in the drive machine data

Note

The number of Technology Extensions is displayed in r4950.

r4955[0...8] contains the identifier for Technology Extension 1

r4955[9...17] contains the identifier for Technology Extension 2, etc.

For r4950 = 1, the following applies:

- Only one Technology Extension is available.
- In this case, p4956[0] is used to activate a Technology Extension.

For r4950 > 1, the following applies:

- Several Technology Extensions are available.
- The associated index for activating Technology Extension ABC_OA depends on the designation.
 - If "ABC_OA" is in r4955[0...8], the following applies p4956[0]
 - If r4955[9...17] contains "ABC_OA", then p4956[1] applies, etc.

4. For additional axes on which this Technology Extension should be activated (e.g. DO_4, AX2), repeat step 3.
5. Control Unit: Exit the configuration for the Technology Extension
 - p0009 = 50 → 0

Note

If extension modules (e.g. NX assembly units) are present, the following is true for axes calculated on these modules:

Commissioning mode (p0009 = 50) must be set for these modules before the Technology Extension for these axes can be activated.

6. Back up the parameters
7. Reactivate the pulse enable for SINAMICS
8. Check the parameter list for AX1

The additional parameters of the installed Technology Extension must now be visible in the parameter list for the axis AX1 (DO_3).

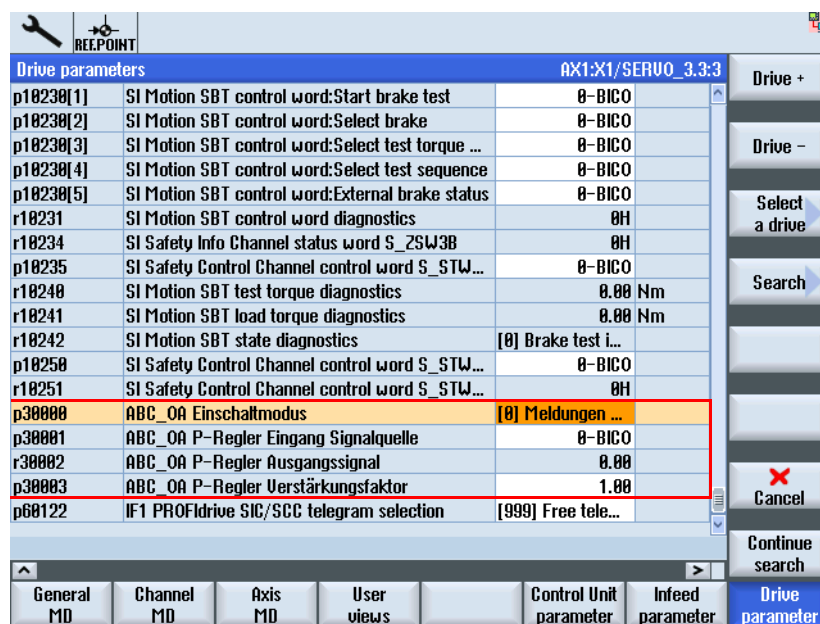


Fig. 3-9 Expert list

3.3.2.3 Commissioning the Technology Extension

By setting the corresponding additional parameters, Technology Extension ABC_OA can be commissioned using HMI Operate.

Parameters p30000 ... p30003 are available for ABC_OA.

Commissioning the Technology Extension EXLOOP

The parameters from p32500 onwards are available for the Technology Extension EXLOOP, see "List of parameters (Page 49)".

Commissioning is described in Chapter "Function description and commissioning (Page 37)".

3.3.3 Upgrading the Technology Extension

The subsequent description in this chapter refers to the fictitious Technology Extension "ABC_OA". This is to be upgraded from version V1.1 to V1.2.

The procedure described in this chapter can be correspondingly applied to any real Technology Extension.

This description to upgrade a Technology Extension is valid both when using an HMI as well as when using an SFTP client.

The upgrade is essentially a new installation of the latest version of the Technology Extension. When upgrading, the existing version is overwritten by the new version.

Requirements

- The file for the Technology Extension ABC_OA "abc_oa_v1_1_oaif04402300.tgz" has already been installed and assigned to the required drive objects, see "SINUMERIK Operate (Page 29)".
- The file with the new version of the Technology Extension "abc_oa_v1_2_oaif04402300.tgz" is ready:
 - When using an HMI: On the FAT partition of the USB memory with the portable service system.
 - When using an SFTP client: On a local hard drive.

Procedure

Install and activate the new version of the Technology Extension as described in the following chapters:

- "Installing Technology Extension on the drive object (Page 29)"
- "Activating Technology Extension for the drive object (Page 31)"

During this procedure, the previously used version of the Technology Extension is overwritten.

Additional information about upgrading

Pay particular attention to the following information about upgrading:

1. The data from the previous version of the Technology Extension saved to folder "/card/oem/sinamics/oa/abc_oa/" as well as file "/card/oem/sinamics/oa/abc_oa.cfs" are overwritten.
 - Parallel operation of drive objects with active Technology Extension "ABC_OA" Version V1.1 and other drive objects with active version V1.2 is not possible.
 - You must reinstall Technology Extension "ABC_OA" Version V1.1 to switch to the previous version V1.1.
2. The drive objects activated in the previous version of the Technology Extension remain activated.
3. The parameters set in a drive object in the previous version of the Technology Extension and their values are retained.
4. New parameters of the newly installed version of the Technology Extension are preassigned the factory settings and may have to be set.

3.3.4 Uninstalling a Technology Extension

Procedure

To uninstall a Technology Extension via SINUMERIK Operate, proceed as follows:

1. Deactivate the Technology Extension in the drive object, see "Activating Technology Extension for the drive object (Page 31)".
2. Stop the system:
 - Connect via Secure Shell (SSH).
 - Run the following command: `sc stop all`.
3. Delete the subdirectory and files on the memory card:
 - Select the system data.
 - Select directory `/oem/sinamics/oa` under the system CF card.
 - Select subdirectory `abc_oa` and delete.
 - Select file `abc_oa.cfs` and delete.

Note

Pay attention to the sequence when deleting:

First the subdirectory and then the file.

4. Carry out a POWER ON (switch off/switch on).

Function description and commissioning

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This chapter describes the principle of operation and the commissioning of the Technology Extension EXLOOP. It complements the following chapter:

- "Field of application, features (Page 13)"
- "Installation and activation (Page 15)"

4.1 Principle of operation EXLOOP

With the EXLOOP Technology Extension, the following external setpoints for the drive can be specified via BICO interconnection:

- Field-generating current (I_d_set)
- Torque-generating current (I_q_set)
- Transformation angle (φ)
- Velocity actual value (v_act)

The internal setpoints of the servo control are overwritten here.

The following modes can be selected for the current setpoint specification:

- Current setpoint specification with encoder evaluation by PLC

With this mode, field-generating current (I_d_set), torque-generating current (I_q_set), and transformation angle (φ) are used by an external source.

When the encoder is not connected, the signal source can be selected with BICO interconnection to display the velocity actual value.

- Current setpoint specification with encoder evaluation by drive

With this mode, field-generating current (I_d_set) and torque-generating current (I_q_set) are used by an external source. The transformation angle is calculated internally via the assigned encoder.

Requirements

The function of the EXLOOP Technology Extension is only to be used with electric motors (rotary/linear).

4.2 Commissioning

The following description of the functionality also specifies the usual sequence for commissioning the Technology Extension EXLOOP.

Requirements

The following requirements must be satisfied in order to commission the Technology Extension EXLOOP:

- When installing using STARTER or SIMOTION SCOUT:
 - The Technology Extension is installed as technology package in STARTER, see "Installing the OA support package in STARTER (Page 17)".
 - The technology package is loaded into the Control Unit, see "Download the technology package (Page 19)".
 - The Technology Extension is assigned to the SERVO drive object, see "Activating the Technology Extension in the drive object (Page 20)".
- For installation using SINUMERIK Operate:
 - The Technology Extension is installed on the drive unit, see "Installing Technology Extension on the drive object (Page 29)".
 - The Technology Extension is activated for the axis (drive object), see "Activating Technology Extension for the drive object (Page 31)".

A license is required, see "Licensing (Page 45)".

4.2.1 Configuration

The configuration of the Technology Extension EXLOOP is shown in the following function diagram:

- "7412 – Structure (Page 54)"
- "7413 – PROFIdrive telegram interconnection receive data (p0922 = 1 --> 999) (Page 55)"


Configuration of the encoder interface (only for current setpoint specification with encoder evaluation by PLC)

Current setpoint specification with encoder evaluation by PLC (p32500 = 0) requires the encoder interface to be configured on the used drive objects during commissioning, even when an encoder is not physically connected. The necessary variables are created here that are used by the EXLOOP Technology Extension for value transfer and motor operation.

At the end of commissioning, the created encoder interface must be deactivated again via parameter p0145 on all drive objects used by the EXLOOP Technology Extension, because an encoder is not physically connected. The variables remain active here.

4.2.2 Parameterizing the Technology Extension EXLOOP

The settings described below are necessary for the Technology Extension EXLOOP.

| |
|--|
|  WARNING |
| <p>Motor rotation or unintentional motion of the motor due to unsuitable setpoint settings</p> <p>Unsuitable setpoint value specifications for the transformation angle (φ), the torque-generating current (I_{q_set}) or the field-generating current (I_{d_set}) or non-matching setpoint value specifications for these three variables can lead to unwanted motion of the motor or motor rotation. This can result in severe injury or death.</p> <ul style="list-style-type: none"> • Make sure that the specified transformation angle (φ) corresponds to the actual transformation angle of the motor. • Make sure that the specified torque-generating current (I_{q_set}) matches the actual load inertia and motor inertia and corresponds to the desired acceleration profile. |

Define the mode (p32500)

The mode for the current setpoint specification must be selected in parameter p32500:

- p32500 = 0: The setpoints for the field-generating current I_d (p32505), the torque-generating current I_q (p32506) and the transformation angle (p32507) are used by an external source.
- p32500 = 1: The setpoints for the field-generating current I_d (p32505) and the torque-generating current I_q (p32506) are used by an external source. The transformation angle is calculated internally.

Note

If the setpoints are specified in a slower sampling time than the current controller sampling time (p0115[0]), the setpoints are interpolated linearly by the EXLOOP Technology Extension.

Interconnect signal sources (p32505, p32506, p32507, p32508)

The signal sources for the external current setpoints (I_d , I_q) and the transformation angle and for displaying the velocity actual value must be interconnected with a signal source (e.g. telegram) via BICO parameters. With a setpoint specification via an IRT master, for example, the SIEMENS telegram 102 can be used as the starting point, thus preassigning the default BICO interconnections, see FP 7413 (Page 55):

- Extension of the SIEMENS telegram 102 by the EXLOOP signals via p0922 = 999 and p2079 = 102.
- Free telegram configuration with BICO via p0922 = 999 and p2079 = 999.

The following table contains the BICO interconnections of the signal sinks p32505 ... p32508 with the setpoints (PZD) that can be received in double word format using the PROFIdrive telegram.

Table 4-1 BICO interconnections PROFIdrive receive telegram (example)

| Signal sink (connector input) | | Signal source (connector output) | |
|-------------------------------|---|----------------------------------|--|
| Cl: p32505 | Field-generating current setpoint (Id_set) | CO: r2060[3] | PZD "EXLOOP_ID_SOLL" (IF1 PROFIdrive PZD 4 + 5) |
| Cl: p32506 | Torque-generating current setpoint (Iq_set) | CO: r2060[5] | PZD "EXLOOP_IQ_SOLL" (IF1 PROFIdrive PZD 6 + 7) |
| Cl: p32507 ¹⁾ | Transformation angle setpoint (φ) | CO: r2060[7] | PZD "EXLOOP_PHI" (IF1 PROFIdrive PZD 8 + 9) |
| Cl: p32508 ¹⁾ | Display of velocity actual value (v_act) | CO: r2060[9] | PZD "EXLOOP_V_IST" (IF1 PROFIdrive PZD 10 + 11) |

¹⁾ Only in the "Current setpoint specification with encoder evaluation by PLC" mode (p32500 = 0).

Note

If the parameter p32508 is not interconnected in "Current setpoint specification with encoder evaluation by PLC" mode (p32500 = 0), the display in the basic unit r0063 always remains 0.

Enable external setpoints (p32501)

The specification of the external setpoints must be enabled via the binector input p32501 = 1-signal. The internal setpoints of the servo control are overwritten here.

Activate EXLOOP on several drive objects

The EXLOOP Technology Extension can be activated on several SERVO type drive objects. Activating the EXLOOP Technology Extension on the drive objects is described in Section "Activating the Technology Extension in the drive object (Page 20)".

Series commissioning

The installed Technology Extension EXLOOP is transferred in STARTER with the "Load to file system" function. This can be used for series commissioning.

4.3 Example for EXLOOP

This example describes the configuration of the EXLOOP Technology Extension with BICO interconnection of the signal sources for the external setpoint specification without transformation angle.

Requirements

1. The drive object is configured as SERVO.
2. The EXLOOP Technology Extension is installed.

Setting EXLOOP mode

p32500 = 1 is set for the current setpoint specification with encoder evaluation by the drive.

Interconnect signal sources

The signal sources for the external current setpoints are set via BICO interconnections in the connector inputs:

- CI: p32505 = r2060[3] - IF1 PROFIdrive PZD 4 + 5 as signal source for the field-generating current setpoint (Id_set)
- CI: p32506 = r2060[5] - IF1 PROFIdrive PZD 6 + 7 as signal source for the torque-generating current setpoint (Iq_set)

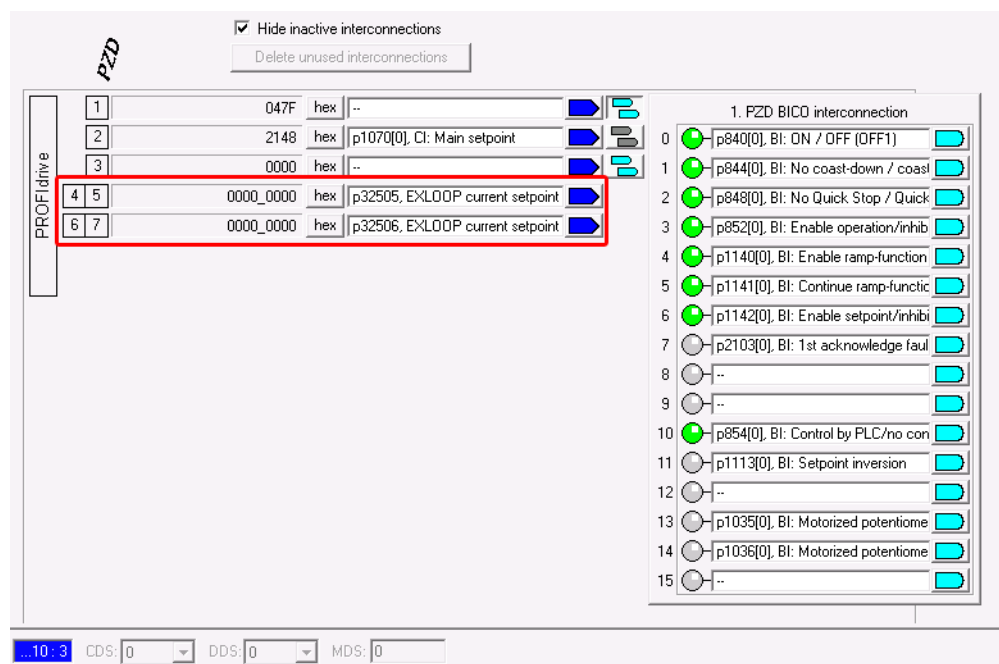


Fig. 4-1 Interconnect signal sources

Enable external setpoint specification

The following options are available to enable the EXLOOP Technology Extension:

- Enable via binector input p32501 = 1-signal; EXLOOP is then always active.
- Telegram extension at PZD 3: Interconnection from bit 0 to p32501.

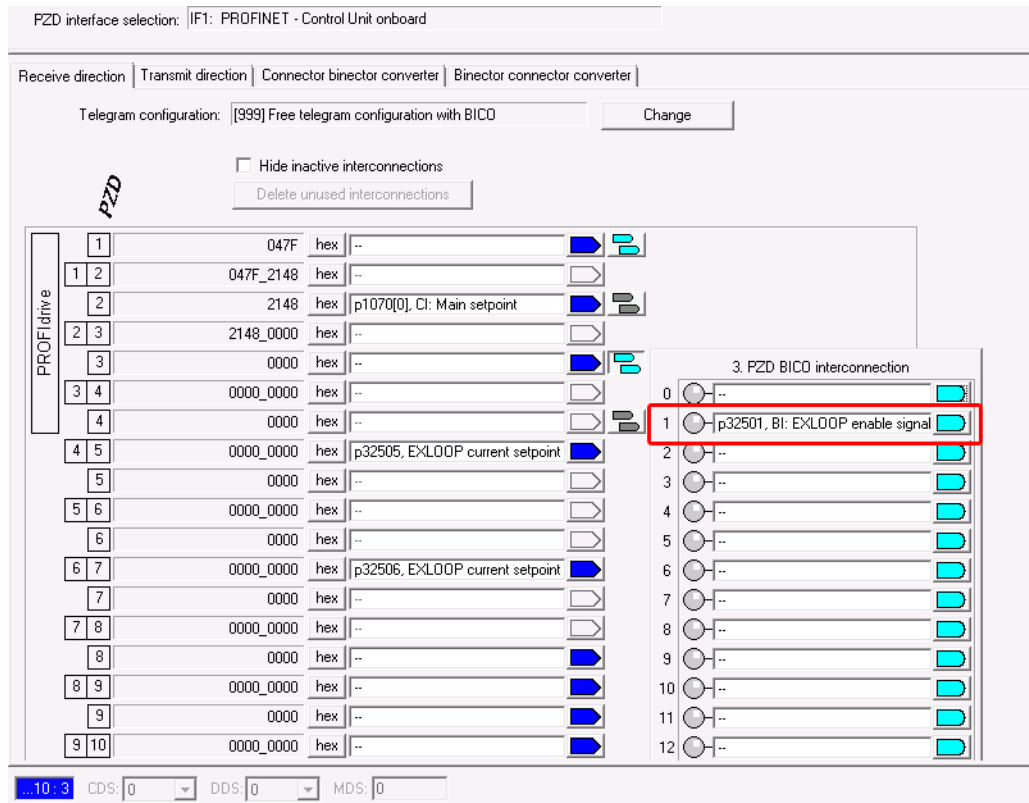


Fig. 4-2 Enable external setpoint specification via BI: p32501

Result

The EXLOOP Technology Extension supplies feedback signals via the following parameters:

Table 4-2

| Parameters | Feedback signal | Description |
|------------|-----------------|--|
| r32502.0 | 1 signal | EXLOOP Technology Extension is active |
| r32515 | Value | Display of the field-generating current setpoint (Id_set) |
| r32516 | Value | Display of the torque-generating current setpoint (Iq_set) |

4.4 Sampling times and number of controllable drives

The Technology Extension EXLOOP operates in the current controller sampling time p0115[0].

The Technology Extension EXLOOP requires additional computation (CPU) time. This can reduce the maximum number of drive objects that can be controlled.

Note:

Information on the system sampling times and the number of drives that can be controlled is provided in the following reference:

References: SINAMICS S120 Drive Functions Function Manual
Chapter "System control, sampling times and DRIVE-CLiQ wiring"

The remaining computation time (see r9976) can be used for EXLOOP and other options (e.g. DCC).

Examples of additional computation time utilization

The following table lists the values for the additional computation (CPU) time utilization with different sampling times (p0115[0]):

- For 1 drive object with activated Technology Extension EXLOOP.
- For 3 drive objects with activated Technology Extension EXLOOP.
- For 5 drive objects with activated Technology Extension EXLOOP.

Table 4-3 Additional computation time utilization for a SERVO drive object with EXLOOP

| PROFIdrive sampling time | Current controller sampling time | Additional computation time utilization (r9976[1]) | | |
|-----------------------------|--|---|--------------------------------|--------------------------------|
| | | 1 drive object with EXLOOP | 3 drive objects with EXLOOP | 5 drive objects with EXLOOP |
| p2048[0] or r2064[1] | p0115[0] | | | |
| 250 µs | 125 µs | approx. 4.0 % | approx. 12.0 % | approx. 20.0 % |
| 1 ms | 125 µs | approx. 3.4 % | approx. 10.2 % | approx. 17.0 % |

4.5 Licensing

A License Key is required for the Technology Extension EXLOOP:

You can generate the appropriate License Key using the WEB License Manager. To do this, you require the Certificate of License (CoL).

The article number (MLFB) for the Certificate of License (CoL) is as follows:

6SL3077-0AA02-6AB0

Note

Information and the procedure required for licensing is provided in the following reference:

References: SINAMICS S120 Drive Functions Function Manual
Chapter "Licensing"

4.6 SINAMICS Safety Integrated

The functions implemented with a Technology Extension are not part of the SINAMICS Safety Integrated Functions, nor do they influence the SINAMICS Safety Integrated Functions.

Note

Information on SINAMICS Safety Integrated is provided in the following reference:

References: SINAMICS S120 Safety Integrated Function Manual

Parameters

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5.1 Overview of parameters

Note

An overview of the parameters, especially the explanation of the parameter list, is contained in the product-specific List Manuals, for example:

References: SINAMICS S120/S150 List Manual
Chapter "Overview of parameters"

5.2 List of parameters

Note

This chapter only includes the parameters for the Technology Extension EXLOOP.

The product-dependent parameters available for SINAMICS should be taken from the online help for the particular control system or commissioning tool or, for example, from the following reference:

References: SINAMICS S120/S150 List Manual
Chapter "List of parameters"

Product: drvoa_exloop , Version: 1100600, Language: eng
Objects: SERVO

| Parameter | Value | Access level |
|---------------------|--|--|
| p32500 | EXLOOP mode / Mode | |
| SERVO | Can be changed: C1(3) Data type: Integer16 P-Group: Functions Not for motor type: - Min 0 Max 1 | Access level: 3 Func. diagram: 7412, 7413 Unit selection: - Expert list: 1 Factory setting 0 |
| Description: | Sets the mode for the EXLOOP Technology Extension. With the EXLOOP Technology Extension, external setpoints for the drive can be specified via BICO interconnection: - Field-generating current (Id) - Torque-generating current (Iq) - Transformation angle - Velocity actual value The internal setpoints of the servo control are overwritten. If the setpoints are specified in a slower sampling time than the current controller sampling time (p0115[0]), the setpoints are interpolated linearly. | |
| Value: | 0: Current setpoint specification with encoder evaluation by PLC 1: Current setpoint specification with encoder evaluation by drive | |
| Note: | EXLOOP: External Loop controller (external control loop) If value = 0: With this mode, field-generating current (Id), torque-generating current (Iq), transformation angle and velocity actual value are used by an external source. If value = 1: With this mode, field-generating current (Id) and torque-generating current (Iq) are used by an external source. The transformation angle is calculated internally. | |
| p32501 | BI: EXLOOP enable signal source / Enable s_src | |
| SERVO | Can be changed: T Data type: Unsigned32 / Binary P-Group: Functions Not for motor type: - Min - Max - | Access level: 3 Func. diagram: 7412, 7413 Unit selection: - Expert list: 1 Factory setting 0 |
| Description: | Sets the signal source to enable the external setpoints. p32501 = 0 signal: The internal servo control is active. External setpoints are not taken into account. p32501 = 1 signal: External setpoints control the drive. After the change from 1 to 0 the external setpoints are reset. | |

| | | | | |
|------------------------|--|-----------------------|----------------------------------|-----------------|
| r32502.0 | CO/BO: EXLOOP status / Status | | | |
| SERVO | Can be changed: - | Calculated: - | Access level: 3 | |
| | Data type: Unsigned16 | Dyn. index: - | Func. diagram: 7412 | |
| | P-Group: Displays, signals | Unit group: - | Unit selection: - | |
| | Not for motor type: - | Scaling: - | Expert list: 1 | |
| | Min | Max | Factory setting | |
| | - | - | - | |
| Description: | Display and BICO output for the status of the EXLOOP enable. | | | |
| Bit field: | Bit | Signal name | 1 signal | 0 signal |
| | 00 | EXLOOP active | Yes | No |
| Dependency: | Refer to: p32501 | | | |
| p32505 | CI: EXLOOP current setpoint field-generating signal source / Id_set s_src | | | |
| SERVO | Can be changed: T | Calculated: - | Access level: 3 | |
| | Data type: Unsigned32 / FloatingPoint32 | Dyn. index: - | Func. diagram: 7412, 7413 | |
| | P-Group: - | Unit group: - | Unit selection: - | |
| | Not for motor type: - | Scaling: p2002 | Expert list: 1 | |
| | Min | Max | Factory setting | |
| | - | - | 0 | |
| Description: | Sets the signal source for the field-generating current setpoint (Id_set). | | | |
| Recommendation: | Typically, the PZD "EXLOOP_ID_SET" is interconnected by the higher-level control. If p2002 = 100 A: the transmitted value 2000 0000 hex (50%) corresponds to 50 A. | | | |
| Dependency: | Refer to: r32515 | | | |
| p32506 | CI: EXLOOP current setpoint torque-generating signal source / Iq_set s_src | | | |
| SERVO | Can be changed: T | Calculated: - | Access level: 3 | |
| | Data type: Unsigned32 / FloatingPoint32 | Dyn. index: - | Func. diagram: 7412, 7413 | |
| | P-Group: - | Unit group: - | Unit selection: - | |
| | Not for motor type: - | Scaling: p2002 | Expert list: 1 | |
| | Min | Max | Factory setting | |
| | - | - | 0 | |
| Description: | Sets the signal source for the torque-generating current setpoint (Iq_set). | | | |
| Recommendation: | Typically, the PZD "EXLOOP_IQ_SET" is interconnected by the higher-level control. If p2002 = 100 A: the transmitted value 2000 0000 hex (50%) corresponds to 50 A. | | | |
| Dependency: | Refer to: r32516 | | | |
| p32507 | CI: EXLOOP transformation angle setpoint signal source / Ang setp s_src | | | |
| SERVO | Can be changed: T | Calculated: - | Access level: 3 | |
| | Data type: Unsigned32 / FloatingPoint32 | Dyn. index: - | Func. diagram: 7412, 7413 | |
| | P-Group: - | Unit group: - | Unit selection: - | |
| | Not for motor type: - | Scaling: p2005 | Expert list: 1 | |
| | Min | Max | Factory setting | |
| | - | - | 0 | |
| Description: | Sets the signal source for the angle setpoint of the transformation. | | | |
| Recommendation: | Typically, the PZD "EXLOOP_PHI" is interconnected by the higher-level control. If p2005 = 90°: the transmitted value 2000 0000 hex (50%) corresponds to 45°. | | | |
| Dependency: | Refer to: p32500, r32517 | | | |
| Note: | The angle is only used for the "current setpoint with encoder evaluation by PLC" mode (p32500 = 0). The reference values in the drive (p2005) and in the higher-level control have to be set identically. | | | |

| | | | |
|------------------------|---|-----------------------|----------------------------------|
| p32508 | CI: EXLOOP velocity actual value signal source / v_act s_src | | |
| SERVO | Can be changed: T | Calculated: - | Access level: 3 |
| | Data type: Unsigned32 / FloatingPoint32 | Dyn. index: - | Func. diagram: 7412, 7413 |
| | P-Group: - | Unit group: - | Unit selection: - |
| | Not for motor type: - | Scaling: p2000 | Expert list: 1 |
| | Min | Max | Factory setting |
| | - | - | 0 |
| Description: | Sets the signal source to display the velocity actual value. | | |
| Recommendation: | Typically, the PZD "EXLOOP_V_ACT" is interconnected by the higher-level control. If p2000 = 3000 rpm: the transmitted value 2000 0000 hex (50%) corresponds to 1500 rpm. | | |
| Dependency: | Refer to: p32500 | | |
| Note: | The velocity actual value is only used for the "current setpoint with encoder evaluation by PLC" mode (p32500 = 0). If the connector input is not interconnected in this mode, the speed actual value (r0063) is equal to 0. | | |
| r32515 | EXLOOP current setpoint field-generating display / Id_set disp | | |
| SERVO | Can be changed: - | Calculated: - | Access level: 3 |
| | Data type: FloatingPoint32 | Dyn. index: - | Func. diagram: 7412 |
| | P-Group: - | Unit group: - | Unit selection: - |
| | Not for motor type: - | Scaling: p2002 | Expert list: 1 |
| | Min | Max | Factory setting |
| | - [A] | - [A] | - [A] |
| Description: | Displays the field-generating current setpoint (Id_set). | | |
| Dependency: | Refer to: p32505 | | |
| r32516 | EXLOOP current setpoint torque-generating display / Iq_set disp | | |
| SERVO | Can be changed: - | Calculated: - | Access level: 3 |
| | Data type: FloatingPoint32 | Dyn. index: - | Func. diagram: 7412 |
| | P-Group: - | Unit group: - | Unit selection: - |
| | Not for motor type: - | Scaling: p2002 | Expert list: 1 |
| | Min | Max | Factory setting |
| | - [A] | - [A] | - [A] |
| Description: | Displays the torque-generating current setpoint (Iq_set). | | |
| Dependency: | Refer to: p32506 | | |
| r32517 | EXLOOP transformation angle setpoint display / Ang setp disp | | |
| SERVO | Can be changed: - | Calculated: - | Access level: 3 |
| | Data type: FloatingPoint32 | Dyn. index: - | Func. diagram: 7412 |
| | P-Group: - | Unit group: - | Unit selection: - |
| | Not for motor type: - | Scaling: p2005 | Expert list: 1 |
| | Min | Max | Factory setting |
| | - [°] | - [°] | - [°] |
| Description: | Displays the angle setpoint of the transformation. | | |
| Dependency: | Refer to: p32507 | | |

Function diagrams

Content

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Note

This chapter only includes the function diagram for the Technology Extension EXLOOP.

The product-dependent function diagrams available for SINAMICS are listed in the following reference:

References: SINAMICS S120/S150 List Manual
Chapter "Function diagrams"

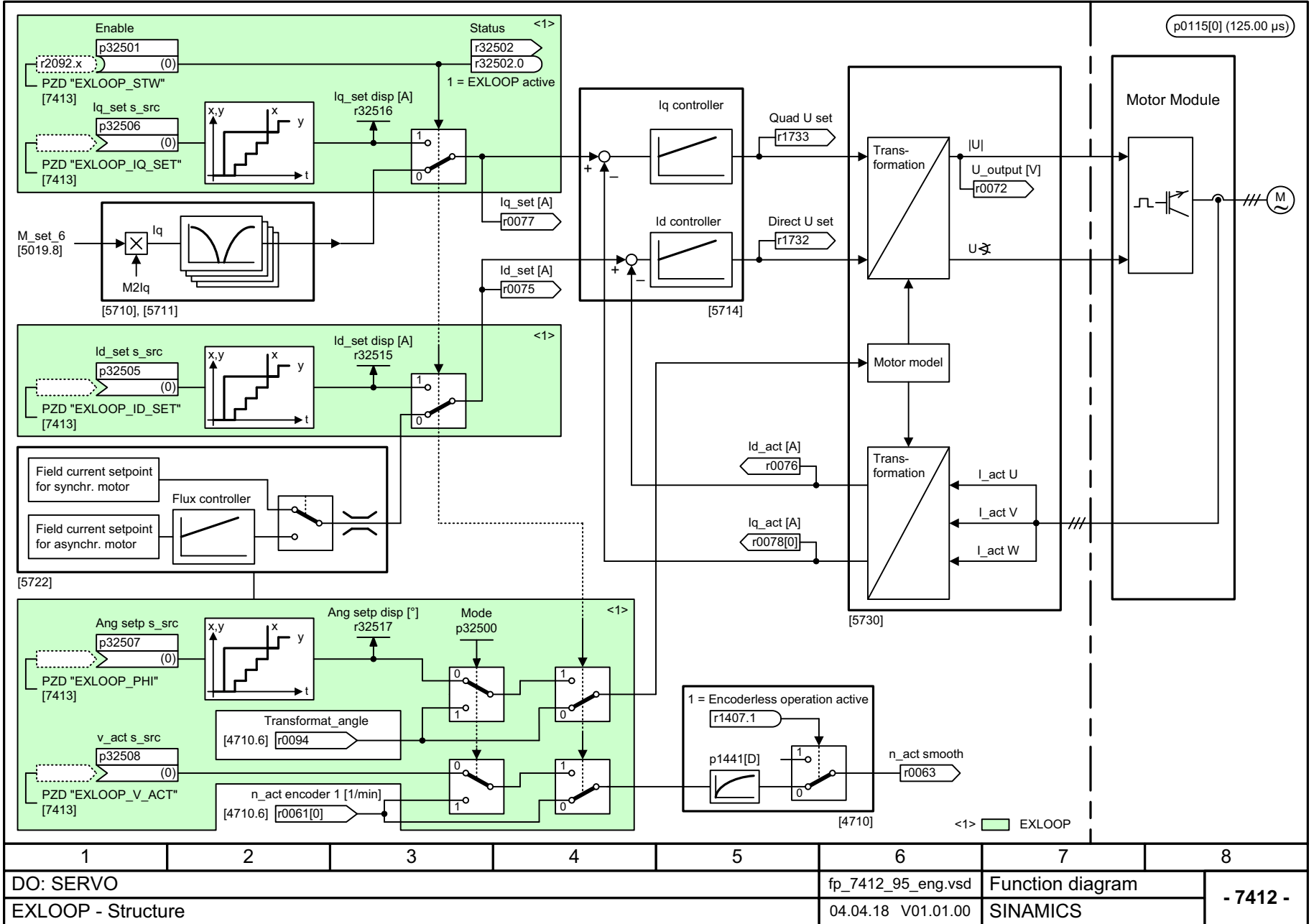
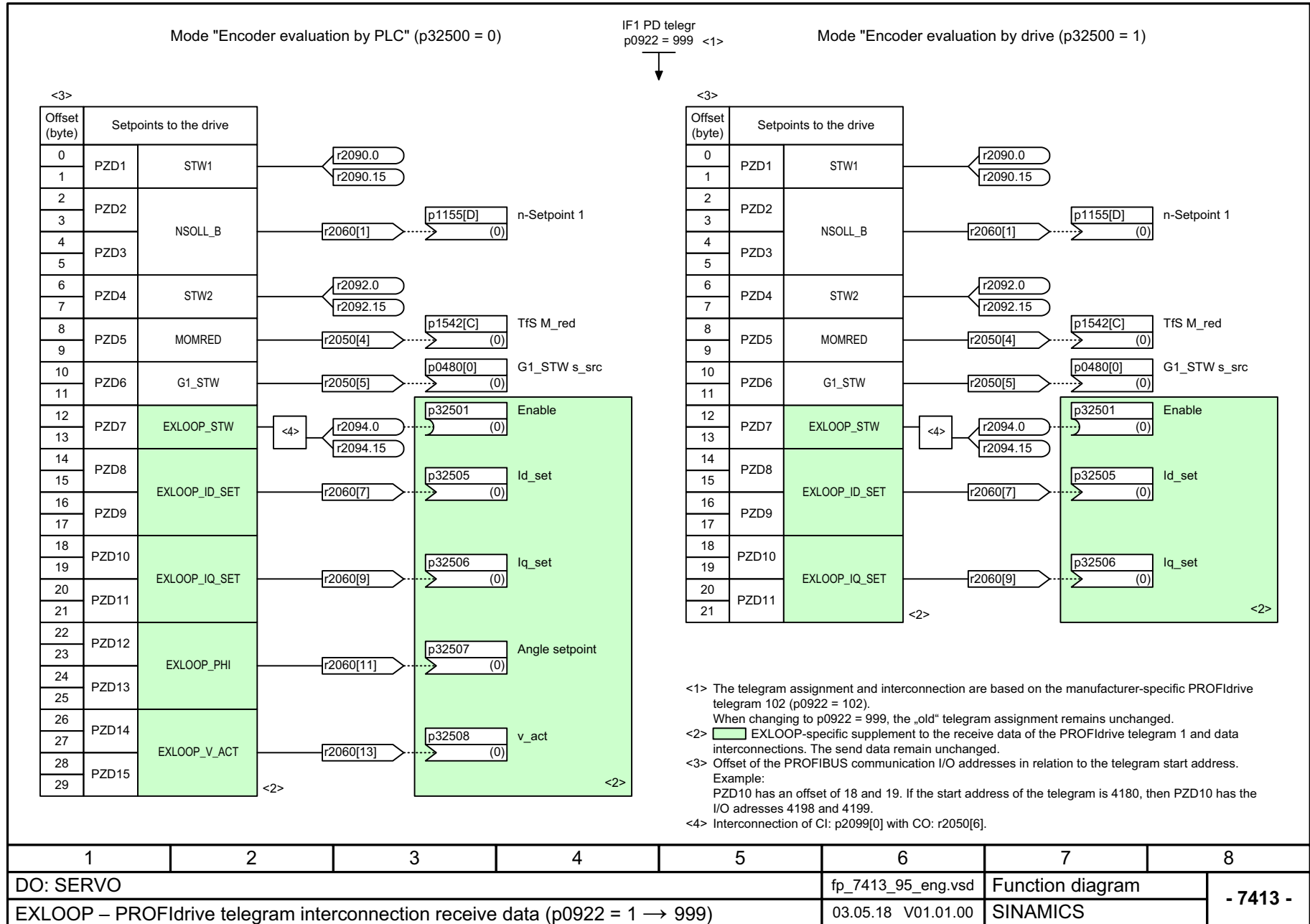


Fig. 6-1 7412 - Structure

| | | | | | | | |
|--------------------|---|---|---|---|--------------------|------------------|----------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| DO: SERVO | | | | | fp_7412_95_eng.vsd | Function diagram | |
| EXLOOP - Structure | | | | | 04.04.18 V01.01.00 | SINAMICS | |
| | | | | | | | - 7412 - |

Fig. 6-2 7413 – PROFIdrive telegram interconnection receive data (p0922 = 1 → 999)



Faults and alarms

Content

Technology Extension EXLOOP does not have its own faults and alarms (messages).

Note

Information on messages that are output (faults, alarms) should be taken from the online help for the particular control or commissioning tool or, for example, from the following reference:

References: SINAMICS S120/S150 List Manual
Chapter "List of faults and alarms"

Appendix

A

Content

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A.1 List of abbreviations

Note

The following list of abbreviations includes all abbreviations and their meanings used in the entire SINAMICS family of drives.

| Abbreviation | Source of abbreviation | Significance |
|--------------|---|--|
| A | | |
| A... | Alarm | Warning |
| AC | Alternating Current | Alternating current |
| ADC | Analog Digital Converter | Analog-Digital converter |
| AI | Analog Input | Analog input |
| AIM | Active Interface Module | Active Interface Module |
| ALM | Active Line Module | Active Line Module |
| AO | Analog Output | Analog output |
| AOP | Advanced Operator Panel | Advanced Operator Panel |
| APC | Advanced Positioning Control | Advanced Positioning Control |
| AR | Automatic Restart | Automatic restart |
| ASC | Armature Short Circuit | Armature short-circuit |
| ASCII | American Standard Code for Information Interchange | American coding standard for the exchange of information |
| AS-i | AS-Interface (Actuator Sensor Interface) | AS-Interface (open bus system in automation technology) |
| ASM | Asynchronmotor | Induction motor |
| AVS | Active Vibration Suppression | Active load vibration damping |
| B | | |
| BB | Betriebsbedingung | Operation condition |
| BERO | - | Contactless proximity switch |
| BI | Binector Input | Binector input |
| BIA | Berufsgenossenschaftliches Institut für Arbeitssicherheit | BG-Institute for Occupational Safety and Health |
| BICO | Binector Connector Technology | Binector connector technology |
| BLM | Basic Line Module | Basic Line Module |
| BO | Binector Output | Binector output |
| BOP | Basic Operator Panel | Basic operator panel |
| C | | |
| C | Capacitance | Capacitance |
| C... | - | Safety message |
| CAN | Controller Area Network | Serial bus system |
| CBC | Communication Board CAN | Communication Board CAN |
| CBE | Communication Board Ethernet | PROFINET communication module (Ethernet) |
| CD | Compact Disc | Compact disk |
| CDS | Command Data Set | Command data set |
| CF Card | CompactFlash Card | CompactFlash card |

| Abbreviation | Source of abbreviation | Significance |
|---------------------|--------------------------------------|--|
| CI | Connector Input | Connector input |
| CLC | Clearance Control | Clearance control |
| CNC | Computerized Numerical Control | Computer-supported numerical control |
| CO | Connector Output | Connector output |
| CO/BO | Connector Output / Binector Output | Connector Output / Binector Output |
| COB ID | CAN Object-Identification | CAN Object-Identification |
| CoL | Certificate of License | Certificate of License |
| COM | Common contact of a changeover relay | Center contact of a changeover contact |
| COMM | Commissioning | Startup |
| CP | Communication Processor | Communications processor |
| CPU | Central Processing Unit | Central processing unit |
| CRC | Cyclic Redundancy Check | Cyclic redundancy check |
| CSM | Control Supply Module | Control Supply Module |
| CU | Control Unit | Control Unit |
| CUA | Control Unit Adapter | Control Unit Adapter |
| CUD | Control Unit DC | Control Unit DC |
| D | | |
| DAC | Digital Analog Converter | Digital analog converter |
| DC | Direct Current | DC current |
| DCB | Drive Control Block | Drive Control Block |
| DCBRK | DC Brake | DC braking |
| DCC | Drive Control Chart | Drive Control Chart |
| DCN | Direct Current Negative | Direct current negative |
| DCP | Direct Current Positive | Direct current positive |
| DDC | Dynamic Drive Control | Dynamic Drive Control |
| DDS | Drive Data Set | Drive Data Set |
| DI | Digital Input | Digital input |
| DI/DO | Digital Input / Digital Output | Digital input/output, bidirectional |
| DMC | DRIVE-CLiQ Hub Module Cabinet | DRIVE-CLiQ Hub Module Cabinet |
| DME | DRIVE-CLiQ Hub Module External | DRIVE-CLiQ Hub Module External |
| DMM | Double Motor Module | Double Motor Module |
| DO | Digital Output | Digital output |
| DO | Drive Object | Drive object |
| DP | Decentralized Peripherals | Distributed I/O |
| DPRAM | Dual-Port Random Access Memory | Dual-Port Random Access Memory |
| DQ | DRIVE-CLiQ | DRIVE-CLiQ |
| DRAM | Dynamic Random Access Memory | Dynamic Random Access Memory |
| DRIVE-CLiQ | Drive Component Link with IQ | Drive Component Link with IQ |
| DSC | Dynamic Servo Control | Dynamic Servo Control |
| DSM | Double submodule | Double submodule |
| DTC | Digital Time Clock | Timer |

| Abbreviation | Source of abbreviation | Significance |
|--------------|---|---|
| E | | |
| EASC | External Armature Short-Circuit | External armature short-circuit |
| EDS | Encoder Data Set | Encoder data set |
| EEPROM | Electrically Erasable Programmable Read-Only Memory | Electrically Erasable Programmable Read-Only-Memory |
| EGB | Elektrostatisch gefährdete Baugruppen | Electrostatic sensitive devices |
| ELCB | Earth Leakage Circuit-Breaker | Residual current operated circuit breaker |
| ELP | Earth Leakage Protection | Ground-fault monitoring |
| EMC | Electromagnetic Compatibility | Electromagnetic compatibility |
| EMF | Electromotive Force | Electromotive force |
| EMK | Elektromotorische Kraft | Electromotive force |
| EMV | Elektromagnetische Verträglichkeit | Electromagnetic compatibility |
| EN | Europäische Norm | European Standard |
| EnDat | Encoder-Data-Interface | Encoder interface |
| EP | Enable Pulses | Pulse enable |
| EPOS | Einfachpositionierer | Basic positioner |
| ES | Engineering System | Engineering system |
| ESB | Ersatzschaltbild | Equivalent circuit diagram |
| ESD | Electrostatically Sensitive Devices | Electrostatic sensitive devices |
| ESM | Essential Service Mode | Essential service mode |
| ESR | Extended Stop and Retract | Extended stop and retract |
| F | | |
| F... | Fault | Fault |
| FAQ | Frequently Asked Questions | Frequently Asked Questions |
| FBLOCKS | Free Blocks | Free function blocks |
| FCC | Function control chart | Function control chart |
| FCC | Flux Current Control | Flux current control |
| FD | Function Diagram | Function diagram |
| F-DI | Fail-safe Digital Input | Failsafe digital input |
| F-DO | Fail-safe Digital Output | Fail-safe digital output |
| FEPRM | Flash-EPROM | Non-volatile write and read memory |
| FG | Function Generator | Function Generator |
| FI | - | Fault current |
| FOC | Fiber-Optic Cable | Fiber-optic cable |
| FP | Funktionsplan | Function diagram |
| FPGA | Field Programmable Gate Array | Field Programmable Gate Array |
| FW | Firmware | Firmware |
| G | | |
| GB | Gigabyte | Gigabyte |
| GC | Global Control | Global control telegram (broadcast telegram) |
| GND | Ground | Reference potential for all signal and operating voltages, usually defined as 0 V (also referred to as M) |

| Abbreviation | Source of abbreviation | Significance |
|---------------------|---|---|
| GSD | Gerätstammdatei | Generic Station Description: Describes the features of a PROFIBUS slave |
| GSV | Gate Supply Voltage | Gate supply voltage |
| GUID | Globally Unique Identifier | Globally Unique Identifier |
| H | | |
| HF | High Frequency | High frequency |
| HFD | Hochfrequenzdrossel | Radio frequency reactor |
| HLA | Hydraulic Linear Actuator | Hydraulic linear actuator |
| HLG | Hochlaufgeber | Ramp-function Generator |
| HM | Hydraulic Module | Hydraulic Module |
| HMI | Human Machine Interface | Human Machine Interface |
| HTL | High-Threshold Logic | Logic with high interference threshold |
| HW | Hardware | Hardware |
| I | | |
| i. V. | In Vorbereitung | Under development: This property is currently not available |
| I/O | Input/Output | Input/output |
| I2C | Inter-Integrated Circuit | Internal serial data bus |
| IASC | Internal Armature Short-Circuit | Internal armature short-circuit |
| IBN | Inbetriebnahme | Startup |
| ID | Identifier | Identification |
| IE | Industrial Ethernet | Industrial Ethernet |
| IEC | International Electrotechnical Commission | International Electrotechnical Commission |
| IF | Interface | Interface |
| IGBT | Insulated Gate Bipolar Transistor | Insulated gate bipolar transistor |
| IGCT | Integrated Gate-Controlled Thyristor | Semiconductor power switch with integrated control electrode |
| IL | Impulslöschung | Pulse suppression |
| IP | Internet Protocol | Internet protocol |
| IPO | Interpolator | Interpolator |
| IT | Isolé Terre | Non-grounded three-phase line supply |
| IVP | Internal Voltage Protection | Internal voltage protection |
| J | | |
| JOG | Jogging | Jogging |
| K | | |
| KDV | Kreuzweiser Datenvergleich | Data cross-check |
| KHP | Know-How Protection | Know-how protection |
| KIP | Kinetische Pufferung | Kinetic buffering |
| Kp | - | Proportional gain |
| KTY84 | - | Temperature sensor |
| L | | |
| L | - | Symbol for inductance |
| LED | Light Emitting Diode | Light emitting diode |

| Abbreviation | Source of abbreviation | Significance |
|---------------------|--|---|
| LIN | Linearmotor | Linear motor |
| LR | Lageregler | Position controller |
| LSB | Least Significant Bit | Least Significant Bit |
| LSC | Line-side converter | Line-side converter |
| LSS | Line-Side Switch | Line-side switch |
| LU | Length Unit | Length unit |
| LWL | Lichtwellenleiter | Fiber-optic cable |
| M | | |
| M | - | Symbol for torque |
| M | Masse | Reference potential for all signal and operating voltages, usually defined as 0 V (also referred to as GND) |
| MB | Megabyte | Megabyte |
| MCC | Motion Control Chart | Motion Control Chart |
| MDI | Manual Data Input | Manual data input |
| MDS | Motor Data Set | Motor data set |
| MLFB | Maschinenlesbare Fabrikatebezeichnung | Machine-readable product code |
| MM | Motor Module | Motor Module |
| MMC | Man-Machine Communication | Man-machine communication |
| MMC | Micro Memory Card | Micro memory card |
| MSB | Most Significant Bit | Most significant bit |
| MSC | Motor Side Converter | Motor-side converter |
| MSCY_C1 | Master Slave Cycle Class 1 | Cyclic communication between master (class 1) and slave |
| MSC | Motorstromrichter | Motor-side converter |
| MT | Messtaster | Probe |
| N | | |
| N. C. | Not Connected | Not connected |
| N... | No Report | No report or internal message |
| NAMUR | Normenarbeitsgemeinschaft für Mess- und Regeltechnik in der chemischen Industrie | Standardization association for measurement and control in chemical industries |
| NC | Normally Closed (contact) | NC contacts |
| NC | Numerical Control | Numerical control |
| NEMA | National Electrical Manufacturers Association | Standardization association in USA (United States of America) |
| NM | Nullmarke | Zero mark |
| NO | Normally Open (contact) | NO contacts |
| NSR | Netzstromrichter | Line-side converter |
| NTP | Network Time Protocol | Standard for synchronization of the time of day |
| NVRAM | Non-Volatile Random Access Memory | Non-volatile read/write memory |

| Abbreviation | Source of abbreviation | Significance |
|---------------------|---|--|
| O | | |
| OA | Open Architecture | Software component which provides additional functions for the SINAMICS drive system |
| OAIF | Open Architecture Interface | Version of the SINAMICS firmware as of which the OA-application can be used |
| OASP | Open Architecture Support Package | Expands the STARTER commissioning tool by the corresponding OA-application |
| OC | Operating Condition | Operation condition |
| OEM | Original Equipment Manufacturer | Original equipment manufacturer |
| OLP | Optical Link Plug | Bus connector for fiber-optic cable |
| OMI | Option Module Interface | Option Module Interface |
| P | | |
| p... | - | Adjustable parameters |
| P1 | Processor 1 | CPU 1 |
| P2 | Processor 2 | CPU 2 |
| PB | PROFIBUS | PROFIBUS |
| PcCtrl | PC Control | Master control |
| PD | PROFIdrive | PROFIdrive |
| PDC | Precision Drive Control | Precision Drive Control |
| PDS | Power Unit Data Set | Power unit data set |
| PE | Protective Earth | Protective ground |
| PELV | Protective Extra-Low Voltage | Safety extra-low voltage |
| PFH | Probability of dangerous failure per hour | Probability of dangerous failure per hour |
| PG | Programmiergerät | Programming device |
| PI | Proportional integral | Proportional integral |
| PID | Proportional integral differential | Proportional integral differential |
| PLC | Programmable Logic Controller | Programmable logic controller |
| PLL | Phase-locked loop | Phase-locked loop |
| PM | Power Module | Power Module |
| PMSM | Permanent-Magnet Synchronous Motor | Permanent-magnet synchronous motor |
| PN | PROFINET | PROFINET |
| PNO | PROFIBUS Nutzerorganisation | PROFIBUS user organization |
| PPI | Point-to-Point Interface | Point-to-point interface |
| PRBS | Pseudo Random Binary Signal | White noise |
| PROFIBUS | Process Field Bus | Serial data bus |
| PS | Power Supply | Power supply |
| PSA | Power Stack Adapter | Power Stack Adapter |
| PT1000 | - | Temperature sensor |
| PTC | Positive Temperature Coefficient | Positive temperature coefficient |
| PTP | Point-To-Point | Point-to-point |
| PWM | Pulse Width Modulation | Pulse width modulation |
| PZD | Prozessdaten | Process data |

| Abbreviation | Source of abbreviation | Significance |
|--------------|--------------------------------------|---|
| Q | | |
| R | | |
| r... | - | Display parameters (read only) |
| RAM | Random Access Memory | Speicher zum Lesen und Schreiben |
| RCCB | Residual Current Circuit Breaker | Residual current operated circuit breaker |
| RCD | Residual Current Device | Residual current operated circuit breaker |
| RCM | Residual Current Monitor | Residual current monitor |
| REL | Reluctance motor textile | Reluctance motor textile |
| RESM | Reluctance Synchronous Motor | Synchronous reluctance motor |
| RFG | Ramp-Function Generator | Ramp-function Generator |
| RJ45 | Registered Jack 45 | Term for an 8-pin socket system for data transmission with shielded or non-shielded multi-wire copper cables |
| RKA | Rückkühlanlage | Cooling unit |
| RLM | Renewable Line Module | Renewable Line Module |
| RO | Read Only | Read only |
| ROM | Read-Only Memory | Read-only memory |
| RPDO | Receive Process Data Object | Receive Process Data Object |
| RS232 | Recommended Standard 232 | Interface standard for a cable-connected serial data transmission between a sender and receiver (also known as EIA232) |
| RS485 | Recommended Standard 485 | Interface standard for a cable-connected differential, parallel, and/or serial bus system (data transmission between a number of senders and receivers, also known as EIA485) |
| RTC | Real-Time Clock | Real-time clock |
| RZA | Raumzeigerapproximation | Space-vector approximation |
| S | | |
| S1 | - | Continuous operation |
| S3 | - | Intermittent duty |
| SAM | Safe Acceleration Monitor | Safe acceleration monitoring |
| SBC | Safe Brake Control | Safe brake control |
| SBH | Sicherer Betriebshalt | Safe operating stop |
| SBR | Safe Brake Ramp | Safe brake ramp monitoring |
| SBT | Safe Brake Test | Safe brake test |
| SCA | Safe Cam | Safe cam |
| SCC | Safety Control Channel | Safety Control Channel |
| SD Card | SecureDigital Card | Secure digital memory card |
| SDC | Standard Drive Control | Standard Drive Control |
| SDI | Safe Direction | Safe motion direction |
| SE | Sicherer Software-Endschalter | Safe software limit switch |
| SESM | Separately Excited Synchronous Motor | Separately excited synchronous motor |
| SG | Sicher reduzierte Geschwindigkeit | Safely-limited speed |
| SGA | Sicherheitsgerichteter Ausgang | Safety-related output |

| Abbreviation | Source of abbreviation | Significance |
|---------------------|-----------------------------------|---|
| SGE | Sicherheitsgerichteter Eingang | Safety-related input |
| SH | Sicherer Halt | Safe stop |
| SI | Safety Integrated | Safety Integrated |
| SIC | Safety Info Channel | Safety Info Channel |
| SIL | Safety Integrity Level | Safety Integrity Level |
| SITOP | - | Siemens power supply system |
| SLM | Smart Line Module | Smart Line Module |
| SLP | Safely Limited Position | Safely Limited Position |
| SLS | Safely-Limited Speed | Safely-limited speed |
| SLVC | Sensorless Vector Control | Sensorless vector control |
| SM | Sensor Module | Sensor Module |
| SMC | Sensor Module Cabinet | Sensor Module Cabinet |
| SME | Sensor Module External | Sensor Module External |
| SMI | SINAMICS Sensor Module Integrated | SINAMICS Sensor Module Integrated |
| SMM | Single Motor Module | Single Motor Module |
| SN | Sicherer Software-Nocken | Safe software cam |
| SOS | Safe Operating Stop | Safe operating stop |
| SP | Service Pack | Service pack |
| SP | Safe Position | Safe position |
| SPC | Setpoint Channel | Setpoint channel |
| SPI | Serial Peripheral Interface | Serial peripheral interface |
| SPS | Speicherprogrammierbare Steuerung | Programmable logic controller |
| SS1 | Safe Stop 1 | Safe Stop 1 (monitored for time and ramp) |
| SS1E | Safe Stop 1 External | Safe Stop 1 with external stop |
| SS2 | Safe Stop 2 | Safe Stop 2 |
| SS2E | Safe Stop 2 External | Safe Stop 2 with external stop |
| SSI | Synchronous Serial Interface | Synchronous serial interface |
| SSL | Secure Sockets Layer | Encryption protocol for secure data transfer (new TLS) |
| SSM | Safe Speed Monitor | Safe feedback from speed monitor |
| SSP | SINAMICS support package | SINAMICS support package |
| STO | Safe Torque Off | Safe torque off |
| STW | Steuerwort | Control word |
| T | | |
| TB | Terminal Board | Terminal Board |
| TEC | Technology Extension | Software component which is installed as an additional technology package and which expands the functionality of SINAMICS (previously OA-application) |
| TIA | Totally Integrated Automation | Totally Integrated Automation |
| TLS | Transport Layer Security | Encryption protocol for secure data transfer (previously SSL) |
| TM | Terminal Module | Terminal Module |

| Abbreviation | Source of abbreviation | Significance |
|---------------------|-------------------------------------|---|
| TN | Terre Neutre | Grounded three-phase line supply |
| Tn | - | Integral time |
| TPDO | Transmit Process Data Object | Transmit Process Data Object |
| TSN | Time-Sensitive Networking | Time-Sensitive Networking |
| TT | Terre Terre | Grounded three-phase line supply |
| TTL | Transistor-Transistor Logic | Transistor-Transistor-Logik |
| Tv | - | Rate time |
| U | | |
| UL | Underwriters Laboratories Inc. | Underwriters Laboratories Inc. |
| UPS | Uninterruptible Power Supply | Uninterruptible power supply |
| USV | Unterbrechungsfreie Stromversorgung | Uninterruptible power supply |
| UTC | Universal Time Coordinated | Universal time coordinated |
| V | | |
| VC | Vector Control | Vector control |
| Vdc | - | DC-link voltage |
| VdcN | - | Partial DC-link voltage negative |
| VdcP | - | Partial DC-link voltage positive |
| VDE | Verband Deutscher Elektrotechniker | Verband Deutscher Elektrotechniker [Association of German Electrical Engineers] |
| VDI | Verein Deutscher Ingenieure | Verein Deutscher Ingenieure [Association of German Engineers] |
| VPM | Voltage Protection Module | Voltage Protection Module |
| Vpp | Volt peak to peak | Volt peak to peak |
| VSM | Voltage Sensing Module | Voltage Sensing Module |
| W | | |
| WEA | Wiedereinschaltautomatik | Automatic restart |
| WZM | Werkzeugmaschine | Machine tool |
| X | | |
| XML | Extensible Markup Language | Extensible markup language (standard language for Web publishing and document management) |
| Y | | |
| Z | | |
| ZK | Zwischenkreis | DC link |
| ZM | Zero Mark | Zero mark |
| ZSW | Zustandswort | Status Word |

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- See also Technology Extension (TEC)

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More information

Siemens:

www.siemens.com

Industry Online Support (Service and Support):

www.siemens.com/online-support

Industry Mall

www.siemens.com/industrymall

Siemens AG

Digital Industries

Motion Control

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